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Volume I

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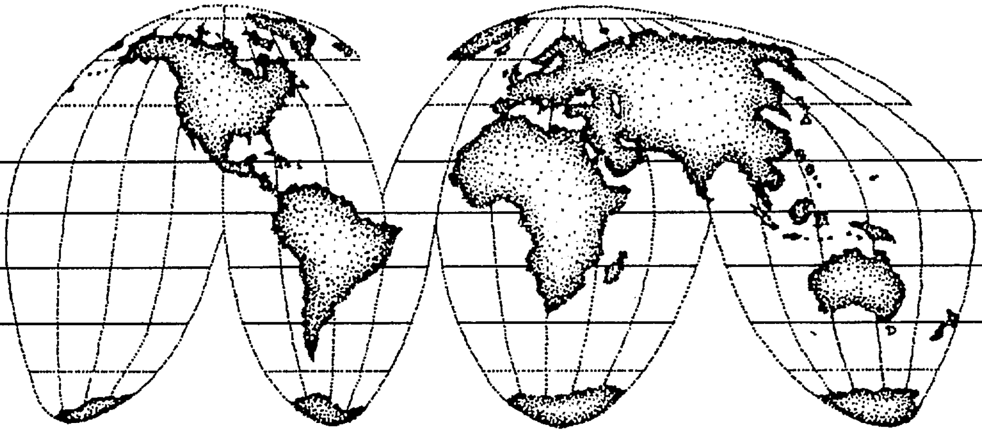

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PREFACE

On August 6-9, 1984, the International Collaborative Effort (ICE) on Perinatal and Infant Mortality of the National Center for Health Statistics (NCHS) convened an International Symposium for the purpose of coordinating research activities of NCHS with parallel activities in selected industrialized countries. The results of these activities are expected to provide guidance for Public Health Service programs and activities designed to improve infant health and reduce the disparities that currently exist between racial, ethnic and socioeconomic groups in the United States.

The ICE Planning Group is comprised of members from the National Center for Health Statistics, the Center for Environmental Health of the Centers for Disease Control, the Division of Maternal and Child Health of the Health Resources and Services Administration, the National Institute of Child Health and Human Development of the National Institutes of Health and the Association of Vital Records and Health Statistics. This group also includes two eminent researchers from each of six countries: the Federal Republic of Germany, Great Britain, Israel, Japan, Norway and Sweden. The participants of the Symposium included as well epidemiologists, physicians, researchers, health statisticians and health planners experienced in the areas of perinatal and infant health and mortality conditions.

The Symposium devoted the first 2 days to presentations describing recent trends and levels, health care systems, and current research and developments related to perinatal and infant mortality in each country represented. On the third day, the participants divided into 4 working groups on:

- Risk factors affecting pregnancy outcome
- Clinical interventions related to fetal health
- Clinical interventions related to infant health
- Community interventions

Reports were prepared and presented on the fourth and final day. Recommendations for research activities of mutual concern were made.

By publishing these Proceedings, it is hoped that the communication and collaboration will continue far beyond this Symposium.

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Acknowledgement must also be given to the substantial contributions made by the authors of the papers reprinted here.

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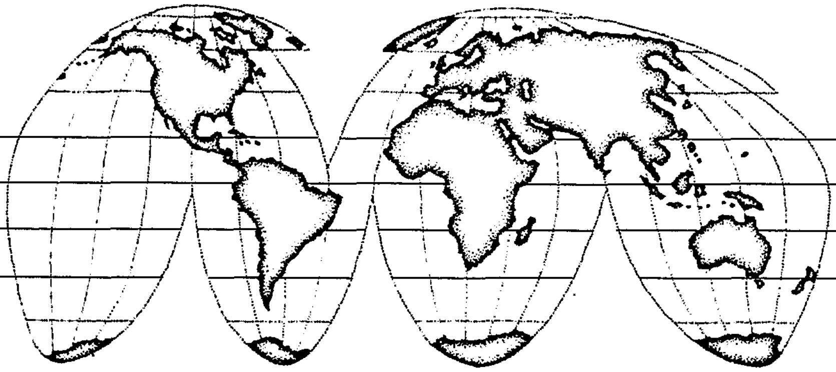


Chapter I: Opening Remarks

Welcome Address

by Edward N. Brandt, Jr., M.D.

It is my pleasure to extend to you all a sincere welcome to this symposium. I hope your visit with us will be as useful and as illuminating for you as we anticipate it will be for us. We are both pleased and honored to be your hosts.

I know I speak not only for your colleagues in science here in the United States but, to a great extent, I think I am also expressing the wishes of the great multitude of Americans who are concerned about improving the chances for every mother to have a safe and easy pregnancy and to deliver a healthy baby.

We are at a very interesting--and frustrating--point. Over the past 20 years or so, our country has made great strides in reducing the infant mortality rate. In 1965, for example, that rate was 24.7 infant deaths per 1,000 live births. The most recent provisional rate for last year is 10.9.

It is our national goal to achieve an infant mortality rate of 9 by the year 1990. And I believe that will be achieved, since the decline in the rate has been both steep and steady.

But to be candid about it, we have arrived at that point where we must say, "our understanding is limited...our science does not yet grasp all the complex questions that surround infant mortality...therefore, if we achieve the low rate of 9, it may well be the result of forces we do not understand."

I think you would agree that no civilized society can turn away from such a possibility; it is encumbent upon us, then, to take whatever steps we need to take to push forward the horizons of our knowledge...to gain the necessary understanding...to do what we can to insure that the curve continues to go down, for that means that lives are saved. And ultimately, "life-saving" is what our work is all about.

But let me hasten to add that we do not feel that the United States is in any way "unique" in feeling sense of mission. The societies that each of you represent--plus many others around the world--are also responding to the call for more progress...more achievement...in the field of maternal and infant health. I think we all share the commitment to improve the health of mothers and their babies. In fact, without our underlying sense of kinship, it would be impossible to hold such a meeting as this.

But here in the United States we now find ourselves at a point where the questions are becoming more complex. Which is another way of saying that we are entering an area that holds more questions than we have answers. Therefore, we are duty-bound to seek new answers...to carry on our own new research investigations...and to benefit wherever possible from the studies and experiences of other industrialized societies.

Ultimately, of course, we want to translate the research results into new methods of medical practice for improving the health of mothers and infants. We know that this can be done and that it can reduce mortality and morbidity among the newborn. We are especially proud, for example, of our record in infant screening.

This was a major research effort of the late 1950s and early 1960s, when the methodology was developed for screening newborn infants for phenylketonuria, or P.K.U. During the 1970s we added a screening methodology for detecting congenital hypothyroidism. And we have moved ahead to develop further screening methodologies to detect other inborn errors of metabolism, such as maple syrup urine disease, galactosemia, and histidenemia.

The screening methodologies have stood the tests of our best research teams. Today, screening for P.K.U. is conducted in all 50 States and in Washington, D.C. It has become part of the basic armamentarium of the health care system. As a result, many hundreds of infants each year are identified, treated, and saved from a life of severe mental retardation.

Since congenital hypothyroidism is about three times more prevalent than P.K.U., we hope that the screening for this condition will soon be as widespread as P.K.U. screening is.

There are other examples of research being integrated into current daily medical practice...but there aren't as many examples as we need, nor do the ones we have relate very directly to some of the chronic problems of infant morbidity and mortality in our society:

- For example, we need more information about the most important indicator of problems in maternal and child health, and that is the prevalence of low birth weight babies.
- We need to know more about ways to maintain the momentum we have in reducing neonatal mortality and improve our performance in reducing perinatal mortality.
- And we need to know more about ways to reduce and eventually eliminate the disparity between the health status of white mothers and babies and that of minority mothers and their children.

We are aware, of course, that some of these problems are rooted in socioeconomic status. But not everything can be explained away quite that easily. We suspect that there are other factors involved, too--cultural, genetic, biomedical, and biobehavioral--and we need to learn more about them.

It is our hope that a number of you here this week can assist us in moving toward a time when we will in fact discover those good answers...a time when we can assure the women of the United States that childbearing in this society is a universally stress-free, trouble-free experience that culminates in the appearance of a well-developed, healthy infant.

These are four very important days for us. Let me once again thank you for joining us...for coming armed with information and experience to be shared with us and with all your colleagues assembled here...and for helping us to rededicate ourselves to improving the chances for the birth of healthy babies.

Thank you.

Charge to Participants

by Manning Feinleib, M.D., Dr.P.H.

The purpose of this International Collaborative Effort (ICE) on Perinatal and Infant Mortality is to encourage the development, planning, and carrying out of coordinated research activities on topics of mutual interest to each of the participating countries. This ICE, as we call it, is led by a planning group consisting of researchers from the National Center for Health Statistics, from the Center for Environmental Health of the Centers for Disease Control, from the Division of Maternal and Child Health of the Health Resources and Services Administration, from the National Institute of Child Health and Human Development of NIH, and of two researchers from each of the following countries: Federal Republic of Germany, England and Wales, Scotland, Israel, Japan, Norway, and Sweden. If we are successful in our efforts in this international collaboration, it is expected that scientists from each country will develop and follow research designs which are developed mutually by the ICE Planning Group and which will be of national benefit and, at the same time, provide information that will permit comparative analysis of results among the several countries involved.

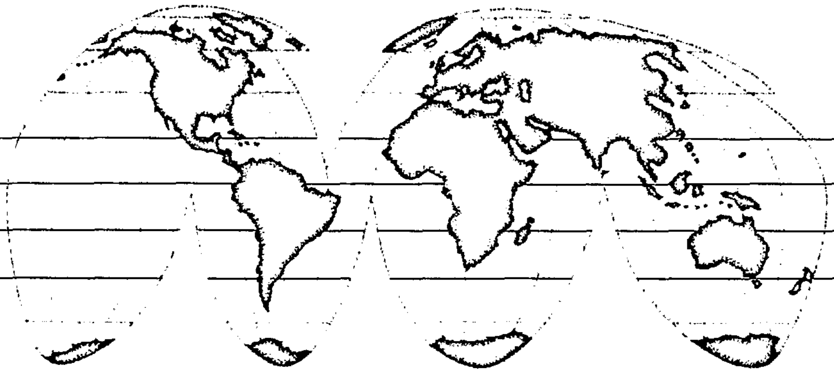
We expect that the comparative analyses will provide results not obtainable by research in any single country. The results from both the individual countries and from the comparative analyses should provide direction to programs and policies intended to reduce perinatal and infant mortality and improve infant health in each of the countries involved and perhaps for other countries with similar problems.

More specifically, the purposes of the Symposium during this week are fourfold. First, it will be important during the Symposium to familiarize the Planning Group with the conditions and activities in each of the countries that we will hear from. Second, through the working groups which will be meeting this week we will select topics of mutual concern appropriate for cross-national investigation. Third, the Planning Group will identify, insofar as possible, the resources such as data bases, ongoing and proposed studies, that the Planning Group can draw upon for its recommendations. And fourth, it will look particularly for topics that can be studied without extensive new resources or development of new data bases. Once the proposals from this collaborative effort from this Symposium are finalized, the ICE will move to the coordination phase and the ICE Planning Group will take the steps necessary to obtain the authorizations, personnel, and funding resources required to implement the proposals. Once research activities are underway, the Planning Group will provide coordination in the form of interchange of information and preliminary findings and make arrangements to provide for technical consultation and assistance and, if necessary, will hold periodic meetings as the resources permit.

The final, or comparative, phase of this endeavor will commence when the incountry research activities are completed and appropriate reports are prepared. The Group will have the responsibility for the preparation of comparative analyses and will prepare the final reports which will contain summaries of each of the countries' reports as well as recommendations that may be more widely applicable.

I think with the efforts that we are starting this morning and which will continue during the week, and the followup activities involving the actual research, analyses, and dissemination of the information, we will go far towards elucidating the reasons for the current levels of infant mortality in the various countries and for the differentials between and within countries and, hopefully, improve the situation so that infant mortality can be reduced in each country, and, as Dr. Brandt said, each mother can be assured to the fullest extent possible of being able to bear and raise healthy children.

Thank you very much.



Chapter II: Recent Trends

Why Are Stillbirth and Neonatal Mortality Rates Continuing to Fall?

by Eva Alberman, M.D.

As in other parts of the developed world stillbirth and early neonatal mortality rates in England and Wales are falling rapidly and consistently, so that over the past years the perinatal mortality rate has been decreasing at the rate of about 1 per thousand births a year. Although there has been some evidence for a shift to a later time of death for some infants, infant and childhood mortality rates are also still falling so that there is a continuing overall improvement in survival.

It is as important to understand the reasons for falls in such rates, as for their increase. Improvements in the collection and presentation of national vital statistics now allow analyses which will help to distinguish effects of the primary prevention of the causes of such deaths, from the secondary preventive measures which improved medical care can offer. Currently available statistics are fully described in the recent publication "Birth Counts" by MacFarlane and Mugford, 1984.

The following account is an attempt to demonstrate possible uses of recently available birth weight-cause specific early mortality rates to begin to answer these questions.

Methods

The data to be described have been obtained from Office of Population Censuses and Surveys Monitors Series DH3 (81/4; 82/2; 83/3; 84/1,3) and the annual reports on Mortality Statistics--Childhood and Maternity Series DH3 (1 to 11).

Problems arising in the use of these data are fully described in the relevant reports. Chief amongst them are the change from the use of the Eighth Revision of ICD to the Ninth Revision in 1979. This affected both coding practices and the grouping of birth weight which changed from being: 1,000 grams or less, 1,001-1,500 grams, etc. to less than 1,000 grams, 1,000-1,499 grams, etc.

Individual birth weights for live births were first added to the available national statistics in 1975, when local health authorities were asked to make available to Registrars of Births and Deaths the notified birth weight of each registered birth. The completeness with which this was done has increased from about 67 percent - in 1978 to virtually 100 percent in 1982 and later, so that the data on which the present report is based is still largely estimated rather than complete. This would not affect the principles on which the analyses are based, the validity of which will increase as data collection improves. Statistics relating to incidence of birth weight of 5 1/2 lbs (2,500 grams) or less by health authority, and mortality rates of such babies have been available since 1952. However for all stillbirths, birth weight data have been collected and published since 1961 although the data have been incomplete and the grouping of birth weight variable.

Results

The most important indicator of high and low reproductive mortality risks is birth weight, so much so that even very small changes in distribution can affect the overall level of risk. This holds true whether stillbirth or neonatal mortality risks are considered, although the relationships between birth weight and stillbirth rates differ from those between birth weight and neonatal mortality rates.

Table 1 shows the estimated percent distribution of birth weight in live births from 1979 to 1982. Even in these few years there have been some interesting trends, suggesting that there may be small increases occurring in both the lowest and highest weight groups, with a corresponding fall in the proportion weighing between 2,500 and 3,499 grams. These trends will need to be followed for future years before drawing any firm conclusions. When data for more years are available it will also be interesting to see to what extent demographic changes are related to this pattern, and whether it is in part caused by a shift from still to live births.

Birth weight specific mortality - 1979 to 1981

Table 2 shows estimated birth weight specific mortality rates for 1979 to 1981 for stillbirths per 1,000 total births, and for neonatal (first month) deaths per 1,000 total live births. The extremely high risk of low birth weight births particularly of neonatal death, but also of stillbirth is clearly shown, as is the slightly raised risk of the largest babies. The small increase previously shown in the proportion of live births below 1,500 grams is however compensated for by the sharp fall in their mortality risk even over these 3 years. In contrast the small increase in proportion of live-born babies weighing 4,000 grams or more is not accompanied by any systematic decrease in weight specific neonatal mortality rate.

In terms of impact on overall rates the most important changes are in the small group where the mortality is highest, for babies under 2,000 grams consistently account for more than half the stillbirths and neonatal deaths, and those weighing between 2,000 and 2,999 grams for more than another quarter as is illustrated in table 3. In this table the relative contribution made by each of the weight groups can be seen, because each rate is calculated out of total births of all weights, and this allows for the effect of changes both in proportion of risk group and birth weight-specific mortality.

Contribution of deaths with lethal malformations

In the past a serious constraint on the interpretation of birth weight-specific neonatal mortality has been an inability to distinguish between deaths caused by lethal malformation, where medical care can only be palliative rather than curative, and those of normally formed infants.

For stillbirths it has been possible to go back some years, using a birth weight grouping fairly close to that in current use, to look at trends in rates in those in whom cause of death was certified as being due to a congenital anomaly.

Table 4 shows for the years 1975 to 1979 stillbirth rates by birth weight, distinguishing between those certified as caused by a congenital anomaly and the remainder. These data suggest that as far as stillbirths are concerned the most marked falls in each weight group have been those due to congenital anomalies, although the stillbirth rates due to other causes have also fallen. Since we do not have complete birth ascertainment of all malformations it is impossible to say to what extent the fall has been due to the primary prevention (or abortion) of affected fetuses, and to what extent medical care has kept alive affected births who would formerly have died. There has been a sharp fall in ascertained neural tube defects of all weights (which are thought to be well reported) (table 5) suggesting that primary prevention and abortion of affected fetuses has played some part in this fall. However the decrease in perinatal deaths certified as due to congenital anomalies of the central nervous system has been even sharper than the fall in number of babies ascertained as having these anomalies.

Unfortunately we did not have birth weight-cause specific data for neonatal deaths until 1978, and it is not possible to look at such trends until 1979 because of the change in the ICD grouping of birth weight. However, table 6 gives such data as are available based on estimated rates. This suggests that in the case of neonatal deaths the situation may be quite different, with much sharper falls in neonatal mortality in babies without than with anomalies, particularly in the lowest weight groups. These data also point to a failure of mortality rates to decrease in the babies of 4,000 grams or more, with or without malformations.

Discussion

These preliminary analyses of newly available birth data confirm the complexity of reasons for the continuing fall in stillbirth neonatal mortality rates.

As far as distribution of birth weight is concerned the small changes which have occurred are tending both to increase the groups at highest risk and to increase the birth weight groups at low risk. For the low birth weight group the effect of the continuing sharp fall in birth weight-specific mortality rate outweighs by far the small increase in incidence, so that the absolute contribution to early deaths of this group is falling. It seems then that overall the preventive effect in respect to low birth weight is due to secondary prevention, probably to improvements in medical care, rather than primary prevention.

In contrast, there has been a marked fall in the contribution of stillbirths certified as due to congenital anomalies, and evidence has been presented to show that in part at least this is due to a fall in the numbers of births with neural tube defects. Much, but not all of this fall is due to termination of affected pregnancies, but primary prevention of a nature we do not yet fully understand, must also be playing a role.

There has also been a fall, albeit on a smaller scale, of birth weight-specific stillbirth rates certified as due to other causes, particularly in the weight group of 3,001 grams or more, where the rate has fallen by 25 percent between 1975 and 1978 (table 4).

In the neonatal deaths, particularly of under 2,000 grams, there has been a marked fall in the contribution to all perinatal deaths of deaths not certified as due to congenital anomalies, 25.6 percent between 1979 and 1981 alone (table 6). This is in contrast to the 7.9 percent fall over the same period of neonatal deaths due to congenital anomalies. However the size of the fall in the rates of neonatal death due to other causes decreases as birth weight increases, possibly partly because of the increase in the absolute number of such births.

In summary, these newly available data enable us to identify more closely the areas in which primary and secondary prevention action succeeding, and also those in which we seem to be failing to achieve any improvement. The latter is particularly true of the babies of 4,000 grams or more, which are now approaching 10 percent of all live births. Although these are a comparatively low risk group, in 1981 their neonatal mortality was 2.1 per thousand live births, it was over 30 percent higher than that in births weighing 3,500-3,999 grams; and their stillbirth rate was 2.4, 85 percent higher than in the lower weight group (table 2). This group contributes relatively small numbers in absolute terms towards stillbirths and neonatal deaths (229 in 1981) but they are largely deaths of normally formed mature infants whose survival is the most confidently expected.

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Table 1. Estimated percent distribution of birth weight
Live births occurring in England and Wales 1979-1982

Birth weight (grams)	1979	1980	1981	1982
Under 1,000	0.7	0.2	0.2	0.2
1,000-1,499		0.5	0.6	0.6
1,500-1,999	1.2	1.3	1.2	1.3
2,000-2,499	4.5	4.8	4.5	4.6
2,500-2,999	19.6	19.2	19.0	18.8
3,000-3,499	39.2	39.1	39.0	38.7
3,500-3,999	26.9	26.9	27.2	27.3
4,000 or more	8.0	8.1	8.4	8.5
Approximate percent live births with stated weight	67	87	96	96
Total live births = 100 percent	638,028	656,234	634,492	625,931

Notes:
1979 - Estimates based on all available data, corrected for weight not stated.
Source: OPCS Monitor DH3 82/2.
1980 - Estimates based on all available data, corrected for weight not stated.
Source: OPCS Monitor DH3 83/1.
1981 - Estimates based on national 10 percent sample.
Source: OPCS Monitor DH3 84/3.
1982 - Estimates based on available full counts.
Source: OPCS Monitor DH3 84/4.

Table 2. Estimated birth weight-specific mortality rates per 1,000 births; England and Wales, 1979-1981

Birth weight (grams)	Stillbirths[1]			Neonatal Death[2]		
	1979	1980	1981	1979	1980	1981
Under 1,500	269.4	238.0	209.2	455.4	359.8	312.7
1,500-1,999	102.1	88.8	80.8	83.7	74.5	55.2
2,000-2,499	27.1	23.2	21.1	19.3	17.7	14.8
2,500-2,999	5.9	5.2	4.8	5.0	4.9	4.1
3,000-3,499	2.3	1.9	1.8	2.5	2.4	1.9
3,500-3,999	1.5	1.4	1.3	1.7	1.8	1.6
4,000 or more	2.3	2.2	2.4	2.2	2.3	2.1
Percent not stated of live births			4.5			4.5

[1] Per 1,000 total births
[2] Per 1,000 live births
Sources: OPCS Monitors - DH# 82/2; DH3 82/1; DH3 84/3.

Table 3. Perinatal and neonatal mortality rates distributed by birth weight group: England and Wales 1979-81.

Birth weight (grams)	Perinatal mortality rate per 1,000 total birth of all weights		Neonatal mortality rate per 1,000 live births of all weights	
	1979	1981	1979	1981
-1,999	8.02	6.27	4.53	3.48
-2,999	3.93	3.17	1.94	1.61
-3,999	2.37	1.98	1.53	1.31
4,000 or more	0.31	0.36	0.19	0.20
All[1]	14.63	11.78	8.19	6.60

[1] Deaths of unknown birth weight were distributed in the proportion of live birth weight distribution.

Source: Tables OPCS Monitors DH3 82/2 and DH3 84/3.

Table 4. Stillbirth rates per 1,000 total births certified as due to congenital anomalies and others distributed by birth weight group: England and Wales: 1975-79.

Birth weight (grams)	1975	1976	1977	1978	1979[1]
-2,000					
CM	1.23	1.05	1.06	0.89	0.72
Other	3.09	2.93	2.93	2.63	2.57
All	4.33	3.98	3.99	3.52	3.29
-3,000					
CM	0.40	0.39	0.38	0.33	0.30
Other	1.92	1.88	1.96	1.70	1.71
All	2.32	2.26	2.35	2.03	2.01
3,001 or more					
CM	0.24	0.19	0.19	0.14	0.14
Other	1.54	1.38	1.28	1.16	1.06
All	1.78	1.57	1.47	1.30	1.20
Not stated					
CM	0.46	0.48	0.35	0.37	0.29
Other	1.44	1.38	1.24	1.21	1.17
All	1.89	1.86	1.59	1.59	1.47
Total births	609,740	589,979	574,664	601,526	643,153
Still birth rate	10.32	9.67	9.41	8.49	7.97

[1] Ninth revision birth weight grouping.
Sources: OPCS Series DH3 1 to 1979.

Table 5. Number of babies with congenital anomalies reported to Office of Population Censuses and Surveys; those stillborn or first week deaths; legal termination of pregnancy with Central Nervous System (CNS) anomalies: England and Wales 1974-1982

Year	Total births	Babies reported to have anomalies		Stillbirths and first week deaths		Legal termination for central nervous system anomalies
		CNS	Other	CNS	Other	
1974	647,060	2,452	10,277	1,755	1,051	34
1975	609,740	2,227	10,003	1,576	962	73
1976	589,979	1,915	10,469	1,364	881	81
1977	574,664	1,896	10,533	1,279	845	124
1978	601,526	1,757	11,010	1,142	943	194
1979	643,153	1,637	11,892	1,006	1,035	285
1980	661,007	1,476	12,658	887	1,057	481
1981	638,699	1,229	12,221	636	954	441
1982	629,870	1,016	12,265	466	1,008	486

Sources: DH3, 1-11; MB3 84/1; Weatherall, 1982

Table 6. Estimated perinatal and neonatal mortality rates per thousand births distributed by birth weight, England and Wales 1979 and 1981

Birth weight (grams)	Perinatal Mortality Rate		Neonatal Mortality Rate	
	1979	1981	1979	1981
	Certified as due to congenital anomaly			
-1,999	1.48	1.07	0.63	0.58
-2,999	1.04	0.82	0.96	0.83
-3,999	0.60	0.51	0.74	0.63
4,000 or more	0.06	0.07	0.07	0.07
	3.18	2.47	2.40	2.11
	Not certified as due to a congenital anomaly			
-1,999	6.54	5.19	3.90	2.90
-2,999	2.89	2.35	0.98	0.78
-3,999	1.77	1.47	0.79	0.68
4,000 or more	0.25	0.29	0.12	0.13
	11.45	9.30	5.79	4.49
Total rate	14.63	11.77	8.19	6.60

Estimated rates corrected for not-stated birth weight.
Source: Office of Population Censuses and Surveys Monitor DH3 82/2 and DH3 84/3.

Present Status and Trends in Infant Mortality in the Federal Republic of Germany

by Eberhard Schmidt, M.D. and Kurt Holzmann, M.D.

The situation of the Federal Republic in regard to infant mortality is not at all satisfactory. Although there has been some progress, the position of Germany in comparison to other European countries has remained about the same over many years (table 1).

Progress has constantly been achieved in perinatal mortality (figure 1) but in regard to postneonatal mortality, there has been stagnation for almost two decades (figure 2). Postneonatal mortality is about twice as high as in Scandinavia and Japan.

Germany is a Federal Republic, consisting of 11 states (figure 3) of extremely diverging demographic and socioeconomic structures, represented in big differences in regard to

- Population density
- Natality
- Percentage of liveborns from migrant worker's families
- Percentage of children born out of wedlock,

most of these factors being of considerable influence on perinatal and infant mortality (table 2).

In spite of these considerably different situations, each state has been able to lower infant mortality over the last 10 years by between 40-55 percent (table 3).

Furthermore, it could be shown that even within a state, even between neighboring communities, there are marked differences which can be pointed down in terms of birth weight-specific and age-specific mortality rates, indicating mostly organizational problems in neonatal care. There are areas, where it is not advisable to be born as a premature infant. Table 4 gives an overview of birth weight and age-specific mortality in the whole of the Federal Republic in 1981 and 1982.

It is about 10 years now, that birth weights of all infants are registered so there are data on

- birth weight distribution
- birth weight specific and age-specific infant mortality
- cause-specific infant mortality according to the 9th Revision of ICD.

The battle against the unsatisfactory figures in the Federal Republic has been activated from three directions.

1. Official statistical data and their impact

   Due to the fact that the Health Care System in the Federal Republic is an oligopolistic one - for example, responsibilities are split and state authorities have very limited executive power - there are severe limitations on the evaluation of medical care down below community level, since there are no possibilities for official authorities to implement intervention strategies.

   In spite of this, Linkage of Birth and Death Certificates has been introduced in 1980 successively through all states. Unfortunately, however, this was only planned as a temporary measure for two years and since shortage of resources causes slow procedures, data for 1980 will only be available in October 1984. It is doubtful, whether linkage will continue beyond 1981, although there are interventions to this effect.

2. Voluntary quality control system set up by the medical profession

   It is to be expected that politicians ask for more state control on medical care, especially when it is obvious, that the present system is unable to solve the problem as indicated by our poor figures. This is at least one incentive to the organization of a new approach originating from Bavaria, spreading now from state to state, that is the voluntary, anonymous participation of obstetric and pediatric hospitals in the documentation of every single case in a very detailed manner - which allows every hospital at the end of the year to subject its proceedings to critical analysis in regard to procedures and outcomes. This includes handling of anamnestic, pregnancy related and birth-related risks, and the effects on fetal and neonatal outcome, thus permitting individual quality control for each hospital.

   This system is now being extended - first on a research basis - to pediatric outcome in regard to morbidity up to the age of 4 years.

   Data available from this system allow large scale analysis of a great number of problems far beyond the information to be gathered through official statistical analysis.

3. Efforts in regard to regionalization of care

   There are three factors which enhance at least some sort of regionalization of care.

   - The system of anonymous quality control has by itself influenced the referral practices of the medical profession, thus causing a sort of regionalization in itself.

   - The organization of regionalization through governments or carriers of hospitals is grossly and in a long term manner hampered through powerful interests of local sponsors and traditions. This concerns, for instance the closing down of inappropriately small or poorly equipped obstetrical hospitals on one side. On the other side it is difficult to inhibit the foundation of neonatal intensive care units in small pediatric units which are then not able to perform at a required standard.

The initiation of efficient transport systems for at risk newborns, propagated vigorously through the big pediatric centers has at least in certain areas exerted a regionalizing effect, which has reflections in a considerable lowering of infant mortality in these respective regions.

In conclusion, infant mortality rates in the Federal Republic are unsatisfactory. Although perinatal mortality could be lowered constantly throughout years, the Federal Republic stays between rank 11---13 in Europe. Late infant mortality remained at a high level over the last decade.

Within the 11 states there are highly divergent demographic and socioeconomic background factors, influencing infant mortality. On the basis of an oligopolistic health care system with limited possibilities for state interventions, three trends are emerging to approach the problems:

1. There is a tendency to perfect official statistical analysis through linkage of death and birth certificates, although this is planned only as a temporary measure.

2. The initiation of voluntary anonymous quality control systems, which in the meantime cover up to 85 percent of obstetric and pediatric hospitals in certain areas, has deeply influenced the quality of obstetric care, and is about to become a fixed system, and necessarily has led to a sort of voluntary regionalization.

3. State and other official efforts in regard to regionalization of medical care are grossly hampered by diverging interests. However, regionally efficient transport systems, organized through large pediatric centers, have at least in some areas furthered the quality of care of the high risk newborn.

Table 1. Perinatal mortality in selected European countries between 1974 and 1981

Country	Rate		Ranking	
	1974-1975	1980-1981	1974-1975	1980-1981
Sweden	.	6.7	-	1
Finland	.	7.6	-	2
Iceland	11.4	7.7	3	3
Norway	11.8	8.1	5	4
Switzerland	12.5	8.5	7	5
Netherlands	10.3	8.6	1	6
Denmark	11.5	8.8	4	7
Belgium	16.2	9.0	10	8
France	11.1	9.8	2	9
Spain	13.8	11.1	8	10
Ireland	17.1	11.2	12	11
Luxemburg	12.5	11.5	6	12
German Federal Republic	19.7	11.6	13	13
Great Britain	16.3	11.8	11	14
German Democratic Republic	15.9	12.1	9	15
Austria	20.8	12.6	15	16
Italy	22.6	14.3	16	17
Czechoslovakia	20.4	16.6	14	18
Greece	18.0	24.0	18	19
Bulgaria	25.4	20.2	19	20
Hungary	33.0	21.0	21	21
Poland	23.5	21.2	17	22
Portugal	38.4	26.0	23	23
Soviet Union	26.3	27.7	20	24
Rumania	35.0	29.3	22	25
Yugoslavia	40.0	32.8	24	26

Table 2. Selected demographic data and infant mortality in 11 Federal States of Germany

Federal States 1982	Population in 1,000's	Inhabitants per square kilometer	Crude birth rate	Percent foreign per 1,000 live born	Out of wedlock per 1,000 live born	Infant deaths per 1,000 live born	Early neonatal mortality	Still-birth rate
Schleswig Holstein	2,618	167	9.3	5.7	105.2	10.3	4.2	4.6
Hamburg	1,624	2,152	8.1	18.4	159.5	11.4	4.9	4.0
Lower Saxony	7,257	153	9.8	6.5	88.9	10.4	4.4	5.1
Bremen	685	1,696	8.6	13.6	150.2	9.1	3.1	6.6
Nordrhein-Westfalen	16,961	438	9.9	14.0	74.5	12.6	5.7	5.3
Hessen	5,600	265	9.6	14.5	79.3	9.9	4.2	4.8
Rheinland-Pfalz	3,637	183	10.2	6.9	71.7	11.0	4.7	4.6
Baden-Wurttemberg	9,271	259	10.8	15.4	70.2	9.7	4.5	4.6
Bavaria	10,967	155	10.6	8.0	84.2	9.9	4.4	4.3
Saarland	1,058	411	9.7	5.6	75.1	10.7	6.2	5.5
Berlin (West)	1,870	3,894	9.9	22.0	195.6	14.3	6.2	4.2

Table 3. Infant mortality in Federal States and in the Federal Republic of Germany, 1971 and 1981

State	1971	1981
Schleswig Holstein	20.4	11.3
Hamburg	22.6	10.1
Lower Saxony	21.8	10.9
Bremen	23.3	13.4
Nordrhein-Westfalen	24.8	13.6
Hessen	23.9	10.7
Rheinland-Pfalz	22.7	11.3
Baden-Wurttemberg	20.6	9.7
Bavaria	23.5	11.3
Saarland	26.2	12.9
Berlin (West)	28.1	13.4
Federal Republic of Germany	23.1	11.6

Table 4. Birth weight and age-specific infant mortality in the Federal Republic of Germany, 1981 and 1982. (Mortality of liveborn infants per 1,000 births of respective birth weight, by age at death).

Birth weight from ... to under ... grams	Total		0 Day		1 Day		Day 2-6		Day 7-28		Day 0-28		Month 1-12	
	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982
< 1000	785.4	774.8	396.6	361.8	135.9	131.4	114.5	121.7	92.4	94.5	741.2	714.6	44.2	60.2
1000 - 2500	68.4	58.8	17.8	13.3	10.3	9.2	12.5	11.5	12.1	11.1	53.3	45.3	15.1	13.5
2500 and above	4.9	4.6	0.5	0.4	0.4	0.3	0.7	0.4	0.6	0.6	2.2	2.0	2.7	2.6

Source: Federal Republic of Germany 1981, 1982; Stat. Bundesamt.

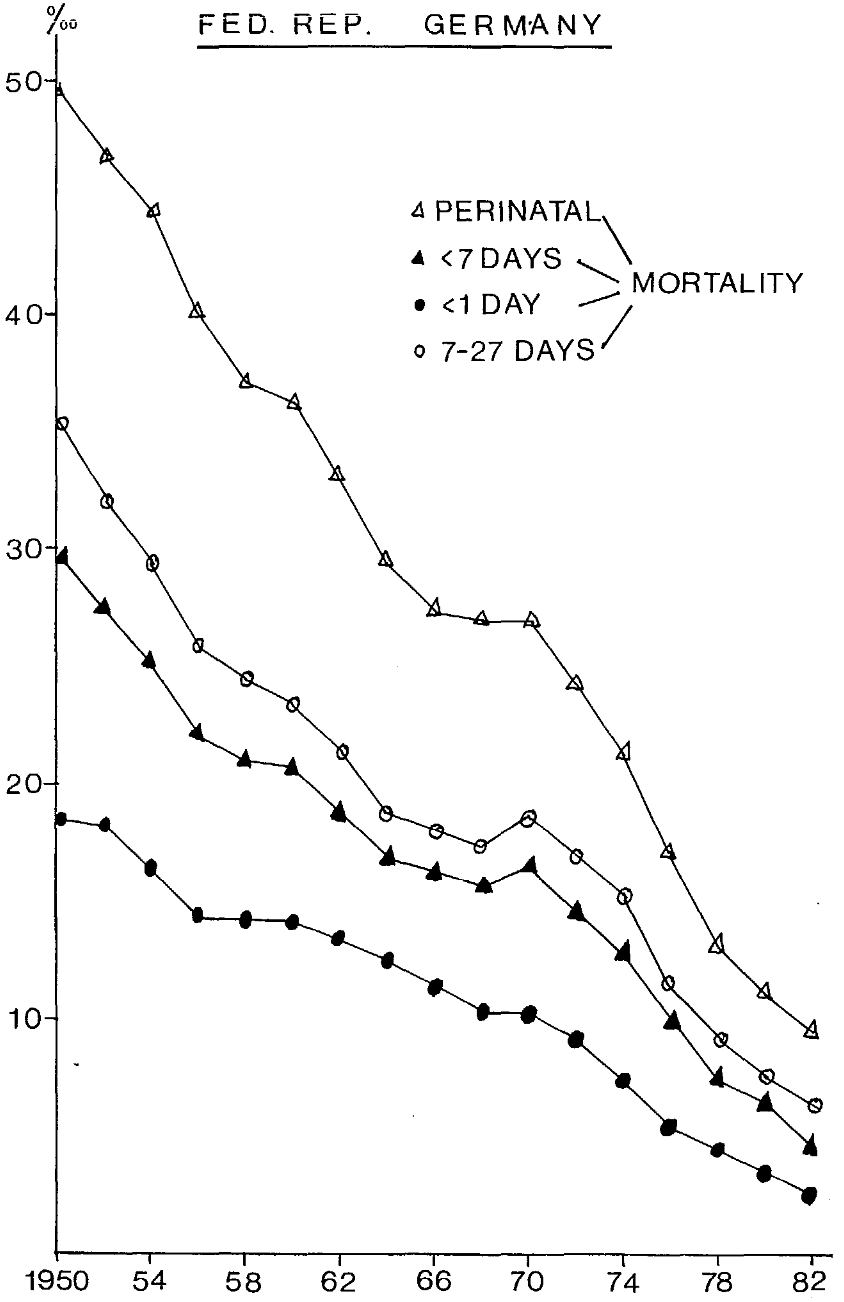


Figure 1. Perinatal mortality: Federal Republic of Germany, 1950-82

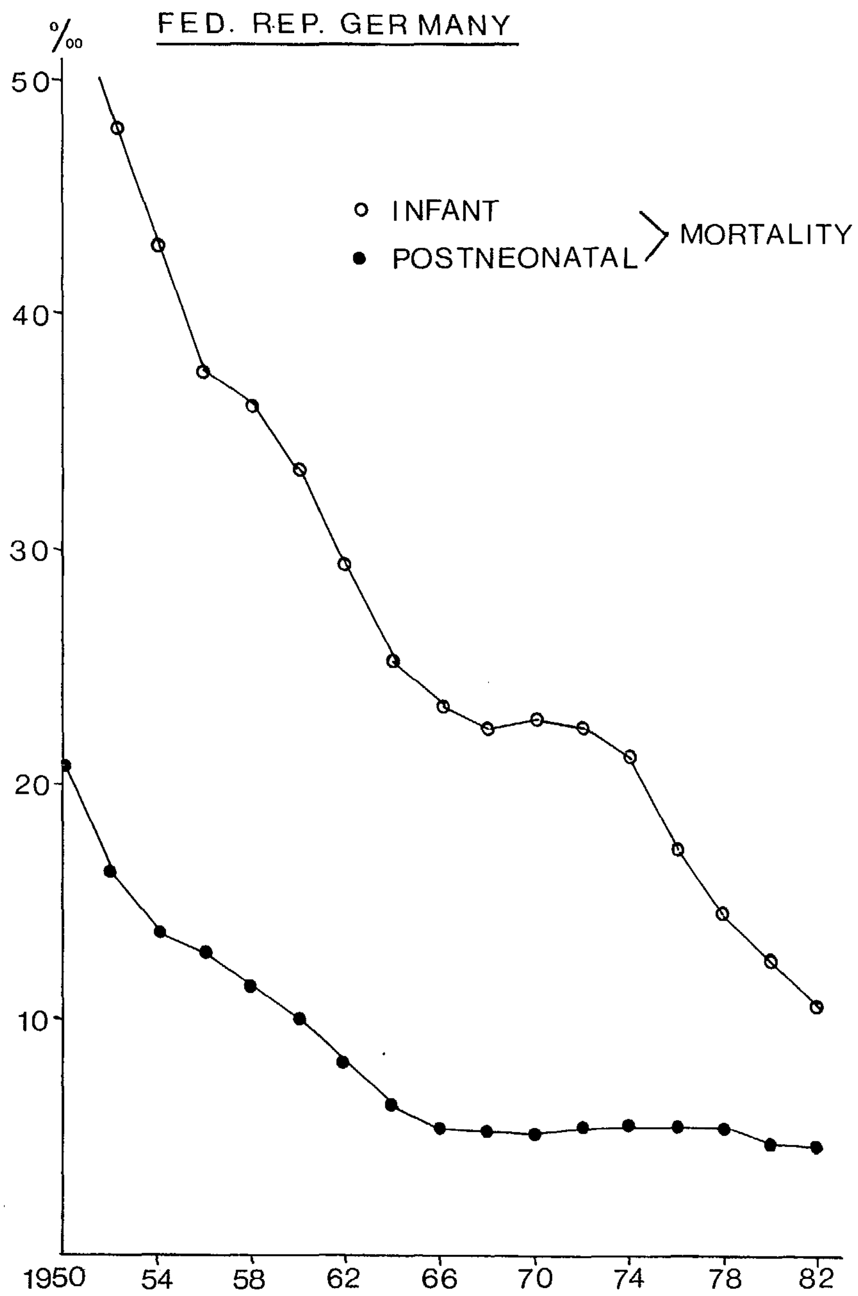


Figure 2. Postneonatal mortality (28-364 days): Federal Republic of Germany, 1950-82

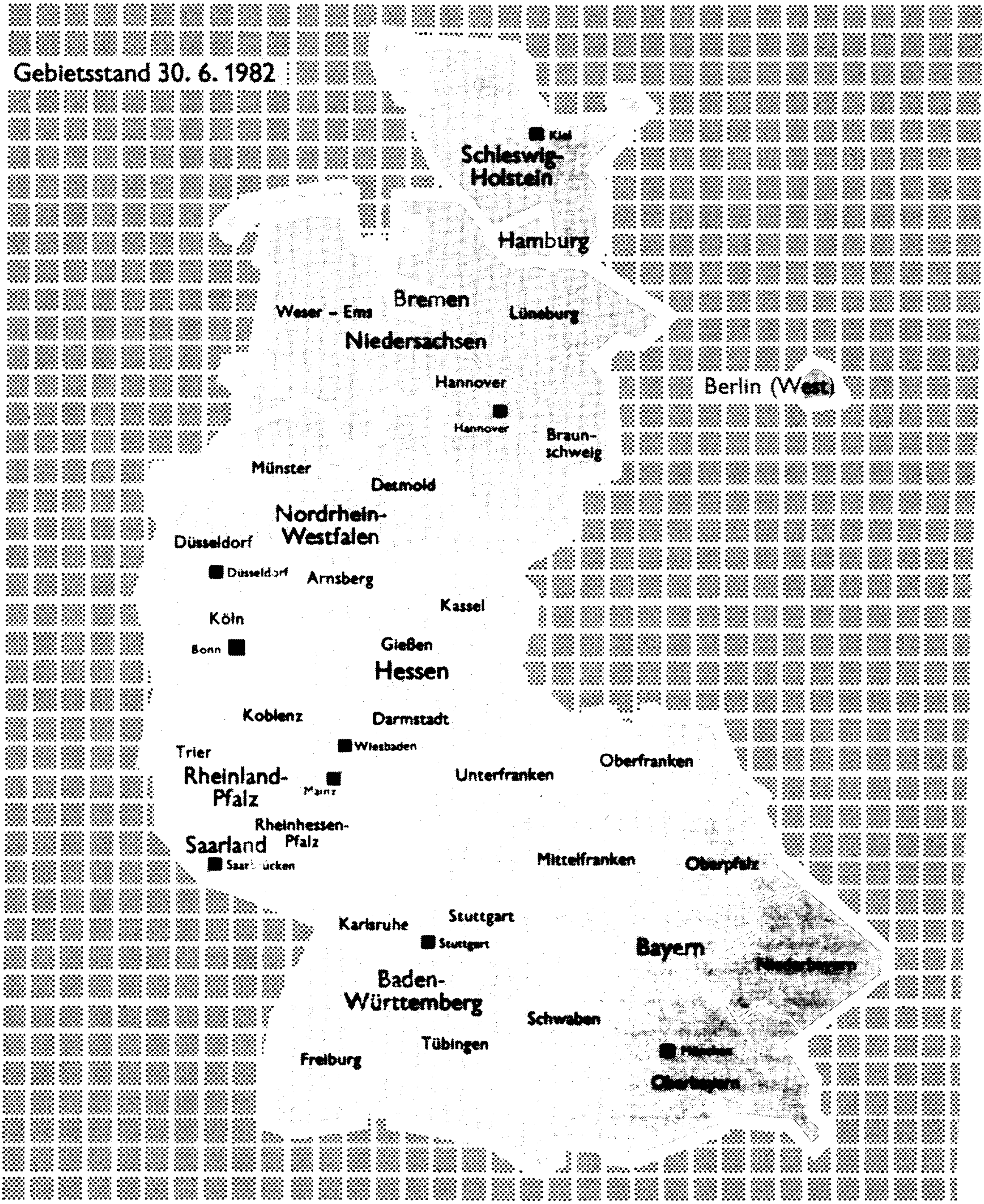


Figure 3. The Federal Republic of Germany and its 11 States

Trends and Levels in Infant and Perinatal Mortality in Japan

by Takefumi Kondo, M.D.

I would like to present trends and levels in infant and perinatal mortality in Japan.

First of all, I will show you infant and perinatal mortality trends in recent years. Table 1 is taken from a booklet, entitled "Statistics Relating to Maternal and Child Health in Japan." This table shows us a summary of vital statistics around 1900 to 1982 in Japan. The highest infant mortality rate per 1,000 live births was recorded as 188.6 in 1918.

There has been a significant and continuous improvement in the infant mortality rates since 1947, when the rate was 76.7, reaching 40 in 1955, 20 in 1964, 10 in 1975. The latest rate, I mean in 1983, was 6.2, less than one-tenth of the rate in 1947.

The perinatal mortality rate in Japan was 46.6 per 1,000 live births in 1950. During the period up to 1960, the rate decreased by only 10 percent. Since then, there has been a significant improvement, the rate going from 41 in 1960 to 22 in 1970, and 12 in 1980. The latest rate in 1983 was 9.3; in 1982, the late fetal death rate was 6.8, and early neonatal death rate, 3.3.

Next, could you please look at table 2. This table shows a summary of vital statistics in each prefecture and large city. In this table each prefecture and large city is denoted by the serial number. The prefecture in Japan is an administrative area over cities, towns, and villages. The differences in infant and perinatal mortality rates between prefectures and cities are relatively small. The highest infant mortality rate was 8.9 and the lowest was 4.8; the difference was 4.1 in 1982.

The number of births, fetal death rate and perinatal death rate, by age group of mother, is shown in table 3 taken from the "Vital Statistics System in Japan." The lowest rate of fetal and perinatal deaths were recorded among mothers at age 25 to 29, increasing at older and younger ages.

The number of live births and perinatal mortality by gestation period is shown in table 4. This table indicates very large differences between the perinatal mortality rates by gestational age, namely 460 per 1,000 live births under 28 weeks. This number includes only early neonatal deaths; 764 at 28 to 29 weeks, 455 at 30 to 31 weeks. The lowest rates are at 38 to 41 weeks. The level of total perinatal mortality is very much influenced by the proportion of births that occur with gestation periods less than 38 weeks. 62.5 percent of perinatal deaths have gestation periods less than 38 weeks.

Next, I would like to explain the birth weight distribution. The number of live births by sex and birth weight is shown in table 5. The proportion with birth weight equal to and less than 2,500 grams was 5.2 percent in males, and 6.0 percent in females in 1982.

Next, please turn to table 6. This table shows the perinatal mortality rate according to birth weight. The perinatal death rate was very high for birth weights under 1,000 grams and still very high, but diminishing in the next two birth weight groups, namely about 600 for 1.0 to 1.5 kilograms, and about 200 for 1.5 to 2.0 kilograms. Thereafter, the rate declined to 40 for the weight group 2.0 to 2.5 kilograms.

The rates of late fetal deaths and of early neonatal deaths follow the same pattern. The number of infant deaths by age is shown in table 7. The rate of the first day deaths in infant mortality was 24 percent in 1982. The rate has been increasing considerably.

The number of perinatal deaths, according to underlying cause of death, is shown in table 8. 4,168 deaths, namely 27 percent of perinatal deaths, were assigned to the complication of placenta, cord and membrane categorized on mother, but 7,560 deaths had no description about maternal conditions. Categorized on child, 12,610 deaths, namely 82 percent of perinatal deaths were assigned to certain conditions originating in the perinatal period.

At the end of my presentation, I would like to explain the vital statistic system in Japan very briefly.

Please look at exhibit A. The following five kinds of vital statistics are reported in Japan. They are live birth, death, fetal death, marriage, and divorce.

The family registration system has been developed in Japan as Koseki, which registers married couples and their unmarried children as a unit, and records any major change of family relationships from birth to death for each person in the family. The Koseki system is carried out under the Family Registration Law. The event on live birth death or fetal death is declared to the local government office covering the residence or occurrence place. For the declaration of the live birth, death or fetal death, the certificate by the attending physician, midwife, or other attendant is necessary. The declaration on fetal death has no relation with the family registration. It is regulated by the Ordinance on Declaration of Fetal Death. The vital statistics report is prepared at the local government office, where the declaration is accepted. The item of each statistical report is so arranged in the schedule to be easily entered from the entry of the declaration. The channels of collecting vital statistical data are shown in exhibit A. The items of vital statistical reports are shown in exhibit A. As shown in these data, Japan has made significant improvements in infant and perinatal mortality. These trends and developments depend on the maternal and child health care systems, including medical care service which will be presented by Dr. Matsuyama later.

Exhibit A. Vital Statistics System in Japan

1. Vital Events

The following five kinds of vital events are reported in Japan.

a) Live birth
b) Death
c) Fetal death (after 12 weeks of pregnancy)
d) Marriage
e) Divorce

2. Family Registration (KOSEKI) System

Family registration (KOSEKI) system has been developed in Japan as KOSEKI which registers a married couple and their unmarried children as a unit and records any major change of family relationships from birth to death for each person in the family (excluding fetal death).

The KOSEKI system is carried out under the Family Registration Law (KOSEKI Law).

3. Declaration

The event on live birth, death, or fetal death is declared to the local government office covering the residence or occurrence place.

The event on marriage or divorce is declared to the local government office covering the residence or the place where the family registration is kept.

Note:

a) For the declaration of live birth, death, or fetal death, the certificate by the attending physician, midwife, or other attendant is necessary.

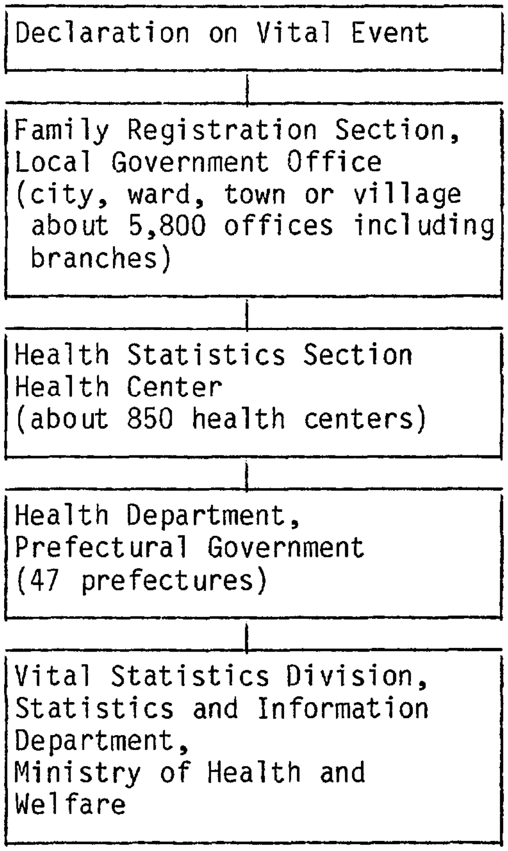
b) The declaration on fetal death has no relation with the family registration. It is regulated by the Ordinance on Declaration of Fetal Death.

4. Preparation of Vital Statistics Report

The vital statistics report is prepared at the local government office where the declaration is accepted. The item of each statistical report is so arranged in the schedule to be easily entered from the entry of the declaration.

Because each report is processed by OMR (Optical Mark Reader) in EDPS at the Department in Tokyo, the local government office is requested not only to fill all columns in detail, but also to mark suitable codes (excluding cause of death).

Vital statistics report is mainly utilized at the national level. However, it is also utilized at local levels such as prefectures and health centers.



5. Items of Vital Statistics Report

a) Live birth

Name and sex
Legitimacy
Date of birth
Place of birth
Address of the baby
Name and age of parents
Nationality of baby
Date of wedding of parents
Type of household
  Agriculture only, agriculture and other works, self-employed, white collar, blue collar, or other.
Occupation and industry of parents (in Population Census Year)
Birth weight (Written exactly in grams but for code of OMR sheet, only two columns are used. For example, weight of 3180 g is marked as "31." However, special code is provided for exactly 2500 g).
Plural birth
Hospitalization and name of institution

Duration of gestation (in weeks)
Parity (number of live births, number of fetal deaths after 20 weeks of pregnancy)
Name of attendant (physician, midwife, other)

b) Death

Name and sex of deceased
Date of birth (and exact time of birth in the case of death within 30 days after birth)
Date and time of death
Place of death (in or out of Japan)
Address
Nationality
Marital status
  Married (age of spouse), single, widowed, divorced, unknown
Date and prefecture on which declaration of death was accepted (in the case of death within 8 days after birth)
Type of household (same as Report of Birth)
Occupation and industry of parents (in the Population Census Year)
Hospitalization and name of institution
Kind of death
  Sickness and natural death, poisoning, other accident, suicide, homicide, other
Cause of death
  A Direct cause
  B Cause of A
  C Cause of B
Other physical conditions
Principal finding of operation
Additional items on death due to the external cause
  Date and time the injury occurred
  Means and conditions
  Place injury occurred (at work or not; detail on the location)
Maternal conditions at pregnancy and delivery (in the case of death within 168 hours after birth)
Address and name of physician

c) Fetal death

Nationality of mother
Name and age of parents
Legitimacy and sex of fetus
Date of fetal death
Address of mother
Type of household (same as Report of Birth)
Occupation and industry of parents (in the Population Census Year)
Parity (same as Report of Birth)
Duration of gestation (in weeks)
Weight of fetus (g) (In coding of weight, same manner as report of birth is used)
Time of death (in the case of spontaneous aged 20 weeks and over)
  Antepartus, Intrapartus, unknown
Hospitalization and name of institution

Plural birth
Spontaneous or artificial
Necropsy
Name of attendant (physician, midwife, other)
Cause of fetal death (on child and mother)
  A Direct cause
  B Cause of A
  C Cause of B
  D Cause of C
  E Cause of D

Other significant conditions
Sickness or reason (in the artificial case under the Eugenic Law)

d) Marriage and Divorce

(Omitted)

Table 1. Summary of vital statistics: Japan; 1900-83

実数 Number

年次 Year		人口 Population	出生 Live births	死亡 Deaths	自然増加 Natural increase	乳児死亡 Infant deaths	新生児死亡 Neonatal deaths	周産期死亡 Perinatal deaths	妊産婦死亡 Maternal deaths	死産 Foetal deaths		
										総数 Total	自然死産 Spontaneous foetal deaths	人工死産 Artificial foetal deaths
1900	明治33	43 847 000	1 420 534	910 744	509 790	220 211	112 259	…	6 200	137 987	…	…
1905	38	46 620 000	1 452 770	1 004 661	448 109	220 450	103 382	…	6 185	142 092	…	…
1910	43	49 184 000	1 712 857	1 064 234	648 623	276 136	126 910	…	6 228	157 392	…	…
1915	大正 4	52 752 000	1 799 326	1 093 793	705 533	288 634	125 337	…	6 452	141 301	…	…
1920	9	55 963 053	2 025 564	1 422 096	603 468	335 613	139 681	…	7 158	144 038	…	…
1925	14	59 736 822	2 086 091	1 210 706	875 385	297 008	121 238	…	6 309	124 403	…	…
1930	昭和 5	64 450 005	2 085 101	1 170 867	914 234	258 703	104 101	…	5 681	117 730	…	…
1935	10	69 254 148	2 190 704	1 161 936	1 028 768	233 706	97 994	…	5 698	115 593	…	…
1940	15	71 933 000	2 115 867	1 186 595	929 272	190 509	81 869	…	5 070	102 034	…	…
1945	20	71 998 100	…	…	…	…	…	…	…	…	…	…
1947	22	78 101 473	2 678 792	1 138 238	1 540 554	205 360	84 204	…	4 488	123 837	…	…
1950	25	83 199 637	2 337 507	904 876	1 432 631	140 515	64 142	108 843	4 117	216 974	106 594	110 380
1951	26	84 573 000	2 137 689	838 998	1 298 691	122 869	58 686	99 865	3 691	217 231	101 237	115 994
1952	27	85 852 000	2 005 162	765 068	1 240 094	99 114	51 015	91 527	3 417	203 824	94 508	109 316
1953	28	87 033 000	1 868 040	772 547	1 095 493	91 424	47 580	85 932	3 373	193 274	89 751	103 523
1954	29	88 293 000	1 769 580	721 491	1 048 089	78 944	42 726	79 776	3 262	187 119	87 201	99 918
1955	30	89 275 529	1 730 692	693 523	1 037 169	68 801	38 646	75 918	3 095	183 265	85 159	98 106
1956	31	90 259 000	1 665 278	724 460	940 818	67 691	38 232	75 706	2 838	179 007	86 558	92 449
1957	32	91 088 000	1 566 713	752 445	814 268	62 678	33 847	70 502	2 677	176 353	86 895	89 458
1958	33	92 010 000	1 653 469	684 189	969 280	57 052	32 237	72 625	2 560	185 148	92 282	92 866
1959	34	92 971 000	1 626 088	689 959	936 129	54 768	30 235	69 912	2 381	181 893	92 688	89 205
1960	35	93 418 501	1 606 041	706 599	899 442	49 293	27 362	66 552	2 097	179 281	93 424	85 857
1961	36	94 285 000	1 589 372	695 644	893 728	45 465	26 255	65 063	1 914	179 895	96 032	83 863
1962	37	95 178 000	1 618 616	710 265	908 351	42 797	24 777	62 650	1 813	177 363	97 256	80 107
1963	38	96 156 000	1 659 521	670 770	988 751	38 442	22 965	60 049	1 701	175 424	97 711	77 713
1964	39	97 186 000	1 716 761	673 067	1 043 694	34 967	21 344	56 827	1 699	168 046	97 357	70 689
1965	40	98 274 961	1 823 697	700 438	1 123 259	33 742	21 260	54 904	1 597	161 617	94 476	67 141
1966	41	99 056 000	1 360 974	670 342	690 632	26 217	16 296	42 583	1 266	148 248	83 253	64 995
1967	42	99 637 000	1 935 647	675 006	1 260 641	28 928	19 248	50 846	1 365	149 389	90 938	58 451
1968	43	100 794 000	1 871 839	686 555	1 185 284	28 600	18 326	45 921	1 275	143 259	87 381	55 878
1969	44	102 022 000	1 889 815	693 787	1 196 028	26 874	17 116	43 419	1 094	139 211	85 788	53 423
1970	45	103 119 447	1 934 239	712 962	1 221 277	25 412	16 742	41 917	1 008	135 095	84 073	51 022
1971	46	104 345 000	2 000 973	684 521	1 316 452	24 805	16 450	40 900	905	130 920	83 827	47 093
1972	47	105 742 000	2 038 682	683 751	1 354 931	23 773	15 817	38 754	827	125 154	81 741	43 413
1973	48	108 079 000	2 091 983	709 416	1 382 567	23 683	15 473	37 598	801	116 171	78 613	37 558
1974	49	109 410 000	2 029 989	710 510	1 319 479	21 888	14 472	34 383	700	109 738	74 618	35 120
1975	50	111 251 507	1 901 440	702 275	1 199 165	19 103	12 912	30 513	546	101 862	67 643	34 219
1976	51	112 420 000	1 832 617	703 270	1 129 347	17 105	11 638	27 133	474	101 930	64 046	37 884
1977	52	113 499 000	1 755 100	690 074	1 065 026	15 666	10 773	24 708	406	95 247	60 330	34 917
1978	53	114 511 000	1 708 643	695 821	1 012 822	14 327	9 628	22 217	378	87 463	55 818	31 645
1979	54	115 465 000	1 642 580	689 664	952 916	12 923	8 590	20 481	(339)376	82 311	51 083	31 228
1980	55	116 320 358	1 576 889	722 801	854 088	11 841	7 796	18 385	(292)323	77 446	47 651	29 795
1981	56	117 204 000	1 529 455	720 262	809 193	10 891	7 188	16 531	(260)294	79 222	46 296	32 926
1982	57	118 008 000	1.515 392	711 883	803 509	9 969	6 425	15 303	(240)279	78 107	44 135	33 972
1983	58	118 786 000	1 508 684	740 034	768 650	9 407	5 895	14 050	(201)233	71 944	40 089	31 855

（注） 1 新生児死亡は乳児死亡の再掲（以下各表とも同様）。
2 昭和18年以前，昭和48年以後は沖縄県を含む。
3 妊産婦死亡中，昭和54年以降の（ ）書は直接産科的死亡であり，再掲。なお，昭和53年までの妊産婦死亡は，昭和54年以降の直接産科的死亡にほぼ該当。

NOTES : 1. Infant deaths include neonatal deaths (same in following tables).
2. The data for 1943 and theretofore, the data for 1973 and thereafter include the figures for Okinawa prefecture.
3. On the column of Maternal deaths, the deaths due to direct obstetric causes are shown in ( ). The Maternal deaths before 1978 almost correspond to the deaths due to direct obstetric causes adopted in 1979.

率 Rates

年次 Year		出生率（人口1000対） Live birth rates (per 1 000 population)	死亡率（人口1000対） Death rates (per 1 000 population)	自然増加率（人口1000対） Spontaneous increase rates (per 1 000 population)	乳児死亡率（出生1000対） Infant mortality rates (per 1 000 live birth)	新生児死亡率（出生1000対） Neo-natal mortality rates (per 1 000 live birth)	周産期死亡率（出生1000対） Perinatal mortality rates (per 1 000 live birth)	妊産婦死亡率（出生10万対） Maternal death rates (per 100 000 live birth)	死産率（出産1 000対） Foetal death rates (per 1 000 total birth)		
									死産率 Total foetal death rates	自然死産率 Spontaneous foetal death rates	人工死産率 Artificial foetal death rates
1900	明治33	32.4	20.8	11.6	155.0	79.0	…	436.5	88.5	…	…
1905	38	31.2	21.6	9.6	151.7	71.2	…	425.7	89.1	…	…
1910	43	34.8	21.6	13.2	161.2	74.1	…	363.6	84.2	…	…
1915	大正 4	34.1	20.7	13.4	160.4	69.7	…	358.6	72.8	…	…
1920	9	36.2	25.4	10.8	165.7	69.0	…	353.4	66.4	…	…
1925	14	34.9	20.3	14.7	142.4	58.1	…	302.4	56.3	…	…
1930	昭和 5	32.4	18.2	14.2	124.1	49.9	…	272.5	53.4	…	…
1935	10	31.6	16.8	14.9	106.7	44.7	…	260.1	50.1	…	…
1940	15	29.4	16.5	12.9	90.0	38.7	…	239.6	46.0	…	…
1945	20	…	…	…	…	…	…	…	…	…	…
1947	22	34.3	14.6	19.7	76.7	31.4	…	167.5	44.2	…	…
1950	25	28.1	10.9	17.2	60.1	27.4	46.6	176.1	84.9	41.7	43.2
1951	26	25.3	9.9	15.4	57.5	27.5	46.7	172.7	92.2	43.0	49.3
1952	27	23.4	8.9	14.4	49.4	25.4	45.6	170.4	92.3	42.8	49.5
1953	28	21.5	8.9	12.6	48.9	25.5	46.0	180.6	93.8	43.5	50.2
1954	29	20.0	8.2	11.9	44.6	24.1	45.1	181.3	95.6	44.6	51.1
1955	30	19.4	7.8	11.6	39.8	22.3	43.9	178.8	95.8	44.5	51.3
1956	31	18.4	8.0	10.4	40.6	23.0	45.5	170.4	97.1	46.9	50.1
1957	32	17.2	8.3	8.9	40.0	21.6	45.0	170.9	101.2	49.9	51.3
1958	33	18.0	7.4	10.5	34.5	19.5	43.9	154.8	100.7	50.2	50.5
1959	34	17.5	7.4	10.1	33.7	18.6	43.0	146.4	100.6	51.3	49.3
1960	35	17.2	7.6	9.6	30.7	17.0	41.4	130.6	100.4	52.3	48.1
1961	36	16.9	7.4	9.5	28.6	16.5	40.9	120.4	101.7	54.3	47.4
1962	37	17.0	7.5	9.5	26.4	15.3	38.7	112.0	98.8	54.2	44.6
1963	38	17.3	7.0	10.3	23.2	13.8	36.2	102.5	95.6	53.3	42.4
1964	39	17.7	6.9	10.7	20.4	12.4	33.1	99.0	89.2	51.7	37.5
1965	40	18.6	7.1	11.4	18.5	11.7	30.1	87.6	81.4	47.6	33.8
1966	41	13.7	6.8	7.0	19.3	12.0	31.3	93.0	98.2	55.2	43.1
1967	42	19.4	6.8	12.7	14.9	9.9	26.3	70.5	71.6	43.6	28.0
1968	43	18.6	6.8	11.8	15.3	9.8	24.5	68.1	71.1	43.4	27.7
1969	44	18.5	6.8	11.7	14.2	9.1	23.0	57.9	68.6	42.3	26.3
1970	45	18.8	6.9	11.8	13.1	8.7	21.7	52.1	65.3	40.6	24.7
1971	46	19.2	6.6	12.6	12.4	8.2	20.4	45.2	61.4	39.3	22.1
1972	47	19.3	6.5	12.8	11.7	7.8	19.0	40.6	57.8	37.8	20.1
1973	48	19.4	6.6	12.8	11.3	7.4	18.0	38.3	52.6	35.6	17.0
1974	49	18.6	6.5	12.1	10.8	7.1	16.9	34.5	51.3	34.9	16.4
1975	50	17.1	6.3	10.8	10.0	6.8	16.0	28.7	50.8	33.8	17.1
1976	51	16.3	6.3	10.0	9.3	6.4	14.8	25.9	52.7	33.1	19.6
1977	52	15.5	6.1	9.4	8.9	6.1	14.1	23.1	51.5	32.6	18.9
1978	53	14.9	6.1	8.8	8.4	5.6	13.0	22.1	48.7	31.1	17.6
1979	54	14.2	6.0	8.3	7.9	5.2	12.5	(20.6)22.9	47.7	29.6	18.1
1980	55	13.6	6.2	7.3	7.5	4.9	11.7	(18.5)20.5	46.8	28.8	18.0
1981	56	13.0	6.1	6.9	7.1	4.7	10.8	(17.0)19.2	49.2	28.8	20.5
1982	57	12.8	6.0	6.8	6.6	4.2	10.1	(15.8)18.4	49.0	27.7	21.3
1983	58	12.7	6.2	6.5	6.2	3.9	9.3	(13.3)15.4	45.5	25.4	20.2
1900〜1983までの最高値		1920(大9) 36.2	1918(大7) 27.3	1948(昭23) 21.6	1918(大7) 188.6	1918(大7) 81.3	1951(昭26) 46.7	1906(明39) 447.3	1961(昭36) 101.7	1966(昭41) 55.2	1955(昭30) 1957(昭32) 51.3

Table 2. Summary of vital statistics in each prefecture and 11 largest cities: Japan, 1982

実 数 Number

都道府県 Prefecture	出生 Live births	2500グラム以下の出生（再掲） Live births weighted under 2 500 gr (re-reported)	死亡 Deaths	乳児死亡 Infant deaths	新生児死亡 Neonatal deaths	周産期死亡 Perinatal deaths	妊産婦死亡 Maternal deaths	直接産科的死亡 Direct obstetric deaths	自然死産 Spontaneous foetal deaths	人工死産 Artificial foetal deaths	婚姻 Marriages	離婚 Divorces
全国 Total	**1 515 392**	**84 367**	**711 883**	**9 969**	**6 425**	**15 303**	**279**	**240**	**44 135**	**33 972**	**781 252**	**163 980**
01 北海道	72 828	4 315	32 537	466	310	736	10	8	2 321	3 138	39 618	12 121
02 青森	20 372	1 011	9 863	162	111	223	4	4	691	495	10 292	2 735
03 岩手	18 581	933	9 587	138	95	196	8	7	491	545	8 461	1 550
04 宮城	30 365	1 571	12 319	200	150	309	2	2	728	1 010	14 437	2 547
05 秋田	15 215	774	8 991	82	55	138	5	3	305	474	7 510	1 473
06 山形	15 764	684	9 572	132	89	173	3	3	341	492	7 385	1 108
07 福島	28 527	1 565	14 444	206	128	332	10	8	798	712	13 146	2 321
08 茨城	35 742	2 066	16 922	293	194	446	6	6	973	530	17 292	2 818
09 栃木	24 865	1 369	12 002	185	136	281	3	3	739	468	12 043	2 076
10 群馬	24 157	1 287	12 306	176	117	227	3	3	573	347	11 844	2 246
11 埼玉	72 689	3 747	24 341	496	330	737	11	11	1 920	927	34 670	7 012
12 千葉	65 492	3 555	23 063	459	288	703	12	12	1 953	776	32 106	6 414
13 東京	133 777	7 279	58 351	792	513	1 251	29	28	4 348	2 435	87 699	18 077
14 神奈川	90 818	5 013	30 526	544	358	852	15	13	2 521	1 225	50 072	10 113
15 新潟	30 850	1 490	17 196	181	123	289	2	2	765	538	14 232	2 260
16 富山	12 761	652	7 548	89	56	125	4	3	407	189	6 234	1 094
17 石川	14 418	811	7 224	86	55	139	—	—	464	221	7 149	1 358
18 福井	10 199	510	5 682	68	50	115	1	1	298	171	5 042	854
19 山梨	9 859	535	5 959	56	38	122	2	1	350	132	4 894	835
20 長野	25 059	1 210	14 947	156	104	271	4	4	670	418	11 868	1 959
21 岐阜	24 319	1 310	12 497	168	102	231	2	2	649	543	12 015	1 949
22 静岡	45 935	2 883	20 481	282	185	443	14	10	1 090	895	23 027	4 846
23 愛知	82 001	4 740	31 652	480	296	723	12	12	2 034	1 990	43 030	7 822
24 三重	20 464	1 218	11 947	146	93	185	3	1	483	441	10 510	1 801
25 滋賀	15 269	789	6 982	108	68	162	2	—	356	205	7 071	969
26 京都	30 493	1 644	16 059	194	116	304	8	7	938	584	15 794	3 134
27 大阪	106 098	5 925	44 578	681	423	1 052	14	11	3 654	2 745	58 437	14 237
28 兵庫	65 925	3 674	31 794	377	248	625	19	15	1 880	1 343	33 606	6 730
29 奈良	15 935	879	7 590	123	84	175	3	2	534	216	7 920	1 359
30 和歌山	12 999	774	8 490	116	78	170	4	4	453	243	6 671	1 596
31 鳥取	7 939	462	4 740	60	40	81	2	1	219	240	3 915	766
32 島根	9 366	490	6 671	57	38	102	5	4	235	238	4 205	651
33 岡山	23 594	1 348	13 656	132	71	191	3	3	631	591	11 508	2 462
34 広島	35 798	1 972	17 778	221	135	330	5	4	1 041	752	17 744	3 542
35 山口	18 780	1 037	11 674	159	104	204	2	2	554	467	9 566	2 329
36 徳島	10 262	504	6 696	63	42	110	2	2	242	235	5 172	1 172
37 香川	12 270	653	7 336	95	64	143	1	1	324	203	6 360	1 312
38 愛媛	18 821	996	11 011	154	106	236	6	3	646	468	9 131	2 359
39 高知	9 804	575	7 518	74	47	104	2	1	256	281	4 916	1 412
40 福岡	62 757	3 837	28 538	380	229	599	12	11	2 047	2 014	32 388	8 393
41 佐賀	12 163	720	6 603	58	27	113	1	1	349	329	5 629	1 141
42 長崎	21 707	1 273	11 895	141	66	236	5	5	687	892	10 057	2 311
43 熊本	23 810	1 494	13 219	169	105	238	3	3	765	857	11 404	2 292
44 大分	15 242	784	9 311	106	72	180	3	2	517	532	7 575	1 633
45 宮崎	16 695	1 001	8 285	142	82	170	2	2	451	720	7 697	1 997
46 鹿児島	24 662	1 527	14 771	172	110	301	6	5	908	598	11 331	2 356
47 沖縄	19 946	1 481	5 247	129	80	205	3	3	500	95	8 579	2 438
不詳	—	—	1 484	15	14	25	1	1	36	12	—	—
11大都市（再掲） 11 largest cities (secondary mention)												
50 東京都区部	92 090	5 121	44 211	539	352	856	19	18	3 195	1 863	64 707	13 577
51 札幌市	20 727	1 214	6 676	120	71	176	3	3	655	879	12 638	3 643
52 横浜市	36 809	1 964	12 301	205	143	345	8	7	1 025	501	21 141	4 097
53 川崎市	14 543	862	4 072	94	50	128	3	3	441	176	8 860	1 603
54 名古屋市	26 694	1 625	10 887	136	91	242	3	3	744	847	15 341	3 221
55 京都市	16 669	934	9 394	105	65	177	4	3	591	365	9 429	2 023
56 大阪市	28 406	1 702	17 544	177	113	296	3	3	1 219	1 036	18 505	4 964
57 神戸市	16 180	987	8 514	79	54	140	7	4	509	424	9 151	2 199
58 広島市	12 746	711	4 517	74	49	108	1	—	380	290	6 678	1 390
59 北九州市	13 527	813	6 377	65	31	109	4	4	435	551	7 410	2 256
60 福岡市	16 665	1 032	5 230	95	54	159	4	4	522	521	9 162	2 246

率 Rates

都道府県 Prefecture	出生率 Live birth rates	死亡率 Death rates	乳児死亡率 Infant mortality rates	新生児死亡率 Neonatal mortality rates	周産期死亡率 Perinatal mortality rates	妊産婦死亡率 Maternal death rates	直接産科的死亡率 Direct obstetric death rates	自然死産率 Spontaneous foetal death rates	人工死産率 Artificial foetal death rates	婚姻率 Marriage rates	離婚率 Divorce rates
全国 Total	**12.8**	**6.0**	**6.6**	**4.2**	**10.1**	**18.4**	**15.8**	**27.7**	**21.3**	**6.6**	**1.39**
01 北海道	12.9	5.8	6.4	4.3	10.1	13.7	11.0	29.6	40.1	7.0	2.16
02 青森	13.3	6.5	8.0	5.4	10.9	19.6	19.6	32.1	23.0	6.7	1.79
03 岩手	13.0	6.7	7.4	5.1	10.5	43.1	37.7	25.0	27.8	5.9	1.09
04 宮城	14.3	5.8	6.6	4.9	10.2	6.6	6.6	22.7	31.5	6.8	1.20
05 秋田	12.1	7.2	5.4	3.6	9.1	32.9	19.7	19.1	29.6	6.0	1.17
06 山形	12.6	7.6	8.4	5.6	11.0	19.0	19.0	20.5	29.6	5.9	0.88
07 福島	13.9	7.1	7.2	4.5	11.6	35.1	28.0	26.6	23.7	6.4	1.13
08 茨城	13.6	6.4	8.2	5.4	12.5	16.8	16.8	26.1	14.2	6.6	1.07
09 栃木	13.7	6.6	7.4	5.5	11.3	12.1	12.1	28.3	18.0	6.6	1.14
10 群馬	12.9	6.6	7.3	4.8	9.4	12.4	12.4	22.8	13.8	6.3	1.20
11 埼玉	13.0	4.3	6.8	4.5	10.1	15.1	15.1	25.4	12.3	6.2	1.25
12 千葉	13.3	4.7	7.0	4.4	10.7	18.3	18.3	28.6	11.4	6.5	1.31
13 東京	11.6	5.0	5.9	3.8	9.4	21.7	20.9	30.9	17.3	7.6	1.56
14 神奈川	12.8	4.3	6.0	3.9	9.4	16.5	14.3	26.7	13.0	7.1	1.43
15 新潟	12.5	7.0	5.9	4.0	9.4	6.5	6.5	23.8	16.7	5.8	0.92
16 富山	11.5	6.8	7.0	4.4	9.8	31.3	23.5	30.5	14.1	5.6	0.99
17 石川	12.8	6.4	6.0	3.8	9.6	—	—	30.7	14.6	6.3	1.20
18 福井	12.8	7.1	6.7	4.9	11.3	9.8	9.8	27.9	16.0	6.3	1.07
19 山梨	12.2	7.4	5.7	3.9	12.4	20.3	10.1	33.8	12.8	6.0	1.03
20 長野	12.0	7.1	6.2	4.2	10.8	16.0	16.0	25.6	16.0	5.7	0.94
21 岐阜	12.3	6.3	6.9	4.2	9.5	8.2	8.2	25.4	21.3	6.1	0.98
22 静岡	13.2	5.9	6.1	4.0	9.6	30.5	21.8	22.7	18.7	6.6	1.39
23 愛知	13.1	5.1	5.9	3.6	8.8	14.6	14.6	23.6	23.1	6.9	1.25
24 三重	12.0	7.0	7.1	4.5	9.0	14.7	4.9	22.6	20.6	6.2	1.06
25 滋賀	13.8	6.3	7.1	4.5	10.6	13.1	—	22.5	13.0	6.4	0.88
26 京都	12.1	6.4	6.4	3.8	10.0	26.2	23.0	29.3	18.2	6.3	1.25
27 大阪	12.7	5.3	6.4	4.0	9.9	13.2	10.4	32.5	24.4	7.0	1.70
28 兵庫	12.9	6.2	5.7	3.8	9.5	28.8	22.8	27.2	19.4	6.6	1.31
29 奈良	12.8	6.1	7.7	5.3	11.0	18.8	12.6	32.0	12.9	6.3	1.09
30 和歌山	12.0	7.8	8.9	6.0	13.1	30.8	30.8	33.1	17.7	6.1	1.47
31 鳥取	13.1	7.8	7.6	5.0	10.2	25.2	12.6	26.1	28.6	6.4	1.26
32 島根	11.9	8.5	6.1	4.1	10.9	53.4	42.7	23.9	24.2	5.3	0.83
33 岡山	12.6	7.3	5.6	3.0	8.1	12.7	12.7	25.4	23.8	6.1	1.31
34 広島	13.0	6.4	6.2	3.8	9.2	14.0	11.2	27.7	20.0	6.4	1.28
35 山口	11.9	7.4	8.5	5.5	10.9	10.6	10.6	28.0	23.6	6.0	1.47
36 徳島	12.4	8.1	6.1	4.1	10.7	19.5	19.5	22.5	21.9	6.2	1.42
37 香川	12.2	7.3	7.7	5.2	11.7	8.1	8.1	25.3	15.9	6.3	1.30
38 愛媛	12.4	7.3	8.2	5.6	12.5	31.9	15.9	32.4	23.5	6.0	1.56
39 高知	11.8	9.0	7.5	4.8	10.6	20.4	10.2	24.8	27.2	5.9	1.70
40 福岡	13.6	6.2	6.1	3.6	9.5	19.1	17.5	30.6	30.1	7.0	1.82
41 佐賀	14.0	7.6	4.8	2.2	9.3	8.2	8.2	27.2	25.6	6.5	1.31
42 長崎	13.6	7.5	6.5	3.0	10.9	23.0	23.0	29.5	38.3	6.3	1.45
43 熊本	13.2	7.3	7.1	4.4	10.0	12.6	12.6	30.1	33.7	6.3	1.27
44 大分	12.4	7.5	7.0	4.7	11.8	19.7	13.1	31.7	32.7	6.1	1.32
45 宮崎	14.3	7.1	8.5	4.9	10.2	12.0	12.0	25.2	40.3	6.6	1.71
46 鹿児島	13.7	8.2	7.0	4.5	12.2	24.3	20.3	34.7	22.9	6.3	1.31
47 沖縄	17.7	4.7	6.5	4.0	10.3	15.0	15.0	24.3	4.6	7.6	2.17
11大都市（再掲） 11 largest cities (secondary mention)											
50 東京都区部	11.0	5.3	5.9	3.8	9.3	20.6	19.5	32.9	19.2	7.8	1.63
51 札幌市	14.1	4.6	5.8	3.4	8.5	14.5	14.5	29.4	39.5	8.6	2.49
52 横浜市	12.9	4.3	5.6	3.9	9.4	21.7	19.0	26.7	13.1	7.4	1.44
53 川崎市	13.8	3.9	6.5	3.4	8.8	20.6	20.6	29.1	11.6	8.4	1.52
54 名古屋市	12.8	5.2	5.1	3.4	9.1	11.2	11.2	26.3	29.9	7.3	1.54
55 京都市	11.3	6.3	6.3	3.9	10.6	24.0	18.0	33.5	20.7	6.4	1.37
56 大阪市	10.8	6.7	6.2	4.0	10.4	10.6	10.6	39.8	33.8	7.1	1.89
57 神戸市	11.7	6.2	4.9	3.3	8.7	43.3	24.7	29.7	24.8	6.6	1.59
58 広島市	13.9	4.9	5.8	3.8	8.5	7.8	—	28.3	21.6	7.3	1.51
59 北九州市	12.7	6.0	4.8	2.3	8.1	29.6	29.6	30.0	38.0	7.0	2.12
60 福岡市	14.9	4.7	5.7	3.2	9.5	24.0	24.0	29.5	29.4	8.2	2.00

Table 3. Number of births, fetal death rates, and perinatal death rates, by age group of mother in Japan (1982)

Age group	Total	Live births	Fetal deaths	Fetal death rates per 1,000 births	Perinatal death rates per 1,000 births
Total	1,593,499	1,515,392	78,107	49.0	10.1
year					
-14	110	15	95	863.6	18.8
15-19	24,805	16,694	8,111	327.0	
20-24	294,134	276,168	17,966	61.1	9.7
25-29	768,032	745,229	22,803	29.7	8.8
30-34	422,136	404,110	18,026	42.7	10.3
35-39	72,627	65,131	7,496	103.2	18.4
40-44	10,927	7,772	3,155	288.7	41.7
45-49	682	267	415	608.5	67.2
50-	11	1	10	909.1	
Unknown	35	5	30	.	.

Table 4. Number of live births and perinatal mortality by gestation period in Japan (1982)

Gestation period (weeks)	Live births	Perinatal deaths	Perinatal mortality rates per 1,000 live births
Total	1,515,392	15,303	10.1
Under 28 weeks	2,184	1,006	.
28-29 weeks	2,201	1,681	763.7
30-31 weeks	3,618	1,647	455.2
32-33 weeks	7,320	1,593	217.6
34-35 weeks	19,085	1,610	84.4
36-37 weeks	104,986	2,026	19.3
38-39 weeks	653,456	2,605	4.0
40-41 weeks	658,712	2,573	3.9
42-43 weeks	61,963	466	7.5
44 weeks and over	1,546	31	20.1
Unknown	321	65	.

Table 5. Number of live births by sex and birth weight in Japan.

Birth weight	Number of cases				Percent			
	Males		Females		Males		Females	
	1960	1982	1960	1982	1960	1982	1960	1982
Total	824,761	777,855	781,280	737,537	100.0	100.0	100.0	100.0
-0.9 kg	207	894	259	970	0.0	0.1	0.0	0.1
1.0-1.4	2,211	2,359	2,556	2,142	0.3	0.3	0.3	0.3
1.5-1.9	9,474	6,146	10,104	5,957	1.2	0.8	1.3	0.8
2.0-2.4	41,665	28,261	47,165	32,261	5.1	3.6	6.1	4.4
2.5-2.9	217,187	178,562	253,896	216,121	26.4	23.0	32.6	29.3
3.0-3.4	387,494	363,460	353,629	343,215	47.2	46.7	45.5	46.5
3.5-3.9	140,205	169,851	97,049	120,567	17.1	21.8	12.6	16.3
4.0-4.4	20,938	25,945	12,087	14,904	2.5	3.3	1.6	2.0
4.5 kg-	1,806	2,257	977	1,294	0.2	0.3	0.1	0.2
Unknown	3,574	120	3,558	106	.	.	.	.
≤ 2.5 kg	64,545	40,094	73,288	44,273	7.9	5.2	9.4	6.0
Average (kg)	.	.	.	.	3.14	3.22	3.06	3.14

Table 6. Perinatal mortality rates, by sex and birth weight (per 1,000 live births) in Japan, 1982

	Birth weight									
Sex	Total	kg -1.0	kg 1.0-1.5	kg 1.5-2.0	kg 2.0-2.5	kg 2.5-3.0	kg 3.0-3.5	kg 3.5-4.0	4.0 kg-	kg ≤2.5
Total										
Both sexes	10.1	1,255.9	615.2	204.7	37.2	5.8	2.8	2.8	5.9	118.1
Males	10.8	1,313.2	641.8	224.7	43.8	7.1	3.0	2.9	5.5	134.2
Females	9.2	1,148.5	575.2	179.3	30.9	4.7	2.5	2.6	6.7	100.9
Late fetal deaths										
Both sexes	6.8	742.5	426.3	144.4	26.6	4.0	1.8	1.8	4.2	80.0
Males	7.0	750.6	424.3	153.9	30.1	4.8	1.9	1.8	3.9	87.7
Females	6.3	680.4	417.8	129.9	23.0	3.3	1.7	1.8	4.8	70.3
Early neonatal deaths										
Both sexes	3.3	513.4	188.8	60.2	10.6	1.9	1.0	1.0	1.7	38.1
Males	3.8	562.6	217.5	70.8	13.7	2.4	1.1	1.1	1.6	46.4
Females	2.9	468.0	157.3	49.4	7.9	1.4	0.8	0.8	1.9	30.6

Table 7. Number of infant deaths, by age (day, week and month) in Japan.

Days	Number of cases			Percent		
	1950	1980	1982	1950	1980	1982
Total	140,515	11,841	9,969	100.0	100.0	100.0
Less than 1 day	8,422	2,808	2,433	6.0	23.7	24.4
1 day	6,790	1,239	952	4.8	10.5	9.5
2 days	6,247	846	675	4.4	7.1	6.8
3 days	4,554	459	358	3.2	3.9	3.6
4 days	3,348	338	271	2.4	2.9	2.7
5 days	3,097	266	197	2.2	2.2	2.0
6 days	2,726	198	181	1.9	1.7	1.8
Less than 1 week	35,184	6,154	5,067	25.0	52.0	50.8
Less than 2 weeks	48,405	7,055	5,773	34.4	59.6	57.9
Less than 3 weeks	57,782	7,500	6,157	41.1	63.3	61.8
Less than 4 weeks	64,142	7,796	6,425	45.6	65.8	64.4
Less than 2 months	82,695	8,682	7,275	58.9	73.3	73.0
Less than 3 months	93,724	9,207	7,715	66.7	77.8	77.4
Less than 4 months	101,596	9,653	8,094	72.3	81.5	81.2
Less than 5 months	107,732	10,097	8,444	76.7	85.3	84.7
Less than 6 months	113,017	10,444	8,740	80.4	88.2	87.7

Table 8. Number of perinatal deaths by cause of death in Japan, 1982

Cause of death	On child				
	Total	Congenital anomalies	Certain conditions originating in the perinatal period	Injury and other poisoning	Others
Total	15,303	2,451	12,610	62	180
760 Maternal conditions which may be unrelated to present pregnancy	1,282	74	1,191	1	16
761 Maternal complications of pregnancy	1,589	307	1,263	-	19
762 Complications of placenta cord and membranes	4,168	94	4,056	3	15
763 Other complications of labor and delivery	704	64	635	-	5
*** Without description about maternal conditions	7,560	1,912	5,465	58	125

Perinatal and Infant Mortality, Recent Trends in the United States

by Joel Kleinman, Ph.D.

Let me just start by giving a very brief overview of where vital statistics come from in the United States.

Vital statistics in the United States are based on a coordinated, cooperative system of separate local, State, and Federal agencies. Each State maintains its own statistical system and sends copies of certificates or data tapes to the National Center for Health Statistics.

Birth and fetal death certificates in the United States generally include information on mother's age, race, previous live births and fetal deaths, educational attainment, marital status, receipt of prenatal care, and on the infant, sex, birth weight, and gestation. Death certificates include information on the infant's age, race, sex, and cause of death.

One of the major limitations of the United States infant mortality statistics is the lack of a national system of linked birth and death certificates. This will, hopefully be remedied in the near future by a project that the Center is now beginning which will develop a national system of linked records. However, there are certain States which have been linking birth and death files for several years. Data from these States have been used in several epidemiological studies.

My overview of trends today will emphasize a particularly important and somewhat puzzling problem in perinatal epidemiology in the United States, the continuing disparity in reproductive outcome between white and black Americans.

Figure 1 shows United States infant mortality since 1950 and, basically, the trends are somewhat similar to England and Wales, with a plateau in the 1950's and a rapid decline beginning again in the late 1960's for both races.

For the period 1970-81, the average annual percent decline for white infants (5.0 percent) was slightly higher than that for black infants (4.2 percent) and this has led to a lot of concern in the United States. However, closer examination of the trends suggests that there have been three phases of decline over the 1968-81 period. From 1968-73 infant mortality decreased by 3.8 percent per year for white infants and 5.1 percent per year for black infants. In the mid-1970's (1973-77), the decline was greater among white infants (5.9 percent versus 3.9 percent per year). In the most recent period, 1977-81, the two rates have been decreasing at the same rate (4.0 percent). The cutoff dates for these periods are somewhat arbitrary but the general pattern holds even when the years are shifted by one on either side. One should notice, however, that declines in infant mortality among black infants have been somewhat more erratic since 1976 than in the previous years.

It is also important to recognize that the infant mortality rates (IMR's) are subject to various reporting problems. For example, underregistration of infant deaths has been documented in Georgia, inconsistencies in race coding between birth and death records have been noted in California, Minnesota, and Washington, and potential changes in the distinction between live births and fetal deaths have been suggested. Thus, it would be speculative to claim that differences in the rate of decline on the order of less than 1 percent per year (for example, 5.0 percent versus 4.2 percent) are definitive.

The major point that emerges from these trends, however, is that black infant mortality remains twice as high as that for white infants and there is no evidence that this relative risk is decreasing.

Figure 2 shows the change in neonatal and postneonatal mortality rates. Unlike the situation in England and Wales and Federal Republic of Germany, we have had, and continue to have through 1981, declines in postneonatal mortality.

The age-specific trends for black and white infants are somewhat different. Neonatal mortality among white infants has been declining more rapidly than among black infants, while the reverse is true for postneonatal mortality. By 1981, the black-white ratio for postneonatal mortality was about the same as the ratio for neonatal mortality.

Figure 3 shows the fetal mortality ratio which follows similar patterns to infant mortality, except that during the 1950's when infant mortality was already showing a relatively flat trend, fetal mortality was still declining fairly steadily. The fetal death rate started to stagnate in the early 1960's. But then again, as with infant mortality, the fetal death rate started to decline rather sharply in the late 1960's. (The fetal death data, by the way, are for white and other infants because black rates are not available for the early years.) Since 1970 the fetal death rate for other infants has been declining a bit more rapidly than that for white infants.

Figure 4 is adapted from an article by Wilcox and Russell in the American Journal of Epidemiology (1983, 118: 857-64). It illustrates one of the basic differences between white and black infants and part of the puzzling aspects of the perinatal mortality situation.

The bottom part of the graph shows the birth weight distribution for white and black infants. Basically, the black birth weight distribution is shifted about 200 grams to the left. In other words, on the average, black babies are about 200 grams lighter than white babies. But what you can't see from this graph is that in the very low range, under 1,500 grams, there is an especially sharp excess of black births that is not completely accounted for by just the shifting of two symmetric distributions.

The top graph shows the weight-specific perinatal mortality rates. Below birth weights of about 3,000 grams, the black perinatal mortality is actually lower than that for white infants. However black mortality is substantially higher than white mortality for birth weight over 3,000 grams.

The next few figures attempt to give you some idea of the geographic variation in infant mortality within the United States. For white infants there is a 39 percent difference between the States, with the highest and lowest rates; from 9.0 in Vermont to 12.5 in West Virginia (figure 5). The lowest rates are generally in the North, especially New England; and the highest rates are in the Appalachian States, the Midwest, industrial States, and some in the South.

Figure 6 shows the black infant mortality rates. We excluded all States that had a black population less than 150,000 people, so there are only 27 States that are being compared here. There is a 58 percent spread between the lowest black rate (16.4 in Massachusetts and the highest rate 25.9 in Illinois). The lowest rates are spread out in three different States: Massachusetts, Wisconsin, and California. The highest rates are also somewhat spread out, in Illinois, Michigan, South Carolina, and Mississippi.

Figure 7 illustrates the black-white difference in infant mortality in a rather dramatic way. This is the distribution of State infant mortality rates. There are 50 States included for white infants, 27 for black infants, and both are presented on one continuous scale.

And, as you can see, there is no overlap at all. The highest rate for white infants, 12.5, is considerably lower than the lowest rate for black infants, 16.4. Furthermore, the spread among the States for black infants is somewhat higher than the spread for white infants.

Let me shift now to discuss low birth weight. Since the United States does not have a linked system of birth and death records much of our national data on socioeconomic differentials are available only for the incidence of low birth weight. The first chart (figure 8) on low birth weight shows the trend since 1970 and as you can see, the incidence of low birth weight among black infants is considerably higher than among white infants. The incidence among black infants has also been declining at a slower rate: 0.9 percent versus 1.7 percent per year.

The situation with respect to very low birth weight, that is under 1,500 grams, is even worse in the sense that the black rate has, if anything, been increasing slightly, while the white rate has come down extremely slowly.

There have been some studies looking at the components of low birth weight in the United States, and it appears that most of the modest decline which has occurred in low birth weight has been mainly for term low birth weight. The incidence of preterm low birth weight has declined even less than the overall.

Figure 9 shows data on the proportion of women obtaining prenatal care in the first trimester of pregnancy. This information is available from the birth certificate in all our States. It shows a very large difference between black and white women, but a narrowing of the differential. In 1970, only about 45 percent of black women had prenatal care the first trimester, that has jumped to 63 percent in 1981. Unfortunately 1982 data show slight decline in the proportion with early care.

In addition, other indicators from the birth certificate suggest that the cohort of births to black women is much more favorable in terms of risk factors. For example, the percent of black women with under 12 years of education dropped from 51 percent in 1970 to 35 percent in 1981. There was also a decline for white women.

On the other hand, the percent unmarried had an adverse change. The percent unmarried among black births was 38 percent in 1970 but increased to 56 percent in 1981. However, even if the data are examined separately for married and unmarried women, there's been very little change in the incidences of low birth weight among the married black women.

Thus, the trends for prenatal care and education point out another one of the problems in interpreting these data. Given these very favorable changes in the cohort of black women giving birth we would have expected that the incidence of low birth weight should have had a greater decline than we actually observed.

There are a number of different racial and ethnic groups in the United States, and figure 10 presents the incidence of low birth weight for these groups. Black infants, again, are the very highest, but at the other extreme, the Chinese have a very low incidence of low birth weight and an extremely low infant mortality rate. Their infant mortality rate is considerably lower than the white population, based on linked records that are available from California, where there is a substantial Chinese population. The Japanese in the United States have a slightly higher incidence of low birth weight, but their mortality also appears to be lower than white infants, but not quite as low as the Chinese.

Hispanic populations in the United States present a mixed picture. Puerto Ricans have a high incidence of low birth weight but Cubans have about the same rate as white infants. Incidentally, their socioeconomic indicators look very similar to white infants.

But the Mexicans are very interesting in that they have the same incidence of low birth weight as white women but their socioeconomic status is considerably worse. For example 63 percent of the Mexicans who gave birth in the United States had less than 12 years of education, compared to 18 percent for white women. Figure 11 also shows much lower use of prenatal care among Mexicans. Black and Mexican women have about the same proportion with early prenatal care. The Puerto Rican data also is somewhat low but this is probably due to a data problem in New York City where many Puerto Ricans live (only 44 percent of black women in New York City are reported as having early prenatal care).

Figure 12 shows data on ethnic differences in marital status. Nine percent of the births to white mothers in the United States are to unmarried women, compared to 56 percent of the black births, with the Puerto Ricans also very high, and the Mexicans somewhere in between. Chinese and Japanese are extremely low.

Figure 13 shows data on teenage pregnancy. Again, it follows a very similar pattern to the data on marital status. Births to teenagers are rare among the Chinese and Japanese, but quite high among the higher risk groups.

Figure 14 shows the incidence of low birth weight by socioeconomic status as measured by education of mother from the lowest education (women who have not completed high school) up to college graduates. There is a very strong gradient, with high excess risk among those who have not graduated from high school. But also of interest is the fact that the lowest rate for black women, among the college educated, is still higher than the highest rate among white women (those who have not completed high school).

When the data are examined in a multivariate sense, the black-white differential remains large. Even among the lowest risk women (married college graduates having their second birth, age 25 to 29, who began prenatal care in the first trimester) the incidence of low birth weight among white women in the United States is 2.3 percent compared to 5.7 percent among black women.

Figure 15 is similar to figure 14, except the dependent variable is the proportion of women who did not receive early prenatal care. The basic message from this chart is that the women at highest risk of having low birth weight babies are the least likely to receive early prenatal care.

Figure 16 shows that access to care is especially low among black women in the rural South. Forty-three percent of the black women in the rural South did not have early prenatal care which is considerably higher than any of the other areas.

In addition to this overall difference, there is also substantial evidence that the content of care differs along these dimensions. For example, black women in the nonmetro South have the highest use of X-rays and the lowest use of ultrasound. Amniocentesis among women ages 35 and over is also substantially lower among black women than white women.

In addition to showing the United States trends in infant mortality and low birth weight, I have attempted to present some of the unique problems we have with respect to racial and ethnic differences. One of the things that we hope will come out of the Symposium is some help in terms of better understanding, through international efforts, these very puzzling aspects of the perinatal epidemiology situation in the United States.

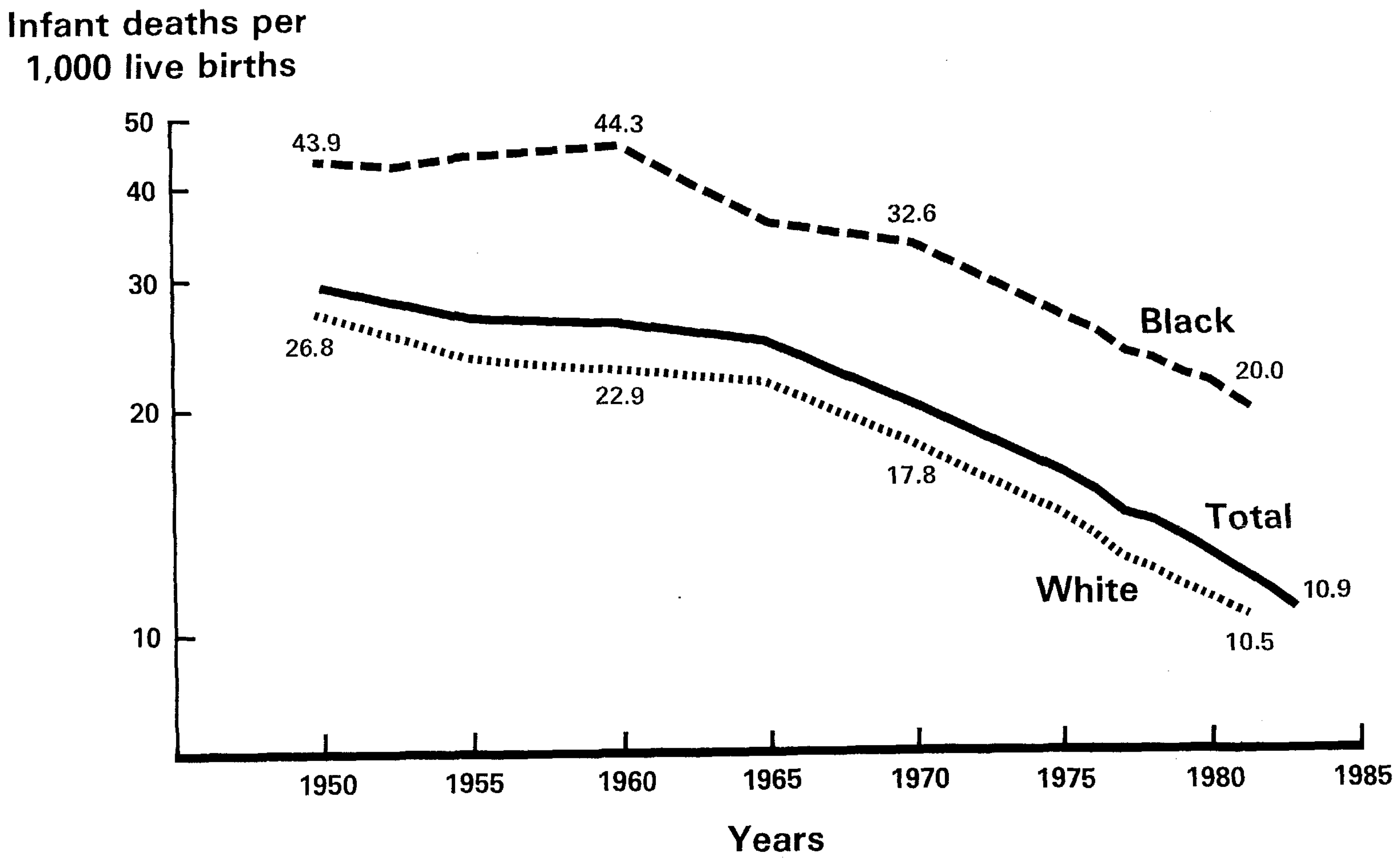
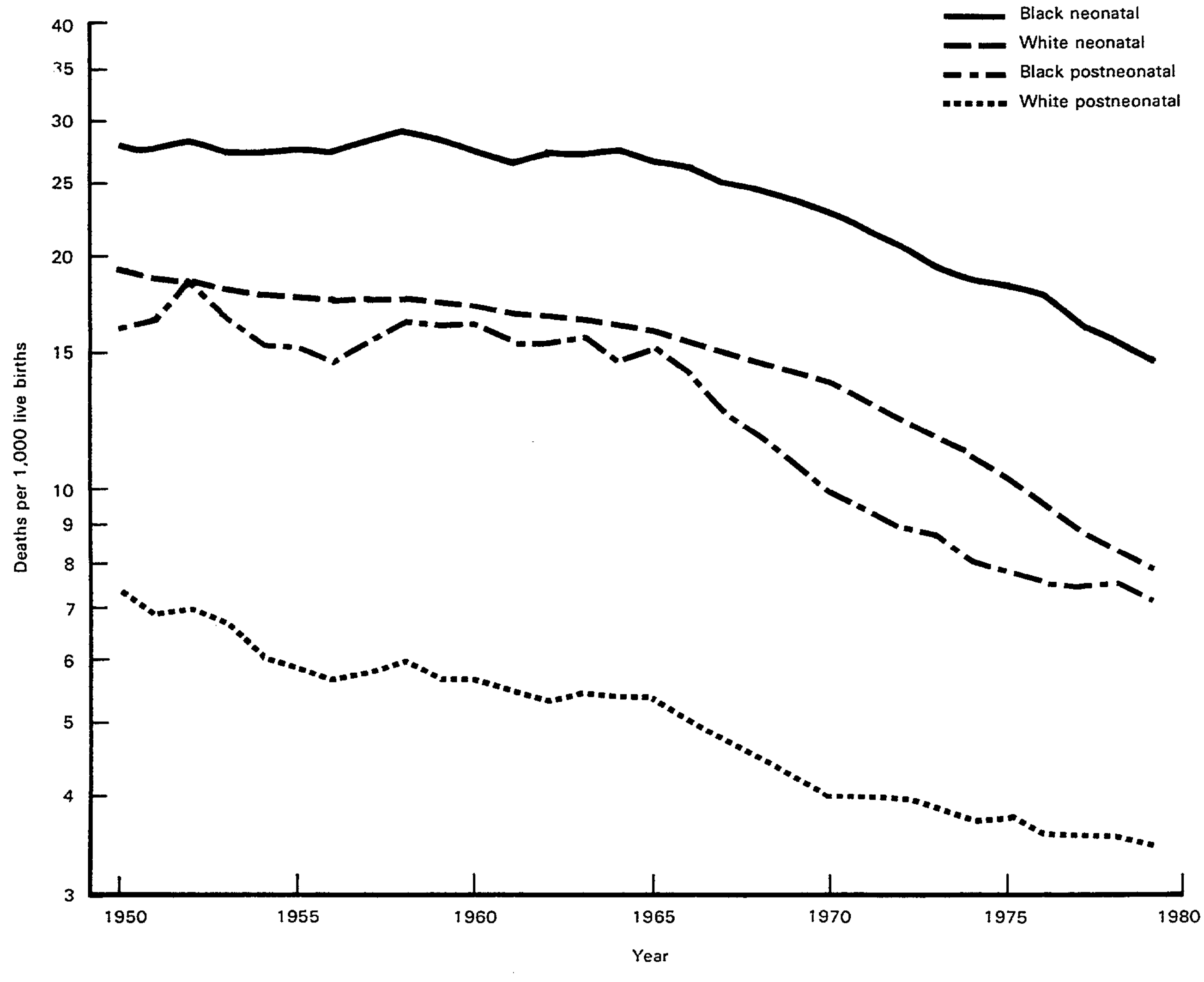
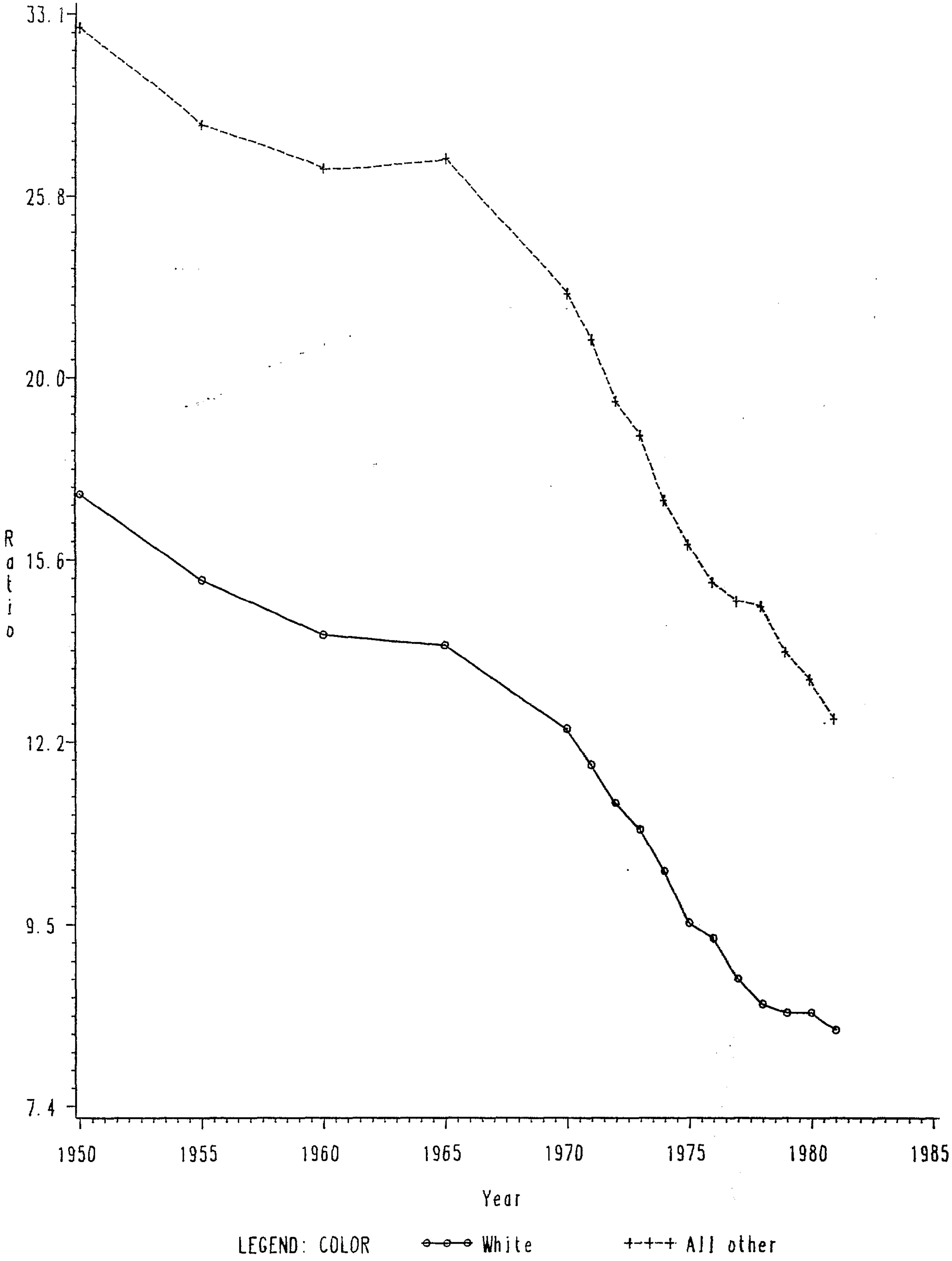


Figure 1. Infant mortality rates: United States, 1950-83



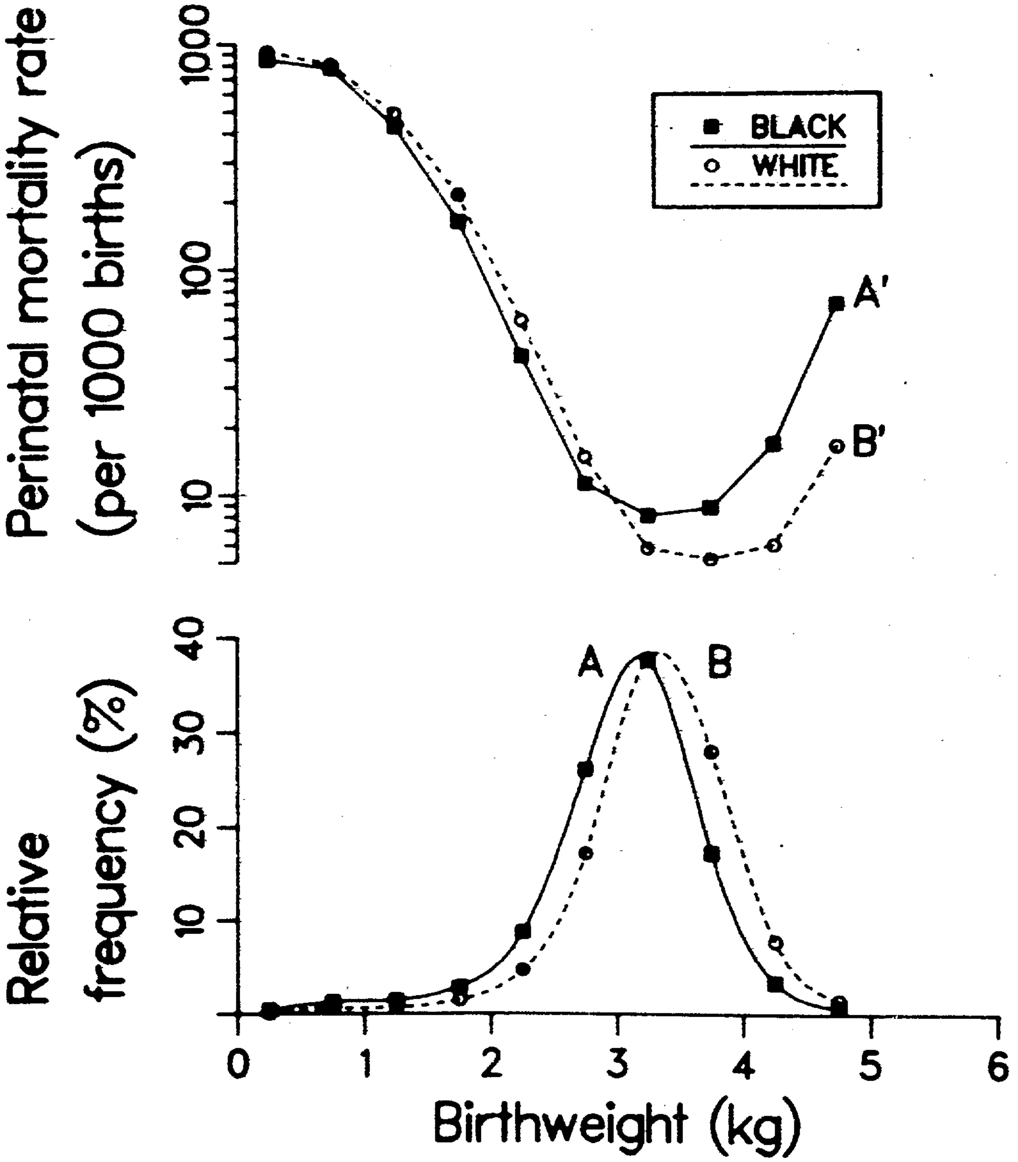
SOURCE: National Center for Health Statistics: Computed by the Division of Analysis from data compiled by the Division of Vital Statistics.

Figure 2. Neonatal and postneonatal mortality rates, by race: United States, 1950-79



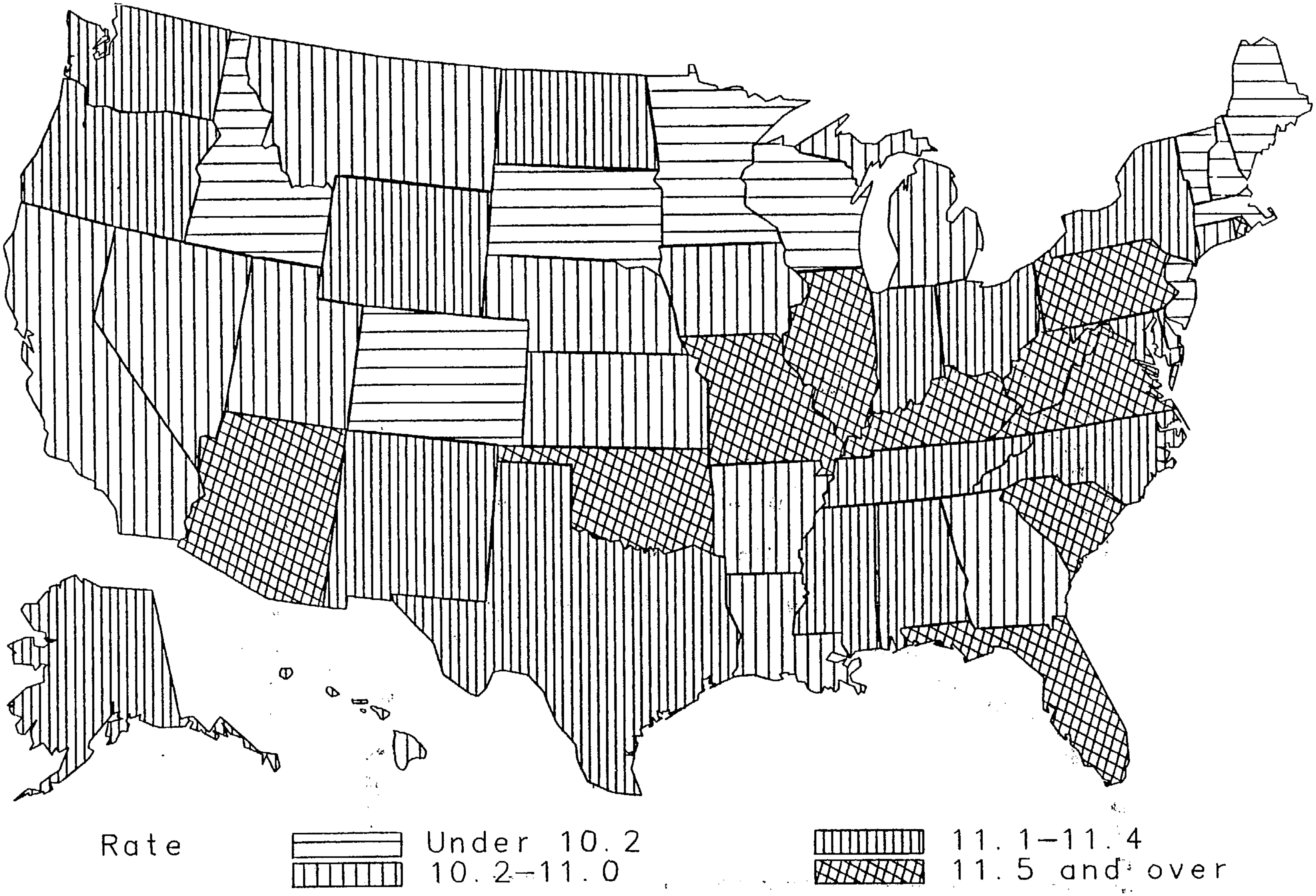
SOURCE: National Center for Health Statistics: Division of Vital Statistics.

Figure 3. Fetal death ratios per 1,000 live births: United States, 1950-81



SOURCE: North Carolina Vital Statistics Data Files (26)

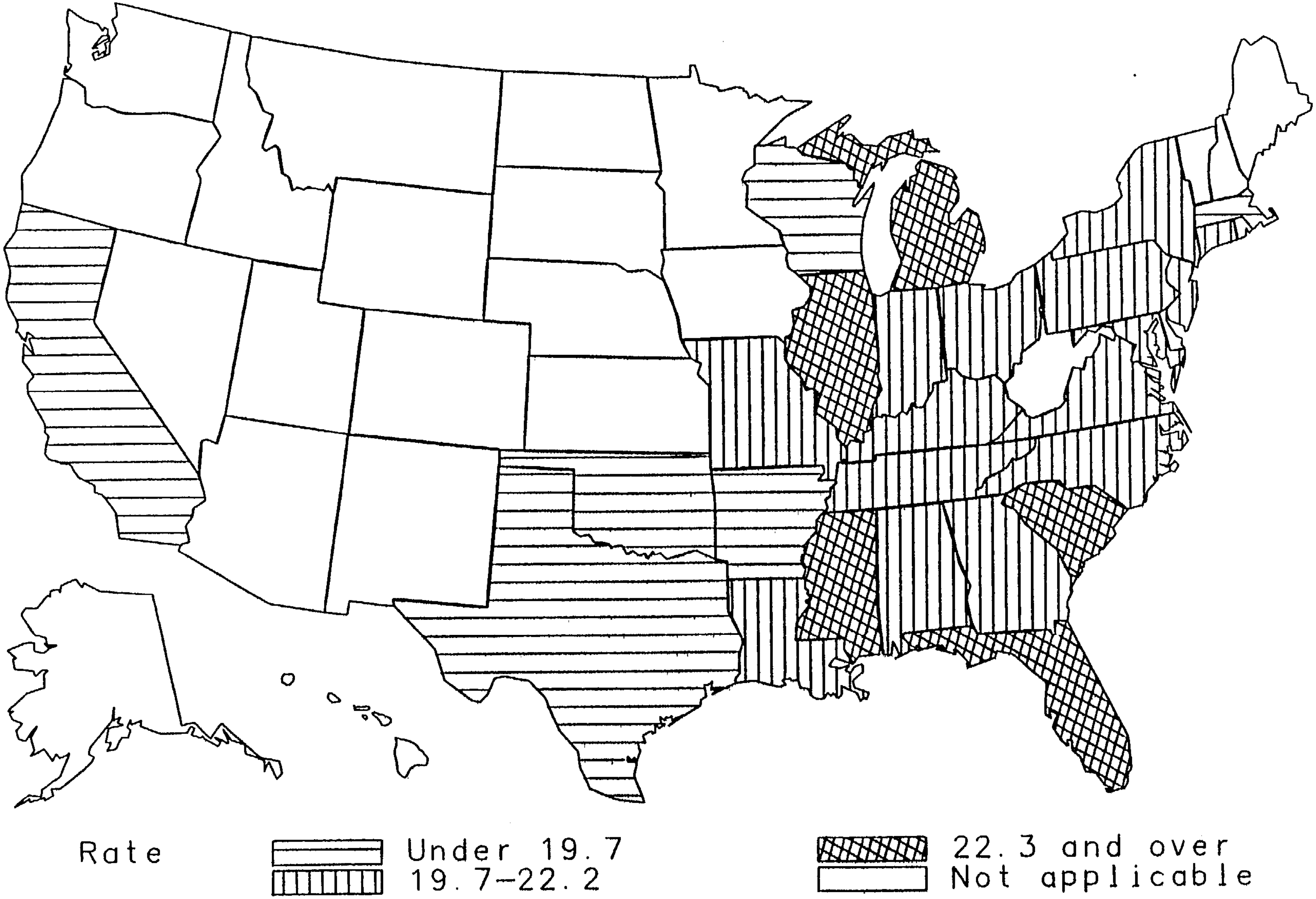
Figure 4. Birthweight distribution and weight-specific perinatal mortality curves for white and black infants, North Carolina, 1970-73.



NOTE: Rates are defined as deaths per 1,000 live births.

SOURCE: National Center for Health Statistics.

Figure 5. Infant mortality rates for white infants, by State: United States, 1979-81



NOTE: Rates are defined as deaths per 1,000 live births.

SOURCE: National Center for Health Statistics.

Figure 6. Infant mortality rates for black infants, by State: United States, 1979-81

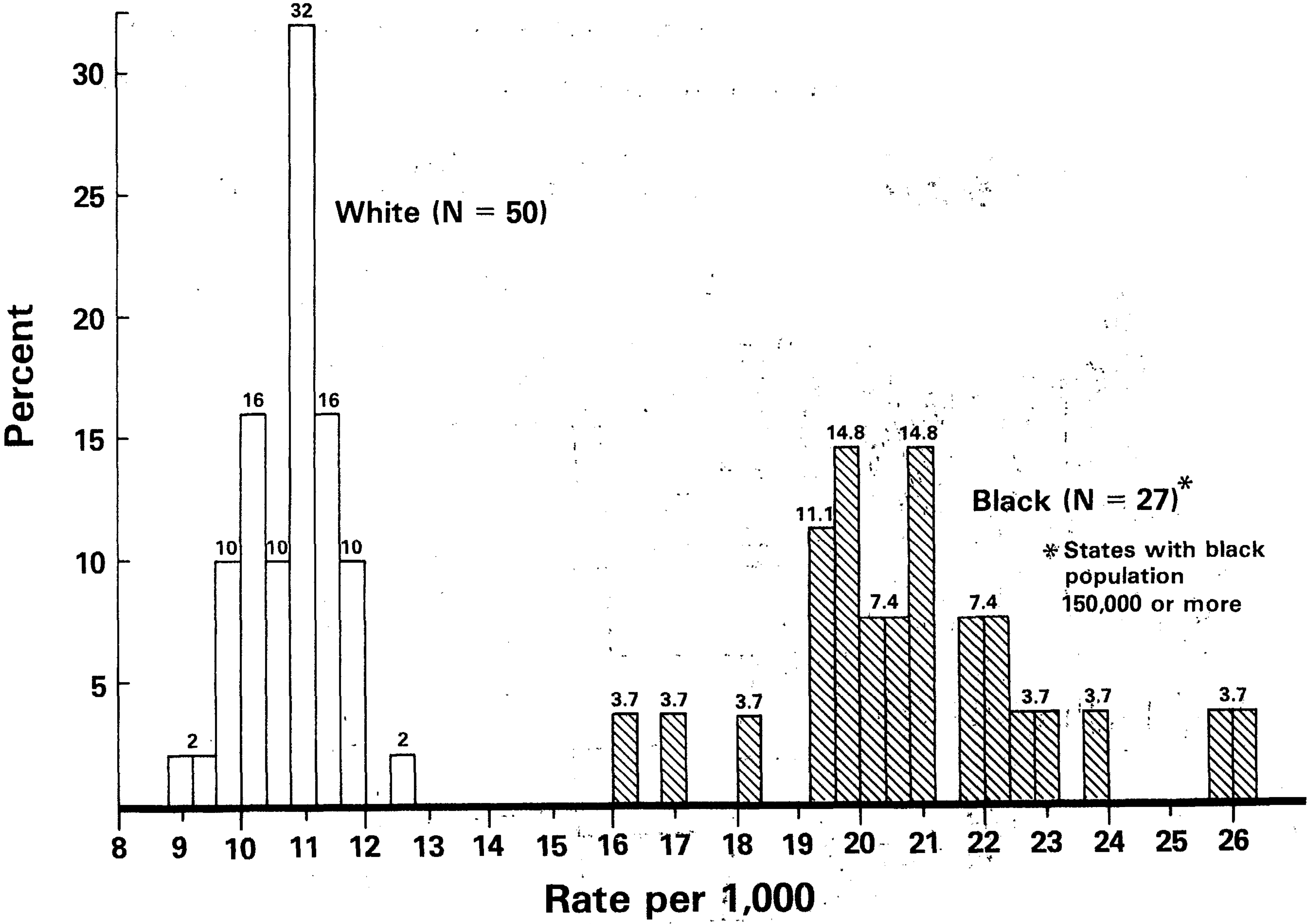


Figure 7. Distribution of State infant mortality rates: United States, 1979-81

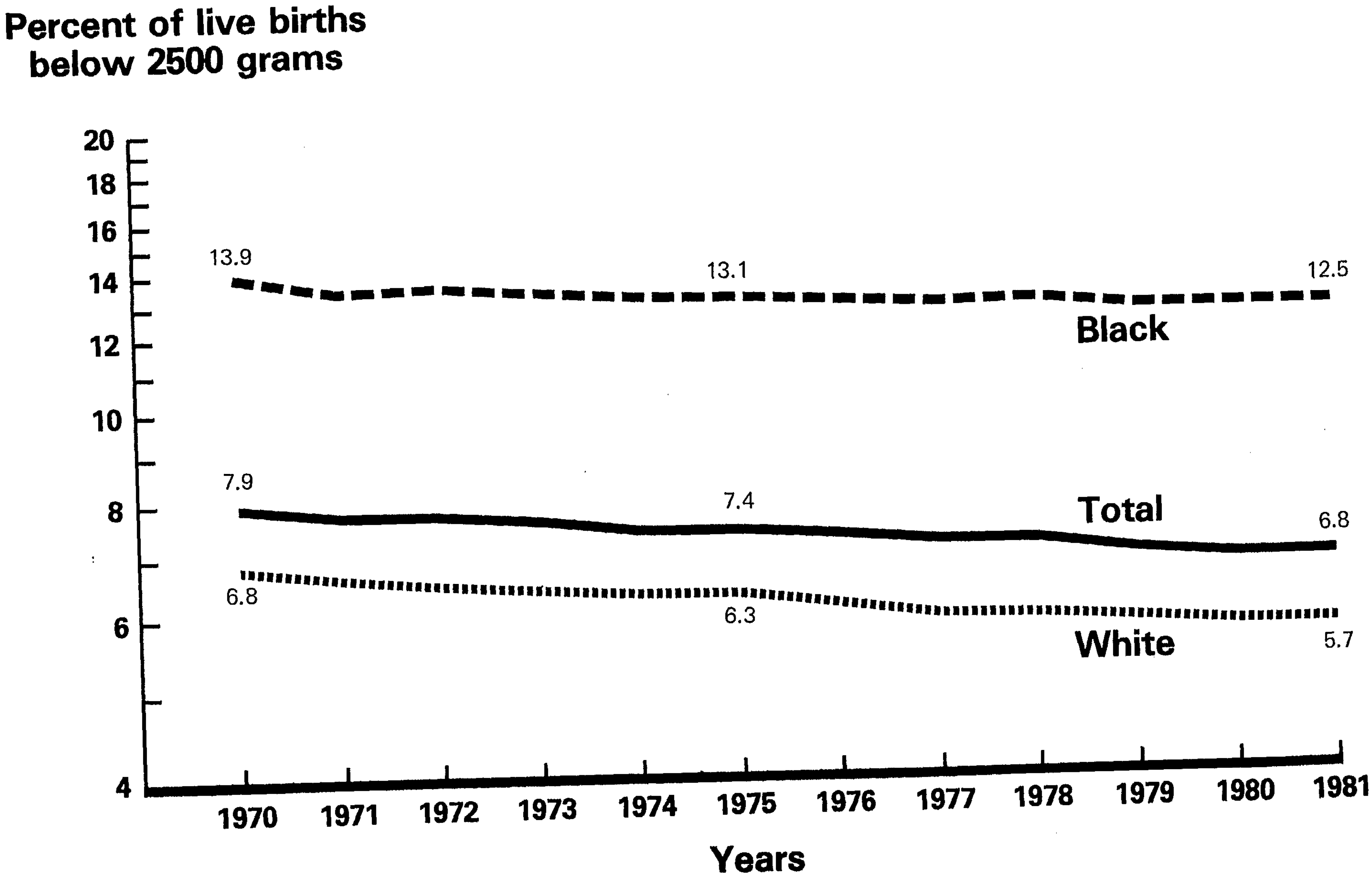
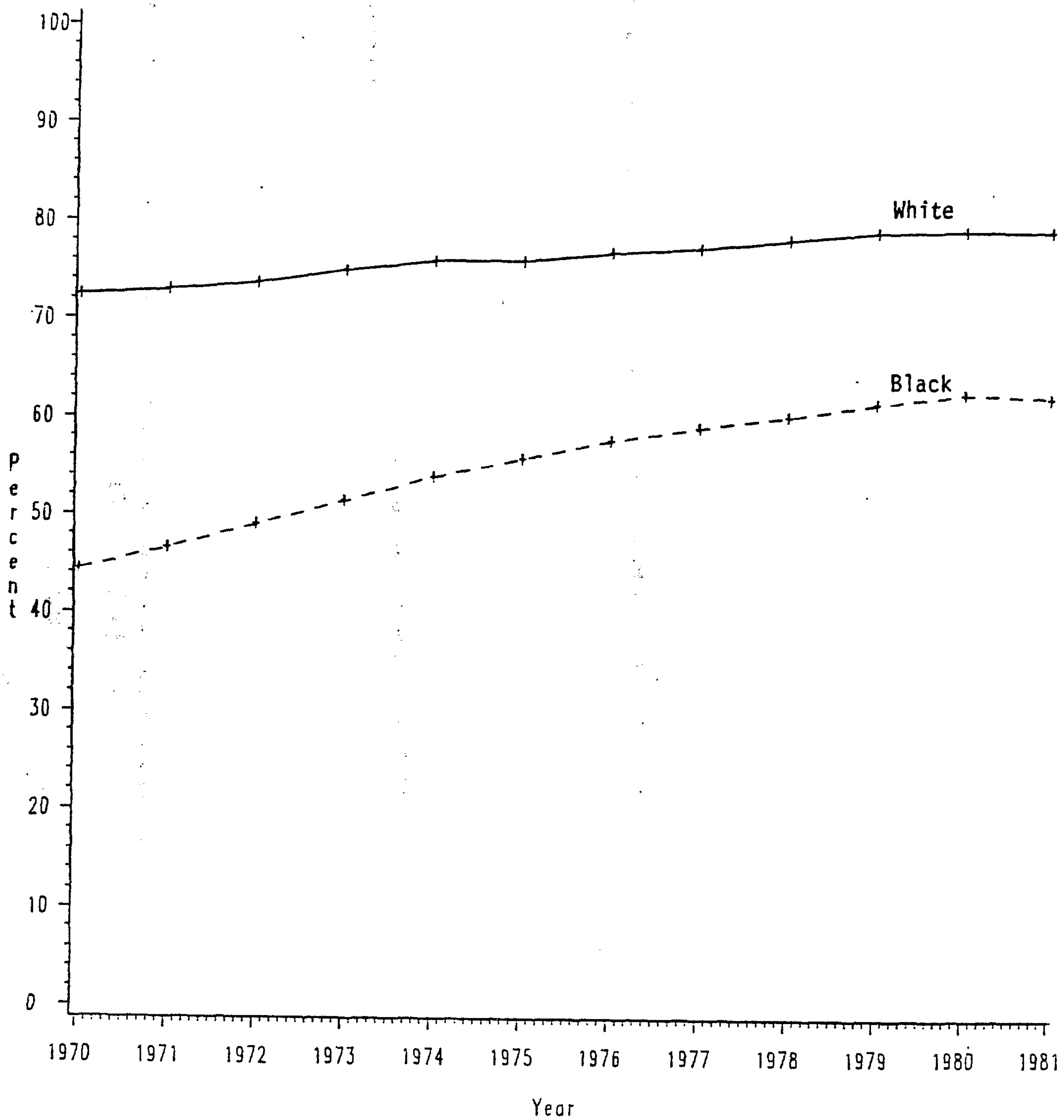
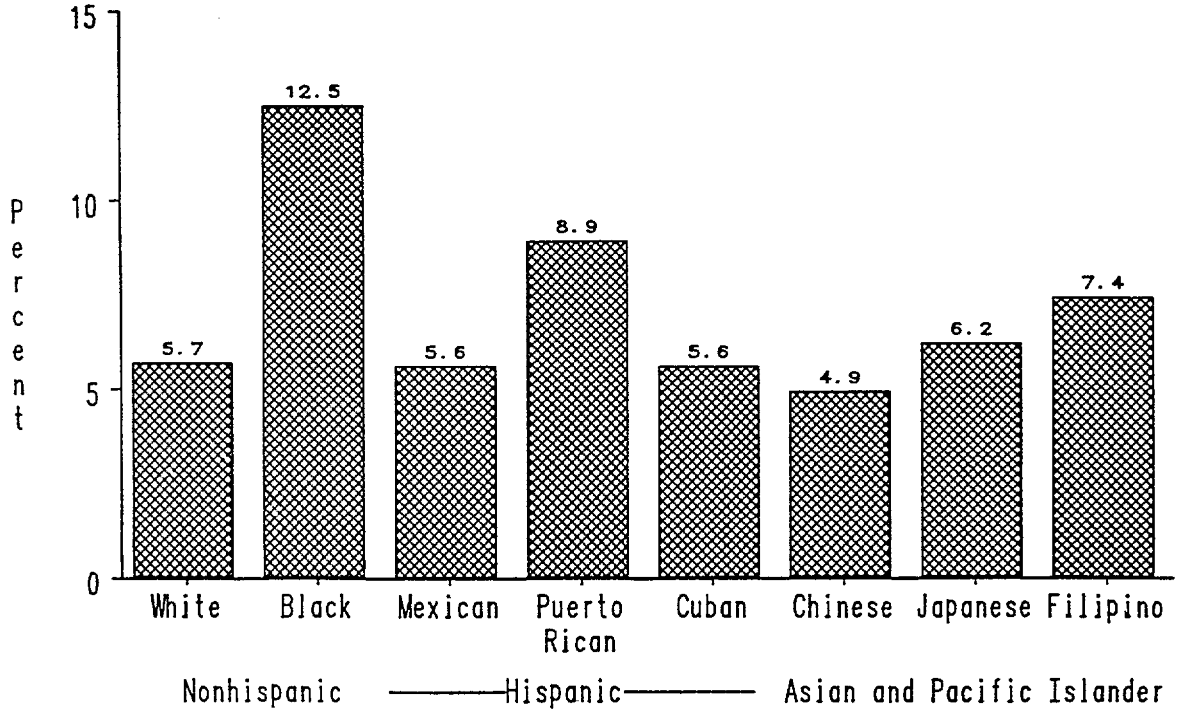


Figure 8. Low birth weight ratios: United States, 1970-81



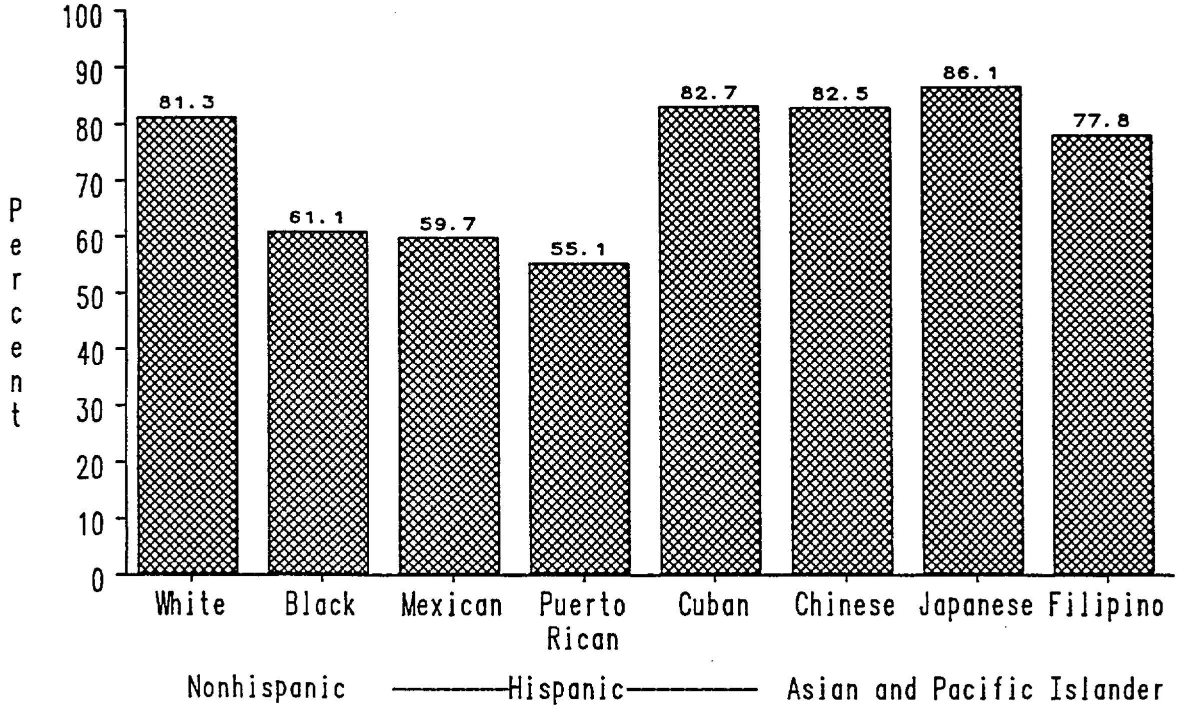
SOURCE: National Center for Health Statistics.

Figure 9. Women beginning prenatal care in the first trimester of pregnancy, by race: United States, 1970-81



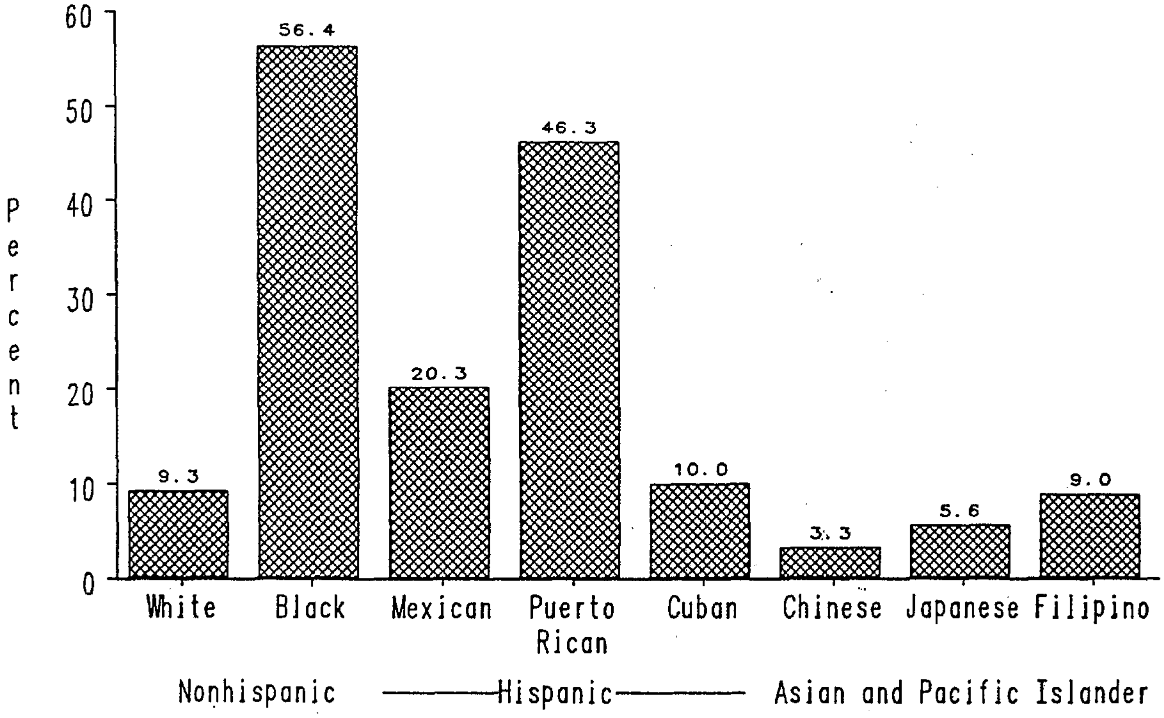
SOURCE: National Center for Health Statistics.

Figure 10. Live births with birth-weight less than 2500 grams, by race and ethnicity: United States, 1980



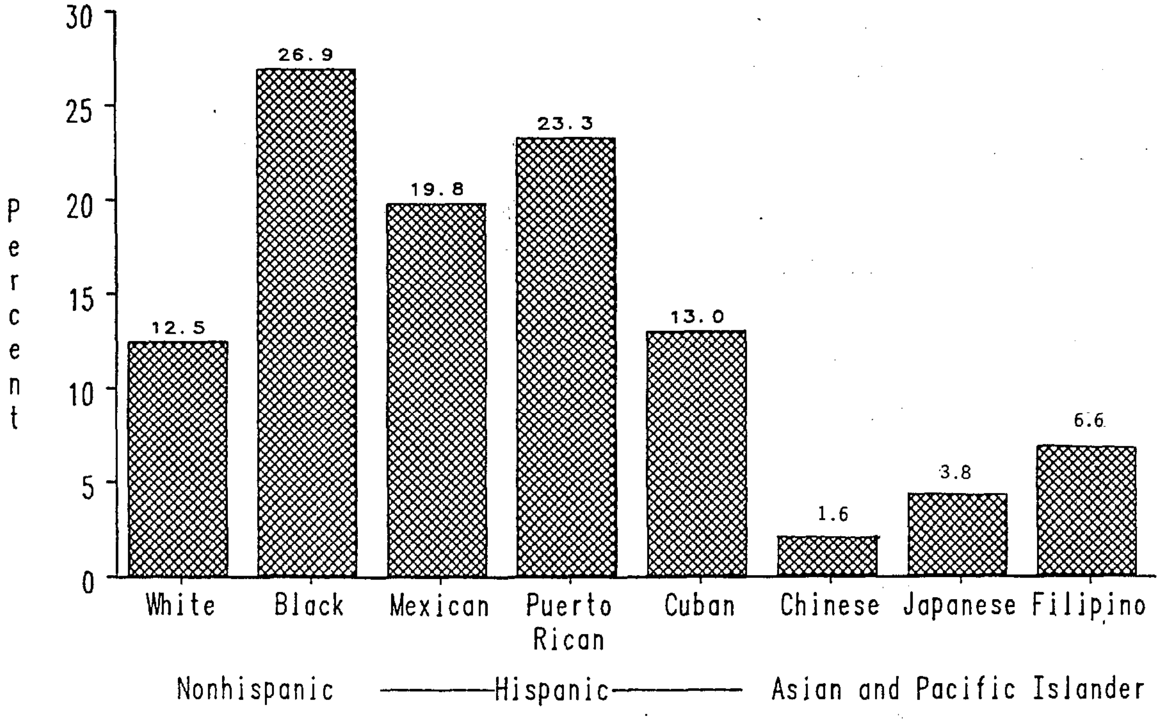
SOURCE: National Center for Health Statistics.

Figure 11. Women beginning prenatal care in the first trimester of pregnancy, by race and ethnicity: United States, 1980



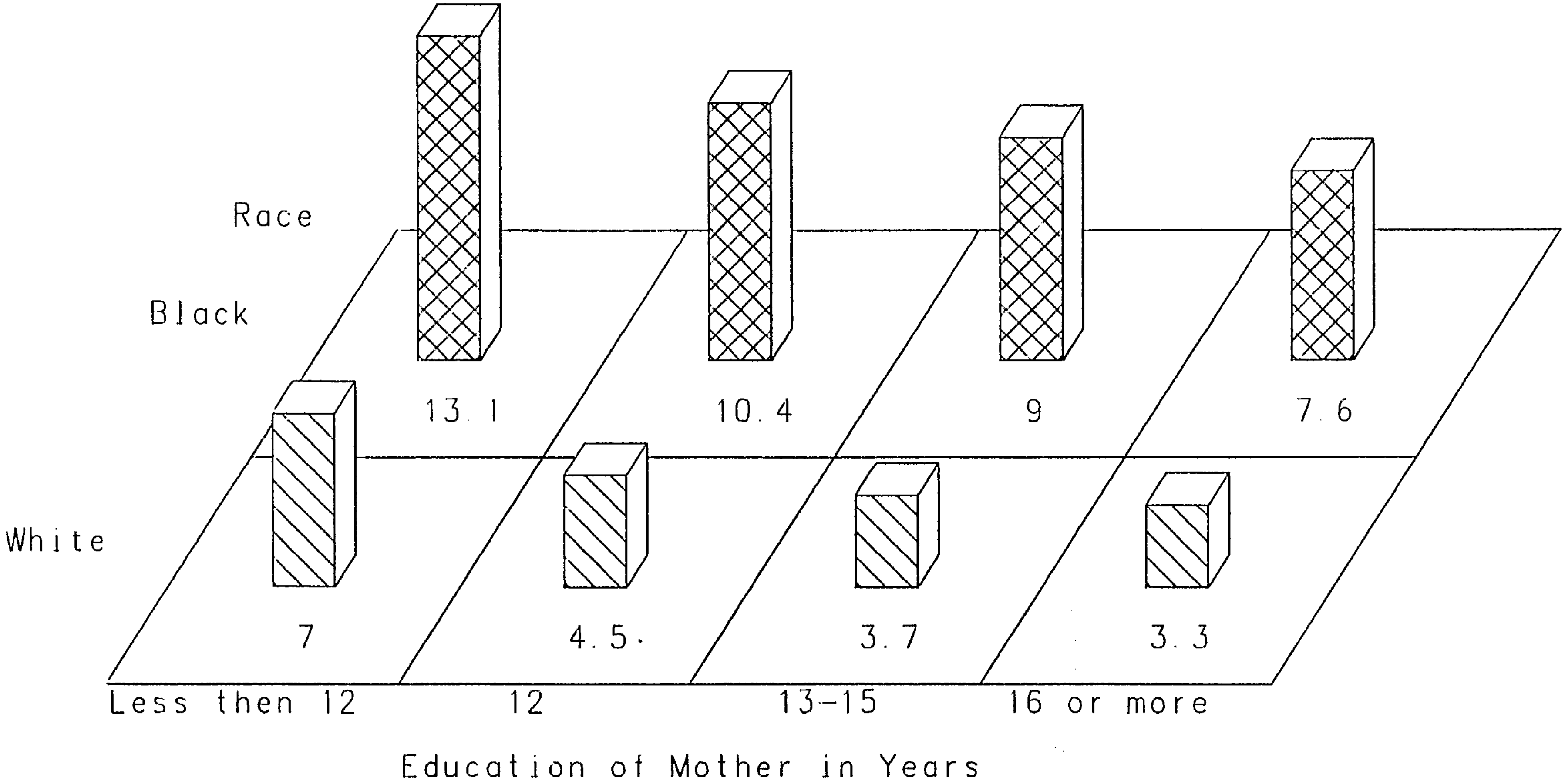
SOURCE: National Center for Health Statistics.

Figure 12. Live births to unmarried mothers, by race and ethnicity: United States, 1980



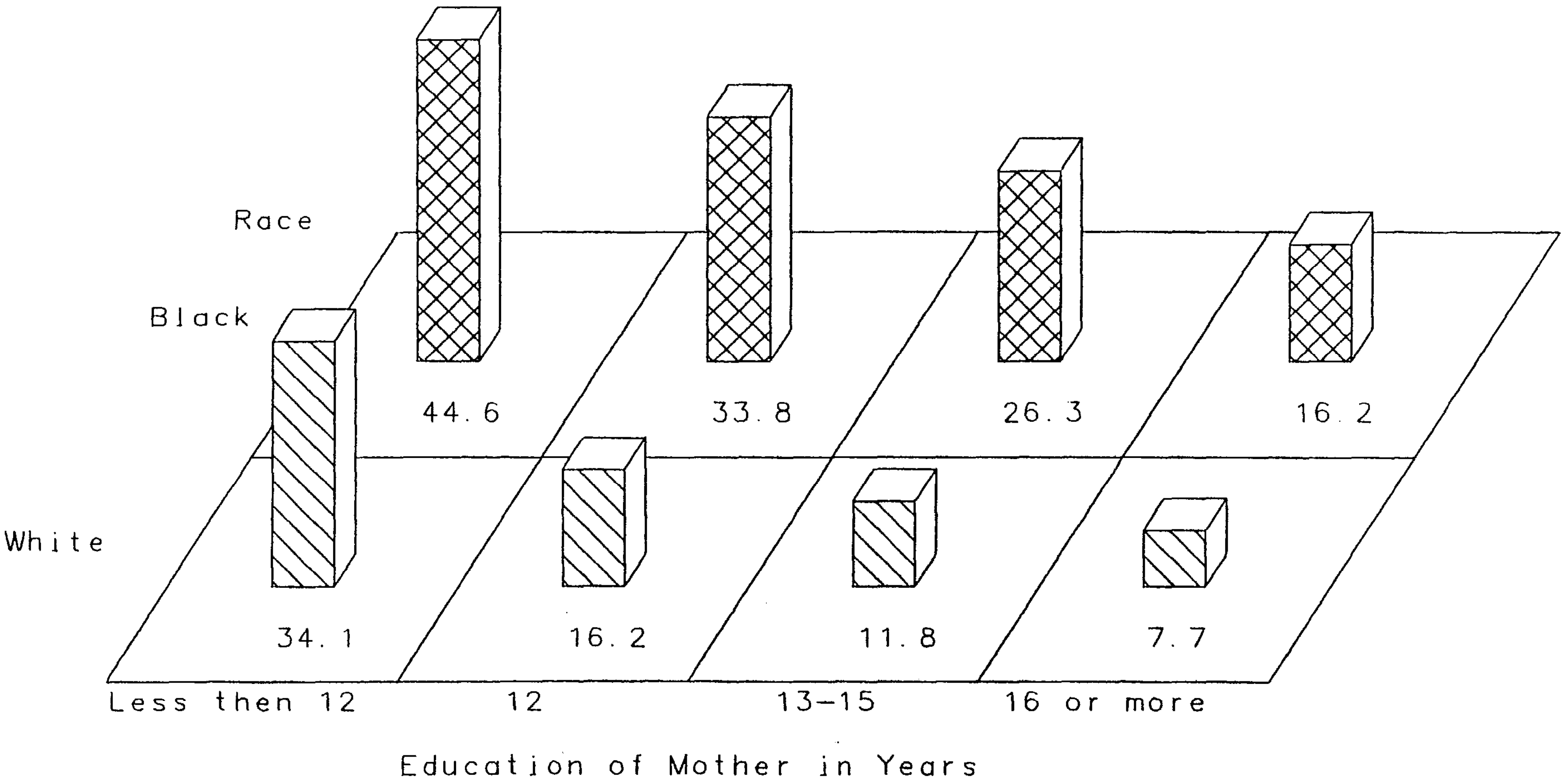
SOURCE: National Center for Health Statistics.

Figure 13. Live births to mothers under 20 years of age, by race and ethnicity: United States, 1980



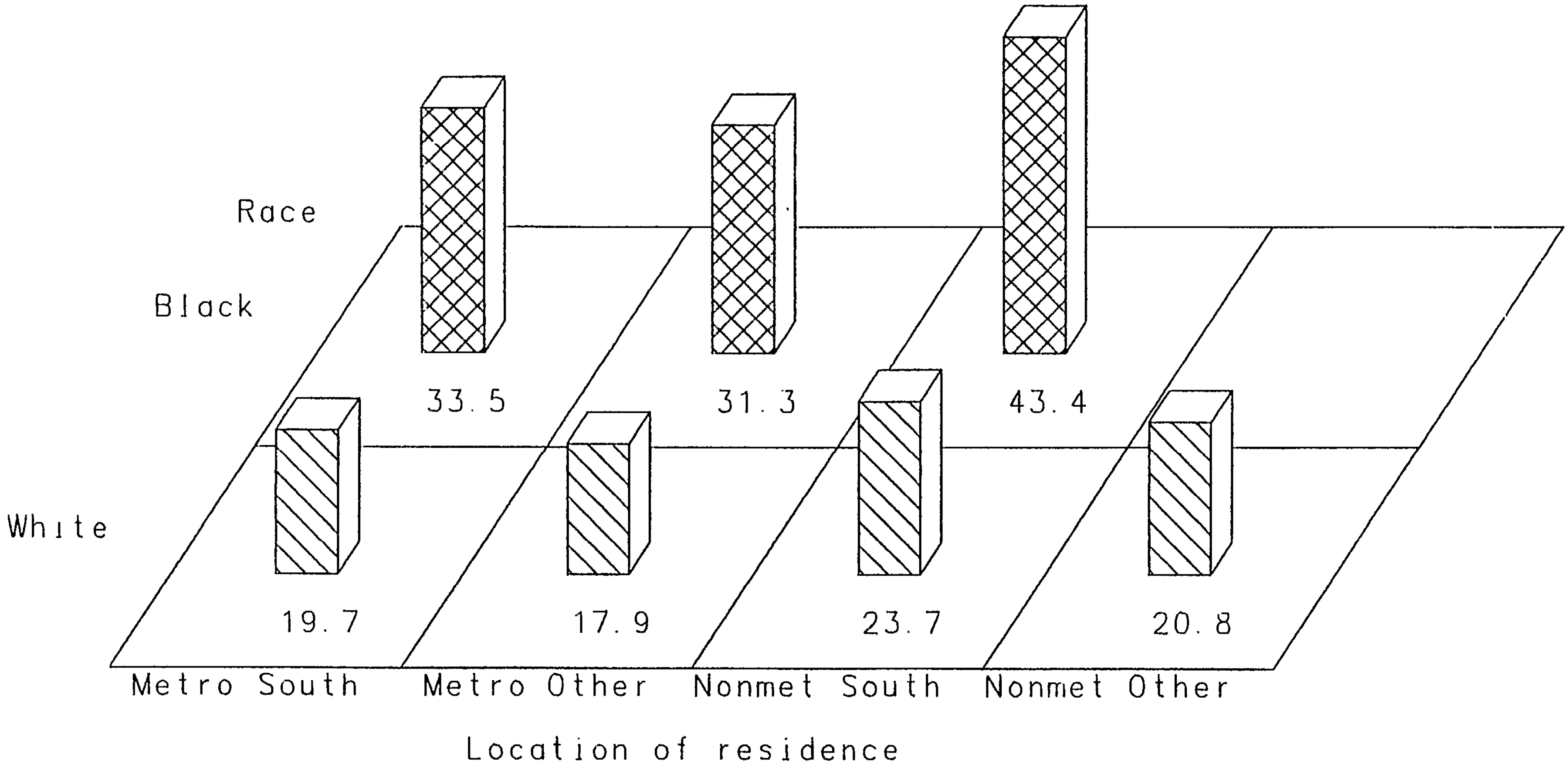
SOURCE: National Center for Health Statistics.

Figure 14. Percent of singleton live births below 2500 grams to women ages 20-39 years, by education of mother and race: United States, 1981



SOURCE: National Center for Health Statistics.

Figure 15. Percent of mothers aged 20-39 with prenatal care beginning after the first trimester of pregnancy, by education of mother and race: United States, 1981



SOURCE: National Center for Health Statistics.

Figure 16. Percent of mothers with prenatal care beginning after the 1st trimester of pregnancy, by race and location of residence: United States, 1980

Perinatal and Infant Mortality, Recent Trends in Israel

by Pnina Zadka

Infant and perinatal mortality in Israel has declined during the last decade in all population groups, although at different rates. Differences among groups remained.

There is no information on parents on the death certificate. The information presented here is mostly based on a matching of death and birth records for the years 1977 to 1980. The matching was performed by the Clinical Epidemiology Department of the Sackler Medical School, University of Tel Aviv, on files prepared by the Central Bureau of Statistics.

95.6 percent of death records for the years 1977 to 1980 were successfully matched with the corresponding birth records. During this period, there were 6,187 infant deaths and 375,547 live births. Results are presented separately for the Jewish and non-Jewish population for two main reasons.

First, the various rates of infant mortality in the non-Jewish population are almost double those of the Jewish population. This is especially true of the postneonatal period.

The second reason is that there are important differences in levels of formal education and other social and cultural factors, and there is a very high proportion of missing information on the non-Jewish birth records.

The data for the non-Jewish population includes East Jerusalem and excludes Judea, Samaria, and the Gaza Strip.

All the data presented here are based on vital event records and the information listed on the records.

Perinatal mortality by weight

Mortality in the early neonatal period declined between 1977 and 1980 for all weight groups (table 1).

The rate of stillbirths also declined. (Stillbirths have to be reported only if weighing more than 1,000 grams, according to health regulations, that's why we don't have any information for stillbirths weighing less than 1,000 grams) (table 2). The same pattern occurs in the non-Jewish population.

Figure 1 shows infant mortality by weight. The first category is the group of less than 1,000 grams and the last is 4,500 grams and more. The solid line represents 1977 and the dotted line is 1980. You can see a decline in mortality in all weight groups between the two periods.

The rates for the non-Jewish population (table 2) are higher in every weight group, but the decline is also evident in the non-Jewish population, for all weight groups.

Infant mortality by mother's age

You can see (table 3) the decline in infant deaths among the older mothers is higher in the Jewish population than in the non-Jewish population (figure 2). There are almost no differences between mothers at different age groups in the non-Jewish population. It seems that mother's age has a significant effect on infant mortality only in the Jews and almost no difference in the non-Jews.

Differences between ethnic groups were found in all periods (table 4). The lowest rates are found among the Jewish mothers of European origin. (Mothers of Israeli origin are mostly third generation in Israel and of European origin.)

Differences between the groups are greater in the postneonatal period than in the early neonatal period, as there are almost no differences in the kind and accessibility of perinatal and prenatal care between the different groups.

Mother's education

Education seems to have a strong correlation with infant mortality in all infant ages (table 5).

The rates were standardized by mother's age. The standard population used was the mean age distribution of all mothers during the years 1977 to 1980 for all education groups.

Data for the non-Jewish population are not presented as the proportion of missing information is very high.

Birth order (parity)

The rates for birth order were also standardized by the same standard population. As there are large differences in age distribution among the different birth orders, so the rates were standardized by age (table 6).

Data for the non-Jewish population is not shown because of the high proportion of missing information, especially maternal age for first order births.

As shown in the table, first order births have a higher rate of perinatal mortality than do births of higher order. Despite the decline in infant mortality, differences remain.

Marital status

Births to unmarried mothers are a very rare phenomenon in Israel. Only 1.3 percent of the Jewish births during the years 1977 to 1980 were to nonmarried mothers: 1 percent to single, (never-married) mothers, and 0.3 percent to widowed and divorced mothers.

Mortality is higher among infants born to single mothers (table 7), especially in the early neonatal period.

Data for non-Jewish population are not presented because of misleading information in the case of second wives of Moslems, where often the second wife is not listed as married, and we found that 4.3 percent of non-Jewish mothers are reported as single.

The non-Jewish group are mostly Moslems, a very traditional society, and in addition 10.6 of the non-Jewish births have missing information of marital status compared to 0.2 in the Jewish mothers.

As you can see, the rates for the single mothers are almost double in some years and 3 times in other years than those of the married mothers. For this data as well, the rates were standardized by mother's age. The single mothers are mostly young mothers.

In this time period there were almost no births to single mothers. Most of the single mothers are teenaged, and there's a very high rate in all periods of perinatal and infant mortality. We found that infant mortality among the single mothers is higher than it is for the married mothers, and there's almost no decline in infant deaths over time to single mothers.

Parents' occupation

The data is presented by occupation groups and not by social class, although we tried to present according to five (table 8) social classes.

As expected, the lowest rate was found in scientific and academic workers, and the highest was in mothers with unskilled occupations with one exception. Agricultural workers, as you see, have a very low rate.

Agricultural workers in Israel are mostly people living in kibbutzim and moshavim with quite high standards of living and fairly good health care services.

There are almost no differences in trends between mothers' and fathers' occupation.

Causes of death

The data presented are the most recent available, 1982 (tables 9 and 10).

The most important causes of infant mortality among Jews and non-Jews are low birth weight and congenital malformations.

Even though the rates are higher in the non-Jewish population, there is no difference in the trend. Other important causes of death among the non-Jews are the infectious diseases.

Postneonatal mortality in the non-Jewish population is almost three times that of the Jewish population, and there is where the big difference lies.
The decline in mortality is mostly due to a decrease in deaths from congenital malformations. In 1977 the rate for congenital malformation in the Jewish group was 3.6 per 1,000, and it dropped to 2.8 in 1982 (table 11). The rate decreased from 6.6 to 4.4 in the non-Jewish group over the same time period.

The decline in infant mortality is almost only due to decreases in the early neonatal period.

The rate dropped during the 6 years (1977 to 1982) from 7.3 to 6.3 in the early neonatal period for Jews and from 10.8 to 8.1 for the non-Jews, there was almost no change in the late and postneonatal period in the Jewish group.

As for the non-Jewish population, there is a 20 percent decrease in all infant age groups. The rates dropped from 10.8 in the early neonatal period to 8.1, and from 12.2 in the postneonatal period to 10.6. In the late neonatal period, it was 3.2 for 1977 to 1982 and it dropped to 2.3 in 1982.

For the non-Jewish population, the most important cause of death, gastrointestinal infections, decreased almost by 50 percent in the 6 year period. Maternal, obstetric, and interpartum conditions have dropped from 2.2 to 0.7; and respiratory distress syndrome, from 1.7 to 1.1.

There were other factors that have been studied but are not being presented, such as region of birth, education and origin of father. Some of these will be presented later.

Table 1. Perinatal mortality rates (per 1,000 live births) by weight (Jews)

Birth weight	1978			1979			1980		
	Perinatal mortality	0-6 days	Still-births	Perinatal mortality	0-6 days	Still-births	Perinatal mortality	0-6 days	Still-births
Total	14.9	7.2	7.7	13.0	7.5	5.5	11.0	6.8	4.2
Less than 1000 grams		704.3			719.3			702.8	
1000-1499 grams	460.4	204.4	256.0	372.7	206.7	166.0	289.5	189.0	100.5
1500-1999 grams	131.9	52.5	79.4	126.3	69.5	56.8	93.2	52.6	40.6
2000-2499 grams	35.5	14.7	20.8	34.8	16.0	18.8	21.1	8.1	13.0
2500-2999 grams	9.8	4.1	5.7	8.0	3.5	4.5	5.9	2.5	3.4
3000-3499 grams	3.8	1.1	2.7	4.1	1.8	2.3	2.8	1.8	1.0
3500-3999 grams	3.4	1.0	2.4	3.1	1.9	1.2	1.8	1.2	0.6
4000-4499 grams	5.1	1.1	4.0	3.3	1.9	1.4	2.5	1.1	1.4
4500 grams or more	11.0	9.2	1.8	11.3	2.1	9.2	7.2	2.4	4.8

Table 2. Perinatal mortality rates (per 1,000 live births) by weight (non-Jews)

Birth weight	1978			1979			1980		
	Perinatal mortality	0-6 days	Still-births	Perinatal mortality	0-6 days	Still-births	Perinatal mortality	0-6 days	Still-births
Total	22.7	9.9	12.8	20.6	10.2	10.4	22.0	10.8	11.2
Less than 1000 grams		871.7			711.6			697.7	
1000-1499 grams	741.2	434.2	307.0	773.0	373.0	400.0	517.5	263.7	253.8
1500-1999 grams	177.2	37.2	140.0	214.9	120.7	94.2	268.7	135.1	133.6
2000-2499 grams	90.1	35.0	55.1	76.6	38.1	38.5	69.1	30.3	38.8
2500-2999 grams	17.9	7.2	10.7	19.3	11.4	7.9	15.3	8.5	6.8
3000-3499 grams	8.6	3.1	5.5	18.2	13.7	4.5	7.1	3.5	3.6
3500-3999 grams	3.8	0.7	3.1	5.5	1.3	4.2	4.8	1.9	2.9
4000-4499 grams	14.9	3.8	11.1	11.1	5.8	5.3	12.6	4.9	7.7
4500 grams or more	34.9	12.1	22.8	43.5	15.9	27.6	41.3	14.9	26.4

Table 3. Perinatal mortality by mother's age

Age of mother	1978			1979			1980		
	Perinatal mortality	0-6 days	Still-births	Perinatal mortality	0-6 days	Still-births	Perinatal mortality	0-6 days	Still-births
	Jews								
Total	14.9	7.2	7.7	13.0	7.5	5.5	11.0	6.8	4.2
Up to 20 years	16.6	8.1	8.5	19.2	12.1	7.1	16.7	10.3	6.4
20-24 years	13.9	7.9	6.0	10.8	7.1	3.7	11.3	7.2	4.1
25-34 years	13.8	6.2	7.6	13.1	7.5	5.6	10.2	6.6	3.6
35 years and over	24.3	10.6	13.7	17.8	7.4	10.4	13.6	5.8	7.8
	Non-Jews								
Total	22.4	9.6	12.8	20.6	10.2	10.4	22.0	10.8	11.2
Up to 20 years	22.1	10.6	11.5	19.9	12.3	7.6	22.7	15.8	6.9
20-24 years	19.1	11.1	8.0	16.3	9.3	7.0	17.6	9.6	8.0
25-34 years	21.2	8.9	12.3	18.9	9.9	9.0	20.3	10.6	9.7
35 years and over	36.4	10.7	25.7	36.3	12.0	24.3	37.9	11.8	26.1

Table 4. Infant mortality by mother's origin[1] and age of infant (standardized[2] by mother's age)

Mother's origin	1977				1978				1979				1980			
	Total	0-6 days	7-27 days	1-11 months	Total	0-6 days	7-27 days	1-11 months	Total	0-6 days	7-27 days	1-11 months	Total	0-6 days	7-27 days	1-11 months
Total Jews	13.4	7.7	1.9	3.8	12.6	7.2	1.8	3.6	12.8	7.5	1.9	3.4	12.0	6.8	1.6	3.6
Africa	13.6	7.5	1.8	4.3	12.9	7.6	1.7	3.6	12.7	7.4	1.6	3.7	12.7	7.4	1.1	4.2
Europe-America	12.4	7.2	2.0	3.2	11.6	6.8	1.7	3.1	12.4	7.3	1.9	3.2	11.0	6.2	1.8	3.0
Israel	10.3	5.3	1.6	3.4	12.8	8.9	0.8	3.1	9.3	5.3	2.3	1.7	9.9	5.1	2.2	2.6

[1] A continent of birth (in case of Israeli born mothers, continent of birth of mother's father.)

[2] The standard population was the mean of the Jewish mothers at the years 1977-1980.

Table 5. Infant mortality by mother's years of schooling and age of infant (standardized by mother's age) (Jews)

Mother's year of schooling	1977				1978				1979				1980			
	Total	0-6 days	7-27 days	1-11 months	Total	0-6 days	7-27 days	1-11 months	Total	0-6 days	7-27 days	1-11 months	Total	0-6 days	7-27 days	1-11 months
Total	13.4	7.7	1.9	3.8	12.6	7.2	1.8	3.6	12.8	7.5	1.9	3.4	12.0	6.8	1.6	3.6
0-8 years	18.1	10.1	1.7	6.3	16.4	8.3	2.2	5.9	18.4	10.5	2.3	5.6	19.5	9.5	2.2	7.8
9-10 years	14.8	6.9	3.7	4.2	14.8	8.2	2.2	4.4	12.7	6.6	2.0	4.1	12.9	7.5	1.9	3.5
11-12 years	11.5	6.8	1.7	3.0	11.5	6.8	1.5	3.2	11.6	7.1	1.7	2.8	11.3	6.3	1.6	3.4
13 years or more	11.2	7.1	1.7	2.4	8.9	5.7	1.4	1.8	10.0	6.0	1.6	2.5	8.8	5.2	1.2	2.4

Table 6. Infant and perinatal mortality by birth order[1], 1978-1980 (Jews) rates per 1,000 live births

Birth Order	Infant Mortality				Stillbirths	Perinatal Mortality
	Total	0-6 days	7-27 days	1-11 months		
1978						
1	13.4	8.3	1.8	3.3	14.9	23.2
2	13.6	7.6	1.4	4.6	5.4	13.0
3	12.6	5.9	2.1	4.6	6.2	12.1
4-5	16.9	11.1	2.9	2.9	5.0	16.1
6 or more	8.3	4.7	1.0	2.6	7.9	12.6
1979						
1	11.7	7.8	1.7	2.2	13.7	21.5
2	13.4	7.1	2.2	4.1	3.4	10.5
3	13.0	6.4	2.1	4.5	4.1	10.5
4-5	16.4	9.1	4.0	3.3	3.6	12.7
6 or more	14.6	7.6	1.7	5.3	3.8	11.4
1980						
1	13.0	8.7	1.4	2.9	5.8	14.5
2	12.5	6.6	2.0	3.9	2.3	8.9
3	16.5	9.6	2.0	4.9	3.3	12.9
4-5	18.7	7.2	3.1	8.4	5.0	12.2
6 or more	10.4	5.6	0.9	3.9	4.7	10.3

[1] Standardized by mother's age.

Table 7. Infant mortality by marital status and age of infant[1] (Jews), 1977-80 rates per 1,000 live births

Marital status and age of infant	1977	1978	1979	1980
Total				
Single	27.8	24.7	16.1	13.8
Married	13.1	12.5	13.0	12.4
0-6 days				
Single	20.3	17.1	10.9	6.8
Married	7.5	7.1	7.4	6.9
7-27 days				
Single	3.1	3.4	-	-
Married	1.9	1.8	1.9	1.9
1-11 months				
Single	4.4	4.2	5.2	7.0
Married	3.7	3.6	3.7	3.6

[1] Standardized by mother's age

Table 8. Infant mortality rates by parents' occupation (Jews), 1977-80 average

Occupation	Mother	Father
1. Scientific and academic workers, technical workers and managers	10.1	10.2
2. Clerical, sales, and service workers	11.5	12.4
3. Agricultural workers	9.8	11.4
4. Skilled workers in industry, building, and transportaton	14.4	13.3
5. Unskilled workers	18.0	16.4
6. Housewives	14.3	-
7. Army	-	11.9

Table 9. Infant mortality by cause, 1982 (Jews)

Cause of death	Infant Mortality				Stillbirths	Perinatal Mortality
	Total	0-6 days	7-27 days	1-11 months		
Total	11.6	6.3	1.6	3.8	6.1	12.4
1. Gastrointestinal infections	0	-	0	0	-	-
2. Respiratory infections	0.3	0	0	0.2	-	0
3. Other infections	0.5	0.1	0	0.4	-	0.1
4. Congenital anomalies	2.8	1.0	0.4	1.4	0.9	1.9
5. Maternal, obstetric, and intrapartum conditions	0.6	0.5	0	0.1	2.2	2.7
6. Low birth weight and short gestation age	4.2	3.2	0.6	0.4	0.4	3.6
7. Respiratory distress syndrome	0.5	0.4	0.2	0	0	0.4
8. Other perinatal conditions	0.6	0.3	0.1	0.2	2.5	2.8
9. Other diseases	0.6	0.1	0	0.5	0.1	0.2
10. External causes	0.1	0	0	0.1	-	0
11. Symptoms, signs, and ill-defined conditions	1.3	0.3	0.1	0.8	0	0.3
12. Not medically certified	-	-	-			

NOTE: Ninth Revision of ICD

Table 10. Infant mortality by cause, 1982 (non-Jews)

Cause of death	Infant Mortality				Stillbirths	Perinatal Mortality
	Total	0-6 days	7-27 days	1-11 months		
Total	21.0	8.1	2.3	10.6	12.4	20.5
1. Gastrointestinal infections	1.4	-	0	1.4	-	-
2. Respiratory infections	1.8	0.1	0.2	1.5	-	0.1
3. Other infections	1.6	0.2	0.2	1.2	-	0.2
4. Congenital anomalies	4.4	1.6	0.6	2.2	2.1	3.7
5. Maternal, obstetric, and intrapartum conditions	0.7	0.5	0.1	0	4.6	5.1
6. Low birth weight and short gestation age	4.0	3.1	0.5	0.4	0.8	3.9
7. Respiratory distress syndrome	1.1	0.9	0.1	0	-	0.9
8. Other perinatal conditions	1.3	0.6	0.2	0.5	4.8	5.4
9. Other diseases	1.8	0.3	0.2	1.3	0.1	0.4
10. External causes	0.2	-	-	0.2	-	-
11. Symptoms, signs, and ill-defined conditions	2.3	0.6	0.2	1.6	0	0.6
12. Not medically certified	0.4	0.1	0	0.3	-	0.1

NOTE: Ninth Revision of ICD

Table 11. Infant mortality by cause, 1977-1980

Cause of death	Jews	Non-Jews
Total	12.8	27.6
1. Gastrointestinal infections	0.2	2.3
2. Respiratory infections	0.5	3.4
3. Other infections	0.5	1.7
4. Congenital anomalies	3.6	6.6
5. Maternal, obstetric, and intrapartum conditions	1.8	2.2
6. Low birth weight and short gestation age	2.3	2.9
7. Respiratory distress syndrome	1.1	1.7
8. Other perinatal conditions	0.9	1.6
9. Other diseases	0.7	1.8
10. External causes	0.2	0.7
11. Symptoms, signs, and ill-defined conditions	0.9	2.9
12. Not medically certified	-	-

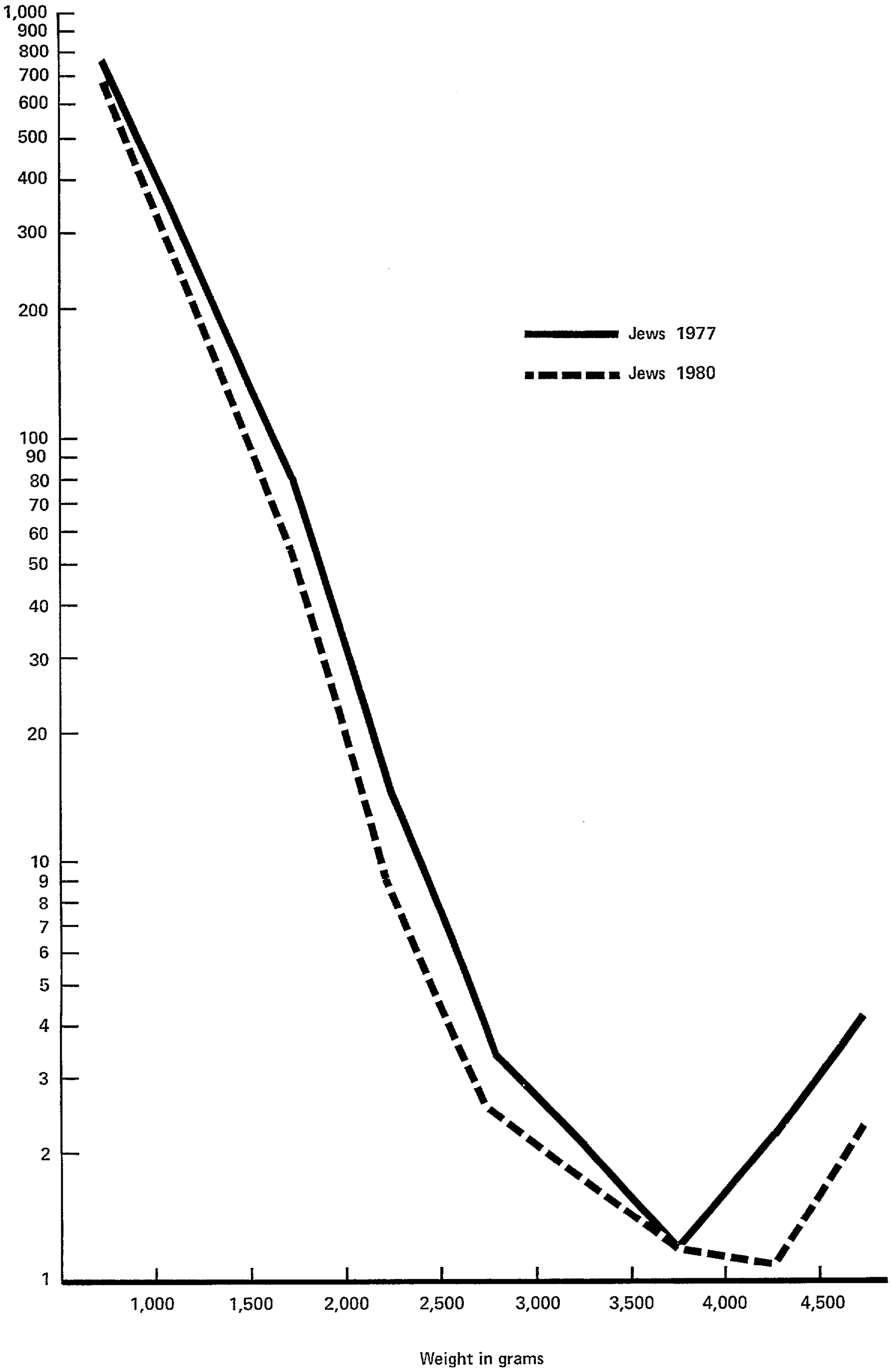


Figure 1. Early neonatal mortality by weight, Jews

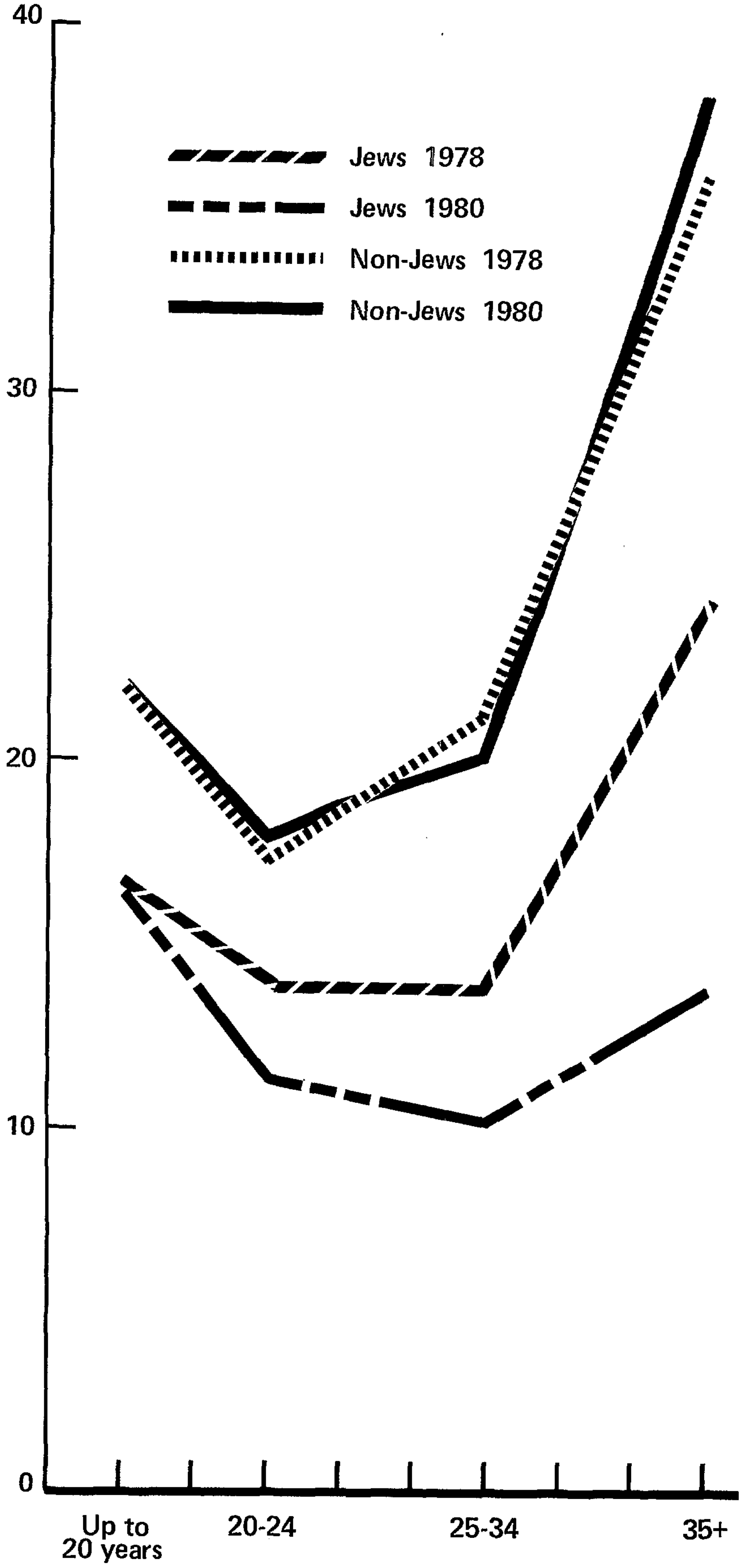


Figure 2. Perinatal mortality, by age of mother

Trends in Perinatal and Infant Mortality in Norway

by Leiv S. Bakketeig, M.D. and Per Bergsjo, M.D.

Long-term time trends

Figure 1 illustrates the long-term pattern of the general decline in perinatal and infant mortality rates in Norway during a 100 year period. Apart from two periods (the 5 years from 1891-95, and the years surrounding the Great Depression, 1926-40), there has been a gradual improvement in the perinatal mortality rate during this long period, but since the beginning of the Second World War, the perinatal mortality rates have been improving at a rate three times higher than that accomplished in the preceding half-century. There is a striking similarity between the fetal and perinatal mortality rates throughout the 100 years. In contrast, the early neonatal mortality rates were relatively constant until after the Second World War when they began to fall sharply.

The infant mortality rates are not closely related to either the fetal or perinatal mortality rates. The infant mortality rate has fallen at a continued relatively rapid pace throughout this time period.

Recent time trends in crude mortality rates

In table 1 are shown late fetal deaths and infant mortality in Norway during the period 1971-82.

The late fetal mortality has dropped by 34 percent during this period, while the perinatal mortality has been reduced by 41 percent. The greatest reduction has been in the neonatal mortality (45 percent), especially the early neonatal mortality, during the first week of life (49 percent). Infant mortality has also fallen by 33 percent during this decade, but as shown in table 2 this is entirely due to the reduction in neonatal mortality. There has namely been no reduction in the post neonatal mortality. As also appears from table 2 the major part of the reduction in neonatal mortality is due to a reduced number of early neonatal deaths.

Recent time trends in birth weight specific mortality rates

As shown in figure 2 the perinatal mortality rates have fallen steadily for births in all weight groups throughout the period 1967-1980. The relative fall as illustrated in the logscale of the figure has been greater for births weighing between 1,000 and 2,500 grams. In figures 3 and 4 the corresponding trends in birth weight specific mortality rates are shown for the two components of perinatal mortality, late fetal and early neonatal deaths.

Fetal mortality rates have improved at a relatively more rapid pace for the average sized or larger births. On the other hand early neonatal mortality rates (deaths during first week of life) have improved more rapidly for births weighing less than 2,500 grams, apart from the very small births weighing less than 1,000 grams, where the improved survival is not relatively as substantial as for births weighing between 1,000 and 2,500 grams. However, unlike the fetal mortality for these extremely low weight births, there is a detectable trend toward improved neonatal survival when these infants are born alive.

Causes of perinatal death

A recent detailed review of a sample of perinatal deaths in Norway has shown that 49.6 percent of the deaths occurred prior to labor, 11.9 percent during labor and 38.5 percent during the neonatal period (Larssen K-E, et al., 1982). Perinatal deaths were in this study defined as fetal deaths of 24 or more weeks of gestation and neonatal deaths that occurred before the newborn babies were discharged from the maternity institution or neonatal unit. The perinatal audit based on the sample of 270 perinatal deaths showed that approximately 30 percent of the deaths were considered as potentially avoidable by the review panel.

The review panel classified all the perinatal deaths according to WHO, 9th Revision of "International Classification of Diseases, Injuries, and Causes of Death," with the exception of anoxia, where the underlying condition that led to anoxia was not known. These deaths were classified as intrauterine deaths (unexplained). Three quarters of all the deaths were autopsied, which together with all the collected information on pregnancy, delivery, and the neonatal period provides for a better basis for classification of perinatal deaths than the ones based on routinely collected mortality statistics.

In table 3 are shown the main causes of death. As it appears the three most common causes were intrauterine deaths (unexplained), intrauterine or birth asphyxia and congenital malformations. A considerable part of the unexplained intrauterine deaths were growth retarded fetuses or postterm births. The major part of deaths due to intrauterine or birth asphyxia were associated with abruptio placenta or prolapse of the umbilical cord.

In table 4 are shown the maternal conditions among these perinatal deaths. The most dominating maternal complications are placenta previa and other placental complications. For 25 percent of the perinatal deaths no maternal disease or condition has occurred.

Two thirds of the potentially avoidable deaths were caused by respiratory diseases (mainly respirating distress) or intrauterine asphyxia due to intrauterine growth retardation or prolonged gestation. These deaths represent a challenge to our future perinatal care, at time of delivery and shortly after, but not the least to an improved antenatal care.

Table 1. Late fetal deaths and infant mortality, Norway 1971-82.

	Deaths per 1,000 births		Deaths per 1,000 live births			
Year (period)	Late fetal	Perinatal	Less than 24 hours	Early neonatal	Neonatal	Infant
1971-75	9.1	16.4	4.5	7.4	8.4	11.6
1976-80	7.1	12.0	2.8	4.9	5.9	9.0
1981-82	6.0	9.7	2.3	3.8	4.6	7.8

SOURCE: NOMESCO: Health Statistics in the Nordic Countries, Copenhagen, 1984.

Table 2. Neonatal and postneonatal mortality, Norway 1971-82.

	Deaths per 1,000 births			
Year (period)	First 24 hours	Rest of first week	Rest of first month	Post-neonatal
1971-75	4.5	2.9	1.0	3.2
1976-80	2.8	2.1	1.0	3.1
1981-82	2.3	1.5	0.8	3.2

SOURCE: (derived from): NOMESCO: Health Statistics in the Nordic Countries, Copenhagen, 1984.

Table 3. Causes of perinatal deaths.

Main cause of death in fetus/infant	Number of deaths	Percent	Deaths per 1,000 births
Intrauterine death (unexplained)	82	30.4	4.1
Intrauterine or birth asphyxia	55	20.4	2.8
Preterm	10	3.7	0.5
Congenital malformations	55	20.4	2.8
CNS-diseases	16	5.9	0.8
Respiratory diseases	36	13.3	1.8
Other diseases/conditions	13	4.8	0.7
Total	270	100.0	13.5

SOURCE: Larssen K-E, et al. Perinatal Audit in Norway 1980, NIS Report 7/82, Trondheim, Norway, 1982.

Table 4. Perinatal deaths by maternal conditions.

Main maternal disease or condition	Number of deaths	Percent	Deaths per 1,000 births
Preeclampsia/eclampsia	16	5.9	0.8
Polyhydramnion	10	3.7	0.5
Unspecified antepartum hemmorhage	14	5.2	0.7
Abruptio placenta	49	18.1	2.5
Other placental conditions	32	11.9	1.6
Other pregnancy related diseases	23	8.5	1.2
Multiple pregnancy	15	5.6	0.8
Labor/delivery complications	23	8.5	1.2
Diseases not pregnancy related	21	7.8	1.1
No disease/complication	67	24.8	3.4
Total	270	100.0	13.5

SOURCE: Larssen K-E, et al. Perinatal Audit in Norway 1980, NIS Report 7/82, Trondheim, Norway, 1982.

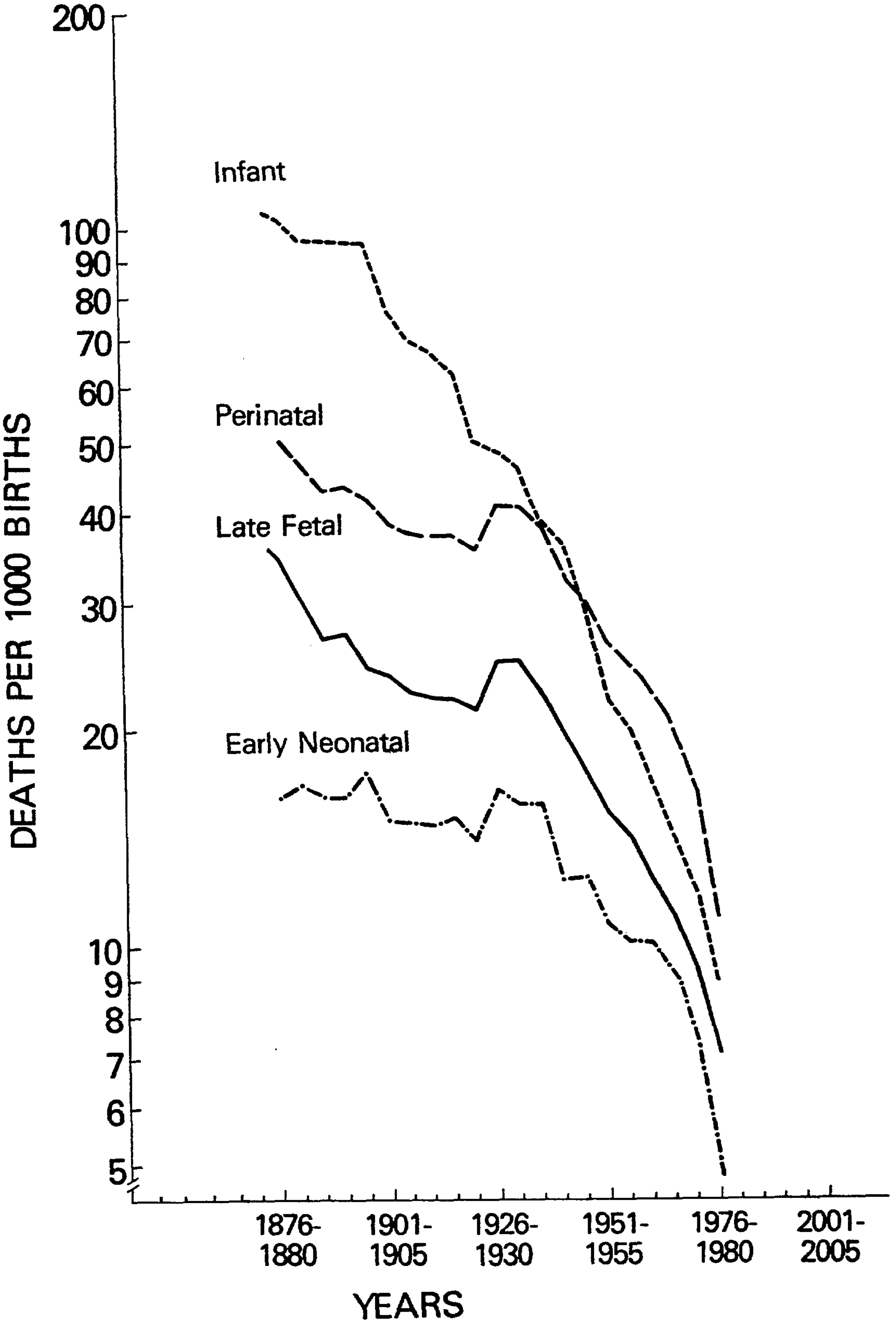


Figure 1. Time trends in fetal and infant mortality: Norway, 1876-1980

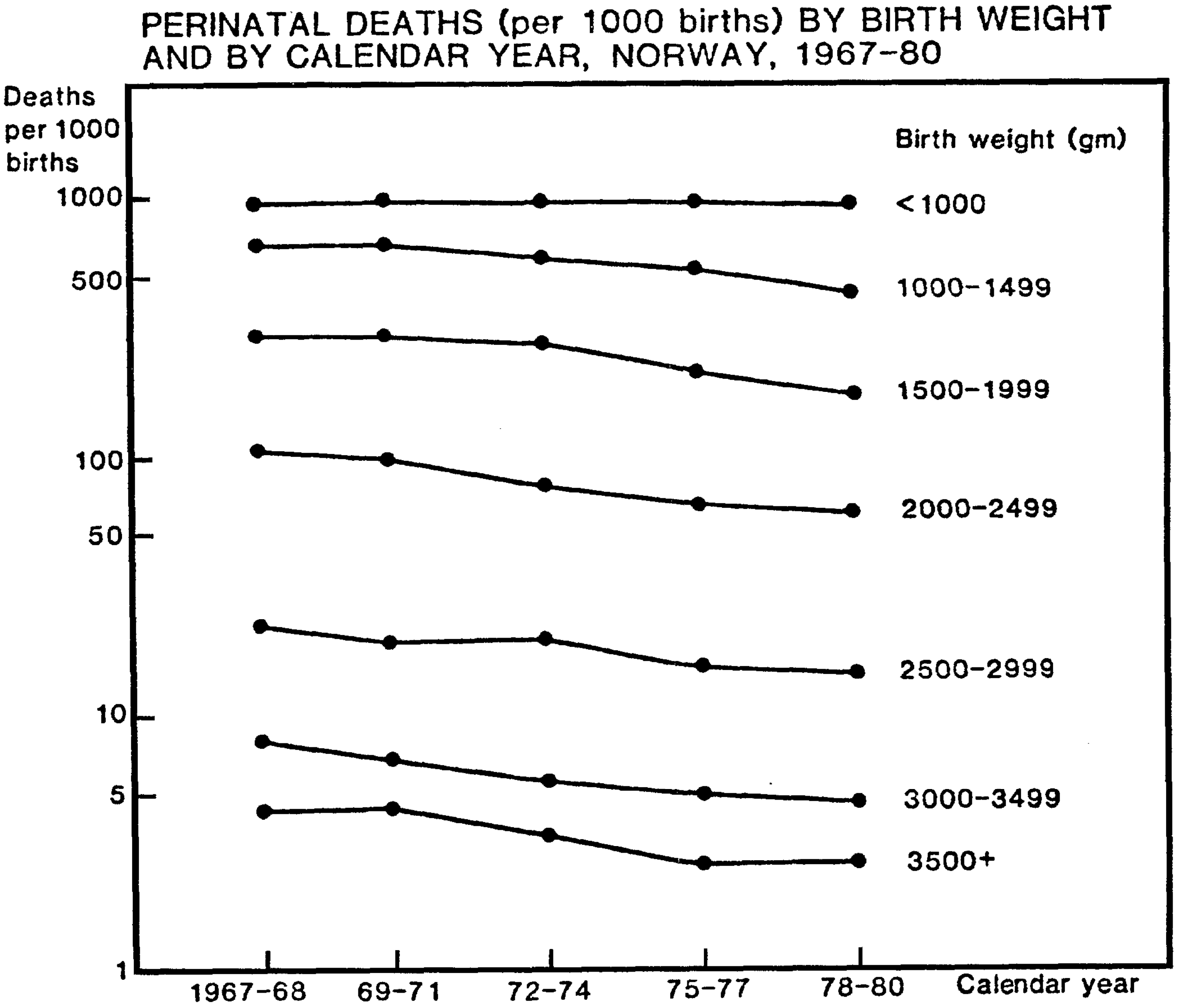


Figure 2. Perinatal deaths per 1,000 births, by birth weight and calendar year: Norway, 1967-80

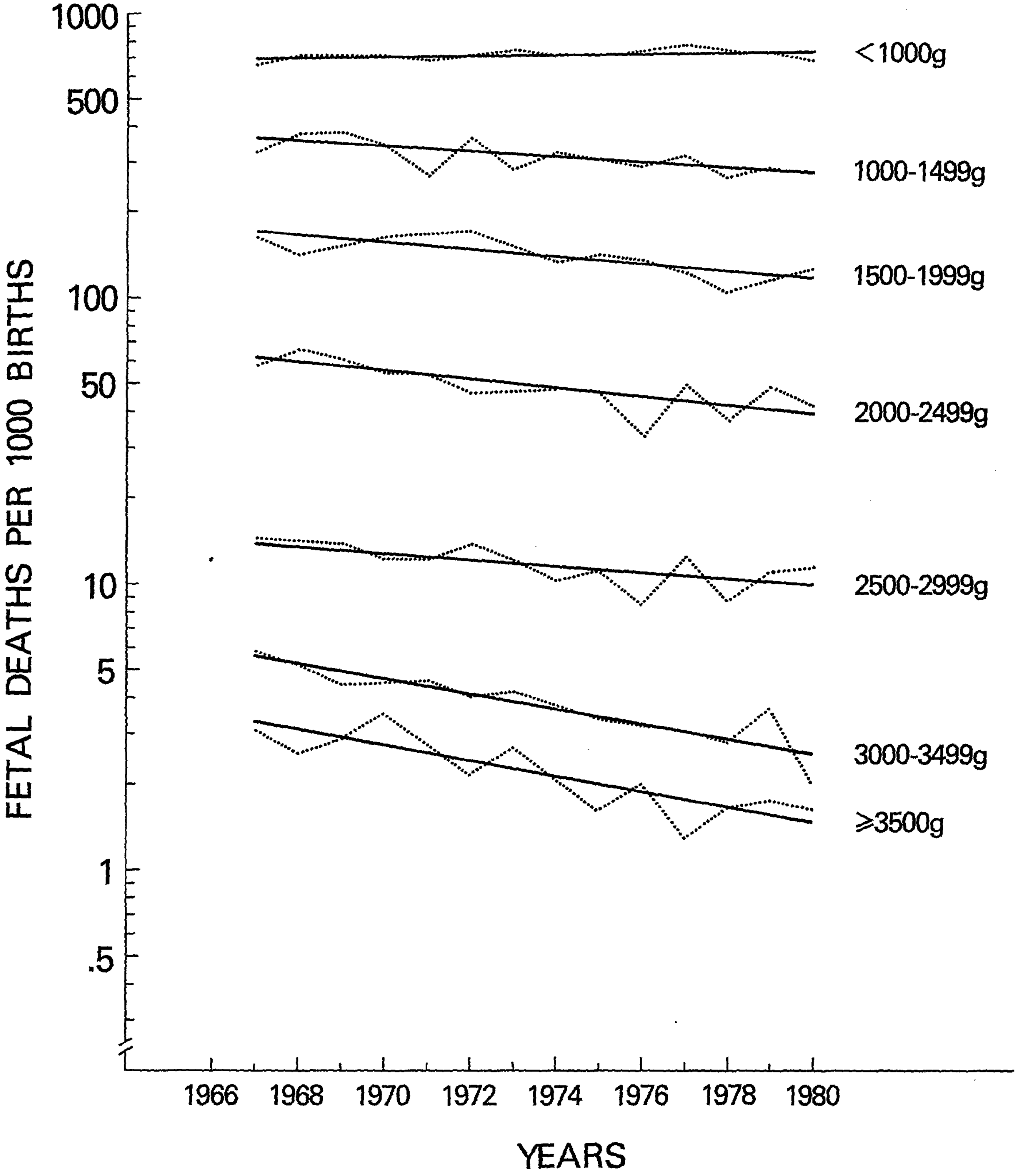


Figure 3. Fetal deaths per 1,000 births, by birth weight and calendar year: Norway 1967-80

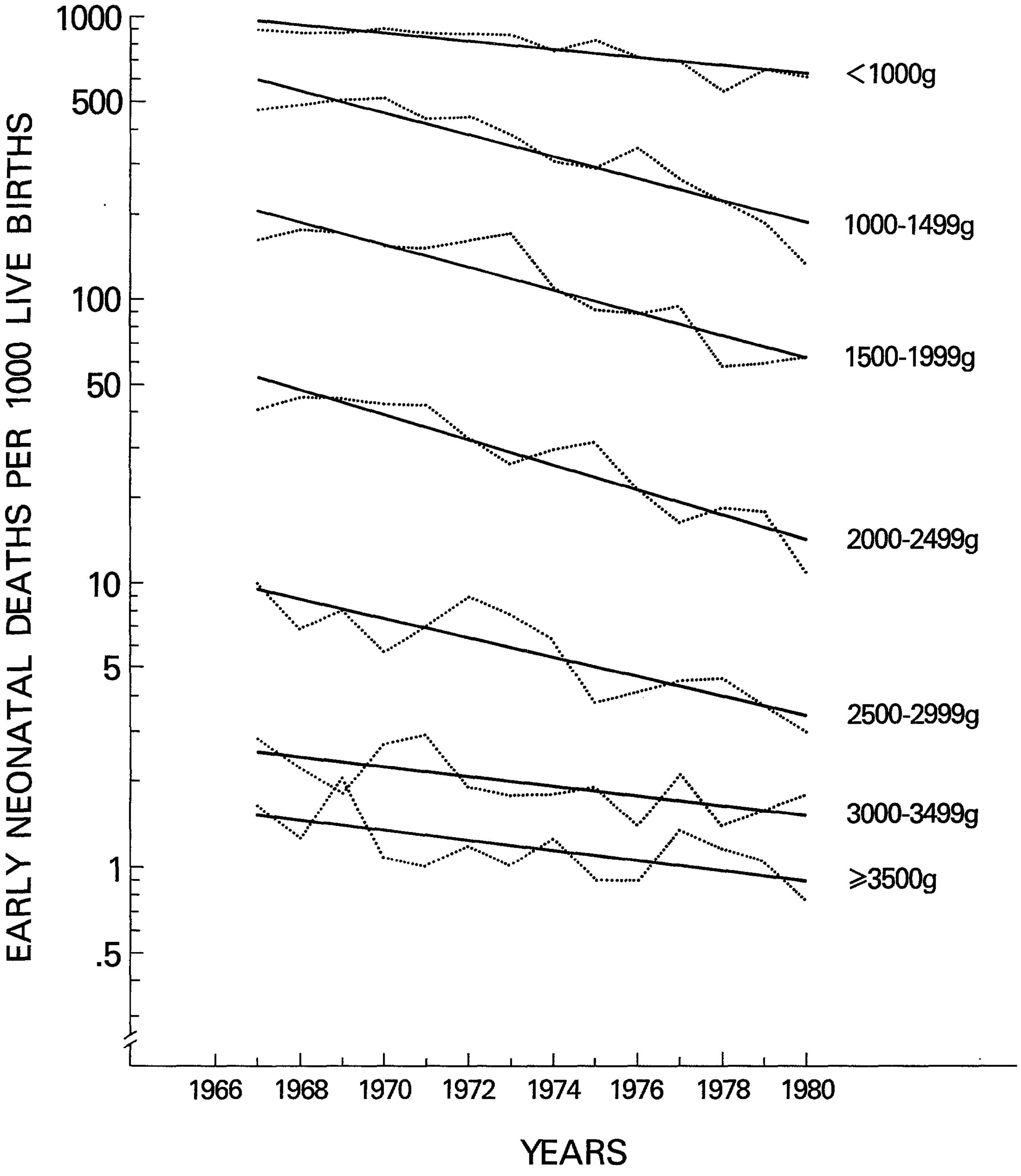


Figure 4. Early neonatal deaths per 1,000 live births, by birth weight and calendar year: Norway, 1967-80

Trends in Infant Mortality in Sweden

by Olav Meirik, M.D., Ph.D.

The reduction of the infant mortality in practically all industrialized countries during recent decades is in most instances a continuum of a process that started more than a century ago. In Sweden for instance, the infant mortality started to drop by the advent of the 19th century. Figure 1 shows the infant mortality in Sweden from 1750 through 1983. From 1800 to 1900 the infant mortality dropped from approximately 200 to 100 per 1,000 liveborn, and in the 20th century the decline accelerated until the rate of 1983 of 7.0 per 1,000.

Infant mortality is conventionally divided in three separate components namely early (less than 7 days), and late (7-27 days) neonatal and postneonatal (28-364 days) mortality. The rate of decrease for these three components has varied substantially over time and consequently also their importance for the decrements of the infant mortality during various time periods. This paper will describe the recent trends in infant mortality in Sweden and scrutinize the importance of the early and late neonatal and postneonatal mortality for the decline of the infant mortality during recent decades and presently. The birth weight specific mortality during first year of life will also be considered.

The components of infant mortality

The Swedish statistics allow us to distinguish between neonatal and postneonatal mortality since 1861. Until recent decades the reduction of the postneonatal mortality was primarily responsible for the decline of the infant mortality rates according to available statistics.

Figure 2 shows the infant mortality in Sweden from 1915 until 1981, the various components of the mortality including that of the first day of life are also displayed. It appears that the reduction in infant mortality until the late 1940s was attributable to continuous decline of the postneonatal mortality. From the 1950s there have been only small improvements in the postneonatal mortality compared to the neonatal mortality which started to drop in the late 1930s, and has been the fastest declining part of the infant mortality.

During the early 1930s there was a slight increase in the early neonatal mortality rate, it is generally thought that this was because of better ascertainment of early neonatal deaths and of late fetal as well, the latter showed an increase in the same magnitude as for the early neonatal mortality. The better coverage of neonatal and late fetal deaths during the 1930s was probably because the proportion of deliveries taking place in hospitals increased from 24 percent in 1930 to 65 percent in 1940 (3). Although there is evidence for an underreporting of early neonatal deaths as late as in the 1930s, the postneonatal deaths are thought to be complete after the first decades of the 19th century (1). In general the rates for infant mortality should be somewhat higher than those in figure 1 up until the late 1930s, thereafter, ascertainment should be complete for all deaths during first year of life.

Turning back to the recent years, figure 3 illustrates that the decline in infant mortality in the 1970s and 1980s has been totally dependent upon the fall in early neonatal mortality. The graphs representing infant and late neonatal mortality parallel each other and the graph for the early neonatal mortality.

To allow the reader a fuller interpretation of the various mortality rates presented here for the most recent years, a few comments should be made on fertility and birth weight distribution in Sweden. The cross sectional total fertility rate in Sweden in the late 1970s has been around 1.7 per woman and the annual number of births approximately 93,000. In 1980 the mother's mean age at birth of the first child was 26.0 years and 28.8 for the second (4). Mean birth weight irrespective of birth order, was 3,491 grams in 1979 (5). The proportion of low birth weight infants (less than 2,500 grams) has been between 4.8 and 4.2 percent during the 1970s and 0.5 percent were very low birth weight (less 1,500 grams) infants.

Early neonatal mortality by birth weight 1973-81

In order to get a better understanding of the mechanism of the recent years decline in infant mortality it is necessary to have a closer look at the early neonatal mortality. Figures 4, 5, and 6 show in sequence late fetal, and early neonatal and perinatal mortality for 1973 through 1981 for birth weight categories for from 1,000-1,499 to 3,500-3,999 grams. The birth weight categories 4,000-4,499 and 4,500 grams had principally the same rates as 3,500-3,999 grams and are therefore not shown. The rates are logit-transformed $\lfloor \ln(p/1-p) \rfloor$. For the series of observations for each birth weight category a regression line has been computed and is superimposed in the figures.

The perinatal mortality shows an almost parallel decline across all of the birth weight categories. When the perinatal mortality is split into early neonatal and late fetal mortality rates there is a tendency that the reduction in perinatal mortality for the low birth weight infants is seen in the early neonatal deaths, however, the lowering of the late fetal deaths is predominantly seen in the heavier (less than 2,500 grams) birth weight categories. Between 1973-74 and 1979-80 as much as 72 percent of the reduction of the overall early neonatal mortality was attributable to the reduction of the mortality in low birth weight infants (greater than 2,500 grams) and 55 percent to improvement in very low birth weight infants (less than 1,500 grams) (6). So far it can thus be stated that the reduced infant mortality in Sweden in the 1970s and early 1980s mainly can be attributed to improvements of the mortality for low birth weight infants during the early neonatal period.

Postneonatal mortality by birth weight

A new question arises, has the almost spectacular improvement in the survival of low birth weight infants in the early neonatal period also resulted in an equivalent survival during the rest of the first year of life, or do the seemingly stable overall late neonatal (7-27 days) and postneonatal mortality rates for recent years hide a shift of birth weight specific rates so that a lowering of the mortality for infants with normal birth weight has been compensated by a higher mortality after the first week of life of surviving low birth weight infants? It has been apprehended that the dramatic fall in early neonatal mortality for low birth weight infants, and in particular for very low birth weight infants, has lead to a subsequent increased death rate for these infants during the rest of the first year after birth. To answer this the medical birth registry (birth certificates) was linked to the so called registry on causes of death (death certificates) at the National Central Bureau of Statistics.

The results are summarized in table 1, which shows the cummulative birth weight specific mortality rates during first year of life for birth cohorts. In order to achieve stable rates two-single years were combined when feasible. It should be recognized that the data presented in table 1 are based on birth cohorts and therefore deviate from the cross sectional rates usually presented.

From table 1 it appears that the improvements achieved with regard to early neonatal mortality for the low birth weight infants and the very low birth weight infants from 1973-74 to 1980-81 have not resulted in any "compensatory" increase in mortality later on during the first year after birth. It should be noted, however, that the mortality risk in the late neonatal period and in the postneonatal period are substantially higher for low birth weight infants compared to infants of birth weight of 2,500 grams and more. Because many more low birth weight infants survive the first week after birth and have a relatively high mortality during the rest of the first year, it can be apprehended that the overall late neonatal and postneonatal mortality may show some increase. As can be calculated from table 3 the overall postneonatal mortality has fluctuated around 2 per 1,000 during the observed period.

It has been pointed out here that the decline in infant mortality during recent years in Sweden has mainly been because of decreased mortality for low birth weight infants in the early neonatal period. For nonlow birth weight infants, the improvement of early neonatal mortality has been marginal and it seems as if a baseline level soon will be reached, in fact the regression coefficient (the slope) of the regression line for early neonatal mortality for the birth weight category 3,500-3,999 in figure 5 is only -0.53. The postneonatal mortality has been fairly stable and for the birth weight categories 3,000-3,499 and above a lower baseline seems to have been reached around which the rates fluctuate randomly. It should also be pointed out that the relative importance of the mortality among the low birth weight infants for the overall infant mortality has gradually decreased as their survival has improved. Consequently, the space for further improvements has been narrowed and it may be that in Sweden the overall infant mortality presently is close to reaching a level where significant decrements will be very hard to achieve.

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Table 1. Early neonatal and neonatal and infant mortality rates per 1,000 for birth cohorts in Sweden 1973-74 through 1980-81

Birth weight	1973-1974	1975-1976	1977-1978	1979	1980-1981
1,000-1,499 grams					
Early neonatal	363.9	291.9	242.5	200.5	189.9
Neonatal	386.9	316.0	264.0	224.0	217.2
Infant mortality	401.8	335.0	282.6	247.4	235.0
1,500-1,999 grams					
Early neonatal	116.3	75.7	80.9	74.6	48.8
Neonatal	128.1	88.3	92.4	79.7	56.4
Infant mortality	140.9	104.2	100.8	99.0	67.0
2,000-2,499 grams					
Early neonatal	28.9	21.3	21.8	19.7	14.5
Neonatal	33.5	25.8	24.2	24.0	17.5
Infant mortality	43.0	33.0	30.3	30.7	21.7
2,500-2,999 grams					
Early neonatal	4.93	4.31	4.55	3.94	3.41
Neonatal	6.11	5.56	5.61	5.13	4.20
Infant mortality	9.22	8.45	8.60	8.79	6.72
3,000-3,499 grams					
Early neonatal	1.91	1.50	1.50	1.24	1.20
Neonatal	2.39	2.06	1.94	1.62	1.60
Infant mortality	4.09	3.85	4.02	3.43	3.11
3,500-3,999 grams					
Early neonatal	1.14	0.94	1.08	0.88	0.77
Neonatal	1.38	1.25	1.35	1.09	1.00
Infant mortality	2.81	2.49	2.76	2.63	2.20
4,000-4,999 grams					
Early neonatal	1.30	1.00	0.51	1.28	1.01
Neonatal	1.75	1.38	0.82	1.73	1.16
Infant mortality	2.42	2.61	1.68	2.64	2.13
4,500- grams					
Early neonatal	2.04	1.32	1.11	2.76	0.86
Neonatal	2.89	1.88	1.29	2.76	1.21
Infant mortality	3.74	3.76	2.21	3.10	1.72
Total					
Early neonatal	6.58	5.19	4.69	4.30	3.70
Neonatal	7.47	6.15	5.47	5.05	4.48
Infant mortality	9.49	8.22	7.53	7.35	6.11

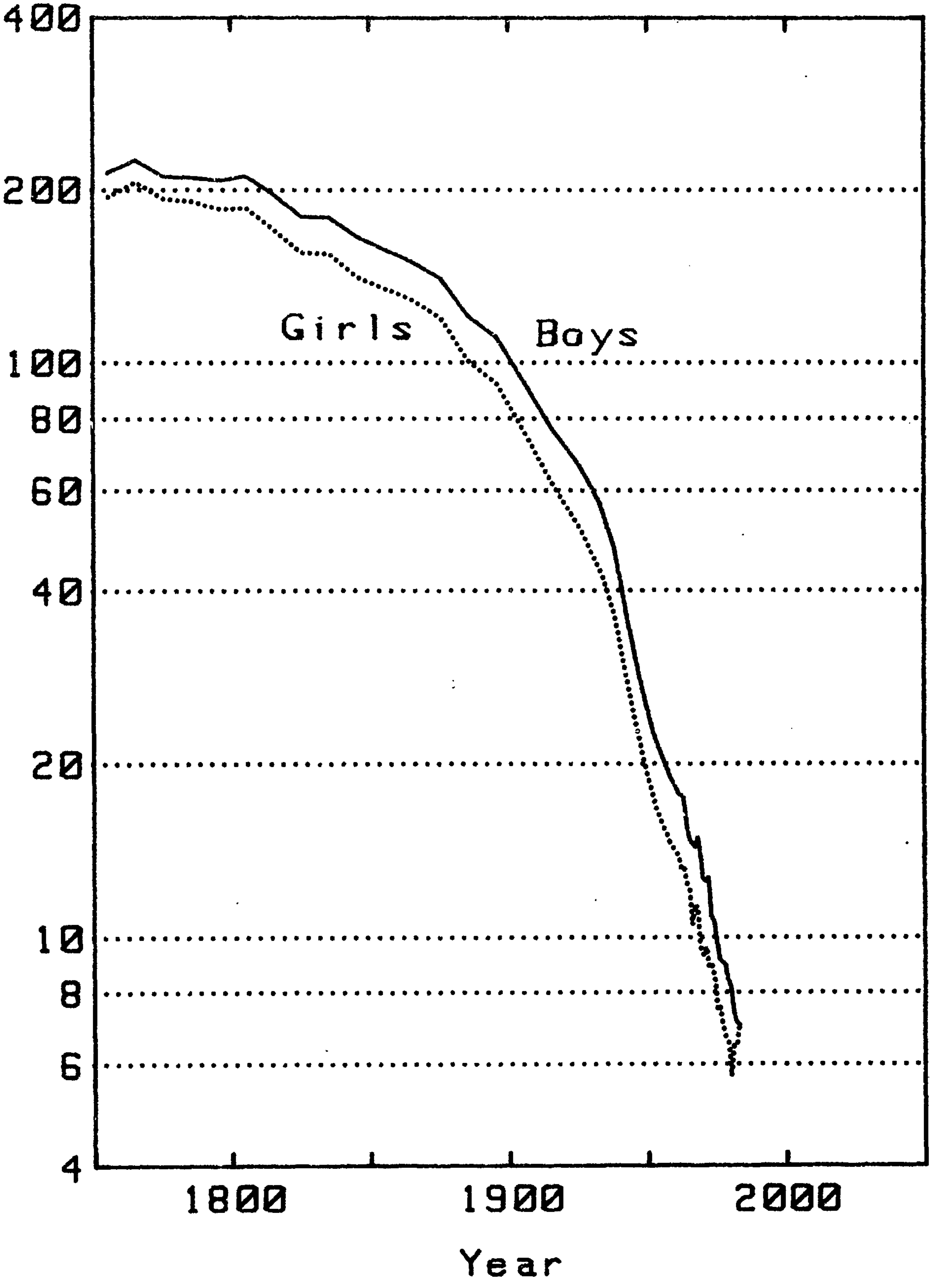


Figure 1. Infant mortality rates per 1,000 live births, by sex: Sweden, 1750-1970

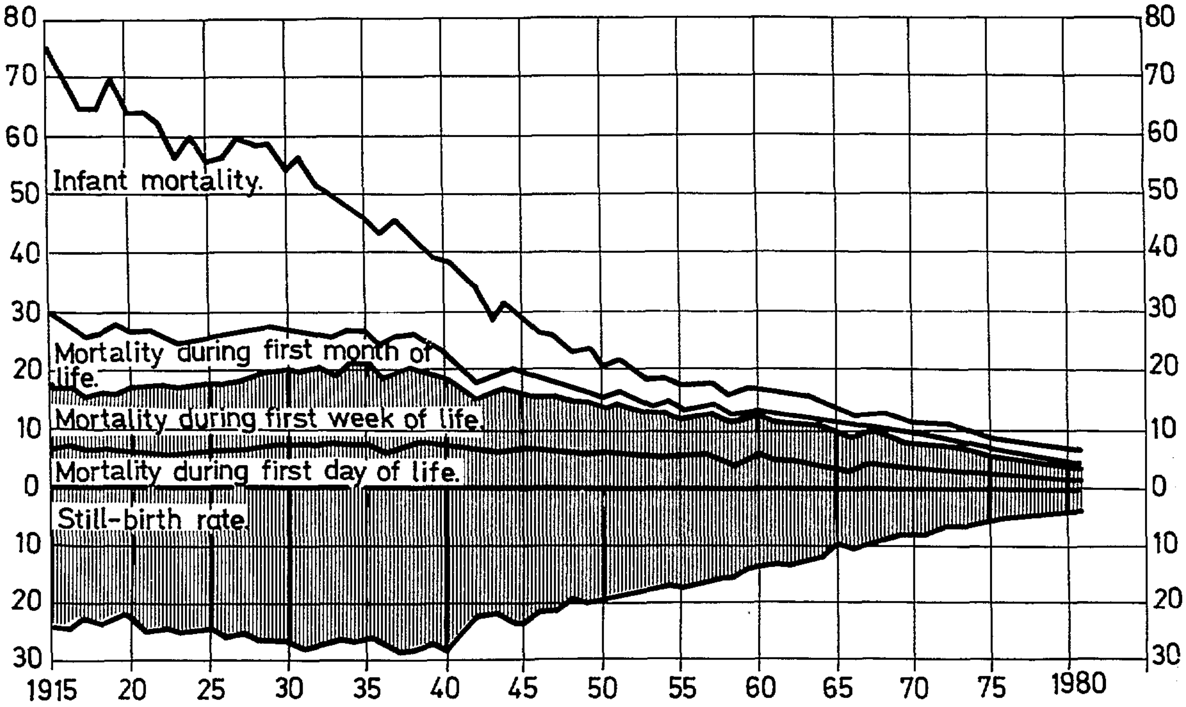


Figure 2. Infant mortality rates per 1,000 live births and stillbirth rate: Sweden, 1915-81

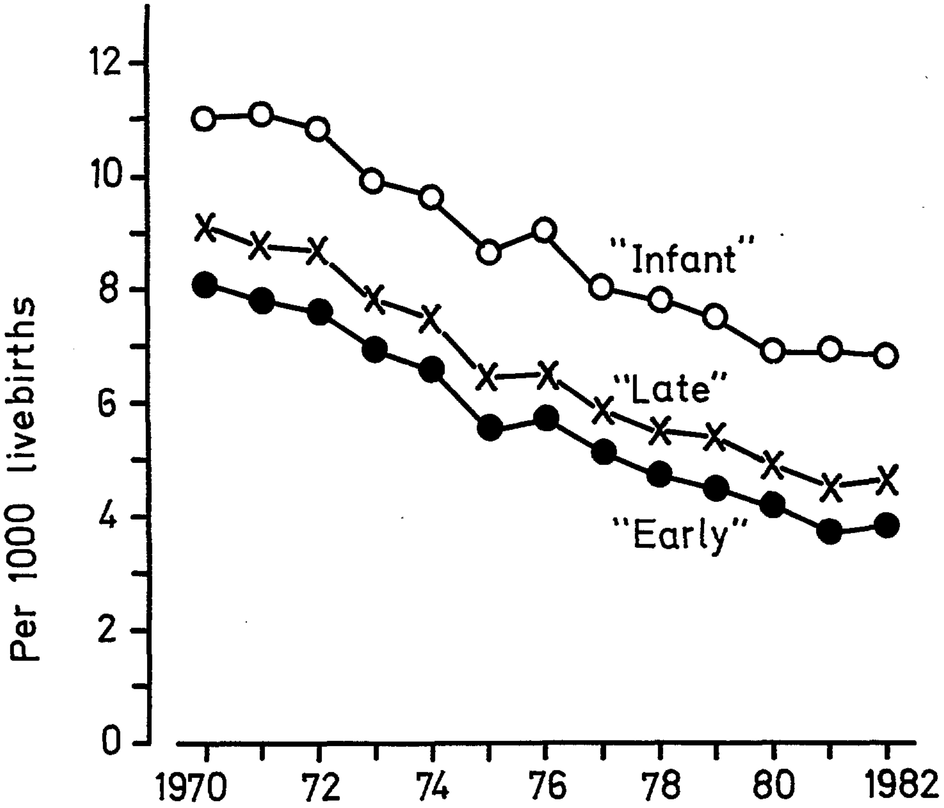
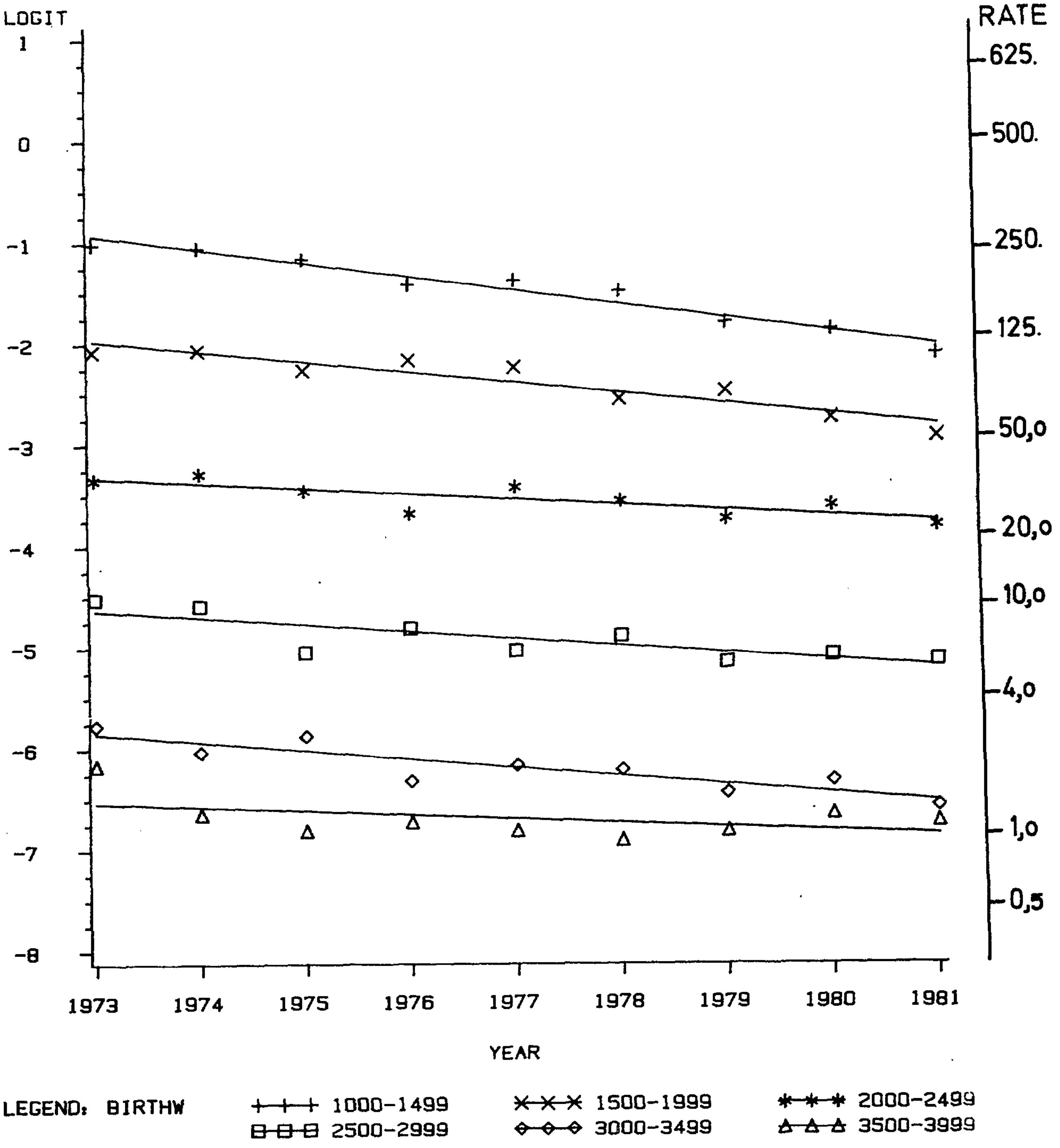


Figure 3. Infant early neonatal and late neonatal mortality per 1,000 live births: Sweden, 1970-82



Late fetal mortality

Figure 4. Late fetal mortality per 1,000 live births, by birth weight: Sweden, 1973-81

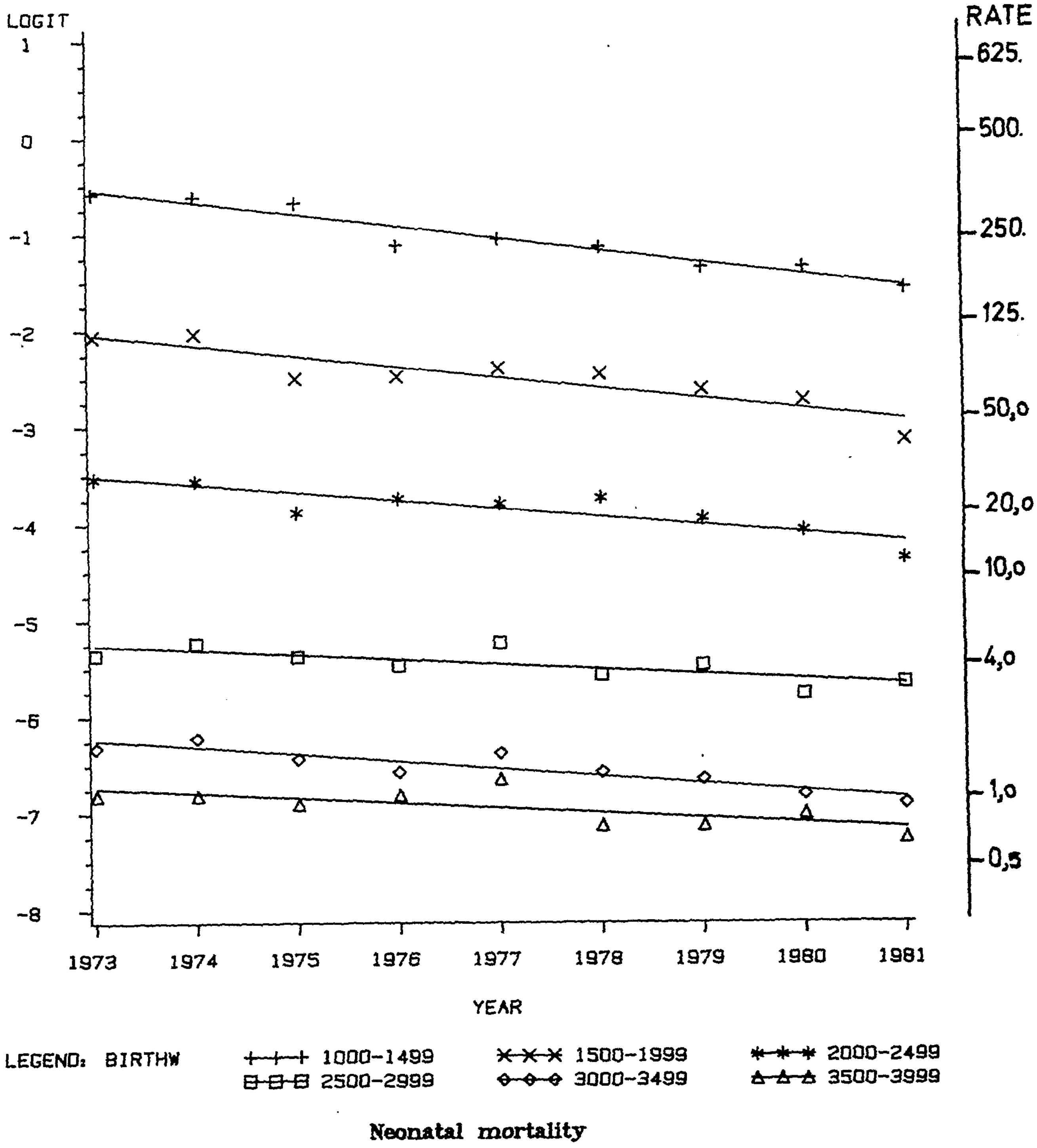
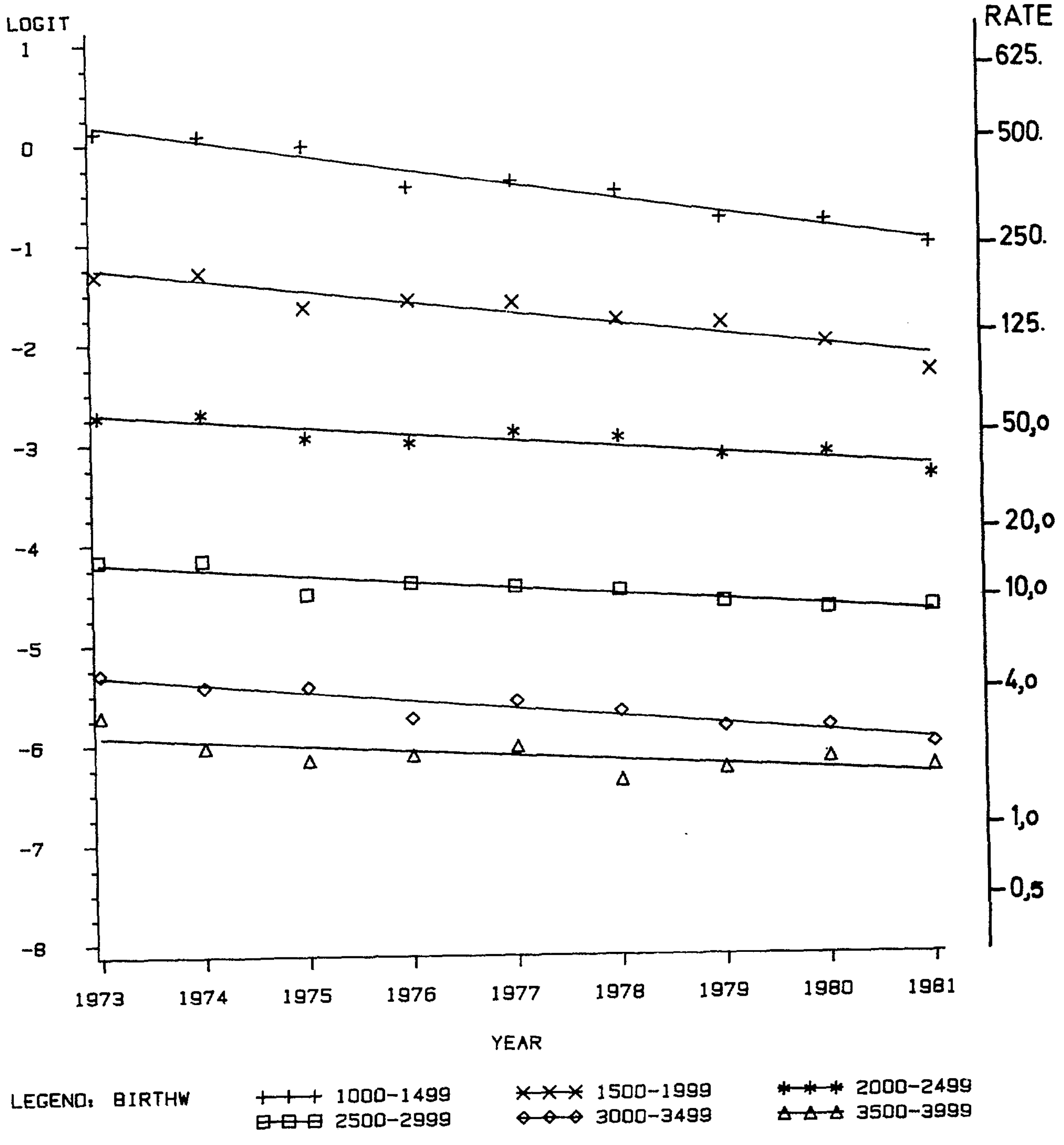


Figure 5. Early neonatal mortality per 1,000 live births, by birth weight: Sweden, 1973-81



Perinatal mortality

Figure 6. Perinatal mortality per 1,000 live births, by birth weight: Sweden, 1973-81

Comparative Overview of Trends and Levels

by Robert B. Hartford, Ph.D.

The purpose of this presentation is to provide an overview of trends and levels in perinatal and infant mortality in the countries from which you heard this morning. The period covered will be from 1945 to 1982 - the latest year for which we have data. The data used in this presentation were obtained from the Demographic Yearbook, published by the Statistical Division of the United Nations, as well as from national sources.

First, however, it is legitimate to ask if data from these countries are truly comparable. Specifically, do they meet four criteria of comparability: completeness, coverage, uniformity of measurement, and appropriateness of the unit of analysis?

Completeness

Are all events within the defined geopolitical area enumerated and included in the statistical system? Without going into detail, I believe that completeness is at least 99 percent in these countries, at least in recent years. Of the data presented, perinatal ratios would probably be of the lowest quality with respect to completeness.

Coverage

Are all population sub-groups in each geopolitical domain included in the enumeration system? Has the geopolitical domain remained constant during the study period, 1950 to the present?

Israel: Due to my reliance on multiple data sources, there are inconsistencies in the geographic area and inclusion of non-Jews in the enumeration data causing problems for much of the time period under study, though the data should be consistent for the last few years.

United States: Adding the relatively small populations of Alaska and Hawaii when they achieved Statehood early in our period of study does not introduce any noticeable problem. The same applies for the effect of minor changes in the Japanese territorial coverage.

Uniformity of measurement

Are common definitions for relevant variables adopted in each country in principle and implemented in clinical practice? The United Nations recommended definitions regarding the distinction between a live birth and late fetal death and the definitions of the delimiting limits of age of death during the first year are the items most crucial to our discussion. According to the definition adopted in 1950 by the U.N., a live birth is a product of conception, which after complete expulsion or extraction from the mother's body (irrespective of whether or not the umbilical cord has been cut or the placenta is attached) shows some sign of life. A late fetal death, on the other hand, is such a product that has attained at least 28 weeks' gestation, but shows no sign of life after expulsion or extraction. The qualifying signs of life are breathing, beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.[1]

Except for Sweden prior to 1960, all countries involved here subscribed to the United Nations definitions throughout the study period. A study carried out in Sweden in the late 1950's quantified the effect on the published rates of using the Swedish, rather than the United Nations definition of a live birth.[2] We have used the results of that study to adjust the Swedish data for 1945 through 1959. The adjustments are proportional to the first day rate and produce increases in the rates from about 1.1 to 1.4 deaths per 1,000 live births.

The most critical age delineation relates to the first day rate--the standard definition of the first day being "under 24 hours." Since 1960, Germany has used calendar days to define first day mortality, which results in a serious downward bias in that rate and at the same time produces an upward bias in the 1-6 day mortality. A recent German publication, however, presents historical trend data consistent with the United Nations definition, and these data have been used in this presentation.[3]

While all the countries under study subscribe to the United Nations' definitions, examination of Japanese mortality under 1 day has led World Health Organization researchers to conclude that the clinical application of the definitions was not uniform, and as a result a significant proportion of infant deaths occurring during the first day seem to have been classified as late fetal deaths.[4] Examination of the historical Japanese data seems to confirm this suspicion, but there is evidence that the clinical application of the United Nations definition has spread and the problem seems to have been virtually eliminated by the late 1970's.

Appropriateness of the unit of analysis

This criterion is more difficult than the others to define, but generally stipulates that a population be of some minimum size (usually 1 million persons) and comprise a complex social system that includes distinct urban and rural sub-areas. While Hong Kong, Singapore, and Monaco would be excluded on this basis, all countries under study here meet the minimum requirements.

Other objective criteria are more difficult to formulate but relate to the low international ranking of the United States in infant mortality in comparison with other industrialized countries. For example, one hears objections such as: "It is not fair to compare the large, heterogeneous population of the United States with the small, homogeneous populations of northern Europe." In this study there are two countries that are not so small--England and Wales, and Germany, and one that is definitely neither small, nor in any sense northern European--namely Japan. Other objections heard include statements like: "The superior pre-natal health care in the United States results in a delay until the infant period of what would be fetal deaths in other countries, so that the infant mortality rate (though not the perinatal ratio) is not truly comparable with the rates in countries with less 'superior' prenatal care." Whereas an evaluation of the relative quality and efficiency of prenatal care in countries under study is beyond the scope of this paper, we will certainly be able to compare perinatal rates.

Trends in perinatal rates and infant mortality rates

Table 1 through 8 present the perinatal death ratios and infant mortality rates by age from 1945 (or earliest available year) to 1982 (or the latest available year). The German table incorporates data from the Saarland and West Berlin, often published separately for years prior to the mid 1950's. Rates are 3-year moving averages of deaths per 1,000 live births.

The perinatal ratio is shown in Figure 1 on a logarithmic scale. In the United States this rate declined more than 60 percent--from 33.0 to 12.8--between 1950 and 1980. England and Wales achieved a similar percentage reduction, while Sweden reduced its perinatal ratio by 74 percent between 1950 and 1980, attaining a rate of 7.7 in 1981, the lowest of any of the countries. Germany and Japan also achieved reductions in excess of 70 percent over the 30-year period. A slow-down in rates of decline is clearly evident from the reduced slopes in several of the countries in earlier years.

Infant mortality in the United States (figure 2) fell by 57 percent from 29.2 in 1950 to 12.5 in 1980; and by 1982 the rate was 11.2. Similar declines were achieved by England and Wales. Israel, Norway, Scotland, and Sweden each achieved declines of roughly 70 percent in the 30-year period. Sweden, traditionally the world leader, attained an infant mortality rate of 6.8 in 1982.

The Japanese data show a truly remarkable and unparalleled performance at these levels of mortality, lowering its infant mortality from about 60 in 1950 to 7.5 in 1980--a reduction of nearly 90 percent. By 1982 the rate (not seen on this figure) had fallen to 6.6--second only in the world to Finland, which posted a rate of 6.4 that year.

In recent years (1975-1980) annual rates of decline in infant mortality have varied from about 3.5 percent in Sweden to 8 percent in Germany. Japan continues to show strong improvement with annual declines in the neighborhood of 6 percent. The annual decline in the same period in the United States has averaged about 4.5 percent.

Trends in selected age components of infant mortality

Until recent years, the most significant reductions in infant mortality occurred by reducing mortality from the so called exogeneous causes--infectious, parasitic, and communicable diseases, which tend to take their toll in the postneonatal period, that is, the period between 28 days and the end of the first year of life.

In the United States, (figure 3) postneonatal rates have fallen by more than half between 1950 and 1980. There are also large declines for England and Wales and Scotland. Declines in Norway and Sweden, while impressive, have tended to taper off since 1970, and recently the Swedish rate has shown evidence of deterioration. Germany and Israel with generally the highest levels in postneonatal mortality, exhibit plateaus and fluctuations in their declines. In the case of Israel, the pattern may reflect recent changes in the population base enumerated. Finally there is the truly amazing decline of post-neonatal mortality in Japan--from 32.0 in 1950 to 2.6 in 1980--a reduction of 92 percent. Postneonatal mortality in Japan seems to have reached a temporary plateau of 2.4 in 1981, although annual rates of decline still averaged about 6 percent until that time.

Next, is the first day mortality rate--relating to infant deaths occurring in the first 24 hours of life, and until recent years much more difficult to reduce than postneonatal deaths.

The United States (figure 4) registered a 50 percent decline as did England and Wales between 1950 and 1980. Scotland and Sweden reduced their first day mortality by 60 percent while Norway attained a reduction of 74 percent. Germany registered a truly phenomenal decline of 86 percent. Israel did not publish first day rates prior to 1952, and coverage changes and possible lack of completeness may be responsible for the irregular pattern prior to 1970. The curve for Japan suggests why researchers have been skeptical of the first day data from that country prior to the late 1970's.

Recently (1975-1980) annual rates of decline of first day mortality have been quite strong in all countries--5.5 percent in the United States; 6.5 percent in England and Wales, Germany, and Sweden; 7.5 percent in Scotland; and 10.5 percent in Norway. The low rate of 1.6 registered by the latter in 1981 jumped to 2.4 in 1982. However, the early neonatal rate (mortality during the first week) in Norway did remain about the same between 1981 and 1982. (See table 1.)

Examination of trends in rates is certainly instructive and suggests many questions--"Why are the levels different among the countries?" and "What causes the different patterns of declines?". Some declines are rather consistent over many years, while others experience slow-downs or even plateaus; yet other rates of decline undulated rather smoothly but over wide ranges.

Trends in the age composition of infant mortality

Next let us examine the relation of the age components to the overall rate. Is it not reasonable to expect that as overall infant mortality declines, the age components maintain consistent relations to the overall infant rate? Apparently not. Figure 5 shows the variation of the percent of infant mortality that occurs in the first day with the overall infant mortality level. Throughout the first half of the period of observation declines in postneonatal mortality in the United States out-weighed declines in neonatal, as well as first day mortality, the latter constituting more than 40 percent of all infant deaths as overall infant mortality fell to about 20 (1970). Since that time the percentage has fallen to about 37 percent.

While the trend lines of the United States and Sweden may converge at lower infant mortality levels, the historical patterns are quite dissimilar--the first day mortality never constituted more than 34 percent in Sweden and this occurred at an overall rate of approximately 17.

In Germany the maximum percent is close to the maximum for the United States but occurred at a much higher overall level of infant mortality (about 30) and the curve is much less peaked. Moreover, once we move to the left of the peak, the first day percent declines much more rapidly in Germany. While both countries have roughly the same overall level, about one-fourth of infant deaths now occur in the first 24 hours in Germany as compared to three-eighths in the United States. While the curves for Germany and England and Wales were divergent at higher infant mortality levels, they tend to converge as infant mortality declines.

The relation between postneonatal mortality and the overall level is essentially an inverted image of the first day percentage (see figure 6). In the United States, the minimum value of 26 percent was attained at an infant mortality level in the low 20's. As declines in neonatal mortality accelerated in recent years, the postneonatal percentage began to climb. Comparing this with Sweden shows a divergence of patterns in recent years with postneonatal mortality contributing far less proportionally to the overall rate than in the United States. In contrast the pattern in England and Wales converges with the German trend at decreasing infant mortality levels, and parallels the United States trend at somewhat higher values.

Summary

Perhaps the most remarkable trend we have seen is the precipitous decline in infant mortality in Japan since 1945 and in its perinatal mortality since the early 1960's. While all countries have achieved impressive reductions in perinatal and infant mortality, only Japan, Norway, and Sweden sustained consistent declines over the entire period. England and Wales, Scotland, and the United States all experienced slow-downs in the rates of decline in mid-period, and Germany and Israel demonstrated periodic fluctuations in their rates of decline.

In general, the age components of infant mortality followed similar patterns as the overall rates, although the percentage declines during the first day of life have become much greater than postneonatal percentage declines in recent years.

Two trends in the postneonatal rates are noteworthy. Dr. Meirik of Sweden reported on the recent deterioration of some of the birth weight-specific postneonatal rates in his country, and a plateau is clearly evident in the overall postneonatal rates in Sweden. In Japan, where overall infant mortality is about the same level as in Sweden, annual declines in postneonatal mortality prior to 1982 have fluctuated between roughly 4 and 8 percent but stablized at 2.4 in 1981 and 1982. More recent data from Japan (not presented in the tables) do indicate a continuation of the plateau.

Finally, trends in the first day mortality and postneonatal mortality, which together comprise well over half of all infant deaths, follow quite different patterns of change, which may reflect any number of differences in the type, availability, and efficiency of the many aspects of health care systems and health practices of the population.

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[3] *Bevolkerung und Erwerbstatigkeit*, Fachserie 1, Reihe 1, "Gebiet und Bevolkerung, 1982," Statistiches Bundeamt, Wiesbaden, Table 10.21, p. 105.

[4] *A WHO Report on Social and Biological Effects on Perinatal Mortality*, Volume 1, Statistical Publishing House, Budapest, Hungary, 1978, op. cit. pp. 23, 34, 35.

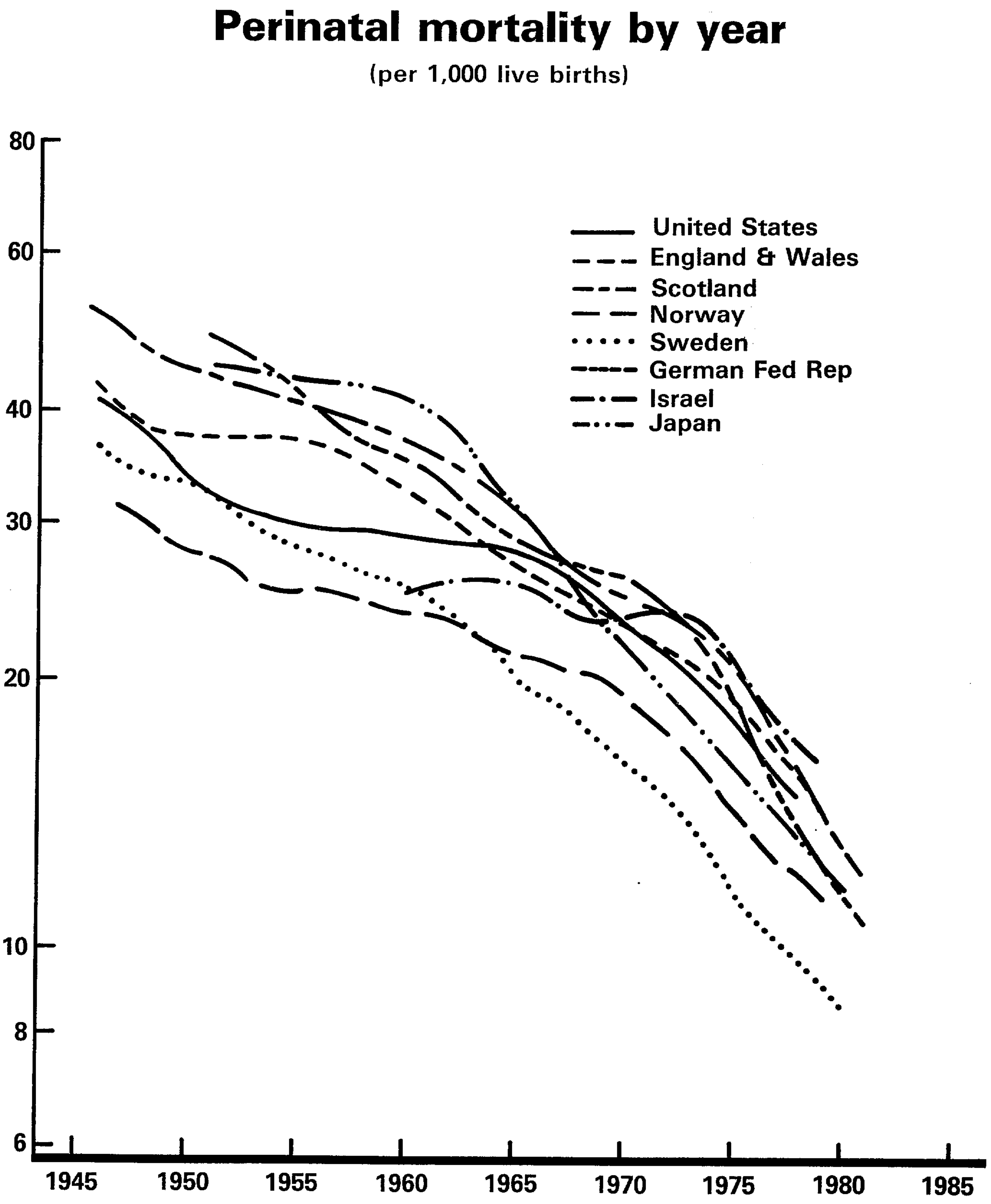


Figure 1. Perinatal mortality per 1,000 live births, by year

Infant mortality by year

(per 1,000 live births)

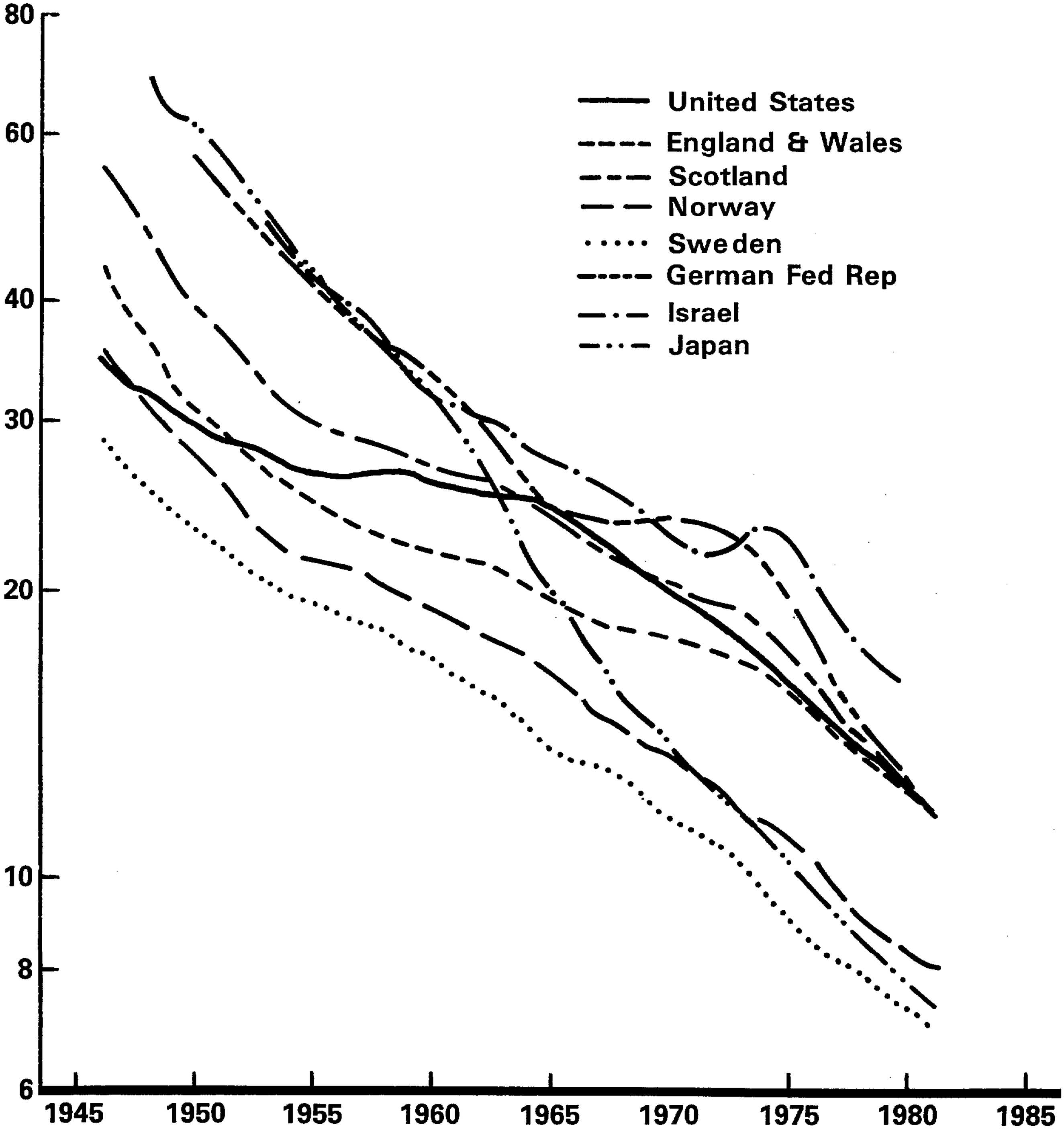


Figure 2. Infant mortality per 1,000 live births, by year

Post-neonatal mortality by year

(per 1,000 live births)

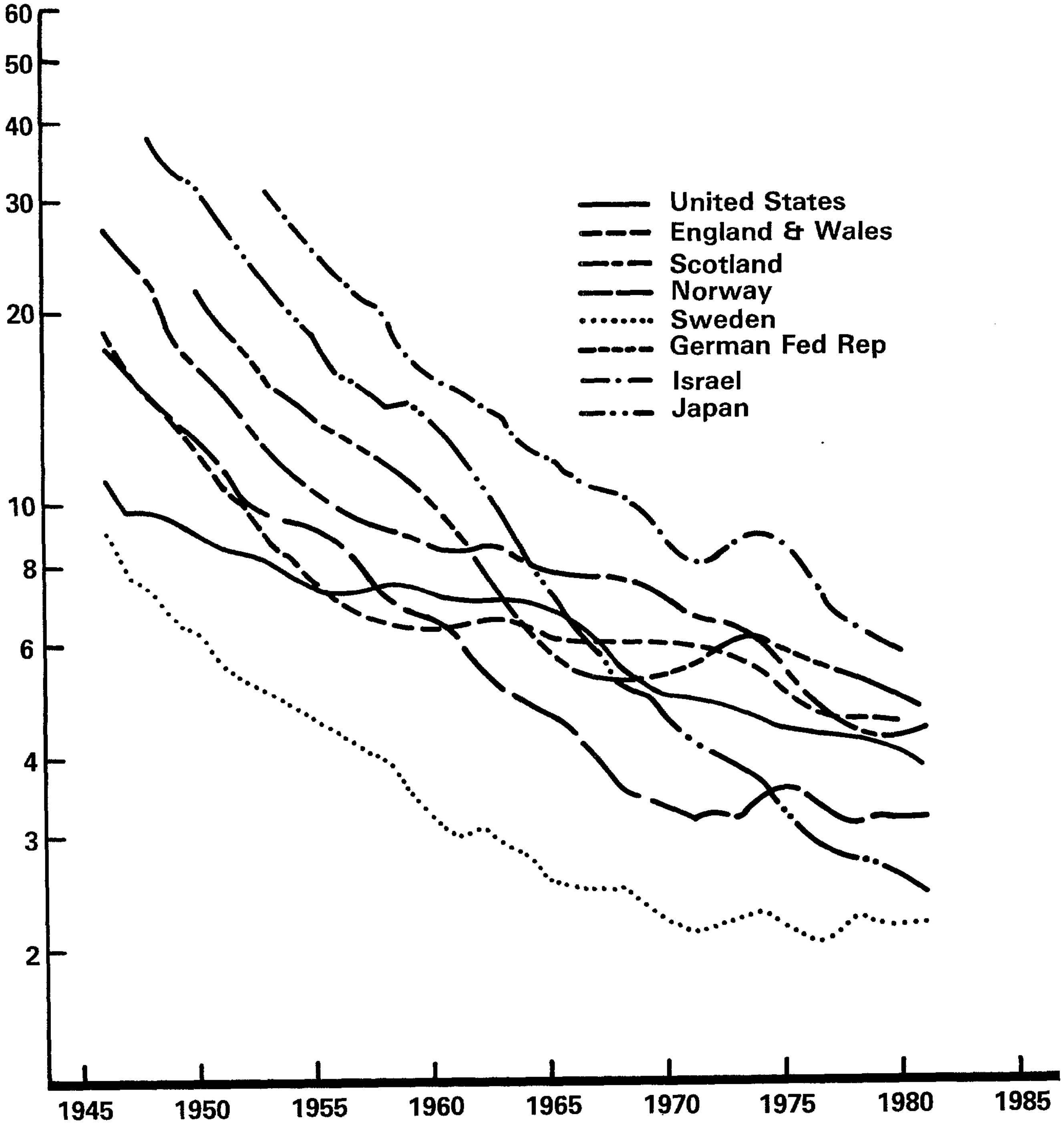


Figure 3. Postneonatal mortality per 1,000 live births, by year

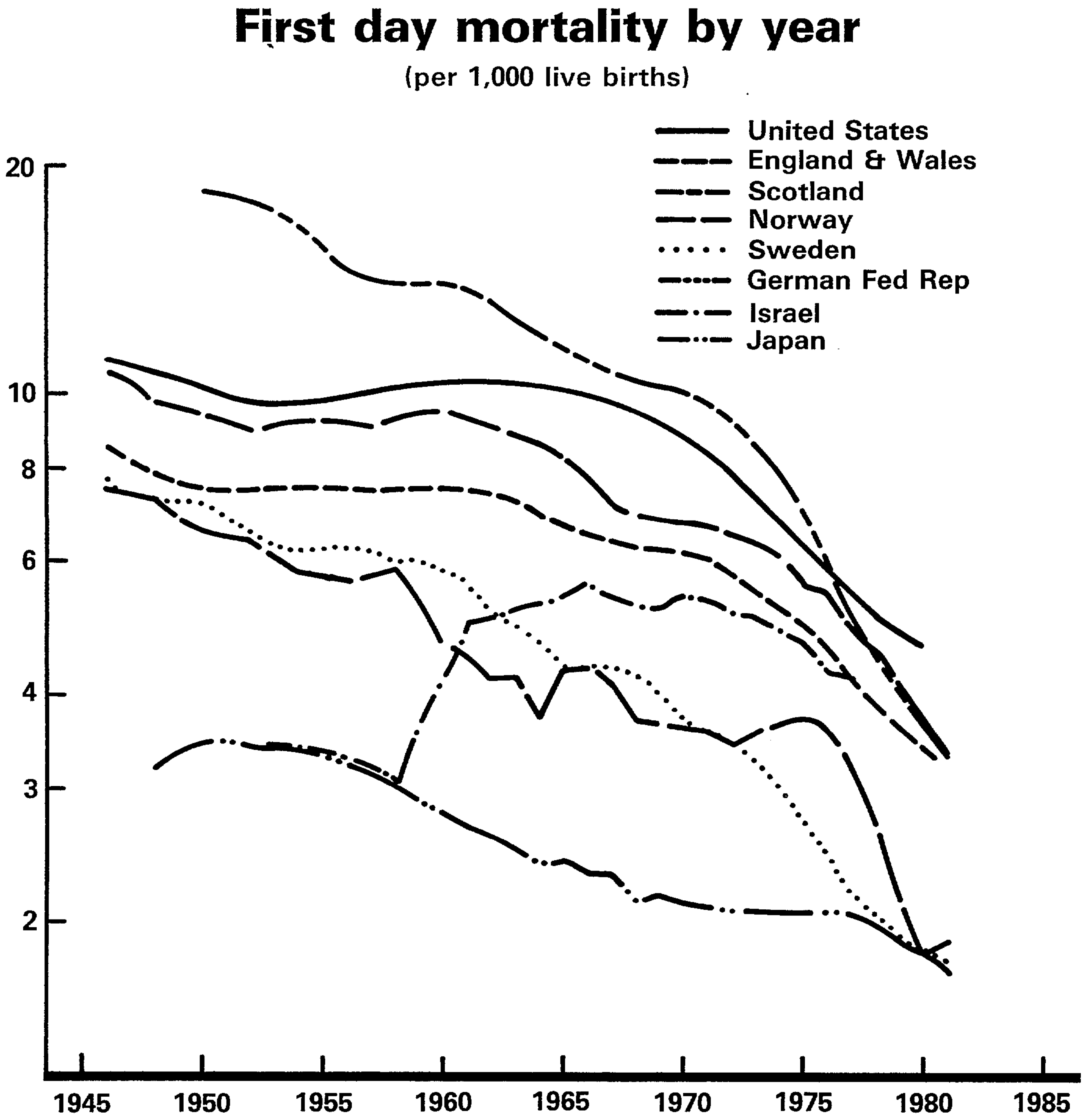


Figure 4. First day mortality per 1,000 live births, by year

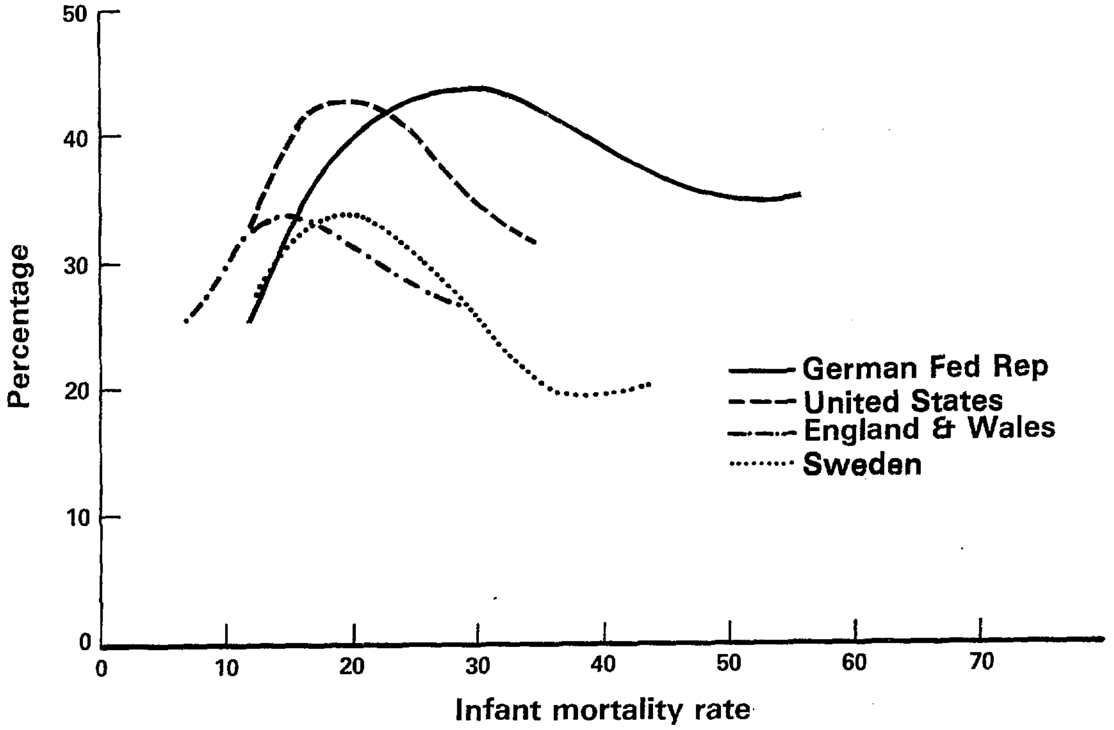


Figure 5. First day percent, by infant mortality level

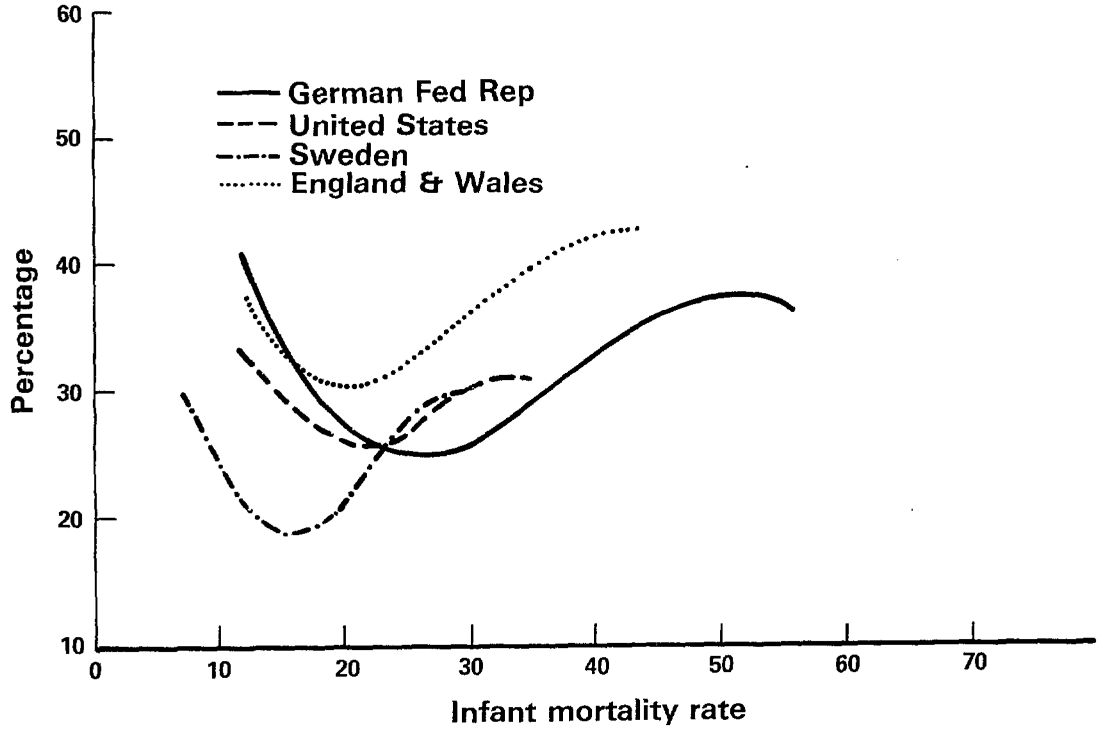


Figure 6. Postneonatal percent, by infant mortality level

Discussion: Recent Trends

Mr. Israel: Dr. Hartford has, very bravely, taken on the very large responsibility to try and do a comparative overview, and I'm going to be somewhat of a devil's advocate a point out that he called his presentation a "comparative overview," and I'd like to break that into two parts, "comparative" and "overview," and point out that although all of the countries that are represented here at this symposium have mature, statistical systems, a statistical comparison is not as easy as it may appear on the surface.

For example, Bob pointed out the general uniformity of the definitions that are used for producing the statistics that we have been looking at, but we must bear in mind that there are official definitions and there are those definitions that are used in actual practice.

What does the obstetrician do in a delivery room in defining or deciding whether a particular product of gestation is live born or stillborn? It's not always easy, in spite of official pronouncements that "everyone follows the WHO definition of live birth and fetal death." I don't want to dwell on that point, but it's something that we may wish to consider further.

He also mentioned the fact that, again, these being relatively mature statistical systems, and I was amazed to see some of our colleagues presenting data from the 18th century, and I commend them for it, there are differences, even though we feel that the data are relatively complete. There have to be differences.

We know the fetal deaths are not as well registered as live births or infant deaths. We know that there are both social and economic pressures that create incentives and disincentives for the registration of both live births and deaths--both fetal deaths and infant deaths.

So when we say we can do a comparison, an international comparison, we have to give that a considerable amount of thought and come to the conclusion that in spite of these kinds of differences, we still can make some comparisons, or perhaps that we shouldn't.

The other part of Bob's title was "overview." He did a comparative overview, and that's precisely what he did, and he talked about some general and broad rates, but in the very short period of time, there was no way for him to do an overview of all of the factors, or at least many of the factors that actually enter into the production of mortality.

For example, we were not looking at birth weight particularly, or gestational age, or marital status, or age of mother, occupation of father or mother, social class, education, causes of death. Those are some of the variables that

I jotted down during this morning's presentations that various presenters showed us.

In addition, we are looking at various types of mortality. As I mentioned, we have fetal deaths, and amongst the fetal deaths there are early, middle, and late fetal deaths.

There are neonatal deaths, again which can be partitioned; postneonatal deaths, perinatal deaths, and so there are so many factors and permutations and combinations of these variables that it certainly is not easy to do a comparative analysis; and I'm sure that Bob would readily agree, he wasn't trying to do a comparative analysis, but really to give you some food for further discussions; and, that, I think he did a fine job on.

So what we would like to do now, for the next 20 minutes, or half hour or so, is to see if you have specific comments, questions that you would like to raise that would be pertinent to the presentations that we have heard so far. I'd like to turn the floor over to you and have you ask some questions or make some points.

Dr. Janerich: I have a question and some comments. My question has to do with a comparison between the data that we saw from Norway and Sweden this morning.

In the data from Norway, the long downward trend, admittedly complicated by changing patterns of recognition of phenomenon is an issue, but in that long, downward trend, there was a distinct interruption in the 1930's that the presenter attributed to events surrounding the Great Depression that a good part of the world was involved in.

The data from Sweden, on the other hand, which included the same time period, to my eye anyway--it's hard to judge because the scales were not the same--didn't show such a distinct interruption in the pattern around 1930.

My question has to do with does Sweden show evidence of an interruption around 1930? I think some of the early data from the United States do show that.

My comment is sort of related to that question, and that is, if we're going to start these analyses at 1945 and draw conclusions about what caused or did not cause the trends to be the same or different in different countries, I think we have to have at least some recognition of the antecedent factors that existed before 1945.

Some of these countries were involved in war and influenced greatly by social conditions surrounding war; and, if, for example, some of those conditions artifically raised infant mortality rates for social reasons, perhaps related to what we saw in Norway this morning, or what was attributable to the depression in Norway, we might be really interpreting antecedent factors and not factors present.

Dr. Meirik: The trend in infant mortality continued through the thirties in Sweden; however, if you scrutinize the slide I showed on fetal and early neonatal mortality during that period, there was an increase in early neonatal and in fetal mortality.

We think, however, that this increase is due to better registration of these events because more and more of the births took place in hospitals, and we had a far better registration during the thirties than we had in prior periods. It's hard to say if it was a real or an apparent increase in these events during that period.

Dr. Bakketeig: I would like to just add a few words to it, because, as I said in my presentation, there was a decline throughout this 100-year period with two exceptions, and one was during the Great Depression I said.

I didn't necessarily mean that I meant the depression was the explanation for it. I think we should be very careful when we are trying to interpret these data, and I go along with what Dr. Meirik just said, that it could also be a difference in registration systems, because we had the same development--all births took place outside hospitals up until 1920 or something, and then they entered the hospitals, and that could explain, actually take care of some of the increase.

Mr. Israel: I apologize, because I don't remember which country it was in--it was either Norway or Sweden--where it was noted that there was a change in the percentage of low birth weight babies. There was a rather sharp change over a small period of time; and the presenter commented that this change in low birth weight babies was noted also in Finland.

That prompted me to wonder whether there was any attempt to look and see if there were any other things going on in that area of the world; for example, was there an influenza outbreak just before or during that period, or whether there was any other kind of infectious disease, or some other incident that would be common to several of the Scandinavian countries at the same time.

Dr. Meirik: Again, for Sweden. We have given it a lot of thought, but so far not come to any conclusion.

One of the things we have been discussing mostly is the effect of legalized induced abortion. Even if we threw out the late sixties and early seventies practice, free early abortion, it was not legalized actually until 1975, and this might have had some impact on it.

However, the low-birth data are rising slightly again, so that the drop in that year has almost disappeared, to get back to the rates we had in 1975 again; close to it, at least.

Dr. Hemminki: I am from Finland. I would just like to add to what he just said.

The drop in Finland was more remarkable than in Sweden. It was something like from 5 to 4 percent in 1 year, and prior to that year there was no increase; it was rather steady. And after that year, as far as I know, there has been no increase back. So it came down in 1 year and stayed there, about, and people have tried to explain it, but haven't found reasons for that. So we don't know why it came down and why it came so abruptly.

Dr. Berendes: What I found remarkable in the presentations--not every one of the presenters emphasized this, but those who remarked about it--was the relatively small change in rate of low-birth weight, and most of the countries presented data comparable to what we have seen in this country, so that, by and large, the gain that we have seen in reducing infant mortality and neonatal mortality, is not due to a change in birth redistribution but due to, presumably, neonatal or perinatal, intensive care, whatever.

Dr. Kleinman: To followup on that comment about the low birth weight rate decreasing from 5 percent to 4 percent, was that decline concentrated in any single birth-weight group, below 2,500, or was it spread out and occurred even in the very low birth weight?

Dr. Hemminki: I'm sorry, I can't remember the figures. They are available, but I can't remember them now.

Dr. Wegman: There is a related question, if you look at the figures that Bob Hartford presented for the comparison among the other countries, it seems to me the United States stands out in the period between 1950 and 1965 as the only country with a relative plateau in that period, while all the other countries went down.

I wonder if there is any obvious explanation for that slowing up during that period.

Mr. Israel: I don't know if anyone has an obvious one, Dr. Wegman.

Dr. Williams: I noticed that same trend, especially with respect to Japan. When the rate of decline was increasing fastest for Japan, it was leveling off and slowing down for the United States.

The curious thing is if you eye-balled it and projected the United States down--I thought those were very fascinating, if we could look at those sometime later--that if the United States rate had continued without that plateau, its current mortality rate would be close to that of Japan and Sweden. So that plateau is very interesting and one that should be concentrated on.

I have one possible explanation--it's purely speculation but it relates also to migration of blacks from the South into the northern metropolitan cities.

The registration system in the South, as we know, was very incomplete in the early part of the fifties, and there was a lot of underregistration of neonatal deaths and the like.

So I think, in any of these comparisons, we need to pay careful attention to the differences in registration systems and especially when we lump together, in this unit analysis that Dr. Hartford mentioned, we can't always compare all the states; and it may be that we will have to break down the United States in terms of regions and do some more regional analysis to pick up some of those effects.

Mr. Hoffman: I would just like to add a further comment. With reference to Scandinavian data, Norway experienced a similar pattern of slowing down of their mortality rates in comparison to Sweden during the same time period, 1956-65. Therefore, other countries besides the United States also had similar trends. Whether this reflects the same concern regarding completeness of registration which was just mentioned by Dr. Williams, or some other more intrinsic factors relating to the evolving health care delivery system, is a matter for further inquiry.

Dr. Oates: Richard Davis has done a very interesting analysis of States by registration, outhospital versus inhospital births for black infants, during that period. He has demonstrated that there is a strong correlation between the proportion of births to black women in hospitals and the rate of low birth weight, and--infant mortality.

So I suspect a great proportion of that plateau is due to an increasing registration of black infants.

Dr. Moriyama: The conference that we had in '65, that was alluded to earlier, was precisely to look at this question of deceleration in the infant mortality rate; and at that time there were about six countries that we selected, and they all showed some deceleration and, of course, the United States showed the most marked change. And we are not able to pinpoint the reasons for it.

But at that time there was a lot of speculation about what caused it; one of them was this race factor, but if you look at the infant mortality rates specifically by race, you find the same sort of change. So I don't think it was the race difference that made the change in mortality rate.

At the same time, as someone else pointed out, there have been many other countries that showed the same phenomenon at that time.

Dr. Emanuel: I think one of the problems we're dealing with is the lack of specificity of data, that the problem of registration has been brought up, and other issues have to be brought up.

You have a number of causes of perinatal mortality, infant mortality, each of which will have their own separate individual epidemiologies.

Until we get more specific data, I think it's very difficult to make comparisons and to really get a handle on what is going on.

Mr. Israel: Well, I would certainly hope that one of the outcomes of this symposium might be some recommendations as to what kinds of additional data we would like to have on an international basis to be able to do just what you are recommending.

Dr. Starfield: There's been an interesting recent paper by Dr. Kessel--that looks at the different patterns in low birth weight over the last few years; that is dividing birth weight into that due to prematurity and that due to intrauterine growth retardation, and they find some trends.

I wonder if there have been any similar studies in other countries which look at the relative proportion of the two kinds of low birth weight and get any clues as to the causes for the changes over the years, or the lack of changes.

Dr. Hartford: Yes. This is in reference to the plateau and also to Dr. Janerich's earlier comment on time trends.

Now, we referred to time trends purely for the historical interest and, really, the symposium is going to focus more on what is going on now or what has been going on within the last 5 years. But since these questions have arisen about the plateaus, I would like to point out that in other data we have, my impression is that the plateau that you saw in England and Wales, Scotland, and the United States can be found in virtually every other English-speaking country in the world--Australia, New Zealand, and Canada, and so on. I have no idea what it is--other countries don't have this.

Howard, I believe you mentioned Norway, but if I'm not badly mistaken, that plateau in the Norwegian experience refers to perinatal, not to infant mortality. These data here show that the overall infant rate, like the infant rate in Sweden, was a very consistent decline over the period of 1945 to the present.

Mr. Shapiro: The data from Japan is extremely interesting and in particular, looking at the proportion of very low birth weight infants, it seems to me that a very unusual situation, compared with the United States, appears in their data.

In the United States, about 1 percent of the low birth weight infants are born at 1,500 grams or less. In Japan, as we received the information today, the proportion is only about 0.4 percent.

Now, this gives rise to a much broader issue of what is going on in the low birth weight group, and the kind of information that Joel Kleinman requested earlier, I think would be very important for us to be into, understand the current situation and why there are these very marked differences in the levels of infant mortality.

The very low birth weight group in the United States accounts for a very substantial proportion of the total infant mortality rate; and I'm sure that's true in Japan as well, but the levels are very, very different, and it would be very important to understand why there are these different levels.

Dr. Karlberg: A question to Bob Hartford. I found your talk very interesting when you compared the proportion of the 24-hours death mortality rate to others, and the change, together with the interaction.

There, one could really get the feeling that we had the period when the mortality during the 24 hours was increasing, but these were the relative figures; and I will ask, how does it look if you use the absolute figures there? Will that be a straight line?

Dr. Hartford: Essentially, yes, in the last few years, there were pretty good, strong declines in all the countries. There was somewhat of a slowdown in the rates of decline in the first-day mortality in the United States and I believe in the other English-speaking countries, but I don't believe there was in the other countries. We can check that later.

Dr. Rush: We have a session and a whole series of discussions on health care and we're talking about birth weight, and I would imagine of all the indices we study which health care seems to be totally irrelevant to, birth weight appears to be probably one of the most commonly discussed, so it might be--no one has talked about some of the issues which do relate to birth weight which tend to be maternal behavior, of one sort or another, tobacco use, possibly infection transmitted in one way or another.

And I would say that we, as part of the byproduct of a national study over the last decade, studying some 12 million births in 15 States in this country, have in fact, confirmed I think it was Villar's and Kester's finding that there have been pretty much exclusively changes in the term low birth weight rates, rather than pre-term low birth weight rates.

But we found something quite startling that we had not expected which was that both in black infants and white infants in the 15 states we've studied over the decade, there have been appreciable increases in birth weight, but they have been limited to women with higher levels of education, that there has been absolutely flat mean birth weights among those with less than 12 years of education, and a rise over the course of the decade of about 40 grams in both black women and white women with 12 or more years.

And I would suggest that given what we know about the changes in the smoking patterns of women and their relative changes with education, that this may well be a reasonable explanation. I don't have too many others, but it is, as I say, it's of interest that we are talking so much about the origins of birth weight distributions and trying to link that with health care, and it would seem to me that's almost a fool's errand.

Dr. Kessel: I'm not sure this is worthy of the last comment, but one of the things that would be interesting to hear some discussion about--Dr. Kleinman shows the variations between subpopulations within one country.

It would be interesting and helpful to us if there were data around other subpopulations in an existing country and how those statistics compare within a country.

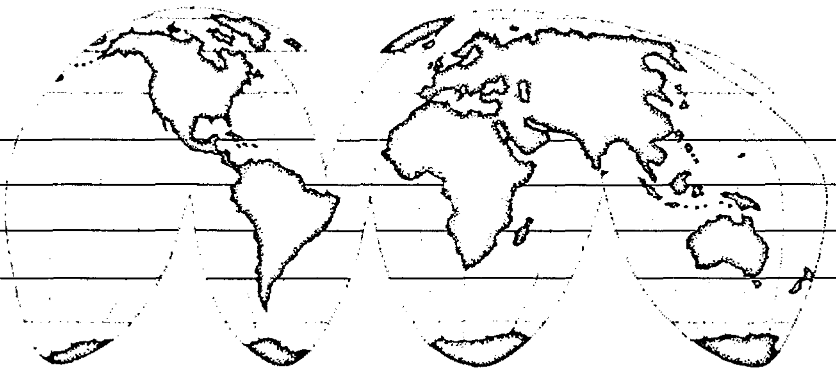
The black-white issue within this country is particularly a strong issue and, indeed, one other issue that Dr. Kleinman identified is those who have migrated from one country to this country, and all the issues of migration attendant to that.

It would also be interesting to compare those that are currently here and what their reproductive outcomes are, vis-a-vis the reproductive outcomes of a similar groups of folks in the country of origin.

So, essentially, it would be interesting to hear two comments; one would be the variation within a country of the subpopulations and, if, indeed, there are dominant subpopulations within a country; and then some comparison of those people based on country of origin.

Mr. Israel: Well, let me assure you, Dr. Kessel, that your comment is not the last comment on the subject. I hope that there will be considerable discussion on points such as this during the course of the symposium.

But for purposes of just laying a background, I think we will call that the last word, at least for now.



Chapter III: Health Care Systems

Health Care Systems in Israel

by Vita Barell and Pnina Zadka

In the 30-year period prior to the founding of the State of Israel, its health services developed in a pattern that persists to this day. The Mandatory government initiated some basic public health services, while personal preventive and some hospital and outpatient services were developed by voluntary charitable agencies such as the Hadassah Medical Organization. Personal care services (including hospitalization and drugs) were developed through the voluntary health insurance funds that were largely organized through the labor movement. The existence of the Sick Fund goes back to the early 1920's, when it was founded by the Confederation of Labour, whose aim was to assure the state of health and well being of its members and their families. Direct care services were provided through their own facilities, including hospitals and drugs.

With the creation of the State of Israel in 1948, the Ministry of Health together with its district offices took responsibility for the basic public health services. Many of the services initiated by voluntary agencies, especially in the field of child care, geriatrics, and psychiatry, were also taken over by the Ministry. Present trends are toward the transfer of direct services from the Ministry to other care giving agencies, such as the Sick Funds, with the Ministry focusing on setting standards and supervising the health services.

The insurance and services initiated by the Labor and Trade Union Movement, developed into the General Sick Fund, which covers 80 percent of the population and provides prepaid comprehensive health insurance and has its own facilities for providing direct primary, secondary, tertiary, convalescent, and rehabilitation services.

Organization

The current organizational framework of the health services in Israel is given in figure 1. The Ministry of Health is responsible for priority setting and allocation, planning and supervising health care services, and licensing and standard setting for the health professions. In addition, it provides a significant share of preventive, curative, and rehabilitative services. The Ministry operates 12 general hospitals which provide 48 percent of all acute care beds, as well as more than half of the psychiatric services. Sixty-nine percent of all mother and child health stations are also provided by the Ministry, while 25 percent are provided by the Sick Funds and about 6 percent by municipalities.

The four voluntary Sick Funds active in the country cover 95 percent of the population for prepaid medical, hospital, drug, convalescent, and other services. These Funds employ close to 60 percent of the country's physicians and operate 1,300 health clinics including more than 220 MCH centers, providing ambulatory, and primary and specialty care.

Preventive and ambulatory primary health care services are present in nearly every village, neighborhood, town, and city in the country and are readily accessible, including secondary referral access to specialty clinics and outpatient hospital services. Three-quarters of the community clinics serve populations of under 5,000 individuals, with half of these in small agricultural settlements with a single doctor. Fifteen percent of the clinics, all in urban areas serve between 5,000-10,000 members, and the remaining 10 percent have larger populations. In urban areas the average list size of the family doctor is 1,500 insured population, while primary pediatricians have a smaller load of about 1,000 children. The rural doctor generally has a list of 1,200 individuals, and serves a small village or a number of agricultural settlements.

The ambulatory services provide secondary referral access to specialty clinics and hospital services. A survey of health services showed Israelis to be relatively high users of ambulatory care services, both preventive and curative, with over 12 visits to physician per person per year.

The Sick Fund runs 8 general hospitals, providing about 30 percent of acute case beds, and many laboratory, convalescent, rehabilitation, and other facilities. No additional fees for services are required from members, except for very low copayment for prescriptions and the cost expenditure for dental care.

Health manpower

The health industry, large by Israeli standards, directly employs 60,000 people (about 6 percent of the civilian labor force) in medical, paramedical, administrative, and support services. Israel currently has more than 8,000 registered physicians (21/10,000 population). The vast majority of Israeli physicians work primarily as employees either of the Ministry or of the Sick Funds. Very few are primarily self-employed in fee-for-service practice; however, a large percentage carry on some fee-for-service, self-employed practice in addition to their primary employment. Of the 19,000 nurses employed (46/10,000 population) 55 percent are practical nurses and 45 percent are registered nurses. There is a relatively high dentist-to-population ratio in Israel (5.4/10,000) but a large proportion of dentists work only part-time.

Population characteristics

Israel has about 21,000 square kilometers. Topographically, it is constituted by four general areas: the coastal plain--fertile, humid, and thickly populated--stretches along the Mediterranean; the central hills include the Hills of Galilee and Golan Heights in the north and the Negev Hills in the south; the Jordan Rift Valley with the lowest point at the Dead Sea; and the Negev Desert, which accounts for about half the country's area.

Israel is a country with rapid population growth--1.37 million persons in 1950 to 2.15 million in 1960, 3.02 million in 1970, 3.84 million in 1980 and reached 4,063,700 by the end of 1982. It is heterogeneous as regards to ethnic origin and sociocultural characteristics, with successive waves of Jewish immigration from 108 countries and there are considerable differences in population characteristics in the two national groups (Jewish and Arab). The Jewish population is composed of four major ethnic groups--European, North African, Mid-Eastern and Yemenite. The non-Jewish group is composed of Moslem and Christian Arabs, as well as a sizable Druze population.

There are 95,000 births per year--25 percent of which are non-Jewish. The crude birth rate among the Jews is 23/1,000 population and 35/1,000 population among the non-Jews. The total fertility rate among Jews is 2.91/female, and among non-Jews 4.7/female.

Israel is an industrialized nation, but atypical. The number of immigrants and the fact that many of them have come from developing societies have had their effect. Side by side with the diseases and problems of industrialization and relative affluence in some groups are other problems related to lack of hygienic awareness and poor enforcement of public health regulations.

Mortality rates and life expectancy in Israel reflect the patterns prevalent in Western countries.

Life Expectancy at Birth, 1983

	Jews	Non-Jews
Males	73.0	70.8
Females	76.3	73.3

Among Jews, acute myocardial infarction is the leading cause of death--132.8/100,000 in 1980 down from 213/100,000 in 1970-74. For the non-Jewish population, mortality rates reflected a younger population--ischemic heart disease death rates were 72/100,000 in 1969-72, 76.4/100,000 in 1973-76, and 120/100,000 in 1980. The increase can be attributed to rapid industrialization and urbanization processes.

Cerebrovascular disease declined slightly as a cause of death among the Jewish population during the same time periods and increased slightly among the non-Jewish population.

Morbidity from the major infectious diseases has declined dramatically over the years, although infectious diseases such as hepatitis and gastrointestinal disorders still constitute a public health problem.

Service utilization

Israel's patterns of health care use are quite different from those in the United States. Americans spend almost one and a half times as many days in acute care hospitals as do Israelis; Israelis make three times as many doctor visits as do Americans. These differences are unexpected, for the two countries are similar in their patterns of disease and death and in the percentage of their aged population (table 1).

National expenditure on health (NEH) by service, 1978

Hospitals in Israel consume 44 percent of all health expenditures, even under a policy of restraints. Ambulatory and preventive health services consume about 32 percent.

The central government is the source for about 40 percent of the national expenditure on health (Ministry of Health 35.7 percent, and other central government sources about 4.3 percent). The National Institute for Social Security provides about 3.5 percent of the NEH, which includes collection and distribution of the employer's contributions to health insurance schemes and financing hospitalization of maternity cases and newborns.

Voluntary Health Insurance schemes provide about one-third of the NEH and the private sector provides another 15 percent. Local authorities, voluntary associations, universities, and donations account for the residual 8.5 percent of the NEH.

Obstetric and neonatal services

Following are a number of tables which summarize the obstetric and neonatal special care services in Israel. As can be seen from table 2, the Government sponsors almost one-third of the obstetric beds in the country, the Sick Funds another 28 percent and the private sector sponsors less than 4 percent. The overall bed occupancy rate is 96 percent with an average length of stay of 4.1 days. The occupancy rates in Government and Sick Fund obstetric services are over 100 percent. The occupancy rates differ considerably by geographic area (table 3).

There are 330 neonatal special care beds in Israel, 36 percent of these (120 beds) are authorized neonatal intensive care beds. Because of reporting artifacts, it is not possible to separately identify admissions for prematurity, special care and intensive care. In the accompanying tables (4-6) all of these services are presented together as neonatal special care services.

Government and Sick Fund hospitals provide more than 75 percent of the neonatal special care wards in the country (table 4), and there are no wards of this type in private hospitals. The average occupancy rate in these wards is 108 percent with an average length of stay of almost 16 days.

Overall, there is one neonatal special care admission for every 13.5 maternity admissions, though the ratio varies throughout the country, as do the occupancy rates (table 5).

Sixty percent of the hospitals with obstetric services also have special neonatal care units (table 6). All of the services with 5,000 or more births yearly, as well as 10 of the 11 services with 3,000-4,999 annual births. One hospital with less than 2,000 births has a special care ward as well.

Problems in MCH services

Fragmentation of services and care is one of the major problems in maternal and child services in Israel (table 7). From the beginning of pregnancy through the end of 1 year of infant life, care is given in multiple sites. This, of course, puts considerable strain on the flow of relevant information from one site to another and the consequent continuity of care. Even within the same facility, there is often discontinuity in medical records and in care-giving policy.

Health service policy in Israel today is directed toward the provision of continuity of care and adequate flow of relevant information over multiple sites, as well as maintaining the generally high quality of services.

In addition, emphasis is being put on the following:

- Appropriate use of high-technology.
- Equitable and efficient distribution of scarce resources.
- Reorganization of services and proper routing of high-risk maternity cases and infants.
- Targeting high-risk populations and designing appropriate interventions to reduce infant mortality and morbidity.
- Maintaining a high level of preventive services and increasing the capabilities of heterogeneous populations to comply with health directives.

Table 1. General utilization data

Acute care beds (27,247)	2.92/1,000 population
Bed days	966/1,000
Average length of stay	6.1 days
Bed occupance	91.8 percent
Total bed ratio	6.7/1,000 population
Ambulatory visits	12/person/year
. infants born in hospital	less than 99 percent
. infants fully immunized	84 percent
. receiving care by trained personnel	mothers - 90 percent children - 90 percent

Table 2. Obstetric services in Israel: 1982

Ownership	Hospitals	Beds	Admissions	Occupancy rate	Average length of stay
Total Number	35	1266	104,857	96.0	4.1
Percent		100.0	100.0		
Government	11	33.4	36.4	103.4	4.0
Municipal	2	9.2	8.0	87.7	5.3
Sick Fund	8	28.2	33.0	112.6	4.3
Hadassah	2	3.9	4.8	106.4	3.7
Mission	4	10.1	6.0	52.3	3.8
Voluntary	6	11.4	9.1	89.4	4.0
Private	2	3.8	2.5	45.9	2.9

Table 3. Obstetric services by region: 1982

Region	Number of hospitals	Beds	Admissions	Occupancy rate	Average length of stay	Number of beds	
						Range	Average
Total Number	35	1266	104,857	96.0	4.1		
Percent		100.0	100.0				
North	11	32.6	28.8	84.2	3.9	15-58	35.5
Sharon	6	18.4	18.4	105.3	4.4	25-55	38.8
Central	4	15.2	18.3	107.0	3.9	36-60	49.0
Tel Aviv	2	9.5	8.0	75.2	4.9	40-80	60.0
Jerusalem	9	14.8	13.3	88.0	3.7	8-30	20.8
South	3	11.3	13.2	124.0	4.7	7-90	47.7

Table 4. Neonatal special care wards[1] in Israel: 1982

Ownership	Number of Hospitals	Beds	Admissions	Occupancy rate	Average length of stay
Total					
Number	21	[2]330	7, 758	107.8	15.6
Percent		100.0	100.0		
Government	9	42.1	40.2	104.5	15.3
Municipal	2	10.9	11.1	99.0	15.3
Sick Fund	6	33.3	31.1	114.6	18.9
Hadassah	2	9.1	11.0	96.2	9.3
Voluntary	2	4.8	6.7	130.7	13.0

[1] Because of reporting artifacts, it is not possible to separately identify admissions for prematurity, special care, or intensive neonatal care.
[2] 120 of these beds are authorized neonatal intensive care beds.

Table 5. Neonatal special care wards[1] by region: 1982

Region	Number of hospitals	Beds	Admissions	Occupancy rate	Average length of stay	Number of beds	
						Range	Average
Total							
Number	21	[2]330	7,758	107.8	15.6	4-30	
Percent		100.0	100.0				
Sharon	3	15.5	15.6	122.5	16.2	6-30	17.0
Central	4	23.0	19.1	107.9	16.7	13-23	17.0
Tel Aviv	1	9.0	6.7	88.5	18.7	30	30.0
Jerusalem	4	13.9	17.7	108.4	12.4	6-16	10.5
South	2	11.6	12.4	106.2	16.0	8-25	16.5

[1] Because of reporting artifacts, it is not possible to separately identify admissions for prematurity, special care, or intensive neonatal care.
[2] 120 of these beds are authorized neonatal intensive care beds.

Table 6. The relation between obstetric services and neonatal special care units

Number of annual births	Number of hospitals	Number with special neonatal care
Total	35	21
9,000 or more	1	1
5,000-5,999	4	4
4,000-4,999	5	4
3,000-3,999	6	6
2,000-2,999	7	5
1,000-1,999	6	1
Less than 1,000	6	-

[1] Because of reporting artifacts, it is not possible to separately identify admissions for prematurity, special care, or intensive neonatal care.
[2] 120 of these beds are authorized neonatal intensive care beds.

Table 7. Care-givers by site and stage

	Site	Prenatal	Delivery	Postnatal
INFANT	Hospital		Intensive care Premature Newborn	Intensive General pediatric E.R.
	Primary care clinic			Community pediatrician
	MCH			Visiting pediatrician
MOTHER	MCH	Visiting pediatrician		Visiting pediatrician (family planning)
	Primary care clinic	Community G.P. Community gynecologist		Community gynecologist
	Hospital	E.R. OPD (high risk) Inpatient	Obstetrics	E.R. OPD Inpatient

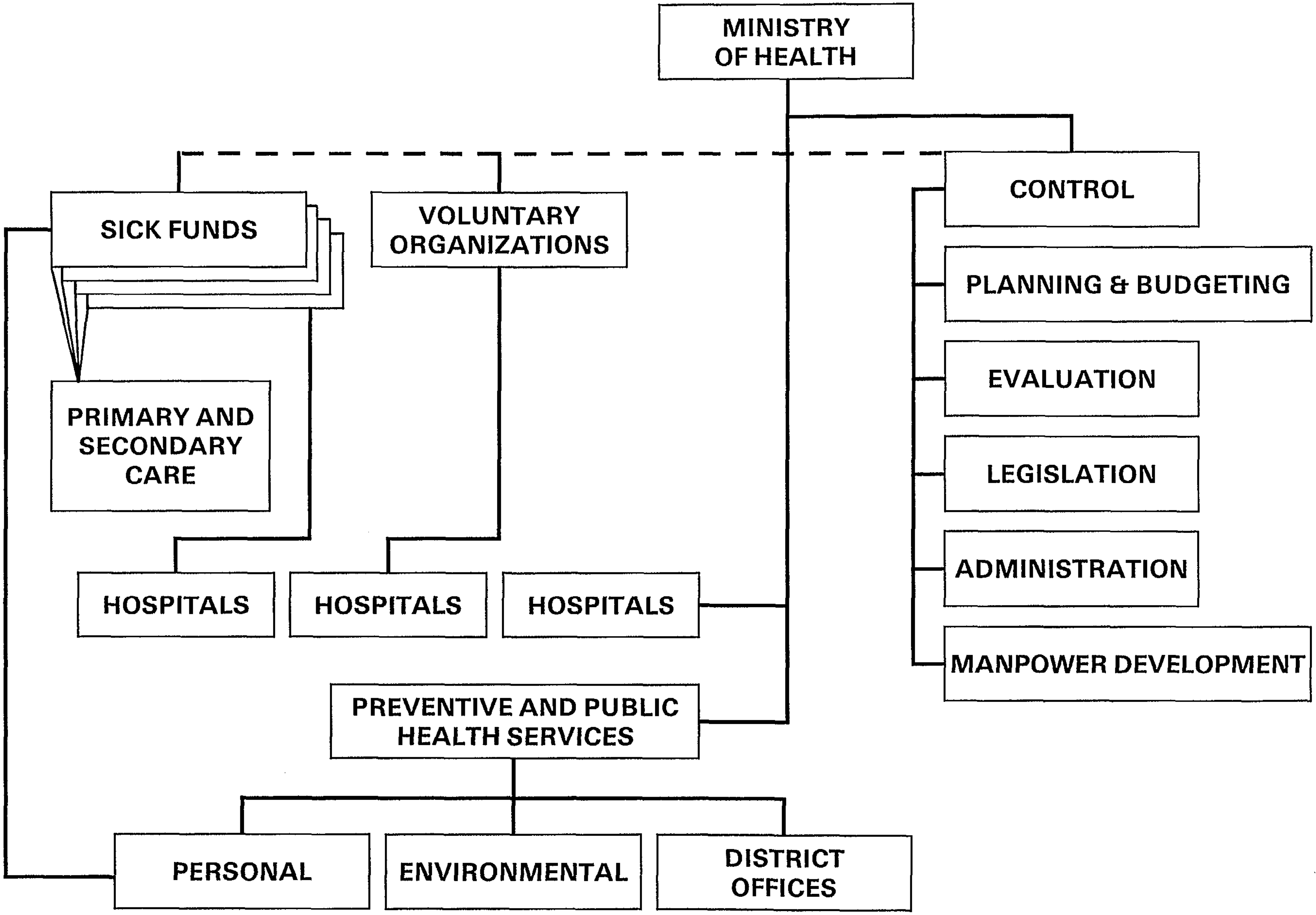


Figure 1. Organizational framework of health services in Israel

Antenatal Care in Sweden

by Olav Meirik, M.D., Ph.D. and G. Lindmark, M.D., Ph.D.

A presentation on antenatal care systems may be oriented towards quantitative and hard data or to qualitative and soft. When it comes to antenatal care presently in Sweden I think the latter approach will be most meaningful. I will focus upon four circumstances or factors which I think are the cornerstones in the Swedish system for antenatal care, namely: the regionalization of obstetric and antenatal health care, the role of the midwives, the record system and the logistics of information, and the attendance and continuity of the care.

In Sweden there are six so called health care regions, each providing care for a geographically defined population. The regions have populations varying from 1.7 to 0.7 million people and each region has one highly specialized hospital for tertiary health care. The regions consist of a number of principal health care districts, with populations varying between 1 million and 150,000 people. Each principal health care district has at the least one central county hospital with obstetrical and pediatric departments, and most principal districts have a number of smaller and less specialized county hospitals. Each of the principal districts are divided into primary health care districts, which are the smallest units. They have around 50,000 people in the urban areas and down to 5,000 people in the rural and more remote areas. In table 1 the outlines of the structure of the health care system are shown.

At primary health care level, the antenatal care is functioning separately and has its own personnel. In the principal districts the antenatal care is professionally headed and supervised by a senior obstetrician at the central county hospital, whereas at the antenatal care clinics at the primary care level midwives are in charge and do routine surveillance of the mothers and patients. Each of the antenatal clinics serve around 2,000 women aged 15 to 44 years and has the primary responsibility for 100 to 120 pregnancies per year. Besides work in antenatal care, the midwives are also engaged in health education, family-planning counseling, and screening for cervical cancer. The midwives work in close collaboration with the obstetrician or the GP's at the antenatal care clinic.

Of the doctors presently working in antenatal care, 85 percent are obstetricians and the rest are general practitioners. The obstetricians working in the antenatal care most often have a job at the central county hospitals and work within antenatal care as consultants; thus, the same doctors are often caring for the mothers in the pregnancy, and during the delivery and the postpartum period.

Within each of the principal care districts, there is, at the least, one antenatal referral clinic which is headed by the senior obstetrician responsible for antenatal care in the principal district. The referral clinic is often located at the central county hospital with easy access to cardiotocographic monitoring, ultrasound, and laboratory facilities. Besides the work at the referral clinic, this senior obstetrician is also responsible for the continued postgraduate training of the midwives and the general practitioners in antenatal care. This senior obstetrician practitioner has great impact on the content of the care.

Guidelines for the personnel in antenatal care regarding referral of risk pregnancies have been given by the National Board of Health and Welfare in cooperation with the Swedish Association for Obstetrics and Obstetricians and anyone with a risk for preterm delivery or a low birth weight infant will be insured specialist care. Likewise, all pregnancies with any complication which might lead to a decision on elective induction of delivery will be handled at the referral antenatal clinics.

The attendance and acceptance of antenatal care in Sweden is very high, and it's a rarity to find a woman who has not received any antenatal care. No pregnant woman could admit that she had not visited the antenatal care clinic without getting reproaches from friends or family members for jeopardizing her own and her baby's health. As many as 85 percent of the pregnant women register in antenatal care before the 14th week of pregnancy, and as a rule they are seen by the same midwife throughout the pregnancy. Most of the pregnant women register at the antenatal clinic in the 8th or 9th week. At the first visit the midwife takes a careful interview, according to a standard record. The interview will most often have the character of a chat, and includes an active search for factors which might increase the risk for complications in the pregnancy or labor or postpartum period. Besides the obstetric and medical history, the interview includes questions on the woman's family, her social situation, her working condition, and life style factors like cigarette smoking and use of alcoholic beverages. At the subsequent visit, usually in the 12th or 14th week of pregnancy, the woman is examined by an obstetrician or GP who assesses the anamnestical and clinical findings and decides if any special monitoring is needed. When a pregnant woman is regarded as a low risk, the midwife will have the main responsibility and all following visits will be to the midwife, except for a last checkup 1 month before expected date of delivery, when another checkup is done by a doctor, mostly an obstetrician.

Whenever there is any problem arising during pregnancy, the woman is seen by a doctor or referred to the referral antenatal clinic. About one-third of the pregnancies have at least one extra visit to the doctor for assessment and discussion of possible risks. In most high risk cases, the midwives take care of the visits, but always in these risk cases there will be extra visits to a senior obstetrician.

An important component in the Swedish antenatal care is the record system. The system has three main forms, which are used throughout all Sweden. These three forms are shown in figures 1 through 3. The form given in figure 1 is the antenatal care record containing information on the mother and father, their social situation and living conditions, work and profession of the mother, previous contraceptive and obstetric history, medical history and involuntary childlessness, and diagnosis related to the mother and the pregnancy, given during the pregnancy. The forms used for delivery and the newborn in figures 2 and 3 should be self-explanatory. In addition to the forms shown here, there are of course additional forms for routine laboratory data and clinical findings, and a graphic display of symphysis-fundus measurements which are used routinely.

In figure 4 is shown a simplified flowchart of the record system. Blueprints of the antenatal record goes with the mother to the obstetrical department; most of the women bring essential parts of the record with them during the third trimester. Another blueprint of the antenatal care record goes to the child health care clinic, which the infant is assigned to. The child care clinic also receives a blueprint of the neonatal care record.

As shown in figure 1, a blueprint from the antenatal, and the obstetrical and the neonatal case record is sent to the National Board of Health and Welfare. At the Board the information in the shaded areas of the record, as shown in figures 1 to 3, are registered and used for the national medical birth registry. This record system assures that background data and updated information will be available when needed for the providers of care, and it facilitates a continuous surveillance of the activities within the care and its outcome.

The record system as described here was implemented throughout Sweden in 1982, an earlier version of the system which started in 1973 has been described elsewhere[1].

What also deserves a comment is the national insurance system. It ensures every woman health care without any cost during pregnancy and delivery and in the postpartum period regardless if it is outpatient or inpatient care. Transports to or from clinics or hospitals are also reimbursed. Since 1955 the mothers have a period of paid leave from work, the leave amounts presently to 12 months and the leave may to some extent be interchanged by the father. Pregnant women in hard physical work have since 1980 the right to less strenuous work; if that cannot be arranged she will get a leave from the 32nd week of pregnancy and will be compensated economically corresponding to the sick leave pay.

In the 1970's, the organization and the content of the antenatal care was revised and it got the present shape in the late 1970's. New methods for surveillance such as amniocentesis, symphysis-fundus measurements, ultrasound screening, and improved methods for biochemical and electronic monitoring of the fetus were successively implemented. The number of obstetricians working in antenatal care increased, and the concept of risk-pregnancies was reinforced and the special antenatal clinics got their final organization and function.

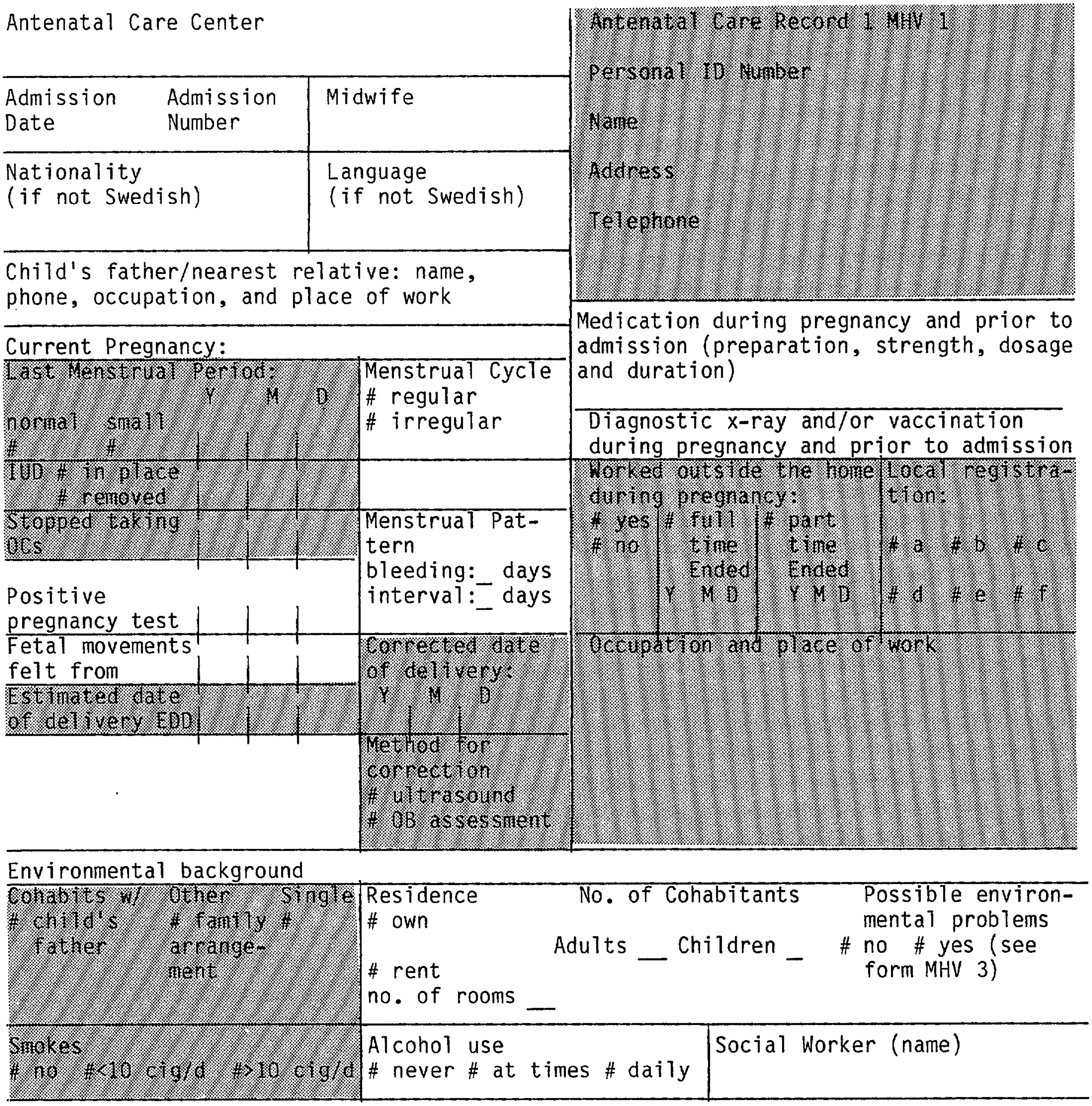
No system should reach a state of being static and the Swedish antenatal care system has not in any way reached that point. Even if the care system presently is running well, it is claimed to be too technical and specialized. It is argued that the antenatal care would be more holistic and care for the pregnant woman <u>and</u> her family and her whole social situation. Consequently, the antenatal care should be integrated with the primary health and principally be managed by general practitioners and not obstetricians. Unfortunately the discussion has mostly been held over the heads of the utilizers of antenatal care. What will come out of this ongoing debate is at the present hard to say.

Reference

[1] Ericson A, Kallen B, Winberg, J: Surveillance of Malformations at Birth: A comparison of two record systems run in parallel. Int J Epidemiol 6:35-41, 1978.

Table 1. Health care system

Level	Population
Regional	1.7 - 0.7 million people
Principal health care district	1.5 - 0.15 million people
Primary health care district	50,000 - 5,000 people


Antenatal Care Center

Admission Date

Admission Number

Midwife

Nationality (if not Swedish)

Language (if not Swedish)

Child's father/nearest relative: name, phone, occupation, and place of work

Current Pregnancy:

Last Menstrual Period: Y M D

normal # small #

IUD # in place

removed

Stopped taking OCs

Positive pregnancy test

Fetal movements felt from

Estimated date of delivery EDD

Menstrual Cycle

regular

irregular

Menstrual Pattern

bleeding:_ days

interval:_ days

Corrected date of delivery:

Y M D

Method for correction

ultrasound

OB assessment

Antenatal Care Record 1 MHV 1

Personal ID Number

Name

Address

Telephone

Medication during pregnancy and prior to admission (preparation, strength, dosage and duration)

Diagnostic x-ray and/or vaccination during pregnancy and prior to admission

Worked outside the home during pregnancy:

yes # no

full time Ended Y M D

part time Ended Y M D

Local registration:

a # b # c

d # e # f

Occupation and place of work

Environmental background

Cohabits w/ # child's father

Other # family arrangement

Single #

Residence

own

rent

no. of rooms __

No. of Cohabitants

Adults __ Children _

Possible environmental problems

no # yes (see form MHV 3)

Smokes

no #<10 cig/d #>10 cig/d

Alcohol use

never # at times # daily

Social Worker (name)

# denotes a square

shaded areas indicate items on the computerized national birth registry

Figure 1. Antenatal care record

Previous pregnancies and births

Date Y M	Abortion legal	Abortion spon.	Ectopic pregnancy	Still-born	Live born	Sex	Birth weight grams	Hospital name	Course	Died <7 da.	Died >7 da.	Child's current health status
												#n/a#MHV3
												#n/a#MHV3
												#n/a#MHV3
												#n/a#MHV3
												#n/a#MHV3
												#n/a#MHV3
Total [					]				Total:[		]	

Previous medical history

#diabetes #renal & urinary tract #epilepsy #hyper-tension #heart disease #lung disease #OB/GYN disease

Latest year of lung x-ray

#surgery/ accidents #allergies #hepatic disease #endocrine disease #psych. disorder #VD #See MHV 3

Latest year of cervical cytology

Notes:

Earlier blood transfusion #

Involuntary childlessness no. of years.

Heredity problems of OB significance, for example coagulation defects, hypertension, malformations, diabetes, multiple births:

MHV 3 #

Doctor's evaluation of pregnancy 4 weeks prior to estimated date of birth:

Pregnancy
normal # complicated

MHV 3 #

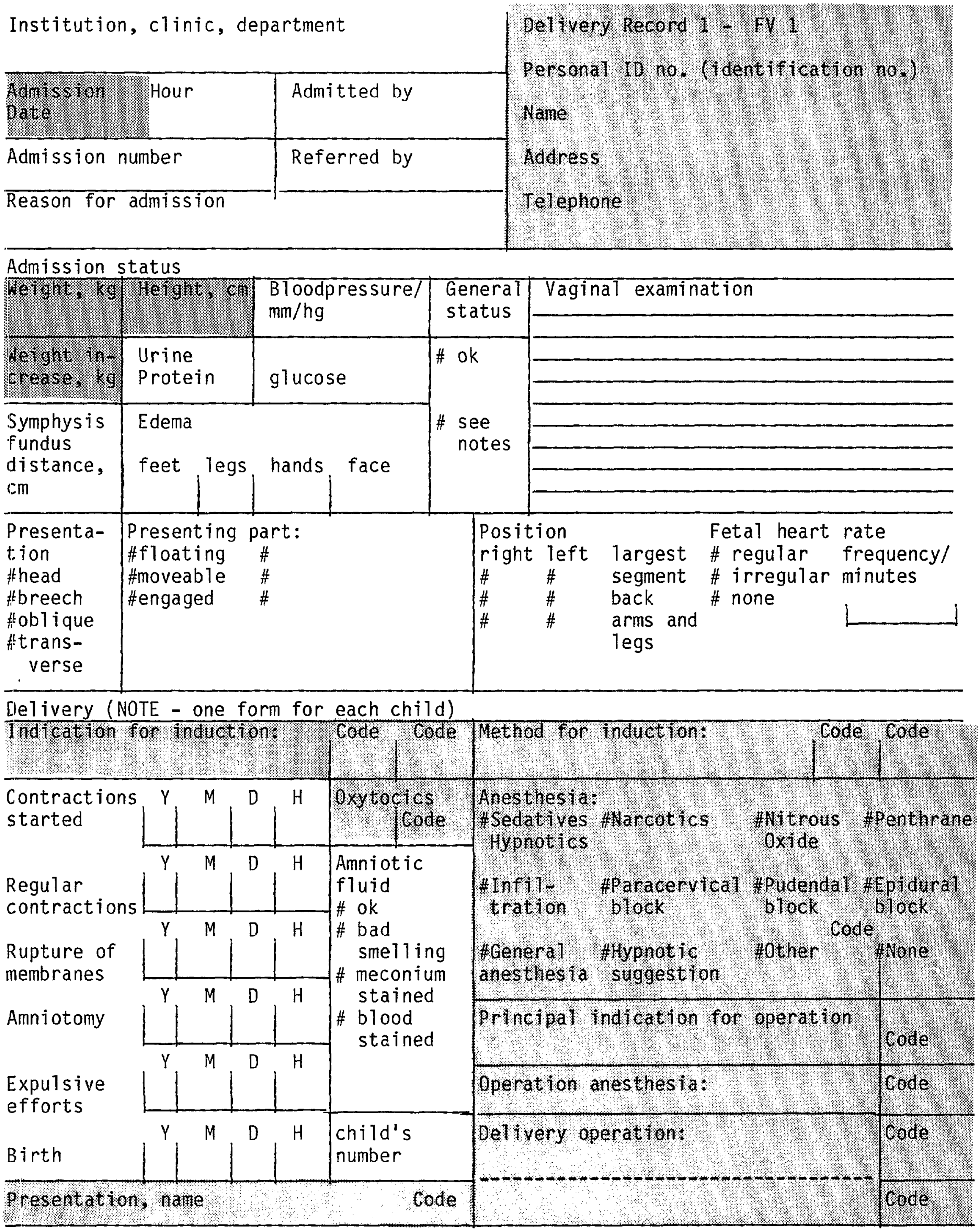
Signature

Diagnosis and procedures during pregnancy (outpatient and inpatient care prior to delivery)

Admission Date	Discharge Date	Hospital	Diagnosis/ Procedures (code)	Instructions for diagnosis/procedures (name)	Abortion # Legal # Spontaneous Weeks of gestation #

# denotes a square

shaded areas indicate items on the computerized national birth registry



Institution, clinic, department

Admission Date	Hour	Admitted by
Admission number		Referred by
Reason for admission		

Delivery Record 1 - FV 1

Personal ID no. (identification no.)

Name

Address

Telephone

Admission status

Weight, kg	Height, cm	Bloodpressure/ mm/hg	General status	Vaginal examination
Weight increase, kg	Urine Protein	glucose	# ok # see notes	
Symphysis fundus distance, cm	Edema feet legs hands face			

Presentation #head #breech #oblique #transverse	Presenting part: #floating # #moveable # #engaged #	Position right left largest segment # # back # # arms and legs	Fetal heart rate # regular # irregular # none frequency/ minutes

Delivery (NOTE - one form for each child)

Indication for induction: Code Code		Method for induction: Code Code
Contractions started Y M D H	Oxytocics Code	Anesthesia: #Sedatives Hypnotics #Narcotics #Nitrous Oxide #Penthrane #Infiltration #Paracervical block #Pudendal block #Epidural block #General anesthesia #Hypnotic suggestion #Other #None Code
Regular contractions Y M D H	Amniotic fluid # ok # bad smelling # meconium stained # blood stained	
Rupture of membranes Y M D H		Principal indication for operation Code
Amniotomy Y M D H		Operation anesthesia: Code
Expulsive efforts Y M D H		Delivery operation: Code
Birth Y M D H	child's number	Code
Presentation, name Code		

shaded areas indicate items on the computerized national birth registry

Figure 2. Delivery record

Umbilical cord around the neck	#hard	#loose	length, cm	no. of umbilical vessels

Cesarian section # elective	# non-elective

Placenta delivered	Y	M	D	H	weight

Placenta's appearance

Placenta #complete	#incomplete	Membrane #complete	#incomplete

Post partum

Child

Bleeding before and after delivery of placenta	ml	Total	
	ml		ml

Birth		No.	Of	Live Birth	Stillborn	
#single	#multiple				#before start of labor	#during

Rupture #clitoris/ labia	#vagina	#perineum	#sphincter	#rectum

Sex		No. of completed weeks gestation
#boy	#girl	#certain #uncertain

Episiotomy
#right #middle #left

Birth weight	Crown heel birth length	Head circumference

Sutures/number/material
inner/outer

Apgar scores	1 min	5 min	10 min	Identification check at delivery	Identification check at transfer

Assisting at birth (name)

Birth notification sent Y	M	D	signature

Diagnoses and procedures during inpatient care of the mother at delivery and in the post-partum period

Discharge date Y M D	Hospital number	Diagnose/procedure Code	Diagnose/procedure Name
Death, hour #			

Institution, clinic, ward

Birth Journal 2 FV 2
Mother's identity number

Mother's name

Address

Telephone number

Delivery
\# normal # other

Infant

Time of birth	Y	M	D	H	M	Infant's no.

Birth #single #multiple	no. of	live birth #	still birth death #before #during

Sex #boy #girl	Completed weeks of gestation # certain # uncertain

Birth weight	Crown/heel	Head circumference	Maturity assessment, weeks #Finnstrom #Other method

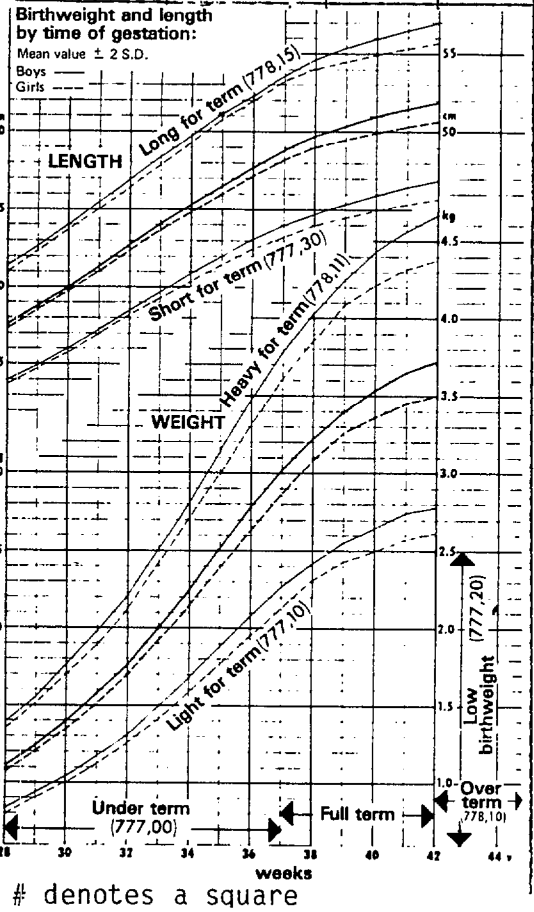
Apgar Score

min.	1	5	10
Heart rate	_	_	_
Breathing	_	_	_
Skin color	_	_	_
Muscle tone	_	_	_
Irritability	_	_	_
Total	_	_	_

Rescucitation

	min
Sensory Stimulation	--
Ventilation by mask	--
Heart massage	--
Correction of acidosis	--
Time of regular breathing	--

Weight at discharge	Length at discharge	Head circum	Identity check at discharge	Palate intact	Anus open #yes #no	Eyes (red reflex)	Vitamin K



Other measures

Status			Comments
Month/day	_ _	_ _	
Hour	_ _	_ _	
Examiner			
Vitality	_ _	_ _	
Spontaneous Movements			
Cyanosis	_ _	_ _	
Icterus			
Skin	_ _	_ _	
Turgor			
Heart	_ _	_ _	
Femoral pulse	_ _	_ _	
Breathing	_ _	_ _	
Head, form			
Fontanell	_ _	_ _	
Eyes	_ _	_ _	
Reflexes			
Tonus	_ _	_ _	
Abdomen	_ _	_ _	
Umbilicus	_ _	_ _	

\# denotes a square
shaded areas indicate items on the computerized national birth registry

Figure 3. Birth journal

DIAGNOSIS # Neonate period ok # Other diagnosis, give below on	Genitalia _ Back _ Other Skeleton _ Hips _ Mouth			
				Malformation reported #
				Discharged to the home #
				to other address #

Recommended health control (0-3)	Child care	Early home visit	Senior ped. date	Other spec. date	Diet at discharge breast-milk partially # completely# formula # (specify)	Metabol Screen yes# date no #	BCG yes # no #

Diagnoses and procedures concerning the infant

Admission Date	Discharge date	Hospital, clinic	Diagnosis procedure Codes	Diagnosis/procedure	No. of days at neonatal ward
					☐
					Days at special neonatal care center
Discharge date	If dead hour min.	postmortem #yes #no			☐

# denotes a square

shaded areas indicate items on the computerized national birth registry

SIMPLIFIED FLOW-CHART FOR RECORDS FOR ANTENATAL, OBSTETRICAL AND NEONATAL CARE IN SWEDEN

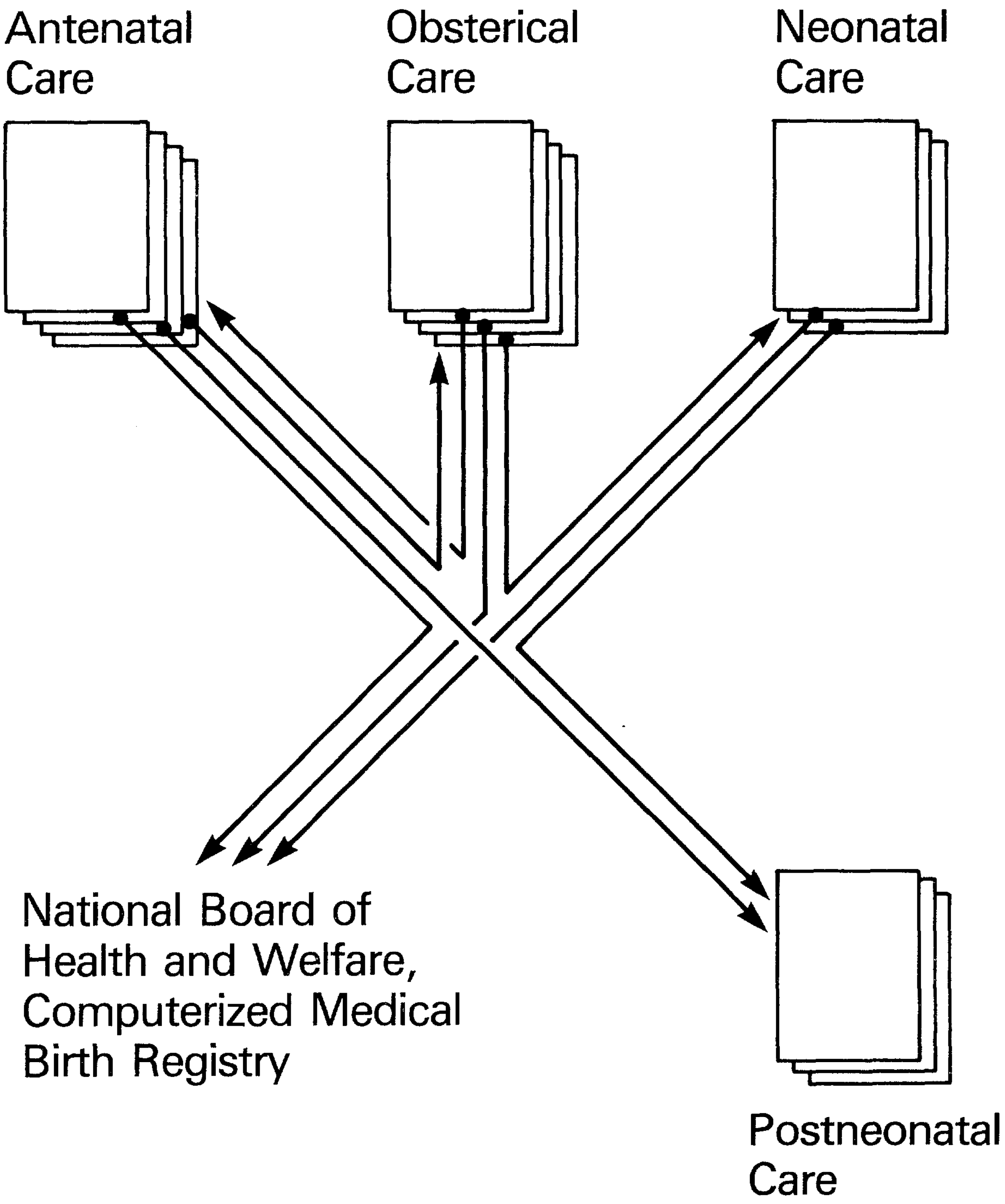


Figure 4. Antenatal care in Sweden

Child Health Prevention and Care in Sweden

by Petter Karlberg, M.D.

Children are defined as individuals 14 years of age.

Child health prevention and care forms a part of the public health prevention and care system. The responsibility for individual-oriented health services and for medical care, both outpatient and inpatient, rests with 23 county council areas and three municipalities which are not part of the county council areas (Goteborg, Malmo and the island of Gotland). These units have populations ranging from about 60,000 to 1,500,999 inhabitants (about 300,000 on the average).

This primary level of outpatient care is organized into primary care districts each with 5,000 to 50,000 inhabitants. Each district has one or more local health care centers where district physicians, both general practitioners and specialists, provide advisory services, health prevention, and health care. It is agreed that child health care should be shared between general practitioners and pediatricians.

A general practitioner serving as a general district physician in Sweden has had a 5-year period of postgraduate training. From 1/7/83 their training in obstetrics, gynecology, and in pediatrics will be increased to 6 months each.

The associations for these two categories have reached the agreement to recommend that there should be an average one pediatrician per 25,000 inhabitants, for example, one per 5,000 children. The pediatricians may serve as district pediatricians with responsibility for the total child health prevention and care, in a certain area and/or as consultants to the general practitioners dealing with child care.

The health prevention for preschool children (up to 7 years of age) is organized nationwide into child health centers, for up to 500 children each. Today each center usually has a nurse specialized in child health working full time together with a part time pediatrician or with a general practitioner with experience in child care with office time once a week. There are psychologists and nutritionists available for consultation. About 99 percent of all infants and preschoolers attend these child health centers. For planning, teaching, and evaluation of the activities at the child health centers, one special child health pediatrician is appointed in each county council area, which in turn is affiliated with the area hospital pediatric department.

The school health services, for which the municipalities are responsible, examine the health of school children every 3 years on a regular basis, but do not provide care.

The secondary level is based on children's hospitals formed by a pediatric department within the county hospitals. There are at present 44 such departments, with both inpatient and special outpatient care and usually also considerable emergency services. Thirty of the county hospitals have child psychiatry departments.

The tertiary level in Sweden is divided into 6 regions, each with one or more regional hospitals. The pediatrics departments here are equipped with a high level of resources with more extensive subspecialties within the departments than others in their regional areas and are affiliated with a medical school. Four regional hospitals also have departments of specialized pediatric surgery.

There are a total of 143 pediatric beds per 100,000 children. Due to the decreased birth rates, the number of beds has been reduced over the last decade.

With special reference to perinatal and infant care the following facts should be mentioned.

There has long been good collaboration between the pediatric and obstetrics departments of the hospitals. Pediatricians are responsible for the newborns in the obstetrics wards. In principle, a pediatrician should be present at risk deliveries and every newborn baby should be examined within 24 hours of birth and then at least twice before discharge (at 5-7 days of age) by a pediatrician. For special observation and treatment a neonatal care unit is a part of the pediatric department. Practically 100 percent of all deliveries are hospital deliveries. Home-midwifery does not exist.

For the care of the newborn infant, special hospital records have been developed for nationwide use as a continuation of the antenatal and delivery records, together constituting a basis for significant perinatal information for the care of the individual child and for compilation at the central, national level of a Medical Birth Registration. A report is sent to the child health center for followup.

A special health record has also been developed for the child health centers for continuous followup of the child to school age. For babies with special risks there is usually a special followup clinic organized within the department of pediatrics and/or special notification is given to the child health center. In maternities with no pediatrics department, pediatric consultants are available or the pregnancy risk cases are referred to hospitals with pediatric departments.

In cases of child mortality postmortem examinations are practically always performed. In cases of significant physical or mental deviation of the infant the followup care is taken over by the neuropediatric/habilitation section affiliated with at least one department of pediatrics within each county council area.

A special register of physical and mental handicaps is being developed and will constitute part of the "Central Medical Birth Register," which has been in operation since 1973.

Health Care System in Sweden

by Petter Karlberg, M.D.

Background

Sweden is located in Northern Europe and has an area of 450,000 km^2 (= 174,000 square miles), making it Europe's fourth largest country, only France, Russia and Spain are larger. However, the population is only 8.3 million with 3/4 in 1/3 of the country.

Scandinavia's relatively mild climate is unique for countries that lie so far north. (Stockholm has about the same latitude as the southern tip of Greenland!) Prevailing westerly winds and the Gulf Stream, the huge ocean current that brings warm water from the West Indies to the North Atlantic, make it possible to grow grain and potatoes even in the northern parts of Sweden and to cultivate the forests profitably.

Valuable national resources--iron ore, forest, and water power--created early opportunities for Swedish industry, and Sweden was once the world's exporter of iron. However, the great impact of the Industrial Revolution was not felt in Sweden until the latter half of the 19th century. The rapid population growth at that time was alleviated partly by a huge migration to North America of about a million Swedes, partly by the breaking of new land. Thus, serious overpopulation problems did not arise. The change from an agricultural to an industrial country took place without violence or upheaval. The long peace, since 1815, the demand for Swedish raw materials and products, and the absence of serious social problems lie behind the high standard of living that is characteristic of Sweden today.

The range in social groupings is relatively narrow.

Population characteristics

Some actual values are given below for the year of 1982. With a birth rate of 1.14 and an overall mortality rate of 10.89 per 1,000 inhabitants and an annual immigration/emigration excess rate of 0.47 the population is fairly stable.

Number of births: 92,748 Number of abortions: 32,602

Average life expectancy:

Sex	At age	0	15	50	65
Male		72.6	58.5	25.9	14.2
Female		78.7	64.4	30.9	17.9

Age distribution (in thousands): (1982)

Age category	Absolute	Percent of total
0-15	1,556	18.6
16-64	5,376	64.6
65 and up	1,395	16.8
Total	8,324	100.0

Infant mortality: 6.8 per 1,000 live births

Health care system

General structure

Health care is regarded in Sweden as being a task for the public sector. Like social welfare services, it is provided mainly by local governments. Responsibility for individual-oriented health services and for medical care, both outpatient and inpatient, rests with 23 county councils and three large municipalities, which are not part of county council areas. These units have populations ranging from about 60,000 to 1,500,000 (about 300,000 on the average). Responsibility for social welfare services and public health (environmental hygiene) rests primarily with the municipalities, which are currently about 280 in number and have populations ranging from about 5,000 to 700,000.

Private health care exists on a limited scale. Only about 5 percent of physicians are in private practice. Within the inpatient sector there are a limited number of private medical care institutions, chiefly private nursing homes for long-term care.

The county councils

The county councils were established in the 1860's, mainly to operate hospitals for somatic illnesses. Over the years their health care tasks have expanded. In the mid-1960's, they took over the responsibility for outpatient services from the central government including all general practitioners and psychiatric care. Health care program accounts for 75-80 percent of the total expenditures of most county councils. In addition to health care the public dental service and care of the mentally disabled, the county councils are responsible for certain educational programs (chiefly training of health care personnel) and have certain commitments in the fields of social welfare and culture. Public education, on the other hand, is financially supported by the State and municipal bodies.

County council members are directly elected by the population for 3 year terms. There are special committees--one being the medical board to oversee the health care programs. The work of the county councils has a strongly political character. The same political parties are represented in the county councils as in the Parliament.

Medical care programs are regulated by the Medical Care Act. According to this Act the county councils are obliged to provide the inhabitants of each medical care area with both outpatient and inpatient services in case of illness, injuries, physical defects and childbirth, to the extent that no one else provides these services.

The county councils and the three governments outside county council areas are affiliated with the Swedish Federation of County Councils (Landstingsforbundet), which provides services to its members. It also serves as a central negotiating body, both for arriving at financial agreements with the national government and for resolving pay issues involving employers.

Central goverment supervision

Although in many respects the county councils operate their health care systems independently, the Swedish State has supervisory powers over their activities. Central government administration below the Parliament and Cabinet levels is traditionally divided into two levels - for health care: (a) the Ministry of Health and Social Affairs, which draws up general guidelines and (b) relatively independent administrative agencies, primarily the National Board of Health and Welfare, which handles planning questions, supervises outpatient and inpatient health care and the professional performance of the health care personnel and carries out health information programs.

National health insurance

A national health insurance system financed by the State and by employers' fees, came into being in 1955. Nowadays it provides medical sickness, and parental benefits. It covers all Swedish citizens and alien residents. It is mainly an instrument for creating greater socioeconomic equality.

Medical benefits are payable for physicians' care (on both a public and private outpatient basis), dental treatment, hospital treatment, paramedical treatment such as physiotherapy, convalescent care, handicap aids, and travel expenses. Compensation may also be paid for drugs, disposable items, and advisory services on birth control or sterilization.

Sickness benefits provide all Swedish residents with guaranteed protection against loss of income due to illness, injury or handicap, amounting to 90 percent of their salaries, but with a certain ceiling. Voluntary insurance is available for instance for students and housewives.

Under the parental insurance system, parents are legally entitled in conjunction with childbirth to 12 months' leave of absence that can be shared between them, including 9 months with a parental benefit that is equal in size to the sickness benefit. A parent without paid employment receives a minimum fixed daily allowance. This same fixed allowance is paid in all cases for the final 3 months.

Health care program

Until quite recently, Swedish medical care has been considerably hospital oriented. The number of beds is relatively high, equivalent to about 15 per 1,000 inhabitants inclusive of beds in municipal homes for the elderly and in private nursing homes.

In contrast, the number of outpatient appointments with physicians is comparably low: about 2.5 medical treatment visits per inhabitant per year + 1.2 public health care visits.

Of the appointments with doctors, 53 percent take place at hospitals, 30 percent are visits to district physicians within the primary care systems, and 17 percent are to the doctors in private practice.

Outpatient care is organized into primary care districts each with 5,000 to 50,000 inhabitants. Each district has one or more local health care centers, where both general practitioners and specialists provide advisory services and preventive care. Ordinarily there are also special centers which provide child and maternity health care services. There are also school health services and special industrial health services.

The secondary level of care is covered by the county medical care with one of a few hospitals within each county council area. These hospitals are divided into two categories:

- District hospitals for 60,000-90,000 inhabitants, with at least four specialties (internal medicine, surgery, radiology and anesthesiology).
- Central county hospital for 200,000-300,000 inhabitants with 15-20 specialties, always with obstetrics and gynecology and pediatrics represented.

The tertiary level of care is covered by the regional medical care system. Sweden is currently divided into six medical care regions, each serving a population averaging more than one million inhabitants. Their activities are regulated by agreements among the county councils included in each of the respective regions. Within each region there is one (sometimes more) regional hospital with the higher degree of specialization required. All of these are affiliated with medical schools and also function as research and teaching hospitals.

Personnel and costs

The Swedish health care system is currently undergoing rapid expansion. The health care personnel has increased considerably during the past few decades. In 1980, almost 400,000 people were employed in this sector, equivalent to 8-9 percent of all employers in Sweden, for 1960 the figure was 3 percent. Health care costs have increased very rapidly in recent decades. Today they amount to an estimated Skr 45,000 million, equivalent to more than 10 percent of the gross national product, as compared to about 3 percent in 1960. The health care system is financed primarily by about 60 percent through county council income taxes, which are proportional. Between 1960 and 1981, the average county council tax grew from about 4.5 to 12.8 percent.

General State subsidies add roughly 15 percent, other state grants 11 percent, the national health insurance system 9 percent and patients' fees 4 percent.

Medical education and research

In Sweden there are six medical schools. At present about 1,030 medical of postgraduate training which qualifies them as specialists, including the specialty of general practitioner.

In 1980 there were over 20,000 physicians, equal to more than one doctor per 450 inhabitants. There is still a considerable shortage of doctors, but their number is expected to grow to more than 26,000 by 1985.

Swedish medical research may be considered well-developed and active. It is characterized by close links between clinical and preclinical institutions. The national government covers half the costs of medical research.

Future health care policies

The health care system is an important part of the existing Swedish welfare system. The fundamental principle is that all inhabitants should be equally entitled to health care, regardless of where they live in Sweden, what economic resources they have, etc.

Health care is given increasing attention in the general political debate due to the importance of health conditions as a qualitative value of life and to the sharply rising cost of health care.

Lines of development:

- Medical care will be further combined with preventive programs including focus on health hazards in the public environment.

- Expansion of ambulatory health care outside hospitals and increased collaboration with the social welfare system.

- Increased resources for the chronically ill, especially the elderly.

- Balance development of the health care system.

Provision of Care in the United Kingdom

by Susan K. Cole, M.D.

Organization

The historical peculiarities that preceded unification of the four countries of the Kingdom have left a bizarre pattern of legal and administrative idiosyncrasies, so that it is, in fact, very difficult to present a United Kingdom picture of the National Health Service. The concept and spirit is similar throughout but in each country a different government department is responsible. The Scottish, Welsh, and Northern Ireland Offices, each with a Secretary of State and junior ministers take on responsibility for the Health Service in their respective countries, while in England, a Secretary of State in the Department of Health and Social Security is responsible to Parliament for the English Health Service. The Health Service is an organization distinct from the civil service--we are a nationalized industry--and organized into geographical regions--14 regional Health Authorities in England, each with about 2.3 million population, one regional authority each in Wales and Northern Ireland, and 15 Health Boards in Scotland with its 5 million population, ranging in size from Glasgow with just under a million to the three Island groups Orkneys, Shetland, and Western Isles, each a Health Board with 20-30 thousand populations.

These authorities are governed by appointed boards of management. Within each Health Authority in England, Wales, and Northern Ireland there are smaller district authorities, with boards of management, answerable to the regional authority. This second layer of management is absent in Scotland.

Funding

The National Health Service is largely funded out of general taxation, in much the same way as (for example) defense. The annual budget for health and personal social services is about 8 percent of the gross domestic product. Within the main allocation, the money is divided up between the Health Authorities.

Historically, London and the South East always spent more on health services than authorities elsewhere in England; and similarly in Scotland, the four university centers, Edinburgh, Glasgow, Dundee, and Aberdeen had larger budgets than the rest of Scotland. About 10 years ago the regional disparities in funding were no longer politically acceptable and attempts were made to move gradually toward a more equal distribution of funds according to need. A somewhat complex formula was derived to calculate the regional allocation on the basis of population, hospital use, mortality, and the cross border flow of patients between authorities.

Care is generally provided without charge at the point of use. (In practice, and from time to time, charges have been introduced. Prescriptions, dental work, and ophthalmic services are currently subject to a charge to the patient, although specific exemptions are made for children, expectant mothers, pensioners and those in receipt of social security benefits.)

Payment of medical and nursing staff

All hospital staff are salaried employees of the Health Authority (in university centers, university medical staff have honorary contracts with the Health Authority). Specialists may elect to work part-time for the Health Service and spend the remainder of their time in private practice. Because private insurance currently available in the United Kingdom does not cover pregnancy, private obstetrical practice is not common. General practitioners are not salaried but are independent contractors, paid a "capitation fee" by the Health Authority for every patient registered with them, and also additional fees for specific services such as antenatal care. In order to be able to provide antenatal or complete pregnancy care and receive the appropriate fees, the general practitioner must have received some post-graduate training in obstetrics.

Care for women and children

Because of the organizational differences already mentioned in the four countries, the exact details may not hold true everywhere, but, broadly speaking, the pattern of care in pregnancy and child birth in Scotland will approximate to the care available in the rest of the United Kingdom, and rather than being tediously exact about our differences, I shall largely concentrate on Scotland, with occasional references to England.

Primary care

Virtually all pregnant women will be registered with a general practitioner who will be the first to be consulted. After the pregnancy is confirmed a decision is made about the place of delivery which, in the 1980s, will be a hospital for all but about 0.5 percent. Around 94 percent of births will occur in specialist units, and about 6 percent of births will occur in a small nonspecialist hospital under the supervision of a general practitioner. These small hospitals are mainly located in remote rural areas and will, as a matter of policy, refer on to specialist centers women who develop a complication during pregnancy.

The specialist units have resident junior obstetrical and anaesthetic staff, and many now also have resident pediatric staff.

For the 94 percent of women who will deliver in a specialist unit, the general practitioner will refer her (usually fairly early in pregnancy) to the specialist antenatal clinic for initial examination. At this "Booking Clinic" (when a bed is "booked" for the patient's confinement) she is examined in some detail including routine blood tests, which in Scotland now include alphafetoprotein screening, and in many centers also the examination will include ultrasound scanning, principally for confirmation of gestational age and also for gross fetal abnormality.

Women who are known to be at risk, will usually continue to attend the specialist anatenatal clinics as often as necessary but the majority will be returned to care of the general practitioner for "shared" antenatal care. This means that the general practitioner will provide regular care up to 32 weeks with the hospital antenatal clinic taking over, thereafter. The exact pattern of sharing will be determined by local agreement. Communication between hospital specialist and general practitioner is maintained by providing the woman with a "cooperation card" on which the main findings at each antenatal visit are transcribed. Some centers have also run an experiment by giving the woman her hospital case notes which she brings with her to each clinic.

There are local developments in this traditional pattern of antenatal care. Consultants do go out to give specialist advice in general practitioner-run clinics, especially in rural areas, to save patients long and inconvenient journeys, and also, increasingly, antenatal clinics are being run by specialist staff and local general practitioners in the big council housing estates at the periphery of the conurbation. These areas, often associated with high unemployment, have relatively high perinatal and infant mortality, and journeys to hospital antenatal clinics may be both expensive and difficult.

There are within most health authorities regional genetic counselling services although in Scotland these services are centered on the four universities and are thus "supra regional" services.

There is no systematic prepregnancy counselling service available, although it is likely that arrangements are made with individual patients to provide such a service after a specific outcome to a previous pregnancy.

The staff involved in providing antenatal care will be both medical and midwifery. Community based midwives employed directly by the Health Authority will usually work with the general practitioner in providing antenatal care, examining women and referring to the general pratitioner any with an abnormality. The same pattern will also prevail in the specialist clinics, with hospital based midwives and junior staff sharing the examinations.

Care in labour

Normal labor and spontaneous delivery is under the care of the midwife who is responsible for calling for medical assistance if an abnormality arises. For deliveries in the home or general practitioner maternity unit, the midwife can also decide independently to call out the "Flying Squad" in the event of an emergency which will require specialist treatment. The Flying Squad is a team from the specialist hospital consisting of midwife, anaesthetist, consultant, or senior resident obstetrician together with packed sterile equipment to provide emergency care, including delivery, blood transfusion, or sedation, as required. If the Squad is called out primarily for a neonate, the medical member will be a pediatrician with an incubator and other neonatal resuscitation equipment. The team travels from hospital to the home or the general practitioner unit by ambulance. Emergency treatment is provided and the patient made as safe as possible for the journey back to the specialist hospital.

In the labor ward of the specialist hospital most of the emergency and routine medical care is provided by the resident staff with the specialist being available "on call."

Neonatal care

All the specialist maternity units in Scotland have a special care baby unit (SCBU), but only in the four university centers is there a full time specialist neonatal pediatrician. In most units generalist pediatricians and junior staff will provide cover for SCBUs. Intensive neonatal care is hard to define in the Scottish context, and the provision of cots cannot readily be distinguished objectively from special care cots. There are problems in staffing the highly active SCBUs, and in Scotland, the Home and Health Department of the Scottish Office has issued a report on staffing and training, which tries to take account of the problems which manifest themselves in nursing staff turnover, and the difficulties faced by consultant pediatricians as they grow older and feel less able to continue with the prolonged hours and concentrated work load in intensive care.

Information

Our civil registration of births, stillbirths, marriages, and deaths are quite separate from the National Health Service hospital generated data collection system which is voluntary and not statutory, and is therefore at risk in a time of staff cuts when it is regarded as a virtue to reduce the numbers of clerical and support staff.

In Scotland we collect summary information on all hospital deliveries. With only 300 or so home deliveries recorded in the Registrar General's Annual Statistics, this, to all intents and purposes, represents all Scottish births. In comparing the numbers of births from our hospital statistics and from civil registration of births, we cover about 97 percent of registered births, losing about 3 percent. The maternity information system contains quite a lot of details about the infant, and I have supplementary neonatal information from a separate system which covers about 75 percent of live born neonates.

The tables that I am going to reference are derived from Scottish hospital utilization and manpower statistics and, where I have been able to obtain them, from similar English data.

About 93-94 percent of births in Scotland occur in specialist maternity units with resident junior staff that I previously described (table 1). The general practitioner units are mainly in scattered rural areas in the Highlands and Border country (table 2). Most of the specialist units are quite sizable, and in Scotland we only have one in an area that has fewer than 1,000 deliveries a year. Table 3 shows that most of the general practitioner units are small with two thirds having fewer than 100 deliveries a year. These data are from Scotland only and compare the bed utilization in the Specialist and General

Practitioner maternity units, and you can get an impression of the real problems in providing local services in remote areas (table 4).

Table 5 shows some medical manpower figures by grade. We have 120 consultant obstetricians and gynecologists for our population of 5 million. Some of them do part time private practice (mainly in gynecology as private insurance does not cover obstetric care), thus giving the equivalent of 112 consultants working whole time for the National Health Service. The remaining staff are in training grades with the senior house officers paradoxically being the most junior. I have shown these in various ways--per 100,000 population, per 1,000 births, and for junior staff, the number per consultant.

Table 6 gives you the same sort of breakdown of nursing manpower. Qualified midwives are the most highly trained, the midwives in training are registered nurses already. We have relatively few enrolled nurses, they are similar to the practical nurse in the United States. The hospital based midwife will remain within the hospital, while her colleague in the community will be responsible for domiciliary deliveries, and may be attached to a general practice. The community midwife will also help run the general practice antenatal care and it is her legal duty to visit and provide domiciliary care to the postnatal woman. Table 7 shows that only about 10 percent of the women get postnatal care in specialist hospitals, most will attend their general practitioner, and all will receive domiciliary care from the community midwife.

The next few tables show just a few more clinical facts about Scottish obstetrics. Table 8 shows that we have an induction rate of 27.4 percent, and very similar forceps and section rate around 12 percent. 13.6 percent of the women in their first pregnancy are delivered by section, as are 10.7 percent of parous women. 61.4 percent of the women with a previous cesarian section have a repeat section and 6 percent of breeches are delivered by section (table 9).

And finally, what happens to the babies, one or two facts. Just under 10 percent are admitted to a special care baby unit for less than 48 hours, while a further 10 percent require admission for longer than 48 hours (table 10). Three percent of the infants require resuscitation by intubation and intermittent positive pressure ventilation, and 7.6 percent have jaundice with a serum bilirubin of 12 mg percent or higher.

Table 1. Place of birth: Scotland and England, 1982.

Percentage distribution of annual births			
	Specialist	General Practitioner Maternity	Home
England	93	4	1
Scotland	94	6	<1

Table 2. All maternity units: Scotland and England, 1982.

Number of births annually	Number of units Scotland	England
4,000 or more	2	22
3,000-3,999	5	33
2,000-2,999	6	77
1,000-1,999	12	82
Less than 1,000	51[1]	161

[1] 46 are general practitioner maternity hospitals.

Table 3. General practitioner maternity units: Scotland, 1982.

Number of births annually	Number of general practitioner units Scotland-only
300 or more	2
200-299	3
100-199	11
Less than 100	30

Table 4. Maternity beds: Scotland, 1982.

Maternity needs	Specialist	General Practitioner
Average available beds/day	2210	434
Percent occupancy	69.4	30.8
Throughput	42.6	25.9
Deliveries/bed/year	27.9	8.7

Table 5. Manpower: Scotland, 1982.

Hospital	Whole time equivalent	Per 100,000 population	Per 1,000 births	Per specialist
(a) Medical				
Specialist	112	2.2	1.7	-
Registrar/senior reg.	123	2.5	1.8	1.1
Senior house officer	152	3.0	2.3	1.4

Table 6. Manpower: Scotland, 1982.

Hospital	Whole time equivalent	Per 100,000 population	Per 1,000 births
(b) Nursing			
Qualified Midwife:			
Teaching/supervisory	235	4.7	3.5
Sister/staff nurse	2097	41.9	31.5
Enrolled nurse	224	4.5	3.4
Training midwife	1000	20.0	15.0
Unqualified auxiliary	1240	24.8	18.6
Community			
Midwives	154.9	3.1	2.3

Table 7. Clinic workload: Scotland, 1982.

Clinics	New patients visits/birth	All attendances visits/birth
Specialist		
Antenatal	1.1	6.2
Postnatal	0.1	0.1
General practitioner maternity	0.7	3.7
Home visits		
Community midwife		
Antenatal		0.7
Postnatal		5.2

Table 8. Labor and delivery: Scotland, 1982.

Labor and delivery	Percentage
Induction	27.4
Forceps delivery	12.7
Cesarian section	12.1

Table 9. Cesarian section (CS): Scotland, 1982.

Type of Delivery	Percentage delivered by CS
Primipara	13.6
Multipara	10.7
Women with:	
Previous CS	61.4
Breech presentation	69.0

Table 10. Neonates: Scotland, 1982.

Birth outcome	Percentage
Admitted to Special Care Baby Unit (SCBU):	
For less than 48 hours	9.8
For more than 48 hours	10.1
Resuscitation by intubation	3.0
With jaundice greater than 12.0 mg percent	7.6

Perinatal Health Care Systems, Norway

by Per Bergsjo, M.D. and Leiv S. Bakketeig, M.D.

Perinatal Health Care in this presentation includes all organized care to prevent unwanted pregnancy and childbirth as well as care providing support and surveillance during pregnancy, delivery, and the neonatal period.

Prepregnancy counseling

In a general sense information and education to prevent unwanted pregnancy is widespread in Norway. Information about contraceptive measures is provided in secondary schools, by teachers and not by health personnel. Obtaining a satisfactory contraceptive alternative may be an obstacle, particularly to young girls, partly depending on geographical availability of obstetrical service. Contraceptive pills require a doctor's prescription. Fitting an intrauterine contraceptive device (IUCD) is also a doctor's responsibility. A few larger towns have special medical offices for counseling on sexual matters, generally run on a private basis by groups of young physicians.

The distribution of use of the various modes of contraception in Norway for 1977 is shown in table 1, which draws on a representative nationwide sample of fertile women. The IUCD was the most frequently used single modality (34 percent), followed by condom (22 percent), and the contraceptive pill (20 percent). The use of the IUCD increased with advancing age, while that of the pill declined. Sterilization, not included in the table, is increasingly common, with over 7,000 reported cases per year. The less safe methods of coitus interruptus and safe periods were still used by 16 percent. Patterns of contraceptive use change with time, and the most recent figures indicate a slight increase in the sales of contraceptive pills.

Professional advice on sexual matters is also given regularly in medical columns in weekly magazines, and periodically through official campaigns, for example against venereal diseases. News media coverage is also reasonably good.

There are no prepregnancy clinics or offices in Norway giving specific advice concerning the active planning of pregnancy. Counseling by medical geneticists is done on a small scale, but mainly during early pregnancy.

Prepregnancy legal regulations

The law on marriage (May 31, 1918) states that a person suffering from venereal disease, which is still contagious, must not marry unless the other party has been fully informed and both have had medical counseling. Marriage between relatives of direct ascending or descending lines and between brother and sister are forbidden.

Early pregnancy problems

The abortion law of June 13, 1975, with later revisions, states that a woman is entitled to abortion on demand, if she upholds her request following obligatory medical information, provided that the operation can be performed before the end of the 12th week. After the 12th week permission can be given by a two-doctor commission if certain criteria are met. These conditions cover both social, medical, and genetic factors as well as rape.

In recent years the annual number of abortions has been 15,000. The post 12th week fraction is negligible. The number of abortions per 100 births is about 30, and there are 15 abortions per 1,000 women between 15 and 49 years of age. Facilities for abortion are countrywide, and the legal right for health personnel not to take active part in the procedure for reasons of conscience has never been as serious obstacle.

The facilities for specialist genetic counseling and culturing of amniotic fluid cells are limited. There are only two laboratories doing cultures for chromosome analyses, with capacity for 500 cases per year, while the stipulated demand is about 4,000. The Oslo area is favored. The official policy is to establish regional genetic centers in other parts of the country, but political dissent slows down the progress.

Perinatal care-general organization

In Norway primary health care and institutionalized medicine are sharply divided. Primary care practitioners have no access to hospital beds, and hospital staff have no private patients. Hospitals have polyclinics but these are only for referrals and followup examinations after hospital care. The patient's "own doctor" is always the general practitioner, whose only contact with the hospital concerning his patients is by telephone or by mail.

This system also affects perinatal care. As 99.5 percent of deliveries take place in hospitals, antenatal care and intranatal care are provided by two different sets of health personnel groups, and in case of neonatal intensive care, a third (pediatric) set takes over the care of the child.

All medical care in pregnancy, childbirth and postpartum is free. This is contrary to curative medicine in primary care where the patient has to pay a part of the consultation fee out of his own pocket. It makes no difference whether antenatal care is given by a general practitioner in his office, by a community health center, or by a practicing specialist. The pregnant woman may have to pay for antenatal preparatory classes, which are often organized privately by midwives or physiotherapists. Hospital care is all free.

Antenatal care

Rules and recommendations

Except for the obligatory serological test for syphilis, which is required by law, there are no official rules concerning the organization or content of antenatal care. An official committee report on perinatal care in Norway, published by the government in June 1984, had a number of specific recommendations aiming to establish a set of basic rules for organization, content, and referrals.

It is too early to say what impact these recommendations will have on existing practice, but they will be mentioned in due context in the following account.

Organization-personnel

The general practitioner has the primary responsibility to do antenatal care in Norway, whether the activity is located in his own reception or in a community health center. Specialists in gynecology and obstetrics with full-time practice outside of hospitals are few, most of them working in the two largest towns Oslo and Bergen.

According to the Central Bureau of Statistics there were 8,311 certified doctors in Norway in 1981. Of these, 1,274 were in private general practice and an additional 754 had similar practice functions as town or municipality health officers. There were 39 practicing specialists in ob/gyn outside of hospitals, out of 217 ob/gyn specialists, the large majority of whom were located in hospitals.

The other key personnel group in perinatal medicine, the midwives, are mainly employed in hospital obstetrical departments. A survey in 1981 showed that out of 694 midwives working in this profession, 656 were employed in institutions. There is some unrest among midwives who feel that more use should be made of their special qualifications in antenatal care. Establishing jobs for more midwives in primary health care is a question of political priorities. Unofficial estimates claim that 1,000 midwives are presently working in other areas of health care. The official 1984 perinatal report recommends that more use should be made of midwives in regular antenatal care, in close cooperation with general practitioners.

Organization-practice

There are no official rules for the practice of antenatal care. Guidelines are given through lectures in the four Norwegian medical faculties (Bergen, Oslo, Tromso, Trondheim) and in the only up to date Norwegian text-book of obstetrics (Bjoro & Molne: Propedeutisk Obstetrikk, Oslo University Press). As to the number of antenatal visits in the uncomplicated case the advice seems to be a total of about 14 at term, starting some time before week 12, and with shortening intervals throughout pregnancy and with little room for individually designed care.

As very little was known about actual practice, a survey was carried out in September 1983 covering a sample of 11 obstetrical departments with reasonable geographical distribution, asking every parturient about her antenatal control experience. It turned out that the number of visits per pregnancy was 10-14 on average, equally in the whole country and with no difference according to parity.

There is an almost 100 percent attendance for antenatal care, and the experience is that the large majority start before week 12. The occasional exception may be the grand multipara and the socially deprived, often drug-abusing mother. There is no system for actively finding and persuading these women to attend, but some attempts are being made in Oslo and Bergen to give drug-abusing gravidae special care by specially trained groups of doctors, nurses, and social workers.

There are no economic or other incentives to make women attend, such as in Finland, where an economic benefit is withdrawn for late or nonattenders.

Content of antenatal care

Clinical rountines are reasonably standardized with the same general content at every followup visit:

Weight
Blood pressure
Edema
Urine, esp. glucose and protein
Hemoglobin
Symphysis to fundus distance
Abdominal palpation of uterus and fetus
Fetal heart anscultation

Additional examinations as required by symptoms or signs.

The initial visit is, of course, more extensive, including gynecological examination with Pap. smear, blood tests for syphilis and blood groups (ABO and rhesus) and a thorough history.

The use of ultrasound is widespread. According to the survey, mentioned above, between 60 and 90 percent of the mothers in the different obstetrical departments had experienced ultrasound examinations during pregnancy, on average 2-3 times each. There is a controversy among obstetricans in Norway whether to advocate routine ultrasound in every pregnancy or to use it restrictively, on medical indications. The June 1984 perinatal report concluded that, on balance, prophylactic ultrasound screening has not been proven superior to examinations on medical indications. The report recommended that ultrasound in pregnancy be restricted to the latter, with a list of indications as guidelines.

Recommendations according to the 1984 survey

The official perinatal report proposed a number of structural changes, and specified rules for record keeping and referral practice.

Firstly, the number of antenatal visits should be lower than as of today, in uncomplicated, low risk cases. Some of the control visits can be conducted by a midwife cooperating with the general practitioner, according to the following scheme:

Week	Para 0	Para 1+
9 weeks	Doctor	Doctor
16 weeks	Midwife	
20 weeks	Midwife	Midwife
24 weeks	Doctor	
28 weeks	Midwife	Midwife
32 weeks	Midwife	Doctor
34 weeks	Doctor	
36 weeks	Midwife	Midwife
38 weeks	Doctor	Midwife
39 weeks	Midwife	
40 weeks	Doctor	Doctor
41 weeks	Doctor	Midwife

A new pregnancy record form is proposed, which is a modification of existing forms. It is designed to be used both as a doctor's record, for referrals and as basis for the Medical Birth Registry data collection system.

Intra partum care

Organization

The law on hospitals (of 1969) requires every Norwegian county to provide hospitals sufficient to meet the needs of its population, including obstetrical services. Due to geographical conditions with scattered population and communication difficulties, most hospitals are of moderate size. The 19 Norwegian counties (average population 200,000) have been grouped into five regions, each with a regional hospital of university hospital size and standard. Further classification of departments for obstetrical service is:

- Central hospital with separate ob/gyn department.
- Local hospital with ob. section of surgical department.
- Combined small hospital with obstetrical section.
- Maternity home.

The local hospital may or may not have a staff gynecologist, if not, obstetrics is the responsibility of the surgeons. The small maternity homes are run by midwives and supervised by the local general practitioner.

During the 1970's there was a marked reduction in the number of obstetrical institutions in Norway, from 158 in 1972 to 97 in 1980, mainly because many small maternity homes closed down. During the same period the annual number of births fell from 68,000 to 51,000. The change between 1974 and 1980 is shown in table 2. The 1980 distribution of institutions according to the annual number of births is shown in table 3. It is seen that 21.6 percent of births take place in institutions with less than 5,000 births annually, and there are only two departments with more than 3,000 births per year (Bergen and Stavanger).

Home deliveries are in the order of 100 per year, and these are mostly unplanned.

Choice of birth institution is by medical advice in areas where a real choice exists (small maternity home or local hospital near home versus well equipped obstetrical department further away). The 1984 perinatal report recommended the following requirements for deliveries in the smaller institutions:

- Para 1 +.
- Previous normal obstetrical history.
- Expected date of delivery is certain.
- No need for induction of labor.

It has been estimated that the minimum time for women to get from home to birth institution is more than 2 hours for 2 percent and from 1-2 hours for 10 percent. Approximately 0.2 percent of all births take place during transportation, the districts with scattered population being overrepresented.

It is recommended that midwife and/or doctor attend transportation of parturients to hospital whenever possible when travel time exceeds 1 hour, and that they, and ambulances, should have the necessary equipment for emergency deliveries.

Practice

Normal deliveries are conducted by midwives. Doctors are summoned in cases of suspected complications, and for any sort of operative delivery, twin births and breech presentation. In specialist obstetrical departments there are regular doctors' ward rounds. The father, or another person of the mother's choice is permitted to be present during labor and delivery, as a legal right.

In 1980 cardiotocograph for monitoring was available in approximately 50 percent of all maternity institutions, which had 87 percent of the deliveries. This means that CTG was available in the larger specialized institutions but largely lacking in the smaller ones. We do not know to what extent CTG is actually used in birth monitoring. In general, it is thought to be used selectively in induced labors and in cases of suspected intrauterine growth retardation, and where asphyxia is suspected for clinical reasons.

Vacuum extraction is the most common method for operative vaginal delivery in head presentation, although some centers prefer forceps almost exclusively. The annual frequency of cesarean section rose during the 1970's, from about 2 percent to 9 percent which appears to be a new level. Induction of labor for suspected post term pregnancy and other indications is relatively frequent, according to the Medical birth registry 17.6 percent of all births followed induction in 1979.

Pain relief is increasingly by epidural analgesia, which in 1980 was available in institutions covering 91 percent of all births. However, actual use depends on the availability of anesthesiologists, which is a limiting factor. Otherwise pethidine (meperidine) and N_2O/O_2 inhalation are the standard methods.

Anesthesiologists are available around the clock in institutions covering 76 percent of the births (1980), part time available at 11 percent of the births, and only occasionally or not at all in small institutions with approximately 12 percent of the births (table 4).

Post partum care

Organization

Delivery takes place in special delivery beds. Mothers and children are observed in the delivery departments for 2 hours or more after birth. Then they are tranferred to the postnatal wards. In 1980 there were 1,591 maternity (postnatal) beds in Norway, or 31 beds per 1,000 births. The postnatal wards are staffed by midwives, nurses, and infant nurses. Obstetricians are responsible for the medical care of the mothers, whereas pediatricians look after the newborns if pediatric service is available (see below).

Practice

The average length of stay for primiparae in Norwegian birth institutions in 1980 was 6 or 7 days as a rule (table 5), which is according to medical recommendations. Women who have their second or later births have 1-day shorter stay on average. Shortage of beds leads to shorter stay in some hospitals, while regions with ample bed capacity tend towards longer average stays.

Apart from recovery from childbirth, the postpartum period in institutions is intended for training in infant care and breast-feeding. During the past 10 years rooming-in has become more and more common, at least during daytime. In 1980, rooming-in practice was as shown in table 6. Interestingly, a distribution according to the type of institutions shows that the most restrictive practice tended to be in the smaller institutions.

As to breast feeding, the baby is put to the breast within 2 hours of birth in 99 percent of all births regardless of time of day. Breast feeding routines varied, from "on demand" in institutions covering 39 percent of births, through a combination of fixed and demand systems in 28 percent to fixed schedules in 33 percent. In cases of living children refusal to breast-feed is extremely uncommon. If the child is transferred to a neonatal intensive care unit, the mother empties the breasts with a pump.

Pediatric service

The availability of pediatricians in maternity institutions is shown in table 7. Twenty-one institutions covering 63 percent of the births in 1980 had a pediatric department, while 53 (mainly small) institutions with 13 percent of the births had no pediatric service. In institutions with regular service all newborns are seen by the pediatrician the morning after birth.

Transfer of mothers and newborns

Transfer of mothers from one institution to another took place in 7.6 per 1,000 deliveries in Norway 1979, that is, 392 instances. In 30 percent of these, the transfer time was more than 2 hours. Ordinary transfer time between institutions varies greatly due to geographical differences and hospital planning policies, as seen in table 8. Actual transfers with long transfer time were overrepresented in the northern region, region 5. While ambulance transport is most common in the eastern and southern parts of the country, sea transport is quite common all along the western coast, while air transport is often used in the north.

Of newborns, 7.9 percent were transferred to a pediatric neonatal intensive care unit in 1979, but 6.7 percent were transferred within the same hospital, the rest, 1.2 percent or 602, to another hospital (table 9). The frequency of transfers varied greatly between the regions, from 7.8 percent to 3.9 percent, to a great extent due to varying intrahospital transfer availability.

Surveillance

The Medical birth registry of Norway issues monthly reports to all county medical officers, with information on a number of key items concerning births in the respective counties. These reports include a list of congenital malformations, with confidence, or "alarm" limits to alert the health authorities in cases of unexpected changes.

Ad hoc quality control meetings are held internally in hospitals as part of the ongoing education programs. A five-county formal audit of perinatal deaths was conducted in 1979 to assess the state of the art, as will be described elsewhere. Based on this experience, the 1984 Perinatal Report recommended that perinatal committees be established in all counties, as a permanent audit body and to establish guidelines for perinatal services.

Table 1. Contraceptive practice among 2,800 non-sterilized, non-pregnant, Norwegian women in 1977, by age groups.

Age	Number of responders	Used contraception	Coitus interruptus	Safe period	Spermicide	Condom	Pessary	Oral Contraception	IUCD	No Information
		Percent distribution								
Total	2,800	84	10	6	1	22	1	20	34	3
18-19 years	140	87	10	4	1	30	1	30	21	3
20-24 years	577	84	8	5	1	19	0	32	28	1
25-29 years	700	83	5	4	1	19	1	21	38	3
30-34 years	653	88	10	6	1	21	1	15	44	2
35-39 years	428	85	14	9	3	24	3	12	34	3
40-44 years	302	78	18	10	2	28	3	9	21	7
Number of responders	2,800	2,362	270	168	37	607	39	550	957	78

Table 2. Maternity institutions in Norway 1974 and 1980, by type of institution.

Type of institution	1974		1980	
	Number of institutions	Percent of births	Number of institutions	Percent of births
Maternity hospital	2	4.0	1	2.1
Department of gynecology/obstetrics	31	67.4	33	78.1
Obstetric ward in department of surgery	29	17.7	25	14.4
Obstetric ward in local hospitals	10	5.1	8	3.0
Maternity homes	14	1.3	3	0.3
Combined maternity home/cottage hospital	45	3.9	27	2.1
Total	131	[1]99.4	97	[2]100.0

[1] 0.6 percent in 1973/74 were born outside institution.
[2] Percentages are based on births in institutions in operation at 1 March 1980.

Table 3. Maternity institutions in Norway 1972-1980, by annual number of births.

Annual number of births	1972		1974		1980	
	Number of institutions	Percent of births	Number of institutions	Percent of births	Number of institutions	Percent of births
Less than 50	66	1.8	37	1.0	21	0.7
50-499	51	17.4	58	21.6	46	20.9
500-1,499	30	40.3	23	32.7	20	35.8
1,500-2,999	9	29.0	11	33.2	8	29.8
3,000 or more	2	10.3	2	10.8	2	12.8
Total	158	[1]98.7	131	[1]99.4	97	[2]100.0

[1] 1.3 percent of births in 1971 and 0.6 percent of births in 1973/74 took place outside institution.

[2] Percentages are based on births at institutions in operation at 1 March 1980.

Table 4. Anesthetic service in Norway, 1980.

Anesthetic service	Number of institutions	Percent of births
24-hour service	30	76.1
Part-time	16	11.4
Occasional	3	1.4
No service	48	11.0

Table 5. Average length of stay for primiparae at maternity institutions in Norway, 1980.

Number of days	Number of institutions	Percent of births
5 days	8	22.5
6 days	32	44.0
7 days	44	30.2
8 days or more	13	3.2

Table 6. "Rooming-in" at maternity institutions in Norway, 1980.

Type of practice	Number of institutions	Percent of births
Mother's choice all day	14	18.6
Mother's choice during daytime	74	80.1
During breastfeeding	8	1.1

Table 7. Differences in pediatric service at maternity institutions in Norway, 1980.

Type of service	Number of institutions	Percent of births
Department of pediatrics	21	62.9
Regular pediatric consultant	11	13.2
Occasional pediatric consultant	12	11.3
No pediatric service	53	12.5

Table 8. Length of time needed for transfer of mothers in labor, 1979, regional differences.

Region	Time required for transfer (minutes)				
	Less than 30 minutes percent of births per region	30-59 minutes percent of births per region	60-119 minutes percent of births per region	120-179 minutes percent of births per region	180 or more minutes percent of births per region
Region 1 and 2	4.2	6.9	15.5	7.7	0.4
Region 3	9.2	3.4	4.0	8.8	4.8
Region 4	13.4	0.2	13.7	16.7	0.8
Region 5	5.6	20.1	22.8	10.1	0.8
Total	6.9	6.6	13.5	9.6	1.5

Table 9. Transfer of newborns in Norway 1979, by region.

Region	Number of births	Total number of transfers		Of these: within hospital	
		Number	Percent of births per region	Number	Percent of births per region
Region 1 and 2	25,921	2,272	8.8	2,025	7.5
Region 3	11,515	1,065	9.2	891	7.7
Region 4	8,214	418	5.1	323	3.9
Region 5	6,052	323	5.3	237	3.9
Total	51,702	4,078	7.9	3,476	6.7

Characteristics of the Health Care System in the Federal Republic of Germany and the Organization of Infant Medical Care.

by Kurt Holzmann, M.D. and Eberhard Schmidt, M.D.

The health care system of the Federal Republic of Germany is based on four major principles:

1. The Practicing Physicians, either general practitioners or specialists, are handling about 90 percent of the population through their care.

   The number of physicians is constantly increasing (1970: 1 MD : 612 inhabitants, 1981: 1 MD : 432 inhabitants). About 50 percent of these 143,000 MDs are working in their practice, approximately 45 percent in hospitals, the remaining number working in administration or research. About 45 percent of all MDs are working as specialists, 11 percent of the total number of specialists being obstetricians and gynaecologists (7,615), 8 percent being pediatricians (5,164), 66 percent of all obstetricians and gynaecologists and 60 percent of pediatricians work in practice, the remainder work fulltime in hospitals. There are about 27,000 physicians who could be classified as general practitioners in practice.

   Practicing MDs work in private offices. Yet, they are financed through the insurance companies which pay them according to a detailed catalogue of single items of clinical or laboratory diagnostic or therapeutic procedures. Insurance companies may be state-supported or private, the latter making up for 10 percent of all patients. So the system, in which the MDs in practice are working, may be called a semi-private system.

2. The second sector is comprised by the hospitals.

   They are run by different sponsors. Fifty-two percent of beds are in state (f.i. university hospitals) or community-run hospitals, 36 percent in free general benefit, and 13 percent in privately operated hospitals. In order to be financially supported, every hospital has to be recognized within a state hospital plan, the criteria, under which a hospital is admitted to this plan, being a matter of heavy discussion.

3. The Public Health Service in Germany has very limited competences. The number of Public Health Offices in the Federal Republic has continually decreased from a total of 502 in 1960 to 320 in 1981. In 1981 only 852 physicians with Public Health qualification were working in the Federal Republic, assisted by 1,400 full-time MDs without qualification, and 1,897 MDs without qualification on a part-time basis. Even the number of social workers in Public Health Offices has been reduced continually.

The tasks of the Public Health Service have been reduced to preventive care in schools or at entrance into professional life, aspects of care for the aged and public control and surveillance of communicable diseases. Many of the tasks, handled by Public Health Services in other countries, have been taken over by the practicing physicians. The Public Health Service is partly federal, and partly run by the communities.

4. The Works Doctors, which are partly controlled by the state, partly by the employer. Both parts can exert pressure against each other, mainly in problems of environmental medicine.

This system is an oligopolistic one, with large influences of a self-governing medical profession, and rather limited influence from state authorites. It can be foreseen, however, that considerable changes are forthcoming in the setup within the coming years.

The health care system costs in 1981 were:

210 billion DM/year.

There was an increase since 1970 of 201 percent.

Half of the costs are paid by the state, the other half by the insurance companies.

This corresponds to

10 percent of the gross national income-per person.

50 percent of insurance fees are paid by the insured person.

50 percent by the employer.

On the average, 10 to 14 percent of the salary has to be brought together by the employee himself to cover his part of the insurance expenses.

It is self-evident, that the financing system of practicing physicians, which is covering every single activity with a certain amount of money, may be of deep influence on the MDs incentives to refer patients to other institutions, as compared to physicians in some European countries, who are paid in a lump-sum, and thus have no incentive to keep a patient longer than absolutely necessary.

Neonatal care

Every newborn should be seen in the obstetric hospital by a pediatrician at least postpartum. This is not achieved, since mainly in rural areas there are not enough pediatricians available. There are hardly any home deliveries. Few midwives in free practice are available to care for the infant flanked by the pediatrician in practice.

Recommendations exist in regard to personnel and equipment for newborn care in hospitals of various levels of care, but there are no data about their recognition. In regard to Neonatal Intensive Care Units (NICU), there are a number of institutions which do not fulfill the criteria for designation, but cannot be hampered to do their work.

Official statistics, for example, the birth-weight-specific, age-specific, and cause-specific mortality rate, allow to assume that unsatisfactory handling within neonatal care is the cause of a relatively high loss of prematures, at least in certain areas. The structure problem behind this can be identified in general in:

- Too many small obstetric units.
- Lack of personnel for a satisfactory 24 hour service.
- Lack of equipment for adequate neonatal care.
- Poor referral connections to pediatric intensive care units.

Preventive care system for children 0 to 4 years

In 1972, the Federal Republic introduced a system of prophylactic care for all children from birth to 4 years of age. This system offers to every child eight checkups, paid for by the insurance companies to the acting MD, six of these checks are placed within the first year:

- Immediately after birth.
- Between day 3 to 10.
- Between week 4 to 6.
- Between months 3 to 4.
- Between months 6 to 7.
- Between months 10 to 12.
- Two more checkups at 2 and 3 1/2 years.

It was the aim of this step firstly to improve newborn care, and secondly to lower the incidence of handicaps through early recognition of chronic disease throughout the first years of life.

There is a "yellow booklet" for every child from birth on, arranged for computerized documentation of findings at each visit, a copy of which without personal data, is reserved for central data analysis.

The booklet stays with the parents, who thus have free choice of physician, but on the other hand have to cope with an open documentation which gives rise to a number of problems:

- MDs hesitate to document diseases which are not safely diagnosed.
- To safely diagnose disease there is a tremendous increase of diagnostic procedures to be encountered.
- As soon as the diagnosis has entered the booklet, therapy has to be started, due to pressure from the parents.
- In case it had been advisable to postpone therapy to judge a natural course (f.i. of neurological symptoms), there is overtherapy, which cannot be evaluated in regard to therapeutic success.
- There is a strong tendency to overdiagnose and overtreat especially diseases, such as neurological disturbances, and hip displasias,

which--in case they were overlooked--would be followed by severe health consequences for the patient, and legal consequences for the MD.

Every MD-not only a pediatrician--is justified to carry out this program, since there are areas in which pediatricians are underrepresented--a critical fact mentioned above in regard to newborn care in many rural areas.

This system of examination was supposed to be a big step into the right direction, not only towards improvement of newborn care, towards early recognition of chronic morbidity, but also to lowering of post-neonatal mortality which, as I told you yesterday, is rather high in our country for many years.

However, such a system is only as good as the participation in it. To highlight some of the major problems:

- Participation diminished with lower socioeconomic status.
- Participation is greatly reduced in migrant worker's families.

These two facts are disturbing, since both factors are combined with a higher mortality (table 1).

However, during the last years, the participation was gradually improved through activities of the insurance companies themselves and of public propaganda. But in order to save money, the insurance companies withdrew from financing the first two checks with the reason, that this would fall under the responsibility of the hospital, to be covered by hospital fees, and not to be paid to the practicing physician. As a response, the rate of participation of newborns fell to 20-30 percent, a disasterous consequence.

The system also greatly failed to monitor disease frequencies in the Federal Republic, due to incomplete participation. Furthermore, the system has not been able to serve as a quality control for the practicing physician. Attempts have, however, locally been introduced in several areas to keep track of risk infants, to control the effects of therapy to serve as quality control for the practicing physician.

System inefficient to lower late infant mortality

This system of preventive care has so far also failed to reduce late infant mortality in the Federal Republic. This may be due to the fact that there has been marked reduction in the number of visiting personnel, serving as links between the MD and the population at risk for escaping preventive medical care. According to data, gained by the Perinatal Study Group of WHO in 1982 (publication in preparation), table 2 gives figures on midwives and visiting personnel per numbers of births in some European countries.

Effect of lowering morbidity not yet measurable

It has to be assumed that effects have been achieved in regard to lowering the incidence of chronic disease, especially chronic neurological and orthopaedic incapacities. This can currently not be evaluated, since interventions on different levels of medical care would be responsible for such an effect, and the isolated role of a preventive health care system cannot be separately established.

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Table 1. Infant mortality according to nationality.
(Death within the first year per 1,000 live borns).

Year	Total	German infants	Foreign infants
1971	23.1	22.9	25.8
1972	22.4	21.9	25.9
1973	22.7	22.5	23.6
1974	21.1	20.9	21.8
1975	19.7	19.4	21.1
1976	17.4	17.1	19.7
1977	15.4	15.1	17.7
1978	14.7	14.4	16.5
1979	13.6	13.2	15.5
1980	12.7	12.5	14.1
1981	11.6	11.3	14.1

Table 2. Midwives and visiting personnel per number of births in selected European countries.

Country	Midwives/ number of births	Visiting personnel number of births
Finland	29	13
Sweden	26	13
German Democratic Republic	106	2
Federal Republic of Germany	112	70

Source: Perinatal study group of WHO, 1982, unpublished data.

Maternal and Child Handbook System in Japan

by Eikichi Matsuyama, M.D.

Mr. Chairman and colleagues, the reason why the perinatal and infant mortality rate has markedly decreased in Japan is not so simple to explain. There might be many reasons to be considered.

For example, the following reasons may be suggested. First, almost all pregnant women start to visit obstetric clinics within the first trimester. Second, the percentage of unmarried mothers in Japan is very small. In 1982, it was only 0.9 percent of all mothers. Third, mother's age at delivery is concentrated between the 20 to 34 years old age group. This age bracket is considered to be good for both the mother's and child's health. Fourth, in Japan, there are very few teenage mothers. In 1982, only 1.1 percent of all mothers were teenagers. Fifth, the majority of deliveries in Japan were carried out in hospitals or physicians' private clinics. In 1981, 96 percent of all deliveries were carried out in these facilities. Sixth, in Japan, the mother and newborn child are put in a hospital for one week after birth. This is our custom and from the obstetric point of view, it is good for post-partum and neonatal care because the mother has almost recovered from the stress of delivery and the uterine bleeding also has decreased.

On the neonatal side, the baby has recovered from the drop of body weight and from the neonatal jaundice. Mass screening tests of inborn error of metabolism, so-called Guthrie test, can be carried out during hospitalization.

Seventh, now, I am going to talk about the Maternal and Child Handbook (MCH) system in Japan because this book has been really helpful for implementation of maternal child health in Japan.

The original book is much smaller than the English version and it is very easy to carry in a handbag. During the Second World War, Japan fought against many powerful countries, so that Japan needed big human resources. The Japanese government requested women to deliver as many babies as possible to increase the population.

The MCH Handbook was originally designed at that time. That is, 42 years ago, the first MCH Handbook was issued by the Ministry of Health and Welfare in Japan. The first book was copied from "Mutterpass" of Germany, which means, mother passport. The Mutterpass was designed at Hamburg University and I hear, in West Germany, Mutterpass is still being used.

The original handbook in Japan was named "Maternal Handbook." After the Second World War, this handbook was revised three times. In 1947, the Child Welfare Law was enacted in Japan, and the name of this handbook was changed to "Maternal and Child Handbook."

In 1965, the Maternal and Child Health Law was enacted and the name of the book was changed again to "Maternal and Child Health Handbook." The financial resources of this book are paid by the budget of each city and town so that the book is free of charge.

When a woman becomes pregnant, she goes to the city or town office of her residence to get this handbook. Every time she goes to the hospital or private clinic for a checkup, she carries this book and a physician or midwife records the results of the examination in this book. This book is used until a child becomes six years old.

A pregnant women should fill in the upper half of the first page which gives information on the mother and father. After delivery, when the parents go to the city or town office for the birth registration, the parents should take this book with the birth certificate, and the officer records the certificate of birth registration on the lower half of this page.

Data on past pregnancies and past health disorders are filled in by the pregnant woman herself. There are pages with the record of the development of the pregnancy which is filled by obstetrician or midwife. There are pages which show the infant's and child's physical growth curve of Japanese boys at the present time. The mother can put her boy's weight or length and compare each other. There are also pages which show the physical growth curve of girls. There are pages for the record of a child's development and pages for records of vaccination.

The main purpose of this handbook is that the mother should use this handbook. Namely, the mother has to write all the necessary items in this handbook. Of course, physicians, midwives, dentists or health nurses write medical reports in this book, but the main user should be the mother.

This MCH Handbook belongs to the mother and child, especially the child; therefore, in case of twins, the pregnant mother should get two copies of this handbook, one book for each baby.

In the case of my wife, we have three children, so we have three MCH handbooks. This handbook is useful and used until a child becomes six years old, namely, just before entrance into elementary school. After entrance into elementary school, "Health Handbook" issued by the Ministry of Education is available.

There are some problems about this MCH Handbook. Some items of this book are too detailed. For example, sometimes a women does not want to tell the past induced abortion before marriage to her husband, and also there is a problem of protection of privacy. In Japan, cases of divorce have recently increased markedly, so that if a child reads this book, secrets of the mother's divorce becomes known.

Sometimes this book has been utilized as a piece of evidence in a lawsuit when an abnormal child has been born by abnormal delivery and when physicians and midwives have written the reports in detail in this book. Recently, therefore, physicians have not wanted to write a delivery report in detail.

As I told you before, Mutterpass, the origin of this book is still being used in the Federal Republic of Germany, and I know in Australia they are using "Mutterkindpass" which means mother/child passport.

Anyhow, the MCH Handbook in Japan is very useful, so every Japanese mother should express her gratitude to Germany.

The American Context: The Health Care System in the United States

by Samuel S. Kessel, M.D.

I have approached my task this morning with a great deal of trepidation, knowing that in the audience are several Americans more expert than I in regard to knowledge of many aspects of the American health care system. Our distinguished audience includes the President of the American College of Obstetricians and Gynecologists, the President of the American College of Nurse-Midwives, several prominent obstetricians, State health officers, State directors of maternal and child health services, national experts in public health, and not to mention the prominent individuals from the U.S. Public Health Service. I had considered calling on each of you for five minutes or so as the best way of discharging my responsibility. Rather, I have entitled my talk "An Essay on the Health Care Delivery System for Pregnant Women and Infants in the United States." I have deliberately chosen to add the word "essay" to the title of my presentation this morning to convey to you that the nature of my assignment, as I have perceived it, seems more akin to that of an impressionist commenting on an object of art, rather than as a scientist/engineer detailing subassemblies of an efficient machine.

The attributes of the American health care system seem to exist in the imagination of the beholder. They are more a matter of perspective than of precise scientific measurement. As such, I seek to sketch for you an image, somewhat elusive, perhaps, but to be reckoned only by your imagination. My purpose, then, this morning is to share with you a few biased perspectives regarding the system of American health care in the United States. The importance of which is critical to the context in which to consider both the health status/outcome data presented to you and the potential research opportunities regarding interventions to help achieve optimum maternal and child health.

It is certainly evident that all societies, ancient and modern, have developed systems of shared responsibility for the welfare of the young. The composition of such systems, however, and the precise division of duties within them have varied from one culture to the other and from one generation to the next. It is, indeed, this variation of shared responsibilities that, in part, accounts for the pluralistic character of the contemporary system of health care in the United States. The fundamental character of our health system reflects a basic precept of the American social and political philosophy, namely liberty; that is, the individual freedom to choose wisely or, for that matter, unwisely. With this concept in mind, let me share with you some basic statistics concerning the American health care system. This is indeed a meeting dependent upon statistics.

In 1980, the United States census reported a population of more than 227 million people, with more than 3.6 million births, and 1.3 million legal abortions in the United States. These are distributed over 50 States, the District of Columbia, and the territories of the United States. There were an average of 4.6 physician visits per person with those characterized as being poor or earning less than $9,000 a year in income, averaging 5.6 physician visits. Nearly 70 percent of all visits to physicians were private practitioners. In 1980, the United States recorded a physician to population ratio of 19 per 10,000 population, and of special note for this meeting, slightly more than 19,000 physicians reported that their practice was limited to obstetrics and gynecology. Clearly, care by private practitioners forms the central core of health delivery in the United States. American physicians typically view their role as providing the best current medical care to patients who seek to consult them.

Ours is a system of primary and tertiary care. I have obviously omitted the term "secondary care" because I am not certain what that constitutes. Initial consultation with an obstetrician-gynecologist may be the result of several concerns, ranging from an initial assessment at the onset of menstruation, a desire for information on contraception and sexuality, gynecologic problems, infertility, to pregnancy care. Often in the United States, an obstetrician/gynecologist may become a woman's primary care provider, not only her obstetrical specialist. Most recently, the obstetrical care team has expanded to include other health providers as well. In the United States today, 99 percent of all deliveries occur in the hospital attended by a physician. Only 1 percent of hospital births are attended by nurse-midwives, while one-third of out-of-hospital births were attended by nurse-midwives in 1979.

In 1980, there were more than 6,000 hospitals in the United States, accounting for more than 1 million beds, with better than a 75 percent average occupancy rate. Of course, many of these hospitals do not provide primary maternity services, high-risk perinatal services, or newborn intensive care.

There is, however, tacit recognition of regionalized perinatal systems of care in the United States, at least in principle. Hospitals are designated as level one, two or three, often with State licensing regulating the designation. (Level one being the equivalent of basic primary care with level three being the highest risk, high technology university based care.)

Indeed, transport in utero is recognized as preferable, but neonatal transport is sometimes unavoidable.

Given this recognition in principle, one of the important questions is, how has this been operationalized across the United States. Recall that I said I would paint for you a mural, not give you an architect's drawing of precisely what happens. In theory, the concept of regionalization is strongly supported, certainly by the professions, as evidenced by its central position in a particular document called "Guideline for Perinatal Care," which some of you may be familiar with. In practice, however, turf, ego and reimbursement are rate limiting factors. Perinatal care and infant care are delivered in a variety of settings in the United States, all indicating the remarkable diversity of the private health care sector in the United States.

Yesterday, Dr. Kleinman presented data concerning United States prenatal care statistics. The public health sector for maternal and child health care is represented in part by the numerous out-patient department clinics in public hospitals and neighborhood health centers. However, the domain of community responsibility can best be exemplified by drawing comparisons between our system of educating our young and caring for their health.

Our primary and secondary level education system is fundamentally a public trust, comprised of free and yet compulsory education, regulated largely by the State. Not until the university level does the private sector play a significant role. Conversely, our health system is neither free nor compulsory. The private sector, with the individual, or in the case of child health, the family, assumes responsibility for both the cost and the care-seeking. Save for traditional public health and safety measures, including licensing and regulation, the State has somewhat limited and well circumscribed responsibility relative to the majority of those who reside in the State. Those, who through no fault of their own, however, demonstrate need may be eligible for care provided under a Federal-State program.

Whether self-inflicted such as smoking, or created by circumstances largely beyond the control of the individual, such as poverty, the uneven distribution of risk is a primary variable affecting the delivery of adequate health care in the United States. To the extent that risk is a proxy for need, our government, at all levels--Federal, State and local--has exercised authority to correct for obvious failures of the free-market system of health care, to respond to the needs of subpopulations in our society, at least in terms of access, quality, cost and financing of health care.

The concept of community support is certainly not new, but it is hostage to the climate of opinion, using moral categories such as deserving or undeserving, worthy or unworthy, in determining eligibility for the unserved or the underserved. To this egalitarian end of equal access, demanding that every person with the same health need be given an equally effective chance of receiving appropriate treatment of equal quality, government intervention in the United States is mitigated by vigorous self-interest group politics and a deeply held value system critical of government intrusions. Community efforts, therefore, tend to occur at the margins and operate chiefly through some type of economic means. Indeed, the way in which health services are financed is the single most important determinant of how the American health care system operates, what services are available, which professionals provide those services and, in fact, who will receive them in the United States.

In 1982, national health expenditures for the United States exceeded $322 billion, accounted for 10.5 percent of the gross national product, and accounted for approximately $1,365 per American, with great variation--and I emphasize "great variation" by the geopolitical divisions in our country. Central to our health care financing scenario are third party payors. Third parties, as the term has come to mean, are the payors. The first party is the patient, the second party is the physician, and the third parties are largely those that have a, quote, "disinterest," but are the financiers of the health care. Private insurance accounts for almost 40 percent of the national personal health care expenditures and the Federal, State and local assistance comprising the remaining 60 percent with the Federal contribution accounting for the largest proportion. Hospital care takes the largest fraction of personal health expenditures, at 42 percent, and physician services a distant second, at 19 percent. To be sure, the United States provides some of the highest quality and sophisticated medical care available anywhere in the world. This care, however is largely oriented toward secondary and tertiary prevention.

In times of infirmity or emergency, we call upon a vast array of highly skilled professionals and quality resources, assured that we will receive needed care and that our bill will be covered by our private insurance. Not all Americans are so fortunate. However, beyond private insurance and outright charity, there are two public programs in the United States which pay the fee for service for those women and children who are eligible. These programs are, essentially, Federal-State cooperative programs. I'll mention two of them this morning.

Medicaid, or Title XIX of the Social Security Act, established a joint Federal-State program to provide medical benefits to low income eligible families. Federal payments are based on a matching formula that accounts for relative differences in per capita income among States. The Medicaid benefits are a combination of required services, i.e., hospital care, physician services, laboratory, and several State options. Eligibility is a combined Federal-State activity based on a means test. Being a recipient of aid for families with dependent children is the criteria which makes women and children eligible for Medicaid.

The other program is called Title V of the Social Security Act. Enacted some 50 years ago, Title V remains the only Federal program exclusively directed toward improving the health of mothers and children. Today, the program provides block grant funds directly to States to promote, improve and deliver maternal and child health care. Title V supports numerous unique clinical service, regionalized care and special projects of regional and national significance. All mothers and children in the United States are eligible recipients.

In my short time this morning I have only touched upon a limited set of issues important to consider the context of maternal and child health in America. Let me briefly leave you with a somewhat obvious observation but important for us to consider as we proceed further in our work.

The health care system in the United States is as divergent as are the 50 States and as autonomous as the 6,000 hospitals and half a million physicians practicing in the United States. Opportunities for improvement, even those based upon sound scientific evidence, are all too rare and, indeed, resist fine tuning.

This essay may indeed be flawed in many ways, but none as serious as my omissions. Because of time and complexity I have ignored a detailed litany of factors that are critical to understanding the health care system in the United States. These include the role of technology, the role of the professional organizations, health education, tax incentives, cost containment, supply and demand, neonatal intensive care units, privacy, confidentiality, ethics, malpractice, the media, life style, and on and on and on and on. All of these items bear on our system of care.

I have indeed led you into the forest, a thorny forest, I hope not astray, but it is indeed for others to lead you back. Thank you for your patience.

Overview - Health Care Systems

by Vince Hutchins, M.D.

The organizing committee of this symposium placed the topic "Health Care Systems" in the agenda between "Recent Trends" and "Current Research" in preparation for your workshops tomorrow.

In reviewing trends in perinatal statistics, it is important to understand the health care system in each country that may affect the statistics and perhaps help to explain the difference.

Dr. Bergsjo said yesterday that different aspects of the care system are related to perinatal statistics. We need to know the details of the health care system, how mothers and infants benefit or don't benefit from services, as we review current research and plan for future research, especially if we will be looking for collaborative opportunities and comparative analysis across political borders.

We have heard a description from representatives of seven countries: Israel, Sweden, Great Britain, Norway, Federal Republic of Germany, Japan, and the United States.

In this limited time and from the perspective of each presenter, they have provided a wealth of information and a richness of variety. In these presentations, there are some themes that expose both similarities and differences, and I would like to discuss for a couple of minutes a few of them, from a smattering of knowledge on my part, and a somewhat chauvinistic viewpoint.

One of them is records; we saw examples of records from 1881 in Sweden to presently, records from Sweden and Germany.

It was tempting last night to retrieve some from the Johnstown Study of the Children's Bureau in 1913, a study which was the impetus for States in the United States to begin vital registration of births and deaths, as well as other information, that study told us about how infant mortality is perhaps more of a social disorder than a medical disorder.

We saw Great Britain service data was voluntary and at the mercy of staffing cuts, something we probably all can identify with.

On a more personal note, Dr. Cole said that complicated formulas were not being put together in Great Britain for more equitable distribution of funds. It struck a responsive and somewhat discordant note, as we have been dealing with a formula that was set 50 years ago and we find it, politically, unable to be changed. Dr. Cole may want to take that back.

We have seen examples of child health records for each child kept by the parent, as mentioned by Germany this morning, and then the excellent book that was given to us this morning (from Japan) that included both maternity and child health. The United States does not have one of those. Canada is currently testing a child health book.

Regionalization was talked about and referred to in all the presentations; each country's system discussed it in three levels, with great variation, and most had a population-based division as to what the regions were.

A few thoughts: Norway seems to have little ongoing communication and interaction between a primary level of care in the hospital, and yet that is something--they also have a low infant mortality rate. It's something that we spend a lot of time discussing.

Israel's system is pluralistic and seems to be actually two systems, the Ministry of Health System and the Sick Fund.

Sweden's system was described with different personnel having responsibility at different levels. Midwives ran neonatal clinics, supervising obstetricians in the hospitals.

Germany's semiprivate system, with private offices, and 90 percent of the services seen in private offices by physicians or provided in private offices, paid for by insurance, but public and private--not too dissimilar from what Dr. Kessel was describing.

Now, the stay of women in the hospital, from--Dr. Kessel didn't say this, but an average of 1 or 2 days here, a movement towards 24 hours in Germany, 6 days in Norway, a week in Japan.

Much of the regionalization talked about what happened within hospital walls. It was less clear from the presentations what happens in regionalization outside the hospital walls. And it was not always clear what is regionalization or what is centralization, a theme that we deal with.

And there wasn't a great deal of discussion of continuing education out from the central center or consultation out to the primary and secondary levels--it may be a function of time for presentations.

Another theme was money and personnel. Physicians, mostly salaried in Israel, some capitation in Great Britain and an increasing amount of that here, insurance providing most of the payment in Germany and the United States.

The role of midwives, a great deal of variation. Responsible for all the antenatal clinics in Sweden, responsible for postnatal care, including 5.2 home visits which certainly--in England; a minor role in Germany in antenatal care, only a few midwives here in the United States.

And a corollary, public health nursing declining in this country, something less than 50 public health nurses in Chicago, with a population of over 3 million.

Care, all free in Norway; low copayments in Israel; some women not covered at all in this country. We heard this morning that the first couple of visits are being withdrawn in Germany from insurance coverage.

Another theme I suppose was almost universal, screening for PKU, almost universal screening for hyperthyroidism.

Some discussion of population differences, subpopulation differences, the non-Jews in Israel, the migrants in Germany, and the subpopulations in this country.

This morning we heard more about the context in which health services are provided, some of the organizational differences in Germany, demography in Japan, emphasis on financing in the United States by Dr. Kessel, and the impact that these factors have on perinatal outcomes.

Some of the things not mentioned, such as what is the role of nutrition for the infant or for the woman during pregnancy, or the nutrition of the mother when she was a child or youth, and what are the effects of inadequate education, single parent households, poverty, unemployment, or educational materials not available in the primary language of the home.

And what of working women, which we didn't hear anything of, but is certainly an issue here--the effect of psychological stress at work, the knowledge and stress, perhaps of unequal pay for equal work, the lack of maternity leave from work, the lack of support for breastfeeding, lack of adequate daycare for infants and older children, and what is the effect of lack of counseling service, and the lack of anticipatory guidance, lack of home visits where they are not available; and how are, or should these factors be included in our analysis of perinatal outcomes.

And against this kind of fabric of social factors always is the technology part of it.

Robert Goldenberg wrote recently of the United States:

> "There are still major improvements in pregnancy outcome to be gained by further regionalization of perinatal care and by better surveillance of higher risk pregnancies, through improved perinatal care.
>
> Strategies aimed at reducing the incidence of low birth weight which have potential but which have not been proven should be tested in various kinds of demonstration projects. Research aimed at reducing the incidence of congenital anomalies and improving the medical care available to prevent or effectively treat necrotizing intracolitis, respiratory distress syndrome and intraventricular hemmorrhage should be pursued."

It would seem that there is a great deal of work to do in this country and in the countries we have heard from, and hopefully, as a result of these 4 days, collaboratively with each other.

Discussion: Health Care Systems

Dr. Kleinman: I was impressed by many of the countries which had sort of systems or guidelines for antenatal and postpartum care of the infant.

I'd like to know, first of all, whether there are any data on how often those guidelines are met, and whether there are any formal systems to insure that they are met, any monitoring of the content or quality of--let's start with prenatal care.

Dr. Schmidt: There is no monitoring officially in the Federal Republic of Germany, but there is a study about which I will talk in a second on research in Germany which has followed up this problem in antenatal care. I will give you some results on that.

Dr. Meirik: Talking for Sweden, in regard to antenatal care, we used to have, at least on risk factors, on the records, having it available to midwives at visits, but as the mother had access to the record, she was also aware of these risk factors, and it created a lot of problems for us, to explain to the mother that even if she was in the group, say, for 35 years or older and so on, that even if she was at risk, it didn't mean so very much to her. So, therefore, we have taken away these factors on the record, so that we have not systematically gone through or surveyed the effect of having these risk factors in use.

Dr. Karlberg: Talking about Sweden, and children and the care of them and the monitoring. I think I would express it in this way: Since all babies are delivered in hospitals and they are checked there, then all of them have the information on the medical birth registration sent to the child health centers, and then the nurse must visit the home within 3 days, and if it is really urgent, we can always call up and ask them to go to the home.

Then they have the schedule during the first year and the following year, and then you always have some people who drop out, they will not count. I would say that monitoring, if I would call it that, is done in the child health center. If they do not go the health center, the nurse has to go to the home and see how the child is. And here still you have someone who is never home, and they really need it, the care, and we do our best to get them there.

Dr. Bakketeig: I'm saying that Dr. Bergsjo mentioned the guidelines for antenatal care that are going to be implemented in the near future in Norway, and so far we do not have any setup for evaluating that, but we have proposed a permanent audit system in each county to look into at least those that go wrong, I mean perinatal and other complications. That may answer, at least to some extent, your question.

Dr. Bergsjo: If I understood the question correctly, it was do we know what really goes on during antenatal care, and the answer is that we don't. Therefore, we tried to assess this with a very preliminary investigation last year, but this was very quantitative in questions and the number of visits and so forth, and it didn't go into any detail in that content of the antenatal care visits.

I have a feeling that something can be gained here, and we should probe the matter more deeply, but the question is that we don't know much about what goes on, at least not in Norway.

Dr. Little: I think that Dr. Kessel made a very honest effort to stimulate us, shall we say, and to direct our thoughts into certain channels. I think there are many of us who have, for some time, attempted to provide some leadership and recognize that there are gains to be made on the acute care and intervention sides, specifically through regionalization, obstetrical and neonatal care.

At the same time, I think, if I heard him correctly, he was attempting to try to stimulate us into integrating that with other activities and perhaps movements in personnel and other areas. I certainly think that's an extremely healthy thing, and the reason why I'm here.

Dr. Klein: Well, I think that the guidelines are there, but it's very difficult to know how closely those guidelines are met.

I think some of us have concern that when we talk about risk, we really haven't very well defined risk, risk for what? Risk for mortality for the mother is so low in most countries that that's not a very good way to look at risk, and most of us think of risk in terms of low birth weight.

I have great concern that we have some way to link risk to low birth weight and to outcome. It looks to me like Norway, in this group, is one of the only places that can look at relative risk and attributable risk in a group large enough to make any sense.

It's very difficult in the United States. There are so few people using the same record to have a large enough and a broad enough population-based study to have any outcome data that is very meaningful.

The Institute of Medicine tried to decide, in one of its meetings, how closely American obstetricians followed this, and I would have to say I don't think we have.

Mrs. Barell: In Israel, there are guidelines both for antenatal care and postnatal care, but little systematic monitoring other than on the administrative level, with the exception, perhaps, of the immunization status of infants.

There have been, however, an number of fairly high quality research studies on the question of the content and quantity of prenatal care, particularly in the southern part of Israel, which has linked up the content and quantity of care with outcome measures in perinatal outcome.

Dr. Van Dyke: It's really interesting to hear, whether the guidelines and standards that we're hearing about from the many countries are hard and fast or implied. They are still there, and I think we are behind here in our States, even though we do have a great range of variation in the States. I think we are behind, and that we could very easily push for more consistent standards for the practitioners in both public and private clinics to follow.

Ms. Meglen: I just wanted to mention that in the study that was done in South Carolina, while we were able to look at those women at high risk and compare those who received care according to the standards that we instituted through our MCH program with those who received Medicaid and, therefore, can go anywhere for care, they were controlled for other things, but that, basically, was the difference in the group.

The demographic factors were also controlled. The mortality, the perinatal mortality was double in the group that had no standard for control. And we have used that to get additional funds for a program with control and to also request a Medicaid waiver, which I understand has not been done anywhere else in the country.

We haven't succeeded with that yet, but we think we have good documentation to proceed.

Dr. Cole: In Scotland, in the United Kingdom, I think it is generally accepted that the Royal Colleges of Obstetricians and Gynecologists and the Royal College of Pediatricians agree together to set standards, and as all specialists are members of their respective colleges, I think that it's by professional persuasion.

There is certainly no compulsory element because--God help us--we're all equal; it would make it much easier if we weren't. But it is by the colleges that we do this.

The government does have an all-party committee that sits and discusses standards of perinatal care, and has issued recommendations but the government refused to set standards, and I think this is largely because of the financial implications. The profession could turn around and tell them to put money where their mouth is, and as a result they refuse to do this, but in a kind of way they can get at us because they approve medical training, and they will seek to get standards set in the medical schools. But it is all a bit implicit, rather than explicit.

Dr. Wegman: I think I'd like to bring in one other factor that hasn't been mentioned yet in the U.S. picture.

Since 1966, a series of Federal laws have tried to stimulate a highly decentralized system of regional planning, involving what is referred to, a little euphemistically, as a public-private partnership, with locally named groups trying to do a comprehensive job on all aspects of health services: prenatal care, hospital care, and infant care is an essential part of this.

I was very closely involved with this in Southeastern Michigan, spending 6 frustrating years as the president of the council and getting almost nowhere with it.

The planning process in this country runs up against a lot of special interest groups pulling against each other, and I think only minimal progress has been made; yet, the goal of setting standards and trying to monitor them in a variety of ways, on a local basis, I think comes close to answering the kinds of things that Dr. Kleinman raised originally.

I would hope, this is perhaps not the place for it, but in this country, I would like to see a good deal more support for this planning effort and more combinations of legislators, physicians, and local groups--particularly industry, which have been very strongly involved in this, in trying to advance the setting of standards and the application of it.

Dr. Hemminki: I would like to take up two questions which were on your list which were not discussed previously, and one of them is maternity leave.

None of the people presenting this described what is the length of maternity leave in their country and when does it start.

If I understand right, in Finland, the length of maternity leave is now 1 year, with 90 percent of pay. It would be interesting to hear how it is in the other countries.

I think it is very important, both in terms of low birth weight, when does it start and pay by the work the woman is doing.

Secondly, after birth, it's very important for the child care arrangements, as well as breast feeding, as well as probably symbol meaning for the woman about how much emphasis and how important she is, how much she is paid for being at home.

And the second thing which I would like to hear about is well baby care. It was very interesting, the presentation from West Germany, it would be interesting to know how it is in other countries. And especially I have in my mind who is the person who is doing the well baby care. In Finland it is public health nurses, principally, and as far as I understand, the physician is what it normally is in other countries. It would be interesting to know what kind of person is responsible for the well baby care.

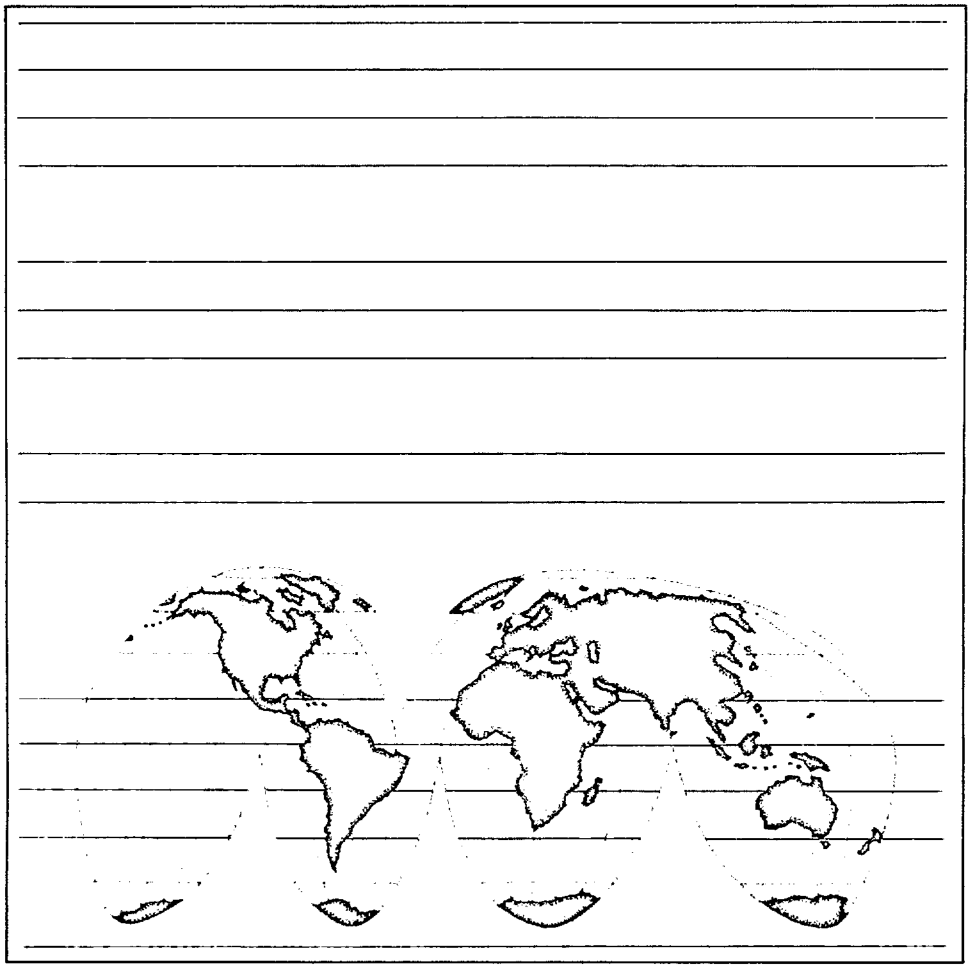
Dr. Perry: Can I just add paternity leave to that list of requests.

Dr. Hemminki: Yes, that's right; it's in Sweden.

Dr. Hutchins: The question is, is there a comment about maternity leave or paternity leave in other countries, as well as care-givers of well child care.

Dr. Meirik: Sweden. I want to correct myself with regard to the evaluation of risk scoring and risk screening. We certainly have not done any evaluation of that on a national basis, but certainly on a local basis. For example, in Uppsala, we often find intrauterine growth retardation, and look at the importance of the risk factor in terms of relative risk for intrauterine growth retardation and/or to the prevalence to the specific risk factors in the population of pregnant women.

Overall, we had a 30 percent prevalence of risk factors, and the most important ones there, smoking, cigarette smoking, and smoking 10 cigarettes or more, which is to be found in about 15 percent of the population. The second most important was previous unfavorable pregnancy outcome.



Chapter IV: Current Research

Current Research in the United Kingdom

by Eva Alberman, Ph.D.

I would like, just briefly, to add a little bit on a totally different area of research, and I think perhaps I ought to start off by paying tribute to those great researchers in the United Kingdom that have made us, I think, reasonably well known in the field of longitudinal studies.

James Douglas did the first national longitudinal study in 1946, and his colleagues are now following up the second generation of those children. Neville Butler well known to you, I'm sure, carried out the 1958 perinatal mortality study. The children, now in their twenties, are still being followed up; and the Chamberlains carried out the study of 1970 births, again backed by the National Birthday Trust, and again, Neville Butler is following up this cohort.

I won't say anything about the results, because they are far too big, but I just wanted to say that they have influenced the research work in the United Kingdom.

The way it is going at the moment is that we are, I think, coming away a little bit from these ad hoc studies, and trying to adjust routinely statutory collected data to produce the same sort of information. And that's really what I want to concentrate on. It means I have to go back a little bit to describe our information system.

We have two statutory systems, as Susan Cole told you yesterday; we have a medical notification; that is, every birth in the United Kingdom has to be notified by the medical attendant to the local district health authority, within 36 hours of birth.

Then there is a civil registration which is the responsibility of the parents; again, statutory, obviously, which has to be within 42 days of birth.

There is a permitted interchange of information between the local health authority and the Office of Population Censuses and Surveys, via the local registrars, and since 1976, there has been a voluntary agreement that during this interchange of information, the birth weight which is collected from the medical information is transferred onto the birth registration. This is why, for the first time, we have birth weight on all our birth certificates. Before that, we only had grouped birth weight data for low birth weights.

The National Health Service (NHS) number, which is generated by the birth registration for every birth in the country, and which enables the child to be registered with a general practitioner, is a unique registration number. What we would like to see is for that to be transferred onto the birth notification, because that information does follow throughout the child's life.

We also have a linking now of birth and infant death certificates from which we get most of our social and perinatal data.

Added to this can be some data which stems from our hospital activity analyses. The NHS hospitals, and remember that nearly 100 percent of our births take place in NHS hospitals, have a duty to produce a 10 percent sample data for the Department of Health, but most hospitals now collect 100 percent data which is computerized. We are trying to get a standardized maternity form which will be added to, or could be added to, the information already available from notification, and could be linked with the birth registration. Such linkage is already available in Scotland and this is why Susan Cole has got splendid medical information from Scotland, which we do not from England.

The line of responsibility for the National Health Service is the central Department of Health including the Scottish and Welsh offices. Then there are the 14 English regions and Wales and Scotland, and within those regions there are district health authorities with a population of between 150,000 and 300,000, about 200 of them.

Each district health authority has a district medical officer who has a responsibility, a very clearly set-out responsibility, for prevention of disease and, in particular, for the child health service.

And each district has to provide, in England, returns on the survival of low birth weight infants and other data, including attendance at child health clinics and immunization.

And this is one way by which we are monitoring the activity of child health services. Because of this system, the district medical officer has at his or her disposal the notification of a birth. This triggers off statutory or near-statutory visits by midwives and health visitors, which Susan Cole described yesterday, and increasingly, a computerized recall system for immunization and vaccination, which is now being used by 60 percent of all districts in England and Wales.

So we are approaching now a national system where birth information can be linked to a recall system for immunization and for health surveillance. Each district will have its own surveillance plans, but usually it includes one or two visits in the first 18 months, and then a preschool visit, and the district medical officer is also responsible for school health.

Increasingly, also we are developing a system where we can link the immunization statistics with later medical data, and we are just introducing a national format which will link very simple results of surveillance. If we could link in the hospital data, you will see that this will give us a very powerful system, indeed. And there are districts in the country in which this is being done.

I would just like to finish by pointing out the research possibilities of such a system, many of which are already underway.

The birth notification system allows a sampling frame for research which has been used extensively, and I've used it a lot myself for followup, for instance, of low birth weight infants or infants born after new technologies, an after prenatal diagnosis. It allows registration of impairments, disabilities and handicaps, if we could but agree on how to classify them, and it allows surveillance of growth.

As I say, there have been numerous followup studies of the outcome of low birth weight. Until recently, most of them stemmed from centers of excellence, like University College Hospital and King College Hospital, but increasingly now, we are producing data from geographically defined whole population areas.

Similarly, several of us are setting up registers of cerebral palsy, on a geographical basis. And, again, this is possible through the birth notification system and following through the results of surveillance and contacting pediatricians.

A quite different type of study, but again, stemming from the birth notification system, has been in the area of the prevention of sudden infant death syndrome. John Emery and Robert Carpenter have used birth notification and subsequent medical information to score for what they found to be statistically high risk factors for sudden infant death syndrome. They have used that for planning preferential surveillance of infants at high risk. And they have found a reduction in the group under surveillance compared to a control group. The numbers, unfortunately, weren't large enough to be statistically significant, but it has aroused a lot of interest.

There's a lot of other work going on the etiology of sudden infant death syndrome which I haven't got time to mention here.

There has also been a lot of interest in producing a classification of impairment, disability and handicap, along the lines of the WHO document which can be easily usable at a simple level for child health, and there's a lot of interest in using the information from notification for studying trends in birth weights and gestation.

There are also the longitudinal studies to which I have already paid tribute; and the National Perinatal Epidemiology Unit, which is doing a lot of work on randomized control studies of obstetric data.

Finally, I should just mention that the Office of Population, Census and Surveys which is like your National Health Statistics, has got a longitudinal study in which they are linking data from birth registration and death registration. They have added marriage and cancer registration on a 1 percent sample, from which we hope to get a lot of information, and we have already had at least one paper looking at occupation of women and relating that to infant mortality.

Now, that's a very rapid run-over, and I've left out a lot of research that is going on.

Thank you.

Current Research in Scotland

by Susan K. Cole, M.D.

It is obviously a morning for perinatal mortality surveys. Eva Alberman and I are going to split this session between us, and I was going to report to you from Scotland on one topic of research which I regard as being very important to our country.

My colleagues, Dr. Gill McIlwaine, who is an epidemiologist and who I am sure many of you will know, and also a team of obstetricians and gynecologists, headed by Professor MacNaughton in Glasgow University, undertook a survey of all perinatal deaths in Scotland in 1977.

They first approached all the consultant obstetricians in Scotland asking them to cooperate in a retrospective survey of case notes of all perinatal deaths. Initially, one or two consultants felt unable to cooperate, but after a personal approach had been made, they too, agreed to allow the relevant facts to be abstracted from case notes, by members of the research team.

The background work required to achieve this initial objective should not be underestimated. The success of this effort was, in part, due to confidence in the research team and also in the tradition in Scottish obstetrics of epidemiology, pioneered by Sir Dugald Baird in Aberdeen. The first report by the research team analyzed the perinatal deaths in Scotland in 1977 by the most important preceding obstetrical factors, the same classification devised by Baird and his coworkers (1954) and also used in the National Birthday Trust Survey in 1958. This report was well received in Scotland, and the obstetricians agreed to continue the survey from 1979. An interested clinician in most major hospitals agreed to complete a special questionnaire after each stillbirth and first week death.

The research team was notified after a stillbirth or a first week death had been registered by the General Register Office (Scotland). A reminder was sent to the coordinating clinician in the relevant hospital (or, in a few cases, a member of the research team would go to the hospital) and the questionnaire would be completed and sent in. The analysis of the data was made more relevant because the team was able to use the national information on maternities, collected by ourselves in the Information Services Division, for denominators. The survey continued as a research project until 1982, when the grant came to an end. It was decided in the Home and Health Department of the Scottish Office that the survey should continue as a routine service. The Chief Medical Officer, Dr. John Reid, asked Professor MacNaughton and Dr. McIlwaine together with some other obstetricians, a neonatal pediatrician, a pediatric pathologist, a midwife and myself, as the persons to be responsible for future data collection, to form an advisory committee to continue the perinatal mortality survey.

The Committee has met during the year of transition from research project to routine commitment, and has decided to extend the work in three ways; to develop a pediatric classification of the neonatal deaths, in addition to the original Aberdeen obstetrical classification; to develop guidelines and standards for perinatal postmortem examinations; and thirdly to extend the scope of the review. At the moment we are trying to collect information on late spontaneous abortions between 20-27 weeks gestation (or weighing 500 grams or over). There are problems about completeness of the data, as these events are not registered, and therefore we do not know of an occurrence until the routine hospital summaries are collected--usually later than the annual enquiry has been completed. We have found that hospitals which already include these cases in their local perinatal death meetings are more successful in remembering to inform us about them than are hospitals which do not. In 1985, we propose to extend the survey to include deaths in first month of life. There may be logistical problems because the annual 700-800 perinatal deaths do not impose too great a burden on any one clinician, nor on the data collection staff, and all forms can be examined in detail by one individual. We estimate that there are about 400 late abortions and a further 100 or so neonatal deaths, a significant increase in the workload. A further practical time consuming problem will arise with deaths in the 2nd-4th week of life that occur in a hospital other than the hospital or birth, or at home, and the involvement of a group of doctors not already accustomed to cooperation with the survey, namely consultant pediatricians and general practitioners. Summary tables will be produced and published annually and the advisory committee intends to publish a full quinquennial report wih commentaries.

That is a brief review of an important development, starting as a research project and its establishment as a continuing service commitment.

I have just time to show you one or two details from the research phase of the perinatal mortality survey, these have been published by the research team and I am grateful to my colleagues for allowing me to present them to you. Table 1 shows a time trend of total perinatal mortality and separate singleton and multiple pregnancy perinatal mortality rates. Table 2 shows a 5 year time trend of perinatal deaths classified by the Baird Aberdeen classification. This classification shows obstetricial conditions during the pregnancy that preceded the perinatal death: a group with antepartum hemorrhage, a group with pregnancy hypertension, perinatal deaths that were thought to be associated with traumatic factors during labor delivery, such as prolapsed cord or a breech delivery in infants weighing more than 1,800 grams; maternal disease such as diabetes or hepatitis which preceded a perinatal death; then there is a large group of infants with severe congenital anomalies that were either lethal, or the death might have occurred following treatment: the final group divided by birth weight into low birth weight--less than 2,500 grams and normal birth weight--over 2,500 grams which had no apparent obstetrical abnormality preceding the event. We will be particularly interested in looking at the pediatric classification of this group of infants. Across the 5 years shown in table 2 there has been a decrease in all categories, particularly in the fetal deformity group. This is partly due to a fall in the natural incidence of anecephaly and spina bifida and partly due to the effect of screening and termination, and figure 1 shows you some work that I have been doing with one of my colleagues in the Information Services Division.

There are two further tables that I did after yesterday's discussion, again using data from the Perinatal Mortality Survey. These data are aggregated from the years 1977 and 1978 to 81. This is birth weight and gestation specific perinatal mortality rates in the normally formed singleton infants--subtracting the infants with fetal deformities from the total perinatal deaths (table 3).

Table 4 shows the time of death, antepartum or intrapartum stillbirths and postpartum deaths in normally formed singleton and multiple perinatal deaths with a total.

Reference

Baird, D., Walker, J., and Thomson, A. M.; (1954) Journal of Obstetrics and Gynecology of the British Empire 61 433.

Table 1. Perinatal mortality survey, 1979-83.

	Rates per 1,000 total births				
	1979	1980	1981	1982	1983
Total perinatal mortality rate	14.1	13.1	11.6	11.5	10.6
Singleton	13.2	12.0	10.7	10.6	9.7
Multiple	60.9	70.8	63.6	58.4	55.9

Table 2. Perinatal mortality survey, 1979-83.

Survey classification singletons	Rates per 1,000 total births				
	1979	1980	1981	1982	1983
Antepartum hemorrhage	1.6	1.6	1.3	1.5	1.4
Pregnancy hypertension	1.0	1.2	0.9	0.8	0.5
Trauma	0.4	0.3	0.4	0.3	0.2
Maternal disease	0.5	0.5	0.5	0.8	0.5
Rhesus + other hydrops	0.1	0.1	0.2	0.2	0.1
Unknown. Birthweight <2,500 grams	4.0	3.2	3.3	3.0	2.8
>2,500 grams	1.7	1.4	1.2	1.4	1.5
Other	0.6	0.8	0.5	0.3	0.5
Sub-total	9.9	9.1	8.3	8.3	7.5
Fetal deformity	3.3	2.9	2.4	2.3	2.2

Table 3. Rounded gestation and birth weight specific perinatal mortality rates in normally formed singletons.

Gestation (weeks)	Birth weight (grams)					
	<1,000	1,000-1,499	1,500-1,999	2,000-2,499	>2,500	Total
<28	913	493				621
28-31	777	403	205	165		353
32-36	603	325	129	49	22	65
37-39			162	23	4	6
40-41				10	2	2
≥42					5	8
Total	784	370	135	30	3	10

Table 4. Rounded perinatal mortaltiy rates in normally formed singleton and multiple infants by time of death in relation to labor.

Time of death	Singleton	Multiple	Total
Antepartum	4	14	4
Intrapartum	1	6	1
Postpartum	4	43	5

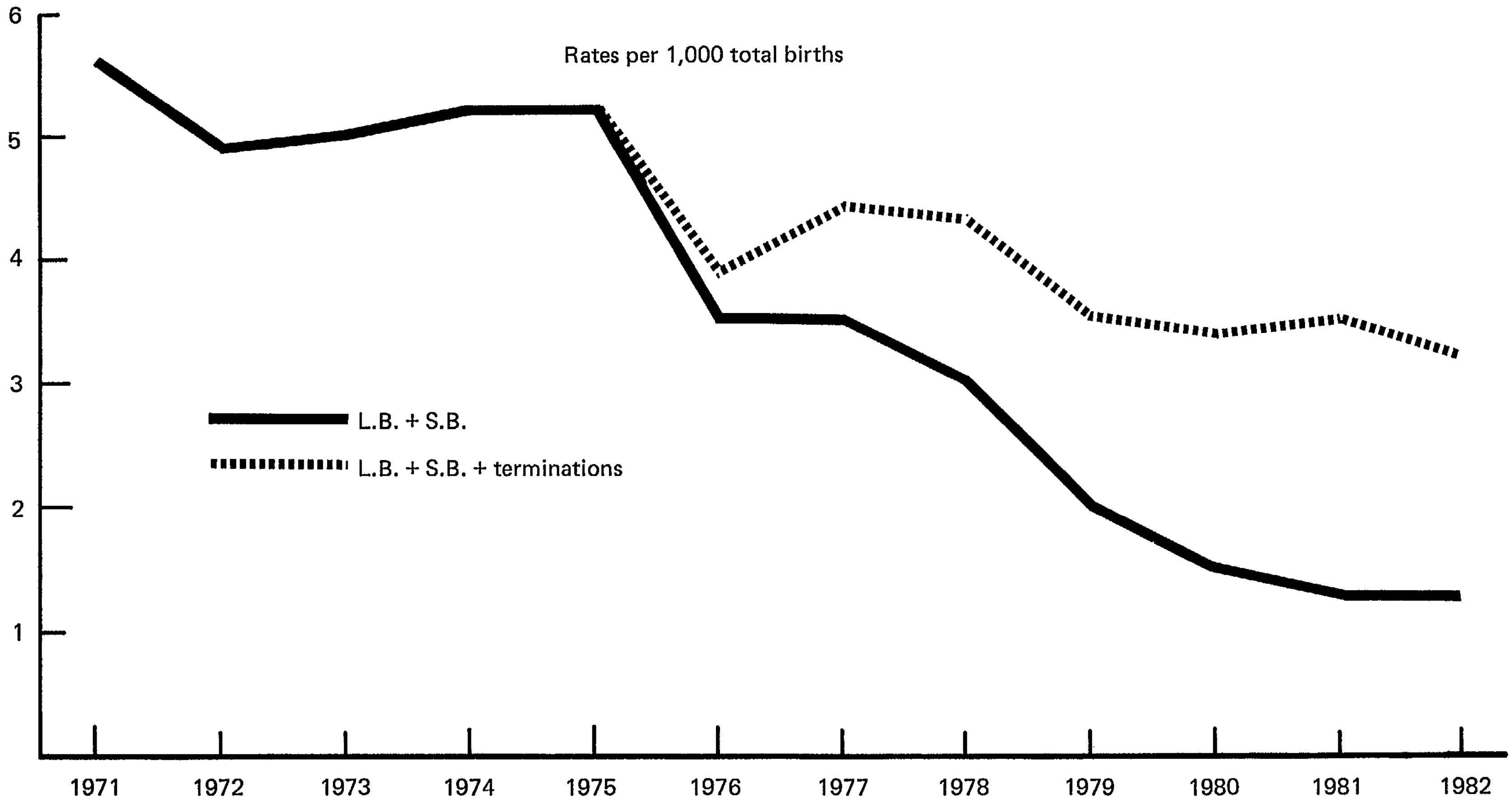


Figure 1. Incidence of anencephaly and spina bifida: Scotland

Discussion

Mr. Shapiro: That's an extremely rich menu of research, and I'm sure the question I'm going to ask is taken care of one way or another; but I'm curious to know the nature of the attention that you are giving in the research to personal habits, such as smoking and drinking, not only the effects in perinatal period, but the long-term effects among the children.

Dr. Alberman: I think I can possibly best answer this by asking David Rush's opinion, because, certainly the longitudinal surveys have been outstanding, and in particular the last one, the Chess Study, has been outstanding in looking at these particular aspects, and David Rush has been outstanding in looking at the smoking data.

I don't know whether he would like to comment on that.

Dr. Rush: Which piece of the smoking data would you like me to comment on?

Mr. Shapiro: The long-term effects.

Dr. Rush: Well, I would say that the longitudinal studies are extraordinary, and they come from a more trusting society than ours. I've always been astounded by the ability of a few, at times persuasive, investigators to elicit cooperation from thousands of people nationwide, to be able to sustain these studies, and they do represent a sampling frame which is, as far as I know, unique worldwide.

We have completed analyses relating smoking during pregnancy, as well as several other factors, to child behavior and cognition, and physical growth at age 5, and there are some long-term relationships. In fact, there are strong long-term relationships.

I would say that at the moment, the indices of physical growth are likely, causally related to smoking in pregnancy. In other words, I think there is some depression in physical growth.

I think that the associations with cognition and behavior are much more likely to not be causally related to smoking, but, in fact, related to the nature of women who smoke, and that we are now actively engaged in analysis. This is the 1970 British birth cohort of all children born in the United Kingdom in 1 week in April 1970. We are actively engaged in the followup at age 10, in an analysis of those data which were collected in 1980 and 1981, and thinking about a restudy of the same children at age 15, before they leave school, which we are going to have to hurry up on, because there isn't much time left.

But they are extraordinary resources. They have been plagued by lack of funds lately. Some of the key staff are surviving on an almost week-to-week basis in order to complete this survey work; and when one considers the value of the resource, compared to the investment involved, it is really quite unjust that the survival of these studies seems to be threatened on a regular basis, but maybe that makes you lean and hungry and more able to get better for the race. I don't know.

But these are amazing resources which, indeed, could be used as sampling frames for many other specific issues than I have been fairly narrowly addressing lately.

Dr. Schmidt: I would like to ask Dr. Cole, do you have any feedback from your perinatal mortality survey to the hospitals, and how is it handled?

Dr. Cole: Yes, this is one of the main principles that the research group insisted on. Originally, they had code check cards that they were going to do it on, punch cards, and copies of the cards were sent back to the people who originated them, so that they are holders of their own data, as well.

But they sent back the sorts of analyses that they had done for all Scotland by health board of residence, so rather than doing a hospital-by-hospital approach, we decided to base it in the community and by the place of residence of the mother, and send the information back to the clinician who worked in that place of residence, without comment and without criticism.

I didn't really emphasize, which I think has been very important, is that we have taken a deliberate decision, originally, the research team are now carrying on into the institutionalized inquiry, that we were not going to look for avoidable factors or do--in any way kind of attribute blame, partly because there are too many factors that we don't understand and, therefore, we can't really decide whether they are avoidable or not; and partly, we felt that we would retain the cooperation of the profession better if we did not go along exactly the same maternal mortality route.

Israel: The National Program for Reduction of Infant Mortality

by Vita Barell

The national infant mortality rate (IMR) in Israel in 1982 was 13.9 per 1,000 live births; among Jewish births the rate was 11.6 per 1,000 and among non-Jews the rate was 21.0 per 1,000. However, in that same year, there were areas in Israel where infant mortality was as low as 10/1,000 and other areas with a rate more than twice the national level. These large differentials between population groups, regions, and communities are the project of the program presented here (figure 1). The Israel National Program on Infant Mortality Differentials attempts to identify problem areas among the regions and communities in Israel as the first phase in a multi-staged endeavor, which includes a comprehensive analysis to identify factors influencing the high mortality rate and to characterize the population groups at risk. Information is the basic tool, and involvement of decisionmakers and service managers in the process of information evaluation, and plan development and implementation is essential. Concomitantly, an attempt is being made to transmit the responsibility to the regions for developing feasible plans and intervention programs designed to reduce infant deaths and to decrease the differential between communities. Preset criteria for evaluation of plan success will be applied.

Method

A national Task Force was established to guide the project in the analytic as well as the organizational aspects and included authorities in pediatrics, obstetrics, maternal and child health, public health nursing, epidemiology and statistics (figure 2).

Regional work parties were set up and members were selected by representatives of the different disciplines in the national committee and deputized by the Ministry of Health in cooperation with the major Health Insurance Sick Fund, with adequate representation of all levels of care and all sponsors.

A concerted attempt was made to present aims, methodology, and results in a form suitable for service managers and clinicians at the field level.

Selection of comparison standards

The comparison standards for identification of these areas were the national averages and the levels of the rest of the area rather than the levels attained in other countries, based on the principle that goals should be realistic and attainable.

Selection of appropriate standards met with a number of problems: The first problem is that the mortality rate is not constant over time and there has been a consistent decrease within the last 10 years (figure 3). Data are presented separately here for Jews and non-Jews because of the considerable differences in mortality rates and population characteristics between the two groups.

The Jewish rate decreased by 6.5 per 1,000 (from 18.1 in 1973 to 11.6 in 1982) and the non-Jewish rate decreased by 16.1 per 1,000 (from 37.1 - 21.0). However, the non-Jewish rate has remained close to double the Jewish level throughout the period.

There are about 70,000 Jewish births and 23,000 non-Jewish births yearly. The latter group is composed of Moslem and Christian Arabs as well as a sizable Druse population. The Jewish population is also heterogeneous, comprising four major ethnic groups--European, North African, Mid-Eastern and Yemenite. Intragroup differences among both Jews and non-Jews are smaller than the differences between them.

The data base

Analysis of national infant mortality patterns was based on the matched birth and infant death record file for the period 1977-80, obtained from the Central Bureau of Statistics. Fetal deaths have not yet been included for technical reasons but will be added to the data base, and stillbirth and perinatal mortality rates will be constructed. In order to base comparison of different population groups and different regions on stable rates, and have sufficient numbers for analysis of relevant risk factors, data for the 4-year period was combined.

National rates by age at death

The average infant mortality rate during the study period, 1977-80, was 13.1 for Jewish births and 26.6 per 1,000 for non-Jewish births (figure 4). The difference between the two groups is particularly striking in the post-neonatal period, when the average Jewish rate was 3.7 per 1,000 and the average non-Jewish rate 12.7 (a relative risk of 3.4). Post-neonatal deaths are the primary component of infant mortality among non-Jews while among Jews the early neonatal rate represents nearly 60 percent of all infant deaths (figure 5).

Cause of death

Inspection of the main causes of infant death in the two national groups shows significant differences in all categories except for maternal and obstetric causes and prematurity (table 1). The latter category is a combination of low birth weight related causes and respiratory distress syndrome.

Congenital malformations (28 percent) and prematurity (27 percent) are the major causes of death among Jewish infants; infections (28 percent) and malformations (24 percent) are the major causes among the non-Jews. The relative risk of death from a malformation is 1.7 times greater among the non-Jews. The largest disparity among the two national populations is in infectious disease mortality (7.3/1,000 among the non-Jews, 5.6 times greater than the comparable rate among Jews--1.3 per 1,000). This excess is mainly due to gastrointestinal infections.

Maternal age at delivery, maternal education and parity, and differences in urban-rural residence all contribute to the differential between national groups. Multi-variate analysis will be performed for evaluation of the contribution of these factors to the differences in infant mortality.

Regional analysis

Israel has about 4 million inhabitants; 3,400,000 Jews and 670,000 non-Jews. The country is divided into 23 health regions with 100,000-300,000 persons each. These regions have only recently been defined and do not represent functioning administrative entities.

The current project is limited to six of these regions situated throughout the country. The six regions under investigation include about 31 percent of all the births in the country, among Jews and non-Jews alike. The combined IMR for all the regions is similar to the national rate during the study period. Our analysis shows considerable differences between the different regions (figure 6).

Statistical methods

In order to obtain relatively stable rates within the regions and in communities of only a few hundred births, a number of years were combined. Communities with very few deaths were grouped together with others in the same Regional Council, or combined with communities of similar characteristics (Kibbutzim, rural villages). A community is considered as having excess mortality, if at least one of the following conditions exist:

- There is an excess in crude IMR.
- There is an excess in either the early neonatal, late neonatal or the post-neonatal rate.
- There is an excess rate in one or more specific causes of death.

The community rates were compared to the comparable rates in the rest of the region and to the national standards. The quantitative basis for definition of a community with excess infant mortality was the level of the significance of the difference between its rate from the national or regional rates--a measure of distance from the standard. The definition was chosen with the approach that it is preferable to obtain false-positives (communities identified as having excess mortality, while their deviation from the standard is a chance deviation) than false-negatives (communities with excess mortality which are not identified).

A local intervention program

The Ramat Gan region (figure 7) has the lowest IMR of all areas presented, yet not all communities within this area are similar. Of the five communities in the area, four are low, while one community stands out with considerable excess infant mortality--Or Yehuda.

The Ramat Gan area was the model for the entire project and an active intervention program has been in place since 1982. The original analysis was done on 1973-76 matched birth and death records and the excess mortality in Or Yehuda was even more pronounced during that period (figure 8 and table 2).

In 1973-76, the infant mortality rate in Or Yehuda, the lowest socioeconomic community in the area, was almost twice as high as the rate in the rest of the district. There was more than a three-fold difference in the late neonatal (3.5) and in the post neonatal periods (3.2), while the perinatal death rate was essentially similar to that of the rest of the area. Within these years, the death rate from respiratory infections, and in particular pneumonia, was eight times greater than the area or the national average.

Or Yehuda is a community of 18,000 in the center of the country, composed of immigrants from Iraq and Libya and their descendents with a recent addition of newcomers from Asian Russia. It is situated only a few kilometers from two major teaching hospitals, and has a comprehensive network of primary medical services.

The findings shown above stimulated an investigation into the causes for the excess mortality in Or Yehuda. The project team included the Sick Fund Director responsible for primary services and the Head of Pediatrics in the Regional Medical Center--a 1,100 bed government teaching hospital. This group worked jointly on the data and their implication for area medical services. Clinical records were assessed, and an intrinsic problem was uncovered: the breakdown in transmission of clinical information from one treatment site to another.

Epidemiological analysis showed large disparities in population risk characteristics between Or Yehuda and the rest of the District (table 3). However, these excess population risk characteristics did not explain the excess mortality, which was not limited to the known risk groups (tables 4-5). The pattern, however, did hint at potentially preventable deaths, with severe social deficiencies that might influence behavior during pregnancy and child rearing, contributing to the high infant mortality. There are limitations to the influence of medical care systems, optimal as they may be, in the face of these deficiencies. While it is unlikely that health system intervention will remove these problems, it may be able to ameliorate their effects. The Or Yehuda program aims and strategies, as well as some of the implementation elements, are shown in figures 9-11.

Current situation

An overview of the yearly infant mortality rates in Or Yehuda to date is presented in figure 12. The intervention program began at the end of 1981. In 1982 the rate in Or Yehuda leveled, and it decreased further in 1983. However, the number of births is small and the difference from previous years is not significant. The yearly rates are very unstable, based as they are on only 500 births. The comparison standard rates for the rest of the region are as yet unavailable and these must be used to properly evaluate change. The mortality rates are not the only criteria for program evaluation and other outcome and process indexes are being developed.

Application of demonstration project

The Or Yehuda Program serves as a model for the National Program. The data processing and statistical techniques developed in the analysis of the Ramat Gan regional prototype are being applied for all six regions. Analysis of population risk characteristics and characteristic-specific mortality rates are currently underway and will be used for targeting intervention.

Thirty-six other communities have been identified among the study regions as having excess infant mortality according to one or more of the pre-defined criteria. The regional working parties are now developing their own situation analyses on the basis of data provided and local information. They are preparing tentative intervention programs according to local problems, priorities and feasibility.

The central working party is responsible for standard setting in data analysis and for coordination and guidance of the regional committees. The locally developed planning program in Or Yehuda, using epidemiological techniques to identify public health problems and target populations has become the model for the National Infant Mortality Differential Project and both are developing along the lines of a planning cycle. Change takes place in a real-world environment, with different sponsors of medical care, different levels of proficiency among medical and nursing care-givers, and very different population needs within each region.

Table 1. Infant mortality rate by cause of death, Jews and non-Jews: 1977-80.

Cause of death	Jews	Non-Jews	Relative risk
Total births	282,364	93,584	-
All causes	13.1	26.3	[1]2.0
All infections	1.3	7.3	[1]5.6
Congenital anomolies	3.7	6.2	[1]1.7
Maternal and obstetric causes	1.9	2.0	1.1
Prematurity index	3.5	4.1	1.2
Other perinatal conditions	0.9	1.5	[1]1.7
Other diseases	0.7	1.7	[1]2.4
Accidents and adverse effects	0.2	0.7	[1]3.5
Ill-defined conditions	0.9	2.8	[1]3.1

[1] $p<0.05$.

Table 2. Infant mortality rate per 1,000 live births: 1973-76 average

Age at death	Or Yehuda	Rest of region	Relative risk
Number of births	1,974	25,963	
Total infant mortality	26.3	13.5	1.95
Perinatal mortality	19.6	16.4	1.20
Stillbirths	9.0	7.7	1.17
Early neonatal	10.6	8.6	1.23
Late neonatal	5.6	1.6	3.50
Post neonatal	10.1	3.2	3.16

Table 3. Description of maternal population by risk factors (percent of all births).

Characteristics	Or Yehuda	Rest of district	Kiryat Ono	Bnei Brak	Givataim	Ramat Gan
0-8 years of school	56.3	14.1	15.2	15.2	10.2	14.2
Less than 19 years of age	10.7	1.8	1.8	2.0	1.0	1.8
5 births or more	13.5	9.7	5.0	19.1	2.8	3.1

Table 4. Infant mortality rate per 1,000 live births, by age of mother: 1973-76.

Age of mother	Or Yehuda	Rest of region	Relative risk
Under 19 years	37.7	17.5	2.15
20-24 years	17.3	13.4	1.29
25-29 years	29.3	12.0	2.44
30-34 years	44.4	11.4	3.89
35 years and over	6.4	17.8	0.39

Table 5. Infant mortality rate by birth weight

	Percent of all births		Mortality rate		
Birth weight	Or Yehuda	Rest of district	Or Yehuda	Rest of district	Relative risk
Total[1]	100.0	100.0	26.3	13.5	1.95
Less than 2,499 grams	7.8	5.9	143.8	120.5	1.19
2,500-3,999 grams	83.3	84.9	14.0	5.8	2.41
4,000 grams or more	6.4	7.1	31.7	7.7	4.12

[1] Includes infants of unknown birth weight.

Identification of communities/regions with excess infant mortality

Description of high rate communities

Identification of target populations

Analysis of factors contributing to excess mortality

Development and implementation of intervention programs

Evaluation of intervention outcome

Figure 1. National program aims

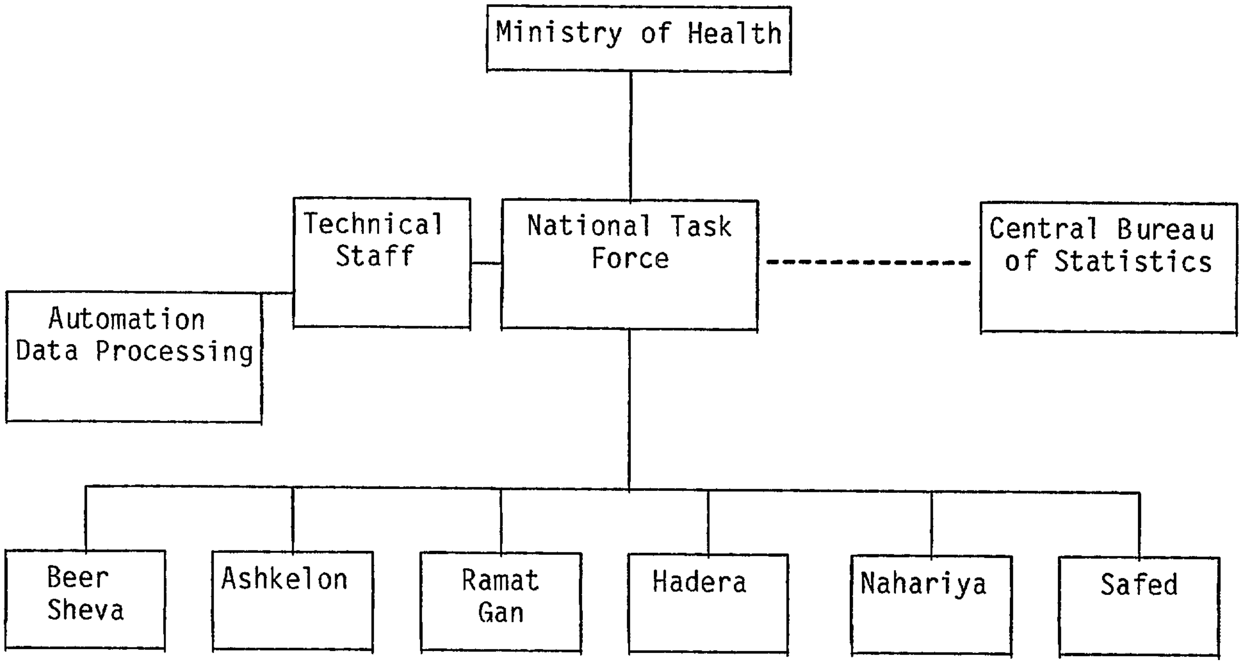


Figure 2. Organizational chart: differentials in infant mortality

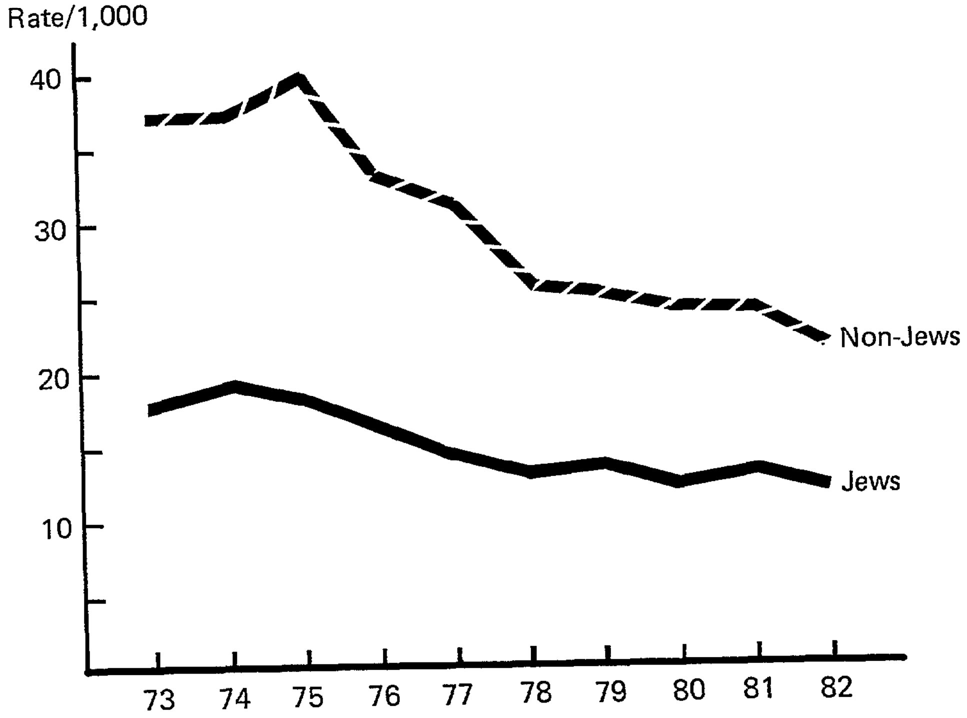


Figure 3. Infant mortality rate in Israel: Jews and non-Jews, 1973-82

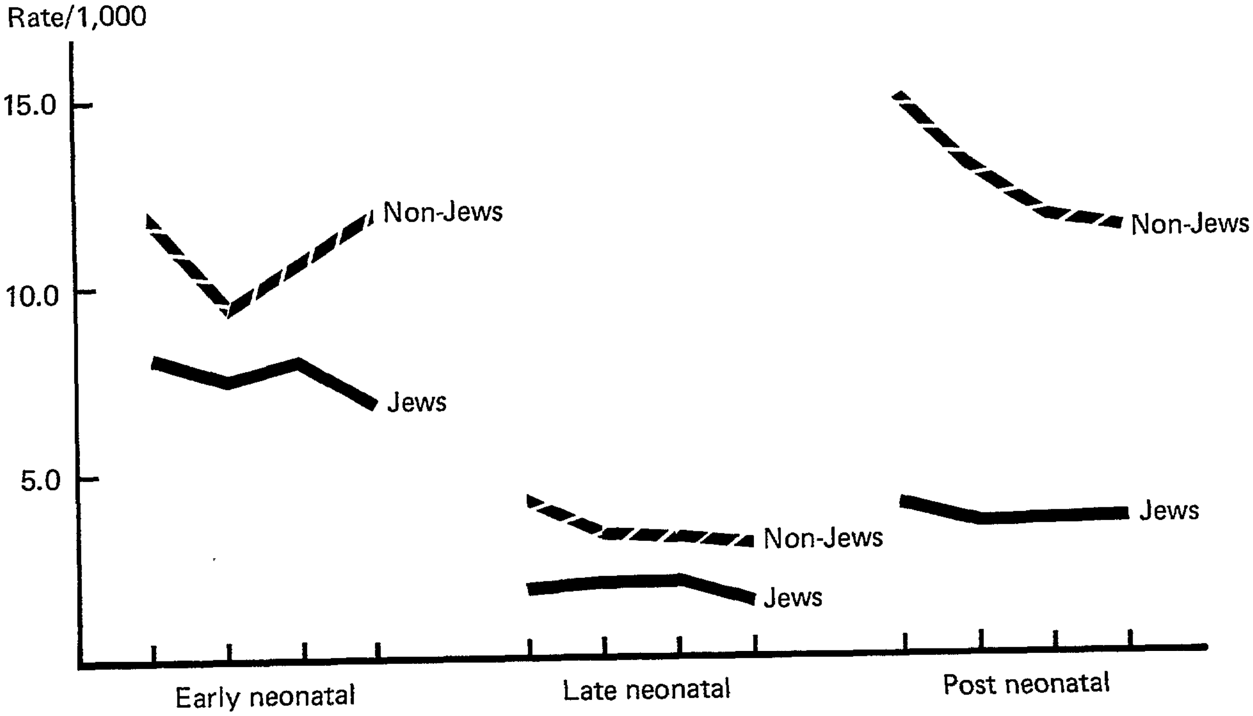


Figure 4. Infant mortality rate by age: Jews and non-Jews, 1977-80

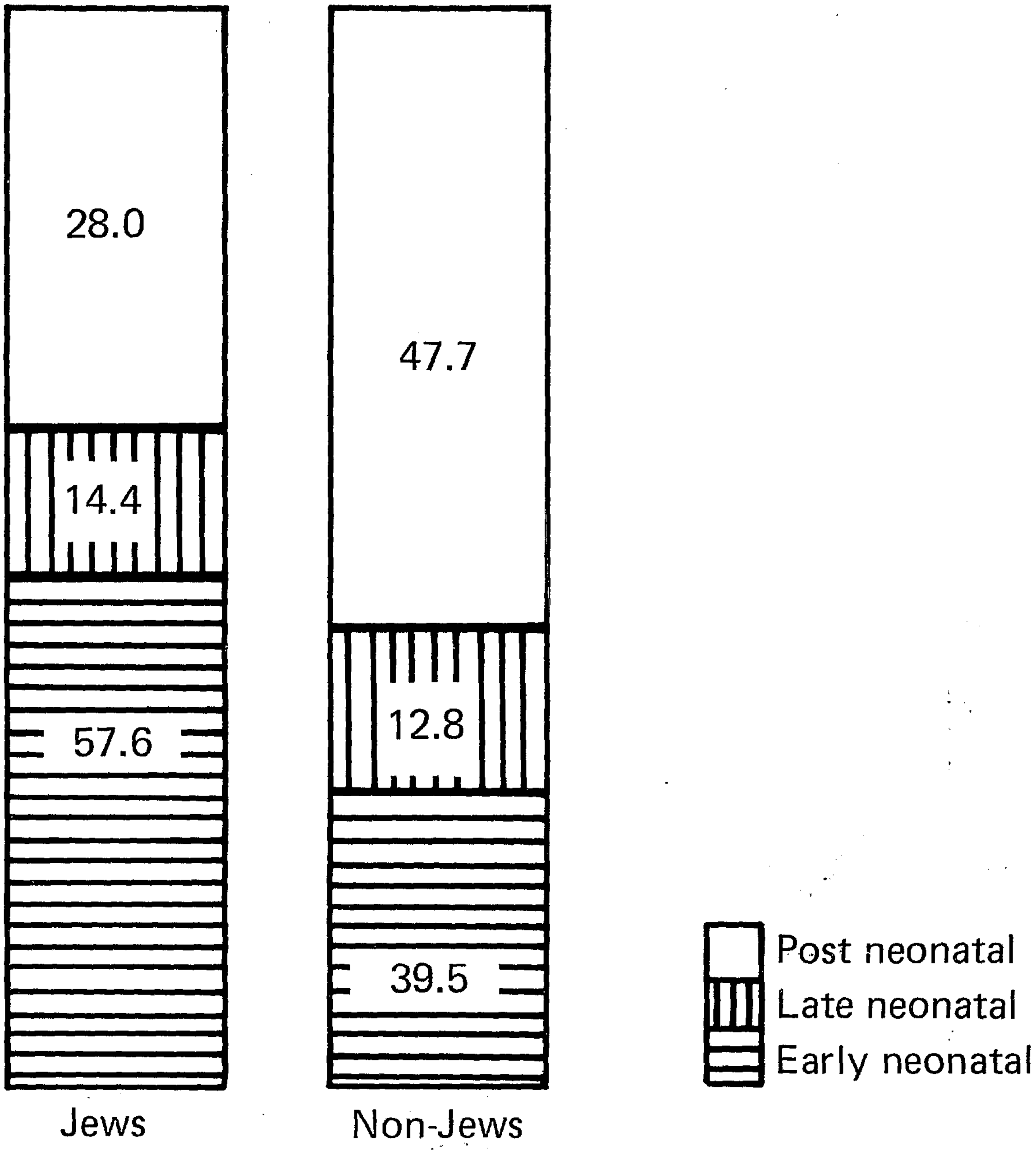


Figure 5. Percent of all infant deaths, 1977-80

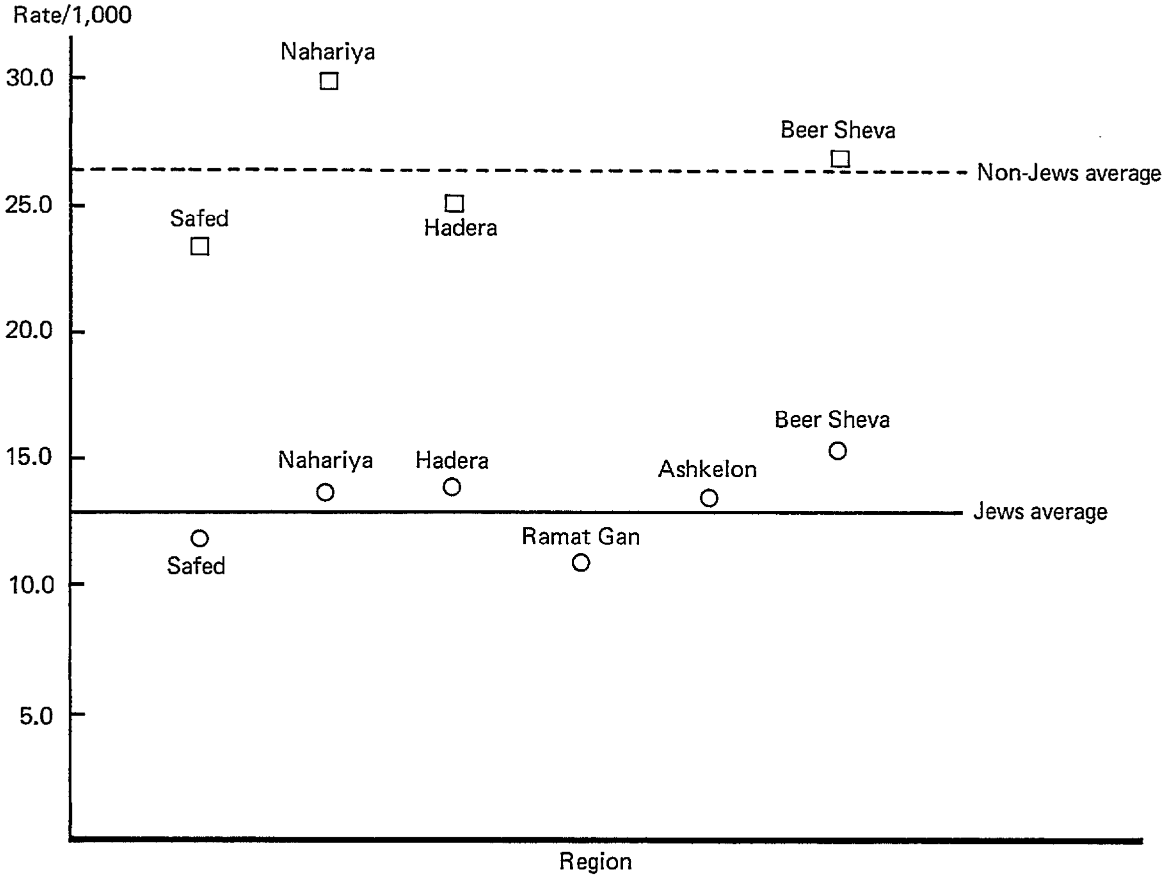


Figure 6. Infant mortality rate by region, 1977-80

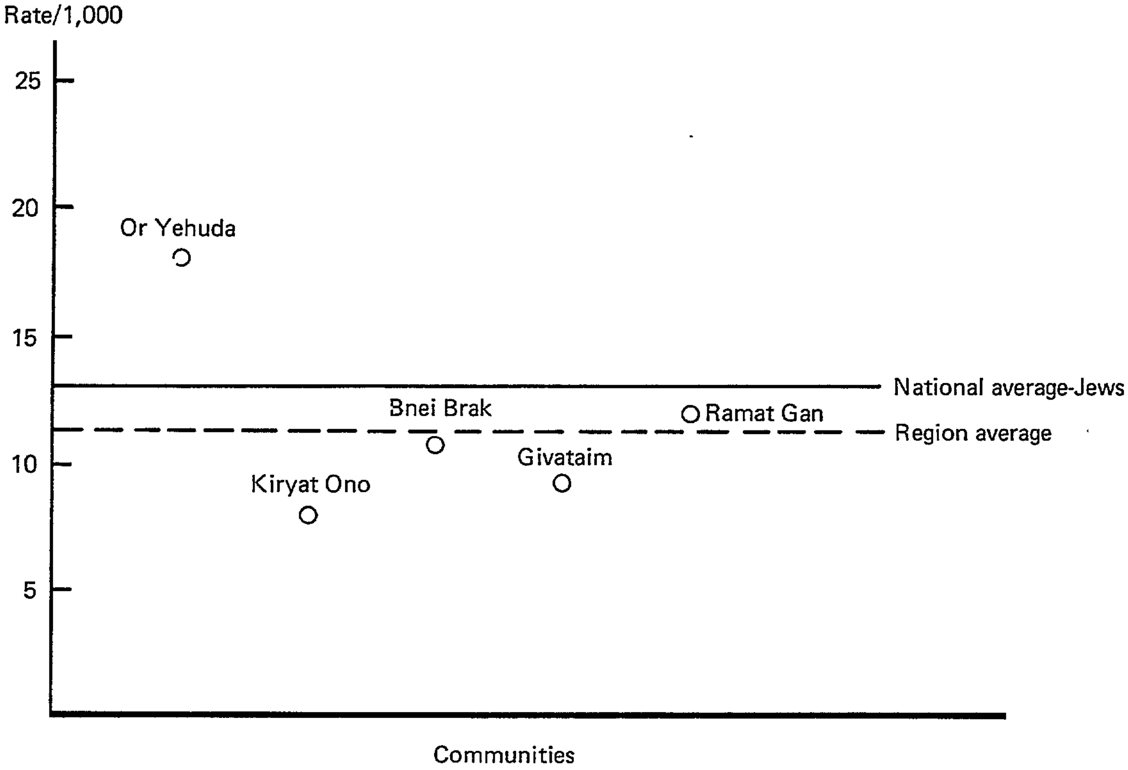


Figure 7. Infant mortality rate in Ramat Gan Region, 1977-80

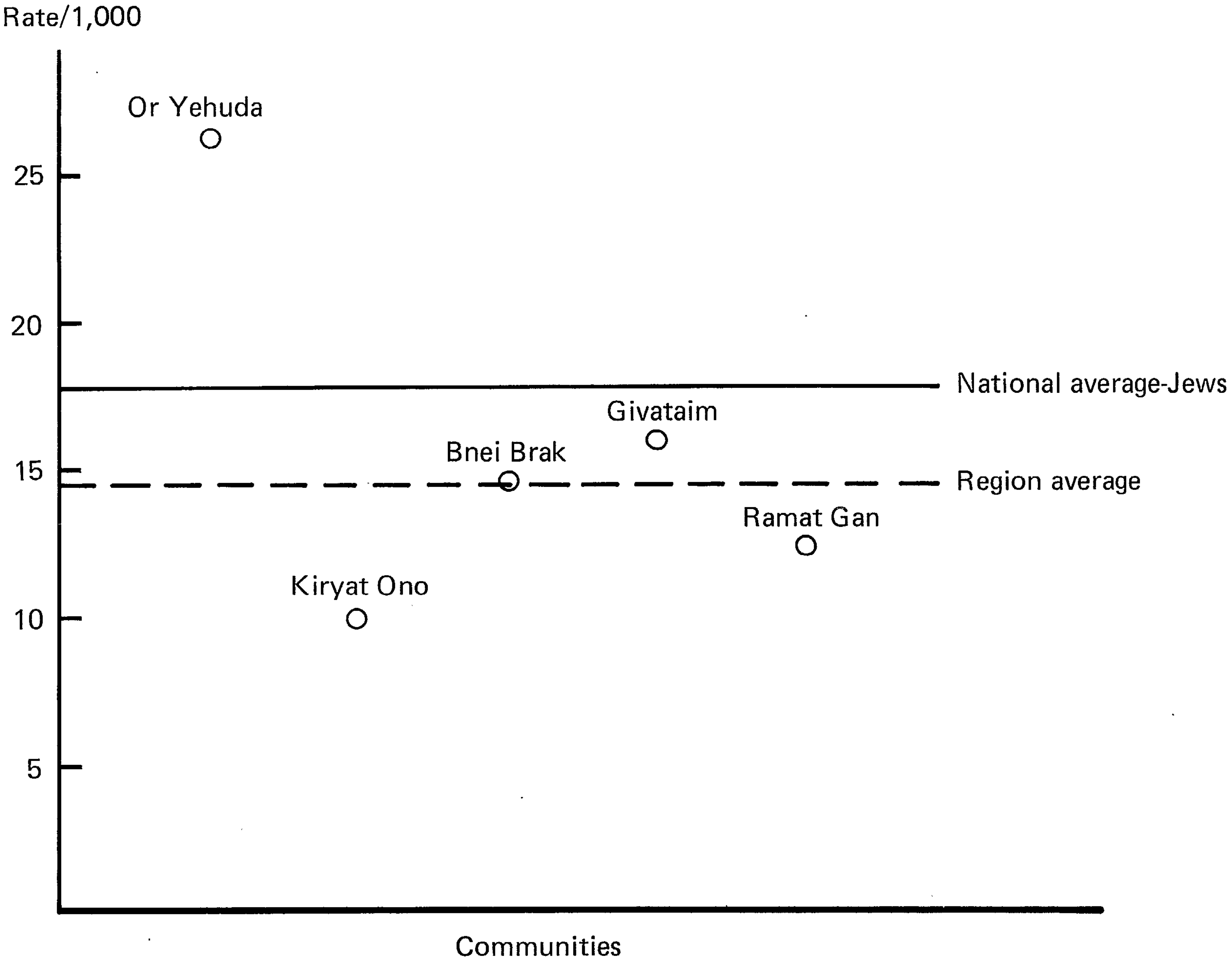


Figure 8. Infant mortality rate in Ramat Gan Region, 1973-76

Situation analysis:

- Statistical analysis of births and deaths
- Epidemiological investigation of deaths
- Joint infant mortality conference

Intervention program:

- Reduction of Or Yehuda infant mortality rate
- Promotion of continuity of care and appropriate medical management

Figure 9. Or Yehuda program aims

Increase primary care capabilities:

- Monitoring mother and child care
- Accessibility of all relevant patient data
- Identification of population risk factors
- Identification and followup of high risk cases

Integration of health systems:

- Increase in transfer of information
- Integration of hospital with primary clinics
- Coordination between pediatric and obstetric services

Figure 10. Program strategy

- Increase in local autonomy in resource allocation
- Joint forum for program management
- Catalyst - service sponsors outside health sector

- Hospital obstetric staff ----> community gynecology clinics
- Board certified pediatricians ----> half-time hospital and community
- Public health nurses added ----> direct community service

- Fetal monitor in community clinic
- Access to ultrasound
- Serum alpha fetoprotein

- Psychologist
- Particularized health education programs

Figure 11. Implementation elements

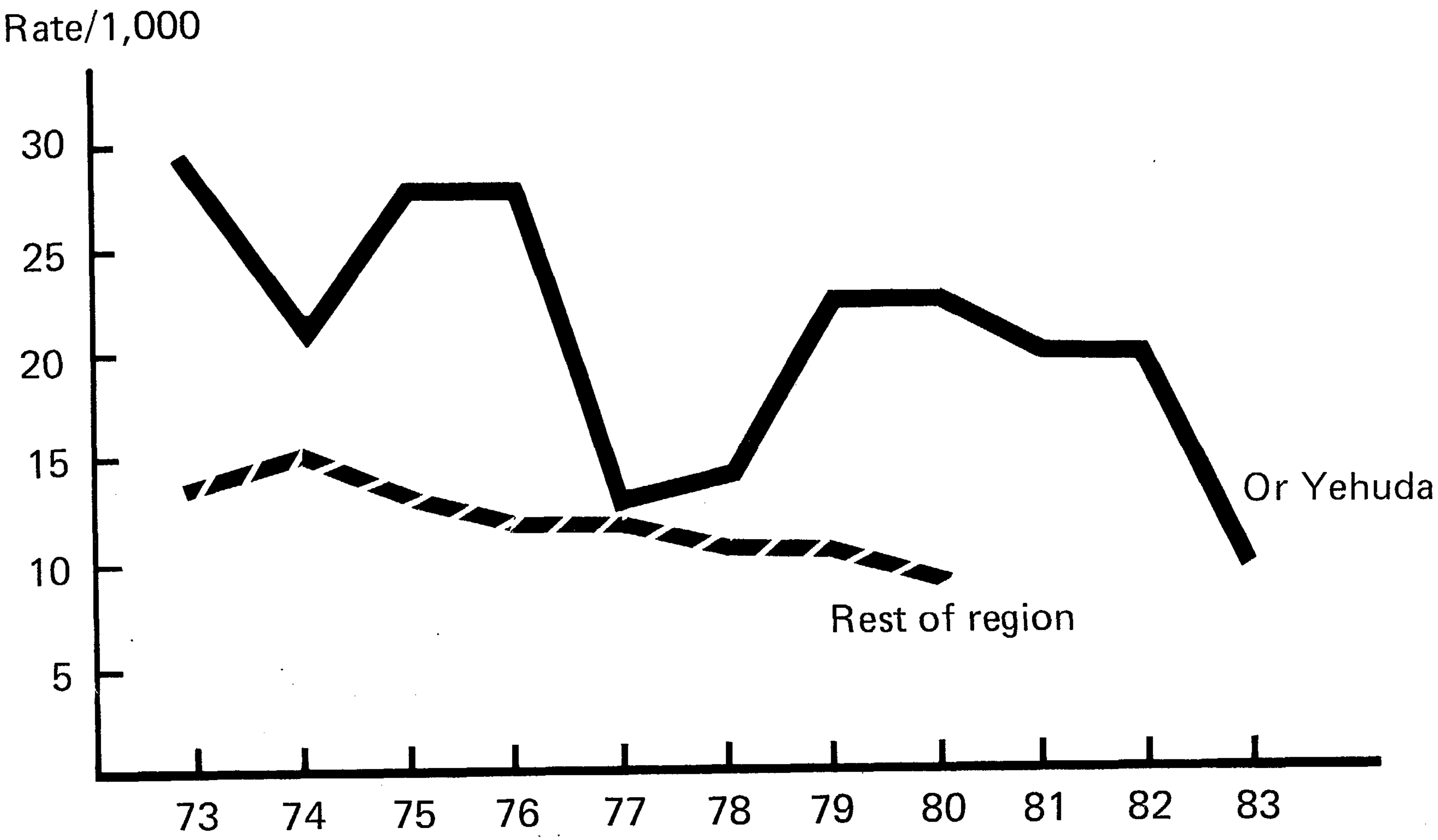


Figure 12. Infant mortality rate, Or Yehuda and rest of Ramat Gan Region

Discussion

Dr. Wegman: One question; is there a reason why the list of causes of death do not follow the international classification?

Mrs. Barell: They are based on the international classification.

Dr. Wegman: The terminology is quite different.

Mrs. Barell: Well, that's probably my English translation from my Hebrew classification. I get a little bit mixed up in language.

However, the ICD-9, I think, is one of the most unfortunate codes produced for work in perinatal and infant mortality. I think they've cut out a lot of the etiological factors that used to be in some of the old codes and separated them out, and have made some problems.

Dr. Wegman: Well, one problem in the other direction, however, is you don't include SIDS at all.

Mrs. Barell: SIDS is included within one of the categories.

Dr. Wegman: But it's separated in the ICD.

Mrs. Barell: Okay. Well, these are combinations of causes which we thought were a relative classification for Israel. Of course, they are based on ICD. SIDS, by the way has a very, very low instance in Israel. We don't know whether it's a coding artifact or what, but I think it's something like less than 0.5 per 1,000.

Dr. Wegman: The only point of my remark is that if we're looking for comparative studies among various countries, then the need to follow a single classification ought to be overriding, it seems to me.

Mrs. Barell: Just to correct, perhaps, the impression, this is the terminology that was used for presentation to field-level people in Israel.

Of course, all of these are based on ICD classifications in grouping. There's no problem with recombination of the data in any manner whatsoever.

Dr. Kleinman: Is the high incidence of mortality among non-Jews compared to Jews also reflected in a higher incidence of low birth weight and very low birth weight?

Mrs. Barell: We have differences in the different regions. First of all, in the south area, the Bedouins, for example, have a considerably higher proportion of low birth weight than the Arab populations of the Naharea do, which was highest mortality rate there.

However, their survival, this all seems to represent some kind of probably genetic factors down there. So the picture isn't homogeneous throughout the country.

However, there is a problem of different types of reporting problems. In the Naharea area the rates have been on the decrease among the non-Jewish population, and the Bar Chevi area, the Bedouin area, because of tremendous input by the health services for improving cause of death reporting, they have managed to keep their rates steady. So I don't know to what extent this is artifactual or not.

Dr. McCarthy: In looking at the differences between the regions, particularly in post-neonatal mortality, does your data base include birth weights such that you would be able to look at birth weight-specific, cause-specific post-neonatal mortality rates?

Mrs. Barell: The data base includes all the information on the standard Israeli birth certificate and death certificate. The birth certificate and death certificate, of course, were matched, and all the relevant characteristics, such as birth weight and maternal education, paternal education, sociooccupational level of father and so on, are all available for analysis.

Dr. McCarthy: Am I correct in remembering that birth weight, however, until recently was not an entity that was well filled out on the certificate?

Mrs. Barell: Birth weight in Israel is well filled out, to the best of my knowledge.

Dr. McCarthy: Well filled out?

Mrs. Zadka: May I answer, please. Birth weight is recorded on the birth certificate since 1950. Also for non-Jews.

Mrs. Barell: Now, the level of reporting on birth weight--some of the socioeconomic indicators, there are problems, but not with birth weight.

Status of Pregnancy in Japanese Women

by Eikichi Matsuyama, M.D.

This afternoon I am going to talk about the status of pregnancy in Japanese women. This subject seems to be very important for decreasing perinatal and infant mortality rates.

Figure 1 shows the spontaneous fetal death rate by each age group of women in Japan in 1981. The fetal death means the fetal death of 12 weeks or more of gestation. The source of this data is the National Statistics of Japan. In the 25 to 29 age group, the fetal death rate is the lowest; the second lowest is the 30 to 34 year age group, and the third lowest is the 20 to 24 year age group. Other groups of under 19 and over 35 years show much higher rates.

From these results it can be said that the babies who are born from the 25 to 29 year age group of mothers, the risk is the lowest and these babies must be most healthy. Also we can say it is most favorable for a woman to deliver her children between the ages 20 to 34 years.

Figure 2 shows the perinatal mortality rate in Japan in 1982 by each age group of women. We can see the same tendency in the 25 to 29 age group, the rate is the lowest, then the 20 to 24, and the 30 to 34 age groups. The rate of teenagers is rather high. The source of this data is also from the National Statistics.

Now, I'm going to talk about the status of marriage in Japan. Figure 3 shows the age distribution of the first marriage of males and females in Japan in 1981. The mean age of females is 25.3, and that of males is 27.9 in this year. Woman's age at the first marriage is very favorable from the viewpoint of giving birth.

Table 1 shows the live birth rate and the total fertility rate by year in Japan from 1930 to 1983. As you can see, the live birth rate and the total fertility rate has decreased every year, and last year, the total fertility rate was 1.80. The size of each family has recently become smaller. Average number of children in each family is now about 2.2.

Figure 4 shows the distribution of live birth rate by mother's age in Japan in 1950, 1965, and 1980. In the past, the distribution was wider from 20 to 40 years but recently, the distribution has gotten smaller from 20 to 34 years.

Almost all children are now born to mothers 20 to 34 years of age. This distribution is especially concentrated between the 25 to 29 age group. The majority of women over 30 years do not want to deliver a baby any more.

As you can see, the number of teenage mothers is fortunately still very small in Japan. This distribution is very favorable for giving birth, as I told you before, and this seems to be one of the big reasons why the perinatal and infant mortality rate has become very low in Japan. However, there is a problem of how women over 30 years of age avoid giving birth because this is carried out by means of induced abortion.

Figure 5 shows the number of live births and the induced abortions by year in Japan. The number of live births has decreased year by year but the number of induced abortions hasn't changed in these years. For example, last year we had about 1.5 million live births and 0.6 million induced abortions, so the number of induced abortions in Japan is rather big.

Figure 6 shows the distribution of induced abortion rate by age group of women and by year of 1955, 1970, and 1983 in Japan. The 30 to 34 year age group is the highest, and the majority of induced abortion cases in Japan is of women more than 30 years old. These women are housewives and they have one, two, or three children already.

Fortunately, the induced abortion of teenagers is still very small in Japan. Induced abortion cases of unmarried women is also very small. This is completely different from the United States's situation.

Figure 7 shows the perinatal mortality rate in Japan from 1960 to 1983. The rate has been decreasing year by year. The late fetal death rate is rather big compared with the early neonatal deaths.

Figure 8 shows the infant death by leading causes in Japan in 1982. The first cause, hypoxia and birth asphyxia, is rising; the second is congenital anomalies. They appear at the time of delivery. Besides these, the figures are very small.

Now, I am going to talk about another topic of congenital abnormalities. First of all, I will explain about the organization of the Japan Association for Maternal Welfare (JAMW). I am an obstetrician and gynecologist, and in Japan we have two associations. One is the Japanese Society of Obstetrics and Gynecology and the other is the Japanese Association for Maternal Welfare. I am a member of both the Society and the Association. The activity of the Society is limited to the academic field, but that of JAMW is much wider. The activity of this Association is experimental.

The Ministry of Health and Welfare has local governments and JAMW also has branch offices. The Ministry of Health and Welfare and JAMW cooperate with each other, and JAMW cooperates with the Society. Figure 9 shows the scheme of the relationship between the administrative system, JAMW and the Society.

The activity of JAMW has been very helpful in the field of maternal and child health (MCH) in Japan. For example, whenever the central government, that is the Ministry of Health and Welfare, has a new plan in the field of maternal and child health, the government asks the JAMW for cooperation. When the government gets the average agreement of JAMW, the new plan can be carried out very quickly. Figure 10 shows the main activities of JAMW. One activity I will explain is number 5, to promote the sociomedical measures for preventing birth defects.

Figure 11 shows the coverage of screening of inborn errors of metabolism, so called Guthrie test, and the number of patients in Japan. This screening system was started in 1977. This has been carried out by the cooperation of the Ministry of Health and Welfare and JAMW, so that the coverage of this test increased by 95 percent within only 4 years. In 1982, the coverage reached 97.8 percent.

Table 2 shows the frequency of inborn errors of metabolism in Japan from 1977 to 1982. Histidinemia is most frequent in Japan. The second most frequent one is cretinism. Phenylketonuria is not very common.

Table 3 shows the frequency of birth defects by year in Japan. These numbers include stillbirths. The survey covers about 5 percent of all newborns and stillborns. It seems that the incidence of anomalies has increased from 1979, but there is no significant difference in each year.

Table 4 shows the frequency of birth defects by month from January to December. There is no significant difference in each month. Table 5 shows the frequency of birth defects by mother's age. For mothers over 35 years of age the incidence of birth defects increased. Table 6 shows the frequency of birth defects by sex. Birth defects in male children are much more frequent than in female children. Table 7 shows the main type of birth defects. The first is cleft palate and the second is cleft lip. They are very common in Japan. The others are shown in the table.

Table 1. Live birth rate and total fertility rate by year: Japan

YEAR	LIVE BIRTH RATE PER 1000 POPULATION	TOTAL FERTILITY RATE
1930	32.4	4.71
1950	28.1	3.65
1955	19.1	2.37
1960	17.3	2.00
1965	18.7	2.14
1970	18.8	2.13
1975	17.1	1.91
1978	14.9	1.79
1979	14.2	1.77
1980	13.6	1.75
1981	13.0	1.74
1982	12.8	1.77
1983	12.7	1.80

Table 2. Number and frequency of inborn errors of metabolism: Japan, 1977-82

Name of disease	Number of patients	Frequency
Histidinemia	990	1:7,900
Phenylketonuria	112	1:69,600
Galactosemia	98	1:79,600
Homocystinuria	49	1:159,200
Maple syrup urine disease	17	1:458,800
Others	75	
Cretinism*	554	1:8,100

*1979～1982

Table 3. Frequency of birth defects, by year: Japan, 1972-83

YEAR	NUMBER OF BIRTHS	NUMBER OF ANOMALIES	%
1972	106,081	731	0.70
1973	109,676	757	0.70
1974	80,223	604	0.75
1975	96,921	795	0.82
1976	105,450	774	0.73
1977	98,418	721	0.73
1978	93,723	772	0.77
1979	160,563	1,435	0.89
1980	158,145	1,400	0.89
1981	140,738	1,191	0.85
1982	121,806	1,033	0.85
1983	125,579	1,157	0.91
TOTAL	1,397,323	11,320	0.81

Source : JAMW

Table 4. Frequency of birth defects, by month: Japan, 1972-83

MONTH	NUMBER OF BIRTHS	NUMBER OF ANOMALIES	%
JAN	119,645	1,028	0.86
FEB	109,375	965	0.88
MAR	114,060	1,085	0.95
APR	113,196	1,066	0.94
MAY	118,769	1,098	0.92
JUN	113,374	992	0.87
JUL	124,933	1,051	0.84
AUG	124,434	1,042	0.84
SEP	120,317	1,026	0.85
OCT	117,628	1,003	0.85
NOV	108,299	931	0.86
DEC	113,049	975	0.86

Source : JAMW

Table 5. Frequency of birth defects, by age of mother: Japan, 1972-83

AGE	NUMBER OF BIRTHS	NUMBER OF ANOMALIES	%
～19	8,210	60	0.73
20～24	270,861	2,421	0.89
25～29	717,966	6,147	0.86
30～34	314,872	2,798	0.89
35～39	58,706	687	1.17
40～	7,341	139	1.89

Source : JAMW

Table 6. Frequency of birth defects by sex: Japan, 1972-83

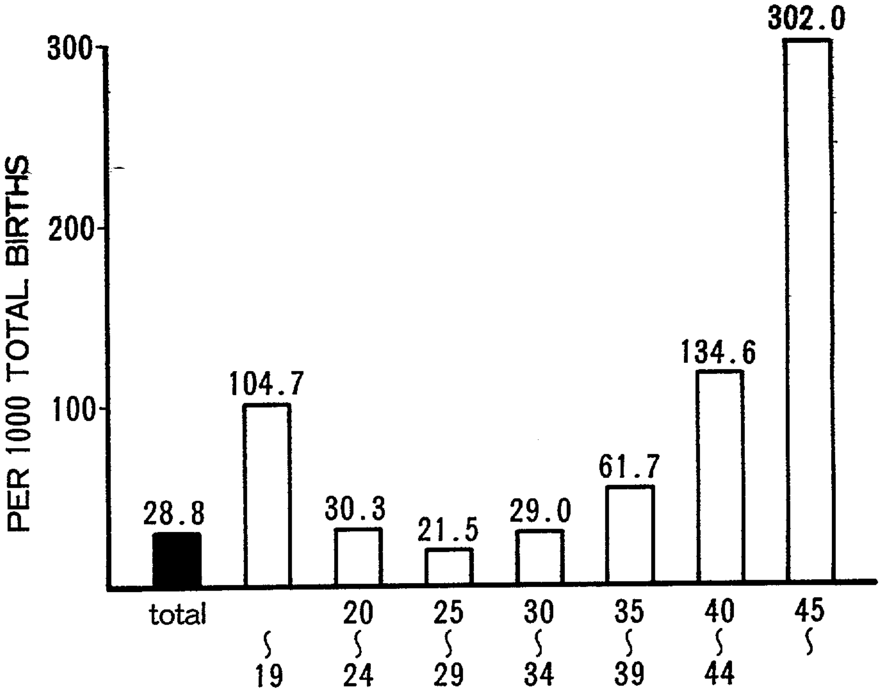
SEX	NUMBER OF BIRTHS	NUMBER OF ANOMALIES	%	SEX RATIO
MALE	606,638	5,508	0.91	58.5%
FEMALE	576,303	3,904	0.68	41.5%

Source : JAMW

Table 7. Main type of birth defects: Japan, 1979-83

TYPE OF ANOMALIES	NUMBER OF ANOMALIES
1. Cleft palate	921
2. Cleft lip	917
3. Anencephalus	677
4. Polydactyly of hand	534
5. Syndactyly of foot	483
6. Down's syndrome	342
7. Polydactyly of foot	307
8. Aproctia	274
9. Auricular anomalies	257
10. Hydrocephalus	253

Total number of birth defects : 6.216
Source : JAMW



*Fetal deaths of 12 weeks or more.

Figure 1. Spontaneous fetal death rate: Japan, 1981

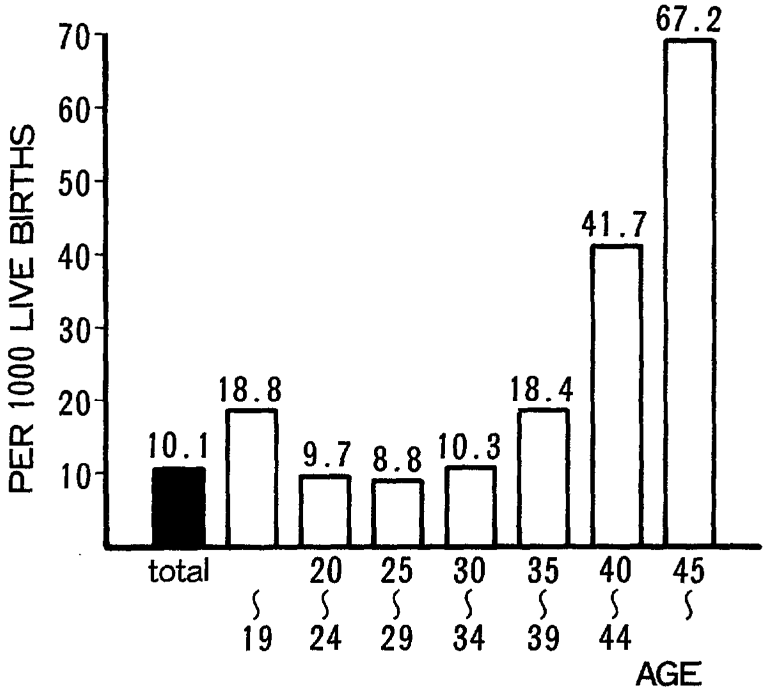


Figure 2. Perinatal mortality rate: Japan, 1982

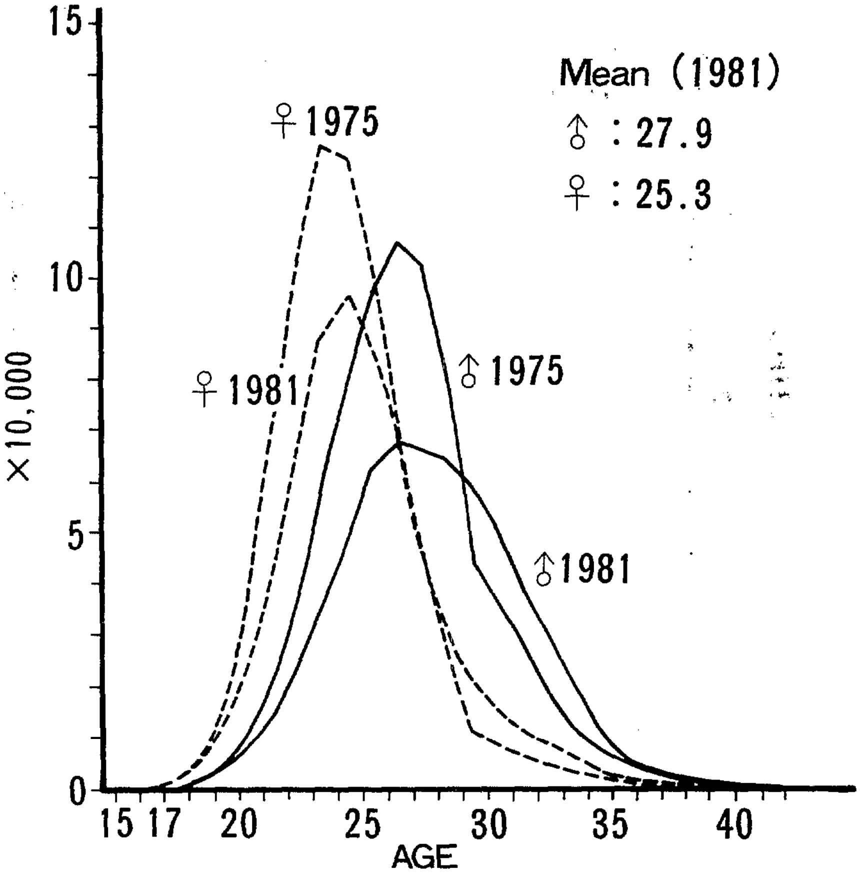


Figure 3. Age distribution of the first marriage: Japan, 1975, 1981

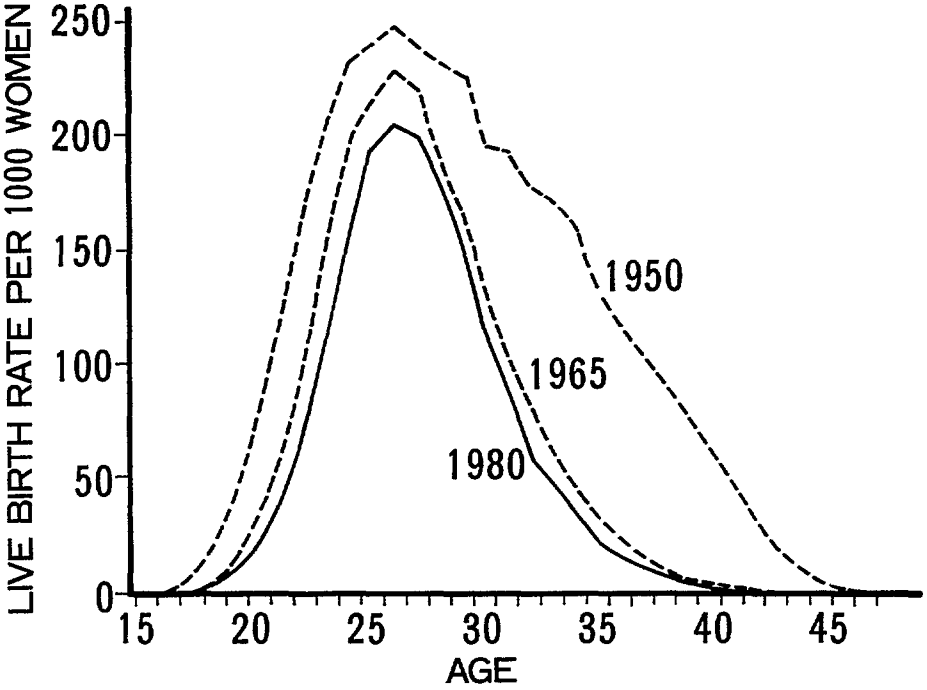


Figure 4. Live birth rate, age of mother: Japan, 1950, 1965, 1980

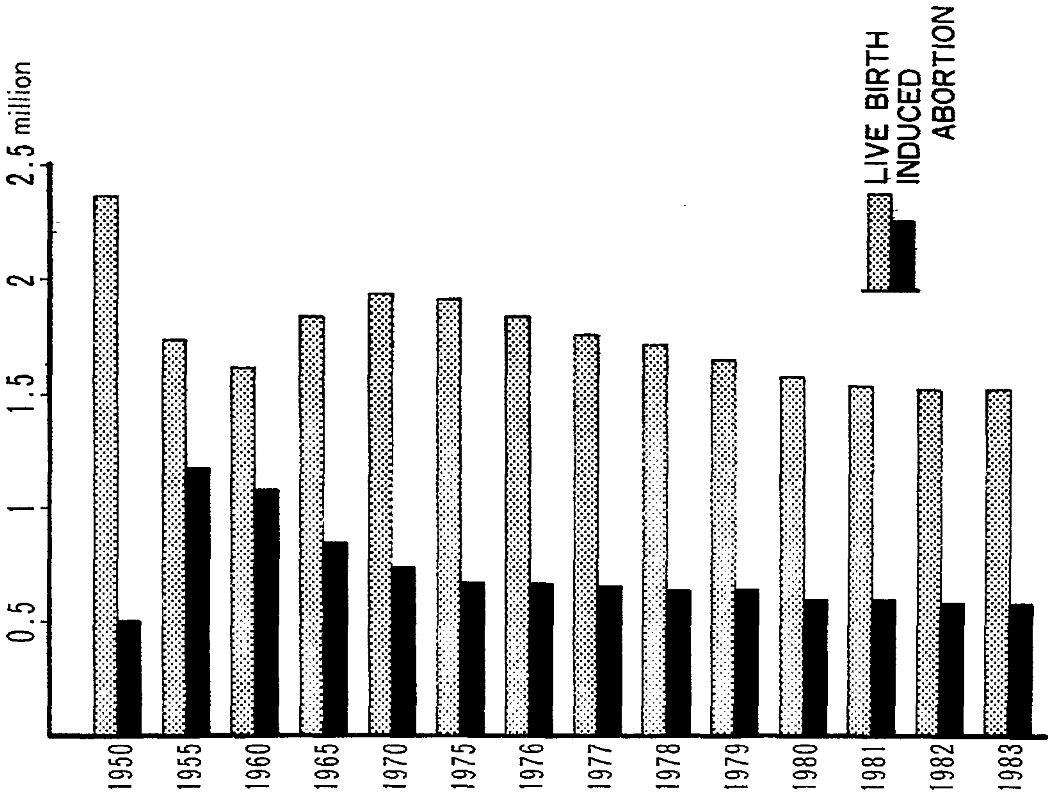


Figure 5. Number of live birth and induced abortion, by year: Japan, 1950-83

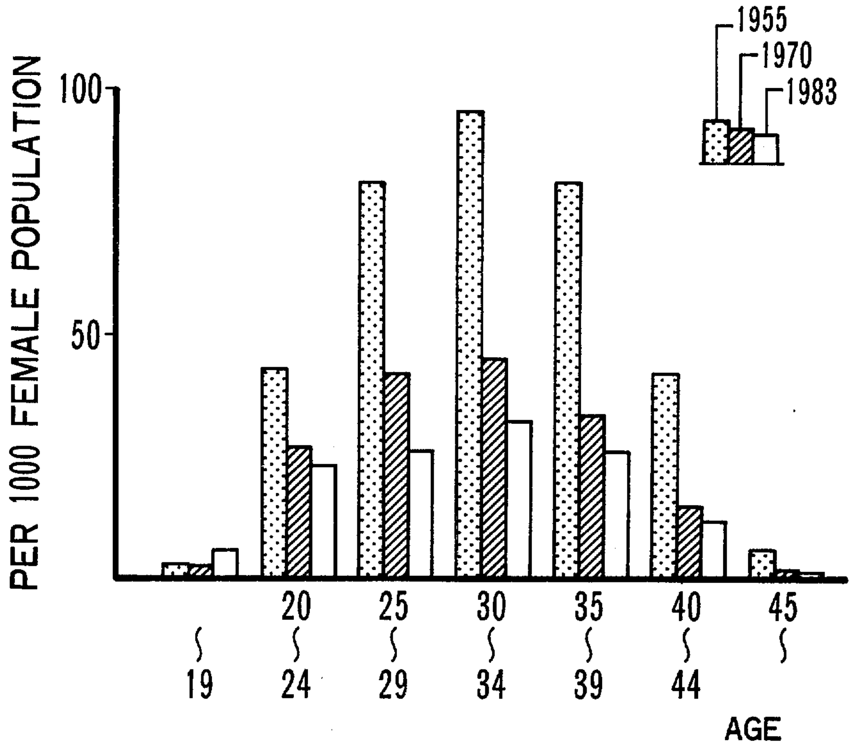


Figure 6. Induced abortion rate, by age and year: Japan

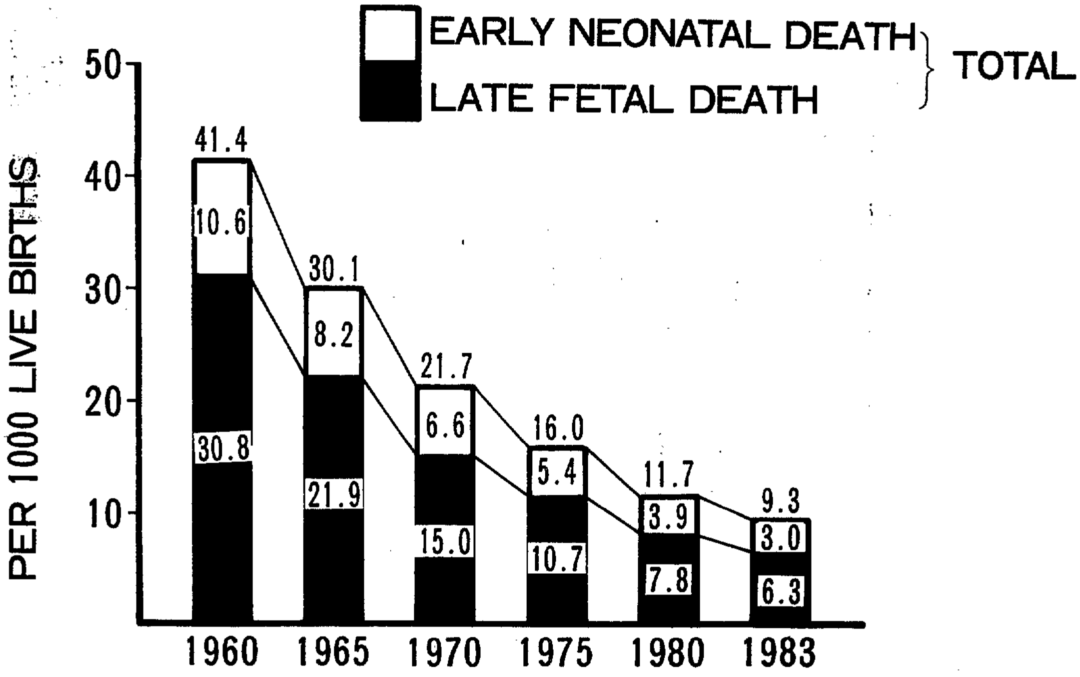


Figure 7. Perinatal mortality rate: Japan, 1960-83

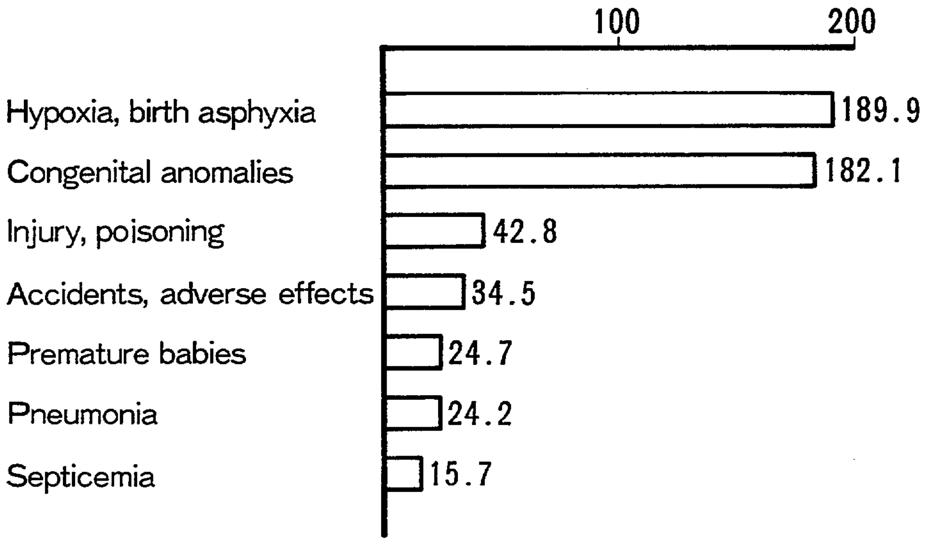


Figure 8. Infant deaths, by leading causes: Japan, 1982

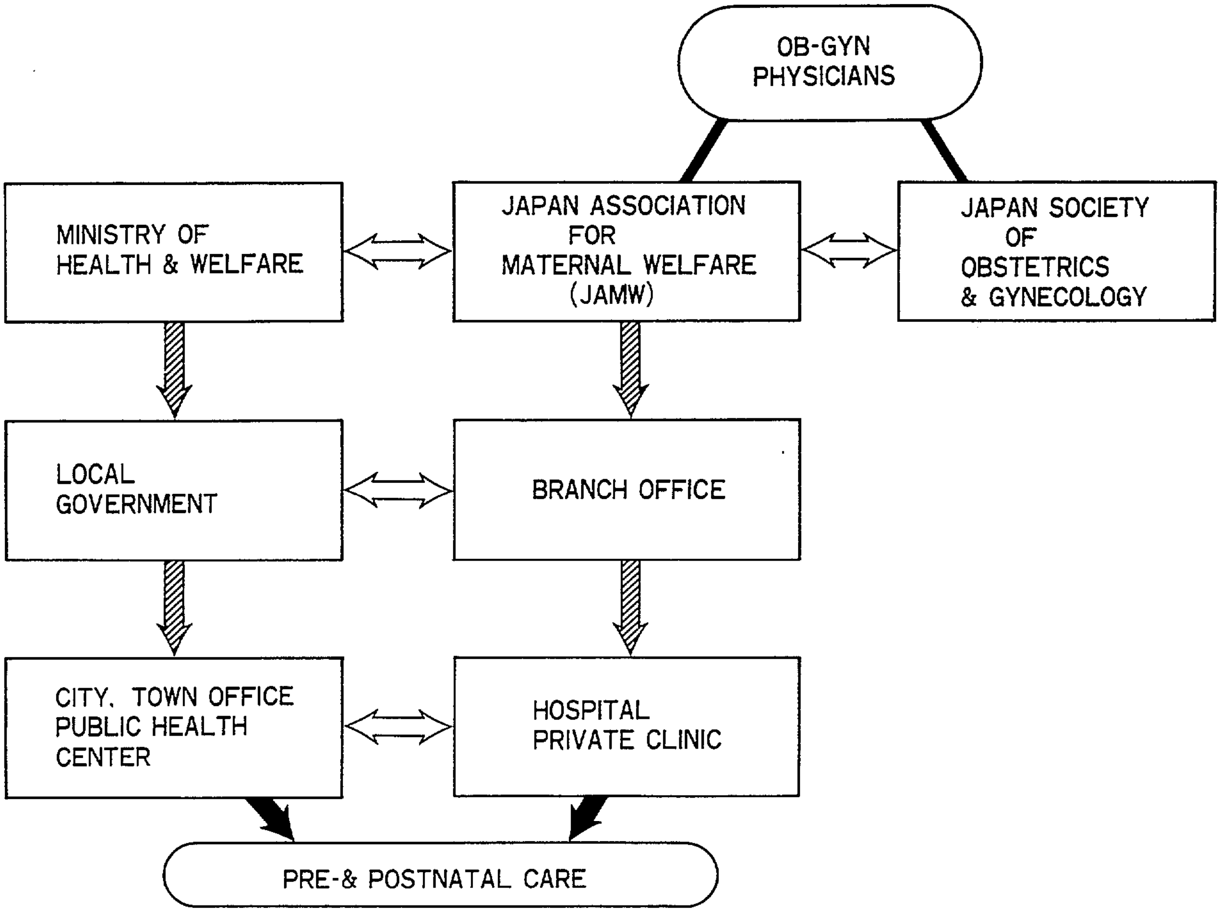


Figure 9. Organizational framework of health services in Japan

1. To promote appropriate applying the Eugenic Protection Law.
2. To implement lifetime training of practicing OB-GYN physicians.
3. To promote maternal and child health care system.
4. To improve emergency measures for mothers and children.
5. To promote socio-medical measures for preventing birth defects.
6. To establish a mass screening system for uterine cancer.
7. To promote family planning.

Figure 10. Activities of Japan Assocation for Maternal Welfare (JAMW)

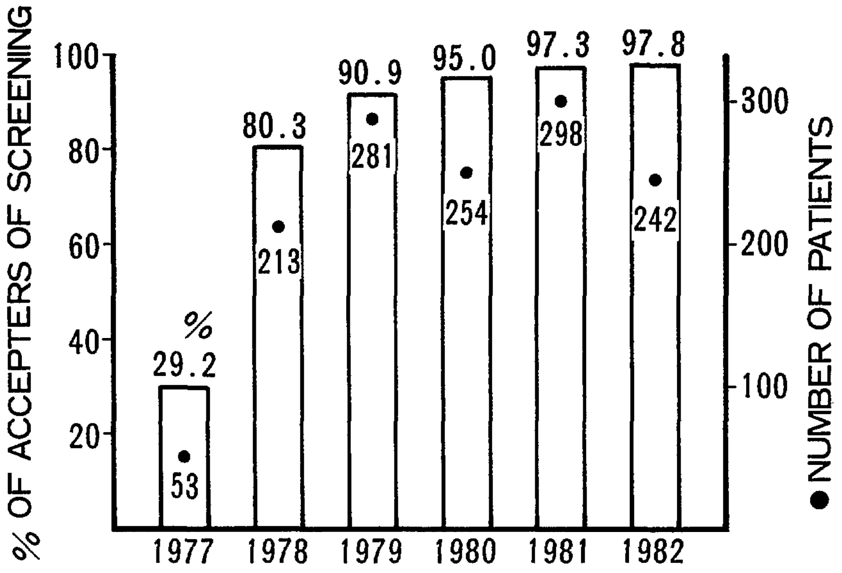


Figure 11. Accepter percentage of screening and number of inborn errors of metabolism: Japan, 1977-82

Discussion

Participant: On your malformation data, is that fairly complete reporting of malformation? Those rates are about what we have on our birth certificates, which we know are quite low, but I was wondering, is that fairly complete reporting of malformations, 0.9 percent?

Dr. Berendes: He wants to know whether the reporting is complete, whether all malformations are reported?

I think the question is, the rate of malformations is markedly low, and the question is whether all malformations are reported, or only serious malformations.

I guess we will have to leave the question open, and maybe we can talk about it during the break.

Dr. Kleinman: Are there any data on smoking among Japanese women?

Dr. Matsuyama: Yes, I have data. You mean smoking women during pregnancy, yes. In Japanese women, the number of smokers is not very large, compared with the American or European people, but with the smoker the instance of low birth weight babies is much higher compared with the nonsmoker, and also premature delivery, the incidence of premature delivery is a little bit higher than the nonsmoker group.

Dr. Berendes: I'd just like to make a comment. The age distribution of mothers is quite similar to certain areas of China, and in China, as you probably know, the state policy is to delay childbearing or delay the age of marriage of women to about age 23 or 24, for men to the age of 25 or 26, and as a result of that, most women reproduce between age 24 and 28, similar to what we see in Japan.

Snapshots of Perinatal Epidemiology in Norway

by Leiv S. Bakketeig, M.D.

Being brave Vikings, asking for trouble, my copresenter, Per Bergsjo and myself have prepared for the information of this symposium a list of recent publications in the field of perinatal medicine in Norway.

I should say that it's a highly biased selection of projects we have listed and you have to forgive us for that. We will briefly comment on a few of these projects, and those being interested in other projects listed may approach us and we will try to provide additional information.

As far as my own presentation goes, it's going to be even more selective and I will present a few things that I've been involved in myself over the last years. I will briefly talk about three different project areas; one has to do with longitudinal analyses within perinatal epidemiology; one has to do with one specific obstetrical procedure, namely screening by ultrasound in pregnancy; and the last area has to do with the evaluation of perinatal care.

Let me first inform you briefly about our medical reporting system of births in Norway. Since 1967, we have had a medical birth registration which covers all births, live births, and fetal deaths, age 16 weeks or more. This information system contains civic information on parents and also medical information on the mother and the child.

A unique 11-digit ID number is used for all individuals in our country, for the child, the mother, and the father. This unique number facilitates linkage between birth and death data, and also it facilitates linkage between subsequent births to the same mother.

The data sets that we have accumulated over the years now have been utilized quite extensively in studying recurrence risks and reproductive behavior among the mothers.

The tendency to repeat low birth weight has been known for a long time, and what we have been able to show in our data sets is that this tendency to repeat low birth weight is part of a very general tendency to repeat similar birth weights and similar fetal ages in successive births. It seems like mothers are programmed to produce birth of a certain size and a certain fetal age.

To illustrate this I will focus on the tendency to repeat small-for-gestation-age births; that is births with a birth weight below the 10th percentile weight for gestation. As you see from the first table (table 1), the relative risk of repeating a small-for-gestation-age birth once you have had one of those births is 3.3. This risk of repeating is cummulative and if you look at those mothers having three births, those with a not small-for-gestation-age (SGA) birth both the first and the second time, they have only a 6 percent risk of having a subsequent small-for-gestation-age birth, and the risk increases to 44.4 percent once you have had two previous small-for-gestation-age births.

This tendency to repeat is also associated with survival. Table 2 shows perinatal mortality of small-for-gestation-age second births by weight-for-gestation of the elder sibling.

If the elder sibling was average weight for gestation, the perinatal mortality is 39.5 per 1,000 for SGA births.

If the first birth was large-for-gestation age the perinatal mortality is 100 per 1,000; however, if the mother's previous birth also was a SGA birth, then the mortality is only 33.0 percent.

Let's then focus on one special group of second births, being small-for-gestation-age and weighing between 2,000 and 2,500 grams.

If the first birth was average for gestation age, then this particular group of births would have a perinatal mortality of 91.2 per 1,000, as compared to only 46.5 per 1,000 if the first birth was small-for-gestation-age, and if the first birth was large-for-gestation-age, then this second birth has a tremendously high mortality.

In the next table (table 3) the general pattern of repeating gestational age and birth weight is related to perinatal mortality, and as it appears there is a very close relationship between this tendency to repeat and mortality. For example, let us focus on second birth weighing 2,500 and 3,000 grams, related to the weight group of their previous sibling. The perinatal mortality for these births with a previous sibling weighing between 2,000 and 2,500 grams, is as low as 2.5 per 1,000, and as high as 32 per 1,000 if the first birth weight was between 3,500 and 4,000 grams.

Let us examine this group of second births in somewhat more detail.

As shown in table 3 the total perinatal mortality for these births is 14.2 per 1,000. However, if the births are subdivided into short, medium, and long babies, a tremendous difference in mortality appears. (Table 4) If it is a medium-long baby for weight, the perinatal mortality is 8.3 per 1,000, compared to 22.7 per 1,000 if the baby is short, and 38.1 per 1,000 if it is long. And if the data are examined in more detail, it appears that there is a very close relationship between the tendency to repeat and also the way the birth is in terms of the weight for length.

We have looked, so far, at mortality as the only outcome measure. Unfortunately, we don't have good enough morbidity data in the Norwegian birth registry study for purposes. However, I have got access to data from Western Australia that permit one to examine conditions like cerebral palsy and mental retardation in relation to the tendency to repeat birth weight. As it turns out this tendency to repeat similar birth weight, which is related to mortality, seems to have an equivalent on the morbidity side. This means that if one has a tendency to repeat a small baby, that small baby is at a lower risk of conditions like cerebral palsy and mental retardation, compared to an equally small baby delivered by a mother who is obviously programmed to have bigger babies.

Data collected longitudinally on successive pregnancies to the same mothers make it possible to compare groups of women with contrasting experience in terms of perinatal events, and also to study varying reproductive histories of individual women.

It is important to take advantage of perinatal data sets like the ones we have in our country, and longitudinal analyses are undoubtedly important and essential supplements to the traditional cross-sectional analysis.

I will now turn to a completely different issue and mention briefly a randomized control trial that we have just completed in our country.

Routine screening by ultrasonography in pregnancy is a very hot issue in Norway, as it is in many other countries. Research findings from randomized control trials are just starting to appear in the literature showing, so far, inconclusive evidence of the potential benefits of such a screening program and also, I could add, its potential hazards.

Two of these randomized trials have been performed in Norway, and both have been presented in The Lancet, one study from Alesund was presented in a recent letter to The Lancet (16 June), and our study, which I will show, was presented 1 week ago in The Lancet (28 July).

The purpose of this study was to evaluate the effects of ultrasound screening, twice during pregnancy, in the 18th and 31st week. We had a collaboration between 25 general practitioners in the Trondheim area surrounding the university hospital, and they all agreed to refer all their pregnant women to an ultrasound outpatient clinic. A total of 1,017 women were eligible for the study and 1,009 entered and were randomized into a screening group (510) and a control group (499). There were 13 abortions in the screened group and 19 in the unscreened group, and only one and two women in these two groups, respectively, were lost to followup.

One of the hypotheses to be tested was an earlier diagnosis of twin pregnancies.

As shown in table 5 in the screening group, out of six twin pregnancies, five were diagnosed prior to the 20th week, compared to only one in the control group. The mean duration of pregnancy in the two groups was seemingly different, but due to small numbers, these differences are not statistically different.

There were no differences in morbidity and complications during pregnancy in the screened and unscreened groups. And the referrals to obstetricians as well as sick leaves showed no differences. Admittance to a hospital, on the other hand, was significantly different in the two groups, with much more hospitalization in the screened group. Number of hospital days are also very different, as shown in table 6.

One of the claimed benefits of this screening program is the ability to avoid unnecessary inductions of labor for false post-term pregnancies.

In table 7 is shown that there were 8.1 percent elective deliveries in the screened group versus 9.0 in the control group. As it appears from table 8 there is a slight indication of a lower number post-term induced labor in the screened group, but these differences are not statistically significant.

There were no differences in the use of interventions during delivery in the two groups, apart from slight tendency to more use of C-section in the screened group.

As shown in table 9, the mean birth weight was the same in both groups and crown-heel length and head circumference were also identical in the two groups.

The proportion of small-for-gestation-age births did not differ between the groups (8.4 percent in the screened group versus 5.7 in the control group).

The need for resuscitation and transferral to neonatal intensive units were also similar in the two groups.

Finally there were 5 perinatal deaths in each of the groups.

The cost of the screening program was estimated to be $250 (United States dollars) per pregnancy, all costs taken into account. A major part of that cost was due to the extra hospitalization.

In summary the benefits of such a screening program seem to be earlier diagnosis of twin pregnancies, slightly fewer post-term induced labors, and improved management of intrauterine growth retardation.

These findings, however, can hardly justify the introduction of a screening program. Further evidence of beneficial effects are certainly needed.

Lastly, I will comment briefly on the evaluation of perinatal care and particularly of such evaluation in relation to time trends in obstetric service in Norway.

We have previously through special surveys described obstetric service in Norway in 1972, 1974, and 1980. We are now in a position that we can follow the trends in services, in terms of personnel and equipment, and care facilities, and then relate these trends to variables attached to the population at risk, available through our medical birth registry and also outcome variables available through the same registry. Hopefully, this analysis will provide some valuable insights into the relationship between perinatal service and outcome variables like mortality.

Table 1. The risk of repeating small-for-gestation-age (SGA) births.

First Birth	Second birth	Number of mothers	Subsequent percent	SGA births relative risk
Not SGA		23,300	8.8	1.0
SGA		2,862	28.7	3.3
Not SGA	Not SGA	21,260	6.0	1.0
SGA	Not SGA	2,042	18.6	3.1
Not SGA	SGA	2,040	23.7	4.0
SGA	SGA	820	44.4	7.4

Table 2. Perinatal mortality of small-for-gestation-age (SGA) second births by weight for gestation of elder sibling.

	Small-for-Gestation-Age (SGA) Births	
Elder Sibling	Number	Perinatal mortality (per 1,000)
Small-for-Gestation-Age	4,578	33.0
Average-for-Gestation-Age	10,070	39.5
Large-for-Gestation-Age	180	100.0

Table 3. Perinatal mortality rate for second births by birth weight of the elder sibling.

Birth weight elder sibling	Second births		
	2,001 -2,500	2,501 -3,000	3,000 -3,500
Less than 1,500 grams	32.3	10.1	1.7
1,501-2,000 grams	34.0	11.0	5.4
2,001-2,500 grams	57.3	2.5	3.0
2,501-3,000 grams	66.0	10.6	3.2
3,001-3,500 grams	95.2	13.3	4.5
3,501-4,000 grams	134.4	32.4	4.2
4,001-4,500 grams	250.0	26.2	7.9
4,500 grams or more	-	-	21.6
Total	82.7	14.2	4.3

Table 4. Perinatal mortality rate for second births weighing 2,501-3,000 grams by crown heel length and by birth weight of elder sibling.

Birth weight elder sibling	Second birth (2,501-3,000 grams)		
	Short (<47 cm)	Medium (47-49 cm)	Long (>49 cm)
Less than 1,500 grams	-	7.1	-
1,501-2,000 grams	-	11.6	-
2,001-2,500 grams	-	1.1	14.6
2,501-3,000 grams	12.2	6.4	32.6
3,001-3,500 grams	28.8	6.7	35.3
3,501-4,000 grams	57.8	19.7	77.5
4,001-4,500 grams	-	20.5	-
4,500 grams or more	-	-	-
Total	22.7	8.3	38.1

Table 5. The diagnosis of twin pregnancies among screened and unscreened women.

	Screened (n=6)	Unscreened (n=4)
Diagnosed prior to 20 weeks	5	1
Mean duration of pregnancy (days)	252	227
Mean birth weight (grams)	2268	1662

Table 6. Clinical management during pregnancy among screened and unscreened women.

	Screened (n=510)	Unscreened (n=499)
	Percent	
Referred to obstetricians	13.3	13.4
On sick leave during pregnancy	15.9	16.2
Admitted to hospital	15.5(p<0.005)	9.2
Number of hospital days:	819	345

Table 7. Induction of labor among screened and unscreened women.

	Screened (n=496)	Unscreened (n=478)
	Percent	
Induced labor	6.5	7.9
Elective Cesarean section	1.6	1.0
Elective deliveries, total	8.1	9.0

Table 8. Induction of post-term pregnancies among screened and unscreened women.

	Screened (n=496)	Unscreened (n=478)
	Percent	
Post-term pregnancies 42 weeks or more (294 days or more)	2.8	4.0

Table 9. Body measurements of the newborn singletons among screened and unscreened women.

Measurements	Screened (n=490)	Unscreened (n=474)
Weight		
Mean (grams)	3555	3530
<2,500 grams	2.2	3.6
Crown heel length		
Mean (cm)	50.6	50.6
Head circumference		
Mean (cm)	34.9	34.9

Snapshots of Perinatal Epidemiology in Norway

by Per Bergsjo, M.D.

I'd like to mention three clinical topics, two interventions which we think may have some impact on perinatal mortality rates, and one more physiological study, combined with smoking in pregnancy.

The first concerns the dramatic rise in Cesarean section frequency in most countries during the 1970's. I did a study together with Eberhard Schmidt on differences in obstetrical intervention rates in the European region of the World Health Organization, and we found large differences, both between the countries and also within the single country. For example, in Norway the regions do not follow the same trend, or rather, the trend is the same but the rates are different.

The north of Norway is shown to be the most active region. The southeast region was almost as active, whereas the southwest coast of Norway was somehow lagging behind.

Now this slower increase is really caused by one particular department in one particular town in southwest Norway. This part of Norway has two large towns with the two biggest obstetrical departments in the country, each having about 3,500 deliveries per year, the department in Bergen following approximately the national average for Cesarean section and that in Stavanger rising much more slowly. And we asked ourselves why was there such a difference between two neighboring towns of the same size with approximately similar obstetric populations.

What we did was to select two years in that period, 1974 and 1979, with approximately the same number of births in both departments, and compared the Cesarean sections by indications.

I don't have the result list here, but it turned out that the main difference was the so-called mechanical indications, meaning obstructed labor or prolonged labor, dysfunctional labor--whatever you like--which made up for most of the differences. Other indications like fetal asphyxia rose in Bergen but not in Stavanger but they weren't sufficient to explain the differences, and others like placental factors or others likewise did not.

So it was actually indications which are a matter of clinical judgement which made up for the difference. And the most likely explanation was that this might be due to different chains of command in the two departments.

In Stavanger, the conservative place, the okay for a Cesarean section had to be given by the senior obstetrician, whereas in Bergen the resident in charge decided, and these younger doctors have a tendency to say "go" more often than the senior obstetrician. Now, whether this is good or bad, I can't say, but I think this is a fact.

And finally, the perinatal mortality rates in the two hospitals during the same period were very similar.

I think this group needs to look into the various rates of Cesarean section.

Now, the second topic concerns the induction of labor. We've heard from Scotland that induction is very frequent there. I believe it's very infrequent in the United States; Norway is midways between. I shall briefly mention a study we did years ago that is not recent research, but which led up to recent and present research.

It was a randomized comparison between two courses of induction of labor for post-term pregnancy, two different ways of administering oxytocin for induction of labor, by the buccal and nasal routes. Presently, we do it by the intravenous route, but at that time we wanted to see how effective those were. The cumulative success rates showed that the buccal course was more efficient, resulting in more deliveries in the course of time presented, which is 24 hours.

The point I want to make is that not all courses for induction of labor result in delivery. That is, every woman delivers in the end, but not all as a result of this induction. This is something which every experienced obstetrician knows when he tries to induce labor, but it isn't always referred to in articles by people who are enthusiastic about inducing labor. You get the impression that everything works, but it doesn't.

On the other hand, induction does give rise to stronger uterine contractions, thereby possibly to more cases of fetal asphyxia, and possibly to more operative interventions to deliver an asphyxiated baby. At least, this is what we found, doing a retrospective study on induced labors a number of years later; and to find out the real value of induction of labor in post-term pregnancies, we are presently conducting a randomized controlled trial, prospectively, asking whether to induce labor at 42 to 43 weeks is better than to wait and see, as long as you control the mother with cardiotocography, nonstress tests and so forth, to ensure that the fetus is well.

This study, I hope, will be finished in about half a year's time so that we can present results on it in the near future.

There was one more thing about this very old trial which was interesting. When we studied birth weight, related to the presumed duration of pregnancy at the time of induction, it turned out that there was a preponderance of the lightest babies among the presumed farthest advanced post-term pregnancies, which isn't very logical. This, I think, can be explained by the uncertain date factor, that we had more women with uncertain dates being induced delivering what was really preterm babies.

The third study I am going to relate concerns the physiology of pregnancy, namely hemoglobin concentrations. We also looked upon the mother's smoking habits, in a selected group of 811 normal pregnancies, nonanemic and normal by a number of criteria. They were grouped not by actual birth weights but by weight centiles or quartiles with reference to the total Norwegian material of birth weights for gestational age.

These were all term pregnancies; and in this table (table 1), they are grouped by the last hemoglobin concentration levels before delivery. The low hemoglobin levels would indicate anemia in nonpregnant women, whereas the high hemoglobin levels would be the approximately normal range for women.

The table gives the distribution of birth weights within each hemoglobin range. If we look at the middle hemoglobin range here, we see an approximately equal distribution, whereas mothers with low hemoglobin levels tended to have the heavier babies, and the mothers with the high hemoglobins to have the light babies, those in the lowest weight for date centiles. In other words, the mothers who had high hemoglobin levels or high hematocrits, if you wish, tended to have light-for dates babies.

Now, if we introduce smoking habits and for a second forget about hemoglobin, this is a similar table (table 2) where they are grouped into nonsmokers, light smokers, and heavy smokers, defined as more than 10 cigarettes per day. The four centile columns show that nonsmoking mothers have an equal, or normal, distribution of weight centiles. Those who are light smokers have a shift towards lighter babies, and the heavy smokers have a preponderance of light-for-dates babies, which we knew would be the case.

Now, the next table (table 3) may be a little complicated; it shows the mean hemoglobin values by smoking habits and weight-for-dates centiles. If you compare the hemoglobin concentrations in each column, starting from the left, you will see that as the mean hemoglobin levels become lower the babies tend to be heavier. On the other hand, smoking habits don't seem to influence hemoglobin values much; and, in fact, we found no significant differences in hemoglobin values with smoking.

Finally, here is the distribution of mean birth weights according to hemoglobin levels by smoking habits, and these are the actual birth weights, so forget about the weights for dates centiles here (table 4).

If we look at birth weights in the mothers with the lowest hemoglobin levels, they are the same regardless of smoking habits in the mothers. But, if we look at those with hemoconcentration, with high hemoglobin levels, we see a shift towards lighter babies with increasing smoking. The mothers who are heavy smokers and who have high hemoglobin levels have babies almost 1,000 grams lighter than mothers who have low hemoglobin levels, regardless of whether they smoke or not. In other words, mothers with the low hemoglobin levels have equally heavy babies regardless of smoking habits, whereas to those with high hemoglobin levels, smoking makes a great difference. Now, this may have been a complicated presentation, but it shows not only that smoking mothers get lighter babies, as we knew, but that the hemoglobin levels, which is an expression of hemoconcentration, makes a difference because low hemoglobin values seem to counter-weigh the smoking effect in the mothers.

And I think I'll leave you with that.

Table 1. Percentage distributions of women with normal pregnancies in Bergen, Norway, according to levels of last hemoglobin concentration before birth, in birth weight for date centiles. Centiles derive from the total Norwegian liveborn population excluding malformed children.

Hemoglobin concentration (g/dl)	Centile			
	0-24.9	25.0-49.9	50.0-74.9	75.0-100
9.0-11.9	11.2	24.0	30.1	34.7
12.0-12.9	30.2	31.2	18.9	19.6
13.0-15.0	62.4	22.4	9.0	6.2

Source: Adapted from Sagen. N. et al., Acta Obstet Gynecol. Scand. 1984, 63. 245-248.

Table 2. Percentage distributions according to weight-for-dates centiles, by smoking habits.

Smoking habits	Centile			
	0-24.9	25.0-49.9	50.0-74.9	75.0-100
Nonsmokers	25.3	26.8	20.7	27.2
Light smokers (1-10 cigarettes)	33.0	25.2	23.4	18.4
Heavy smokers (more than 10 cig.)	47.0	30.3	9.1	13.6

Chi-square = 25.17 df=6 p 0.001

SOURCE: Adapted from Nilsen S.T. et. al., Amer. J Obstet Gynecol. 1984. 148, 752-758.

Table 3. Mean hemoglobin shortly before delivery and standard deviation (in parentheses) according to weight for date centile, by smoking habits.

Smoking habits	Centile			
	0-24.9	25.0-49.9	50.0-74.9	75.0-100
Nonsmokers	12.8 (0.9)	12.4 (1.0)	11.8 (0.9)	11.6 (0.9)
Light smokers (1-10 cigarettes)	12.9 (1.0)	12.0 (0.8)	11.8 (0.8)	11.7 (0.8)
Heavy smokers (more than 10 cig.)	13.4 (0.7)	11.8 (1.0)	11.1 (1.0)	11.1 (0.5)

Each group in the 0-24.9 centile column has significantly higher Hb-levels than any other group within the same smoking category. There were no significant differences between Hb-levels within each separate centile column.

SOURCE: Adapted from Nilsen S.T. et. al., Amer. J Obstet Gynecol. 1984. 148, 752-758.

Table 4. Distribution of birth weight according to hemoglobin levels by smoking habits. Mean weight (g) and SD (g) (in parentheses).

Smoking habits	Hemoglobin (at term)			
	9.0-11.9	12.0-12.9	13.0-15.0	Total
Nonsmokers	3790 (451)	3565 (443)	3260 (449)	3589 (492)
Light smokers (1-10 cigarettes)	3672 (389)	3502 (418)	3107 (452)	3486 (367)
Heavy smokers (more than 10 cig.)	3795 (354)	3126 (576)	2806 (297)	3262 (592)
Total	3748 (426)	3514 (458)	3158 (457)	3526 (501)

SOURCE: Adapted from Nilsen S.T. et. al., Amer. J Obstet Gynecol. 1984. 148, 752-758.

Discussion

Dr. Rush: A few comments to both speakers. Do you know the studies in Birmingham by McKuhen and Record of birth weights of SID pairs related to school? I think it was verbal ability at age 11, and it speaks to a data set on long-term morbidity associated with nonrepetitive patterns of birth weight. They published it about 15 years ago.

They showed no disparity in IQ scores up to ranges of birth weights of 1,500 grams. They had something like 2,700 SID pairs that they were studying from that local authority. And I would suggest that if the data set were still accessible, it would be amenable, I think, to the type of analysis that you showed.

The second comment was that I know Dr. Papiernik told me of a study in which he compared a tape measure and ultrasound and the diagnosis of twinning was just as good with a tape measure as with an expensive piece of gear, if you had the ultrasound as backup when the tape measure wasn't really certain or not. I don't know if he has published that or not, but that's a very interesting piece of information.

The last thing, Dr. Bergsjo, on the hemoglobin issue, Barbara Starfield may have left for the afternoon, and a colleague published a paper on randomized control trials in nutritional supplementations in pregnancy, a review of all those in her literature, and the use of iron supplementation has never been shown to have any effect whatsoever.

In fact, the issue you've brought up, which is, does the hemoglobin precede some physiologic problem, or does the hemoglobin drive some physiologic problem, of course, is insoluble with the cross-sectional study because the hemoglobin clearly represents a lack of adequate plasma volume expansion.

And I think there's a very important piece of work by Pharoah and McIlwaine showing profound problems in water metabolism in smokers in pregnancy, as I remember, something like a difference of 4 liters in body water between heavy smokers and nonsmokers at term, and a difference of about 500 or 600 milliliters of plasma volume.

So the group you show of smokers who did expand their plasma volume are actually women who are probably at the extreme of the distribution of smokers who are not manifesting what appears to be one of the essential, or one of the driving pathophysiologic problems of smoking.

So what you are, in effect, may be suggesting is that these problems of water metabolism in smoking may, indeed, be central to at least one of the pathophysiologic changes that go on in smoking and pregnancy.

Dr. Bergsjo: Okay. Now, first, the iron supplementation, that's an interesting issue because in Norway everybody is iron-supplemented on the assumption that this is important, and we now think that they get too much iron and we are presently engaged in studies concerning various graded doses of iron, or no iron at all, to try to establish a better foundation for advice and pregnancy physiology all together.

We may, by giving iron, also alter the magnesium content, for example, which may have other adverse effects.

As to what smoking does to blood volume and hemoconcentration, we couldn't repeat that in our studies. We didn't find any obvious effect of smoking on hemoglobin levels, which they may have found in Aberdeen, but that may be due to our classification, that we had too big large groups, the quartile.

Dr. Rush: Well, you could--the hemoglobin is, of course, a function of two issues. It's a function of the total red cell, circulating red cell mass, and a function of plasma volume.

Now, you may not have shown it because, in fact, your smokers may have been, for instance, less compliant with that iron therapy and, therefore, they may have had reductions in both plasma volume and red cell mass.

In other words, without measuring the plasma volume and the body water directly, one can only infer in general that lower hemoglobin means higher plasma volume. It's not really absolutely certain.

Dr. Bergsjo: Well, I think it's difficult to continue the subject discussion here, but at least our feeling at present is that they did take their iron and that it is a physiological phenomenon, unrelated to smoking, or that smoking doesn't have the great impact on blood volume or hemoglobin levels--well, that's all I can say at present.

Dr. Cole: In the early 1970's there was work done on the very poor outcomes of pregnancy, associated with nonexpanded plasma volume in terms of edema measurement by Angus Thompson and Frank Kitten's group of this, and I can't recall the details, but I think they did control for smoking, as you did, and it was the hemoconcentration that was the definite bad predictive outcome.

Dr. Stein: I wondered if it at all maintained and demonstrated that smoking reduces the risk of toxemia in pregnancy and if you found that, or others had.

Dr. Bergsjo: You fare worse, so I think it's sort of a masking effect of life--which isn't so dangerous.

Dr. Schulman: I think the conclusion about the routine ultrasound screening is unnecessarily pessimistic. If you look at your numbers of approximately 500 in your control and study group, three of the four things you are hoping to find, you demonstrated trends. That was in the twins, the IUGR, and the post dates. The series is too small for detection of early anomolies that could be terminated.

But if you took that same factor of a thousand and divided it into the United States birth cohort of 4 million, multiply your factors by 400,000, it would be kind of exciting instead of pessimistic.

Dr. Bergsjo: The numbers fall out, yes.

Dr. Williams: I'd like to follow up on that.

As perinatal mortality rates decline, a larger proportion of perinatal deaths may, perhaps, be twin pregnancies or multiple pregnancies.

In California, for example, I think probably throughout the United States, 1 percent of all births constitute 10 percent of perinatal deaths, and those are the multiple births. And with regionalization being what it is, it makes sense to attempt to refer some multiple births to the higher levels of care.

And the question I had for Norway, is this a policy of regionalization in Norway; and, if so, how does ultrasound enter into that policy?

Dr. Kessel: My question has to do with, in part, I guess it's a two-part question having to do with ethics, and I guess the first issue relates to, when you talk about longitudinal studies, and I'm wondering what the issues of confidentiality and privacy are.

I know that certainly in this country they are so large as to almost prevent those kinds of studies and followup, at least to make them very difficult as significant orders of magnitude, and I'm curious about how other investigators from the other countries, whether this is an issue for some of those studies.

I guess, in addition to that also is the ethics of a randomized control clinical trial and looking at different sets of services for different groups. Those, at least, are two problems that we have here in this country, and I was curious as to how the other folks in different countries handled those issues.

Dr. Bakketeig: I'll try to make a few comments on the issues that have been raised.

As to the last comment on followup studies and confidentiality, I would like to say that the studies that I showed today were, apart from the ultrasound study, these longitudinal studies, they were all done within the medical birth registry data set. I mean we did not have to go out and approach anybody. It was all within the data set. So far, it's no problem.

But if we wanted to do a followup study, if we wanted to pick some of these groups and follow them, for example, through school age, whatever, then we would have to have a license from the general director of health, and whether he would have to consult ehtical committees--that would be his decision, but we would have to address him and ask the permission, give good reason for it, and then we might get the permission.

Otherwise, when we set up a randomized control trial, we will have to go before the ethical committee at that hospital or at that region where we are running the study and give all the details in the world to get it through, but they are reasonably liberal so far.

Dr. Bergsjo: Whether early discovery of the twin pregnancies would affect the degree of centralization of births might be in the exceptional case. I don't have the distribution of births, all twin births by hospital categories, but that might be.

Otherwise, the early arrest or early hospitalization of mothers of twins is a controversial issue still, and I think we need to look more into the treatment or care of mothers of twins before we can really say anything about the benefit of this.

Dr. Meirik: Let me make a comment about the confidentiality matter. We had such a debate in Sweden regarding the medical birth registry, and the national board which is running the medical birth registry was accused for getting to the keyhole of the delivery room and looking at what was going on, actually.

This was discussed during several months, but in general it was agreed on that the value of the register was that high, that we should continue having the register. And so there is no problem with that.

With regard to linkage to other registers, we always have to go to the data inspection board and get a permission for linkage between registers.

And in some cases, we even have to approach the individuals that are linked to get their permission, or at least publicly inform that we are going to do the linkage so that people know what's going on.

I would like to make another comment about the ultrasound, and that is that I think one should look on not only the number of inductions, but rather on the adequacy of inductions, so that we get rid of the iatrogenic preterms which we seldom see if we do not have the exact date, which is the most important thing you can get from ultrasound.

Dr. Bakketeig: Only a comment on the pessimistic conclusion that we presented on the ultrasound trial.

I would like to say that in The Lanset paper we did not sound as pessimistic as I did today. We just said that we can't conclude very much and the most sensible thing we can say is that we have to do larger trials, huge trials, to get a definite answer to these things.

And I think that's an important part of the result of a study, because I know that, for example, your panel in this country, NIH Consensus Panel, that quite a few people were so against trials when they entered that panel 2 years ago, and when they saw results like ours they changed their minds. They thought it was not unethical to do trials. So for that reason, I think even small trials like this has been important.

Dr. Rush: A couple of very brief points. Dr. Kessel, there are variations with this country on this issue, as I think Mr. Garland Land, I don't know if he's in the audience, from the State of Missouri, as far as I know there has been an attempt at universal medical record linkage in Missouri, certainly back historically from the days of the regional medical programs, so what is impossible in some tends to be possible in others.

The second issue is I think we, as a group, as professionals, have been really derelict in educating consumers and politicians on the ethics of not doing randomized trials.

I think that to subject large populations to expensive, unnecessary and potentially dangerous interventions at any time in the life cycle is something which we have not argued strongly enough, as a matter of fact, I'm going to say that randomized trials are not the, you know, best thing since sliced bread. There are things that they can't do and that there are certain issues of evaluation of health care for which they are thoroughly inapplicable.

But where they are applicable, and this is certainly one of those sorts of situations, to not do them is clearly derelict, and we live in an open and argumentative society, and we haven't done our homework in properly arguing with the well-intentioned who are desperately concerned about confidentiality and they have not been well informed about the risks of confidentiality to the point of acting out of ignorance.

So if we wish to continue to do our medical therapy out of ignorance, that's the price of ultimate confidentiality.

Dr. Bergsjo: This is going back and forth. I wanted to say that if you wanted to multiply the ultrasound study results by 1,000 or by 10,000 and just to get significant results, I think you would come into the problem of false positives, or if you enlarged the whole thing, you would get into other problems on the way which might outweigh the benefits you appear to get just by multiplying the thing as it is now.

So I think you would come into unnecessary inductions and so forth and, of course, the cost of the whole thing. So the conclusion remains as it is.

Dr. Wegman: Just one very crass note for Dr. Schulman. If you take Dr. Bakketeig's figure of $250 per ultrasound and multiply it by 3.5 million, you come pretty close to one thousand million dollars for ultrasound.

Dr. Schulman: Volume certainly reduces cost.

Recent Research Related to Perinatal and Infant Mortality

Petter Karlberg, M.D.

The task for the International Collaborative Effort on Perinatal and Infant Mortality (ICE) Planning Group is broad and deep: "to provide direction to programs and policies intended to reduce perinatal and infant mortality and improve infant health."

The development from conception to an adult, full-fitting his/her primary potentials, constitutes a long chain of interesting, interwoven events. The first part during fetal life and infancy is biologically the most intensive and therefore also the most vulnerable. Superimposed is the transition period from the intrauterine life to an extrauterine existence, one of the most risky periods in an individual's life.

We know there are risks along the road which may cause disturbance, irreversible damage leading to handicap or later to death. Fortunately, the fetus/the infant has counteracting mechanisms and measures may be taken in order to guard the individual through and to give support. Thus the outcome will depend on the balance between present negative factors and the resistance of the individual and assistant support. These three groups of factors have to be considered at the same time. The risk factors have so far been dominating the analyses, the resistance least. The extremes in the spectrum of outcome are obviously death and healthy infant between morbidity and disturbances. To consider the whole spectrum gives increased possibilities to understanding underlying mechanisms and to give preventive measures. This broad, deep and time/age related field has and is attracting active research in all countries and so also in Sweden.

I will give a short synopsis of what is going on with special emphasis on the task of this symposium with a grouped publication list and some summarizing comments.

Analysis of perinatal mortality in relation to the characteristics of the perinatal population

It is obvious that the perinatal outcome is related to the adaptive/counteracting capacity of the fetus/newborn infant. This capacity is strongly related to maturity and quality of fetal growth. Indices used are usually birthweight (BW), gestational age (GA) and BW in relation to GA.

From a crude perinatal mortality rate only cautious conclusions may be drawn. This is illustrated by the results from a comparative perinatal study between Goteborg, Sweden and Palermo, Sicily, which was initiated by a 3.5 times higher mortality rate in Palermo.

Some sub-groups of the perinatal material had equal crude values as for total Goteborg material. However, BW-specific mortality showed significant differences. Combined cumulative percentage BW-distribution and BW-specific mortality rates on probits scales were found to give a valuable direct visual description of the two sides: actual perinatal population and outcome. The study also showed that BW was higher in Palermo in spite of shorter mothers, then a high rate of prematurity was not a contributing factor to the high mortality.

The same kind of analysis has been performed on the total perinatal population of Sweden during the five years 1973-1977 and on the 1973 international comparative study sponsored by WHO. It is shown that a separation in stillbirths and neonatal deaths (early and late) gives increased information.

Between the department of pediatrics, Goteborg University, the Swedish Board of Health and Social Welfare and the Department of Mathematical, Statistical and Operational Research Exeter University, England, with Dr. John Fryer and collaborators, a joint research project is running. At the present time methods for obtaining reference material for "healthy" perinatal sub-population and for comparative standardization for BW-distribution as well as for BW-specific mortality are under development.

Evaluation of obstetrical risk factors especially risks related to fetal growth

A group in Uppsala (Cuattingins, Axelsson, Eulad, Lindmark and Meirik) has studied factors influencing birth weight by gestational age with special respect to risk for intrauterine growth retardation. From 3,022 births of Uppsala Maternity a risk group according to 15 different factors early in pregnancy was obtained with 636 cases. A control group of 536 cases was at the same time selected. Stepwise multi factorial analysis showed that 10 percent of variation in birth weight was explained by smoking, low birth weight at previous birth, low prepregnant weight and renal disease. On the other hand, there was not found any relation to the following factors: short mother, weight gain during pregnancy, earlier still birth, recurrent abortions, hypertension, vaginal bleeding, or AFP value. There are several other studies in the same field.

Epidemiological analyses of the changing panorama of cerebral palsy in Sweden

Bengt Hagbeog with collaborators has carefully classified and followed up on children with cerebral palsy within the total population of around 1/4 of Sweden with 5 year cohorts during 1959-1978. They found a gradual decline up to the last 5 year cohort, which showed a slight but significant increase in the incidence of depligia in preterms and of dyskimsi in full terms. However, there is still a cumulative net gain of surviving non-CP-children. The findings are penetrated further. Several follow up studies of very low birth babies are ongoing.

Pregnancy outcome and social indicators in Sweden

By linkage of perinatal information from each birth in the Swedish Medical Birth Registration for the years 1976-1977 (near 200,000 births and information in 1975 census in Sweden (including occupation of mother, income of family, type of family, housing) the following social grouping was made:

Group I (with positive indicators): n = 6,915 3.6 percent
Group II (intermediate): n = 156,629 82.5 percent
Group III (with negative indicators): n = 26,430 13.9 percent

In perinatal mortality there was not found any significant difference between Group I and III. However, there were numerical differences in the following characteristics: given per 1,000:

	Preterm delivery	Low birth weight	Small-for-gestational age	Post-term delivery
Group I	43	32	13	27
Group II	55	42	20	42
Group III	77	58	29	59

There are also several other actual studies, for instance:

- on asphyxia during the perinatal period with identification from the shape of the fetal electrocardiogram, metabolic analyses during hypoxia, application of evoked electroencephalographic response (sensoric and visual) in newborn infants for prognostic evaluation after birth asphyxia.
- on energy substrate metabolism in newborn infants with intrauterine growth retardation (a potential risk factor).
- on effects on the child of alcohol abuse during pregnancy.
- on classification and epidemiology of respiratory disorders during the neonatal period.

A grouped publication list

A Improvement analysis of perinatal mortality and morbidity.

B Evaluation of obstetrical risk factors especially risks related to fetal growth.

C Epidemiological analyses of the changing panorama of cerebral palsy in Sweden.

D Analyses of birth asphyxia in animal studies, in clinical studies and in follow-up studies.

E Classification of acute, neonatal respiratory disorders.

F Studies of energy substrate metabolism in newborn infants with intrauterine growth retardation

G Effects on the child of alcohol abuse during pregnancy.

H Pregnancy outcome and social indicators in Sweden.

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Discussion

Dr. Berendes: There's one question that I would like to ask. I have seen the data on the perinatal mortality and rate of low birth weight, as well as preterm delivery by socioeconomic class, the data you showed, and this suggests that there's no effect on perinatal mortality by social class, but there is an effect of social class on rate of low birth weight.

I still wonder whether there's no effect. I mean I question whether there's no effect of social class on perinatal mortality.

Admittedly, there is a trend, and from the way I recall the data, the trend is in the direction of a higher perinatal mortality among the lowest socioeconomic group, except in view of the fact, I think, that the rate is so low, the differences are not significant.

Dr. Karlberg: May I go back to my thoughts from the beginning and say that we have three things to look on. One is the risks, and then we have the capacity of the baby, and that, you could say, strictly since they have a lower birth weight, and then you have a third, and that is the measures and the guarding and taking care of the case.

It could be, and I hope that it is, that the care system picks up these cases and guards the baby through the perinatal period.

It is a possibility, but I have not proved that.

Mr. Hoffman: The question relates to the Box and Cox transformation and whether that's a good way to proceed in coming up with standards of birth weight for gestational age.

I would like to raise an issue which relates then to ultrasound evaluations or even symphysial fundal height measurements, serial measurements. What would be nice would be to have these measurements available to base standards on all births and not just the ones delivered.

And I'm wondering--I have talked to some people who have such data for ultrasound, and they claim that the flattening near term, in fact, doesn't happen.

I don't know if these data are based on large enough samples to see if that's true or not, but I'm wondering if proceeding with a Box and Cox transformation based on delivery data would yield that much more information, or if we shouldn't be thinking more about ultrasound data or symphysial funda measurements, something that would assess all babies. I know this is an area that concerns you.

Dr. Karlberg: My comments would be that we studied the Box and Cox and we have gone further using other methods to see how we can transform it.

And I would like to say that it is important to get these. If we go into using standard deviation scores, which I have found in other situations is very valuable in clinical work in assessing factors, then you will have a continuous variable and not, as now, usually used below and about 2.5 kilos.

Then it is important, and I think everywhere, or later on in life, the weight is not normally distributed, it is skewed, but we also have the length, and that is normally distributed and you don't need to do anything for that. That was the first answer.

Yes I think ultrasound is a very interesting thing. I've heard many people say that when ultrasound is used the gestational age is known.

I would like to question that, how correct it is. Even if you do it at 17 weeks, and use the mean value, there is a variation.

The determined gestational age may have a variation of plus-minus 1 or 2 weeks at full term, tending to straighten the relationship toward a straight line.

We will analyze the material further, including evaluation, if there is a straight line.

Use of Vital Record Data in the United States

by Brian McCarthy, M.D.

We have attempted to coordinate our presentations. I will take a rather broad perspective and present a concept for the use of vital record data with a few examples.

The questions we were asked to address is how do we in the United States use vital data to identify performance problems within our health care delivery system, and could we use this for international comparison and identify areas for potential collaborative research.

I know that if this question had been asked of any five people in this room from the United States, there would be five different answers. I'm not so presumptuous to think that we are the ones that have the answers to that question. We will attempt to lead you out of the forest that Dr. Kessel referred to this a.m. and give you our perspective on these questions.

I will begin by paraphrasing the question in the following way: "How does one use vital data to evaluate the health care delivery system's response to a health problem?"

A recent WHO publication defined evaluation as, "The systematic and scientific process of determining the extent to which an action or set of actions were successful in the achievement of predetermined objectives.

"It involves measurement of adequacy, effectiveness and efficiency of health services that renders possible the reallocation of priorities and resources on the basis of changing health needs."

The purpose of such evaluation is not merely to gain knowledge about health services, but to provide information that is needed in decisionmaking that improves health programs and the services for delivering them, and guides in both the allocation of human and financial resources for future action. This is done by linking evaluation with decision options; that is, by insuring that the results of an evaluation are in such a form that they can be used to decide between alternative courses of action.

Evaluation, then, is a systematic way of learning from our experiences and using the lessons learned to improve current activities and promote better planning by careful selection of alternatives for future action.

Essentially, though, the evaluation has to be based on relevant and sensitive data. It is the transformation of this data into information (although often influenced by political, social, cultural, economic, environmental, and administrative factors that will come to bear) that will form the basis of such an evaluation.

It has been said that in the United States the individual States are data rich but information poor, and it is the translation of data into information that is an apparent stumbling block for more precise evaluation.

Conceptually, what we try to do is seen in the figure 1. In this process we attempt to identify and define what the health problems are through a system of surveillance. This system is a dynamic process that collects, tabulates, analyzes and disseminates data on a specific event, in a defined population in a geographical area.

Its attributes are that it is simple, cheap, responsible, and adaptive; otherwise, it will soon turn into a system that will not perform the tasks it is given.

Surveillance is the first step in evaluation. The process is a circular one describing the health care delivery system's response to the health problem and identifying performance problems within the health care delivery system is the beginning.

The combination of these two steps leads to development and implementation of an intervention strategy that is based on the findings of the surveillance activity. This is followed by an evaluation process that determines the medical effectiveness, economic efficiency, and social assessibility of the intervention. This redefines what the health problem is and brings us back to the first step in the process. The radius of this circular process we would hope becomes smaller as it moves through time. This allows us to focus in on a specific problem.

It is important to understand that the concept of a health care delivery system varies from one country to another. The World Health Organization has described it as a three level system as shown in figure 2. The health care delivery system comprises the individual and his family, the organized health care delivery system, and an intersectoral component that is comprised of other sectors of the society. These sectors affect the health of individuals and families through their policies and activities. The performance problems in each of these levels can be described in terms of skill and knowledge, attitude and resources, and money (manpower, materials, or management).

The first attempt to solve a health problem is at the individual and family level. When this cannot take place there's an organized response to the health problem.

The interaction between the intersectoral component and the organized health care delivery is determined by the health problem. For example, the problem of adolescent pregnancy may require the intersectoral component to provide jobs and educational opportunities while the organized system must provide family planning services.

In the United States our concepts on the use of vital data are evolving. We have moved from a position where we used natality data and mortality data separately to one where we're attempting to link mortality and natality data.

We are proposing to longitudinally link that mortality and natality data so that we will be able to examine the reproductive history of a woman and compare her with her cohort.

Although we have not performed this longitudinal linkage in some States we have linked the matched birth/death files to a "system of interventions" which have developed over the years.

I apologize to our Scandinavian colleagues--I feel as though we're moving on into the nineteenth century while you are in the twenty-first, having done this for a much longer period of time than we have.

Figure 3 is a systematic representation of this linkage within the State of Georgia, and is clearly a similar pattern to what is going on in other States, where a birth-death linked file is now subsequently linked to other intervention strategies.

Each one of these, Medicaid, the high-risk pregnancy program, neonatal intensive care, high-risk infant followup care, WIC (nutritional supplementation for women, infants and children), family planning, service by the health department clinics, and a maternal and infant care projects all represent an intervention directed at a specific determinant of perinatal and infant mortality. We have, in a way, developed a vertical approach to that specific determinant and attempted to combine and manage these strategies so that the horizontal plane is covered.

We are attempting to identify the performance problems by linking participation in these intervention strategies back to the target population, which is represented by the birth-death linked file.

States have chosen different interventions to begin their linkage. For example, Massachusetts has linked its file to WIC; Maine has linked it to AFDC; South Carolina, which has linked it to the high-risk pregnancy program; Georgia has linked it to its neonatal intensive care unit admissions, its high-risk pregnancy program, Medicaid, and its M and I projects; Missouri and California have linked it to Medicaid.

I would like to emphasize this linkage is only a means by which to raise a flag that says, "Someone needs to come and look at me a little bit more closely." It's not the definitive study used to evaluate the intervention. It is only a process to alert you that something is going wrong, that you need to come and look at it more closely. It is a concept of looking at what is a disparity between what is expected and what is observed, a more indepth analysis if required. This analysis will attempt to elucidate what is the performance problem.

I believe the simple things ought to be done first. You don't design a natality survey, or a national follow-back survey, without having generated hypotheses based on some type of surveillance. This concept leads me to ask the question, what is it on those vital registration forms that can raise the flags to identify issues that need to be looked at more closely.

I would suggest that there are many, but for international comparisons, since we're trying to coordinate our activities in a spirit of collaboration, things that I would suggest we do the simple things. I can't think of anything more simple than this particular table (table 1) which is the age at death of an infant by birth weight. Whether or not those are the ages at deaths or the birth weight groups we use is certainly up for discussion. I would recommend that birth weight be grouped into at least three groups, 1,499 grams and less, 1,500 to 2,499 grams, and greater than or equal to 2,500 grams.

The deaths that are most preventable are those occurring in the postneonatal period to infants weighing $\geq$2,500 grams at birth. Depending on where a country is on the infant mortality ladder, one can estimate in which cell there is room for improvement. We could look at differences between countries within each one of these boxes. If we do that it's going to be essential to identify what might be the expected value within each one of these cells. I would suggest this as our first collaborative effort using vital data.

I have an example of this in table 2. This data is from countries in which I have contacts, and needs to be updated but it is a start and an example of the general concept to identify what is the expected value and to be able to compare the expected with the observed so that disparity can be identified.

The second collaboration that I would suggest is to include within each one of those cells the causes of death. Looking at individual ICDA classifications would be very difficult. We need to develop a grouping of causes of death that relate to tasks of the health care delivery system. I've called such a grouping in table 3 a "Modified Wiggleworth's International Classification," simply because I took the idea that Wigglesworth published in Lancet, and extended it to the infant mortality period to include causes such as SID's and accidents, which he originally did not because they were not seen in the perinatal period.

The important objective is to identify a functional relationship between the ICDA classifications and what goes on within the health care delivery system. In order to illustrate this, table 4 is the same age at death and birth weight group table but instead of the expected values for each cell I have indicated the particular tasks within the organized system which may have a performance problem if the disparity between what is observed and what is expected is large. For example, if one looks at the birth weight specific, postneonatal mortality for greater than 2,500 grams, and the expected value is one per 1,000, and the observed is three per 1,000, then one can question and look at what are the community health services that are available for infants that are greater than 2,500 grams.

Table 5 is data which is taken from the 1973 WHO Prenatal Study, which Dr. Karlberg referred to earlier. I would draw your attention to the birth weight specific mortality rates for less than 1,000 grams. There are two countries, the United States and Hungary, which had 800 per 1,000 or less. I would question, in 1973, as to whether or not that was technically possible and, in fact, in a similar circumstance for the State of Georgia when I observed an almost 50 percent survival for 500-1,000 gram infants I questioned that same issue. I found that 21 percent of its neonatal deaths were not being registered. Hence, I would question the completeness of registration in these countries.

The next example from this table is the discrepancy between the 2,500 gram rates among countries, with the United States having one of 4.6 as low, and the high was Cuba with 11.5; and the low birth weight rate for each country varied from 10.8 in Hungary to 3.9 in Sweden.

Clearly, the disparity between low birth weight rates between Sweden and the United States is the explanation for the disparity between the prenatal mortality rates between these two countries.

Similarly, the disparity between perinatal mortality rates (PMR) in Japan and the United States is a result of the birth weight-specific mortality rates in all groups because Japan has a lower low birth weight rate compared to the United States.

One could attempt to identify, through a disease classification that I suggested earlier where the differences occurred in a specific weight group. Table 6 is the cause specific mortality for greater than 2,500 grams grouped according to the ICD codes given in table 7. Let us compare the 4.6 PMR for ≥2,500 in the United States and the 11.5 in Cuba. The relative risks of a fetal-maternal complication being the cause of death is more than three (5.2 versus 1.4) and it's also three for maternal causes of death. I can make various comparisons back and forth, which could then lead to different hypotheses as to why these differences exist between countries. This would eventually result in being able to identify better intervention strategies based on the different experiences of each country.

Table 8 illustrates this same point but within one country. In the United States in 1950, the birth weight-specific neonatal mortality rate for greater than 2,500 grams was 7.8, and in 1980 in an aggregated data base consisting of four States, it was 2.0. The comparable mortality rate for less than 2,500 grams was 173 in 1950 and 75.9 in 1980.

It would be very interesting, from an international standpoint, to see what those differences are at present for our collaborative group.

I would finally like to present data which has recently been studied for the United States. It is an aggregated data base of nine States, and clearly points out some of the issues with regard to infant mortality in the United States. As implied from my earlier discussion you can look at infant mortality as simply being whether or not there are too many low birth weight babies and what the birth weight-specific mortality rates are within each of the birth weight groups.

Figure 4 is the relative risk of experiencing low birth weight infants between black births, white births, and a standard. The standard is white women who are 20 years of age, with 13 years or more of education, who began prenatal care in the first trimester. This data is supplied by NCHS from the 1980 natality tape. The relative risk of experiencing a birth in each of the groups below 2,500 grams is almost 4 in black women compared to white women.

Figure 5 demonstrates the weight-specific mortality for greater than 2,500 grams in the neonatal and postneonatal period for three groups of women. Group One is women who are 20 years of age or greater with 13 years or more of education; Group Two is 20 years of age with less than 13 years of education; and Group Three is women less than 20 years old.

There are some fascinating findings in this figure. First there is no real difference in the birth weight-specific neonatal mortality rate for greater than 2,500 grams between groups. However there is a difference between white and black people.

In the postneonatal period, there is a difference between white and black people for Group One in birth weight-specific mortality for greater than 2,500 grams.

This difference increases substantially in Group Two and Group Three. Black adolescent mothers who have infants weighing greater than 2,500 grams at birth have a relative risk of more than eight of experiencing a postneonatal death compared to the standard.

Not shown here is that this difference is explained by different rates in injuries, infections and SIDS. In my opinion this implicates the parenting skill and health service access of young mothers and that our strategies ought to be developed accordingly.

My time has expired. I hope this simple tabulation of age at death by birth weight group has impressed you as an excellent start for our collaborative effort. Also that when the cause of death and simple demographic characteristics are added that significant insights can be gained into the performance of the health care delivery system.

Table 1. Degree of preventability by birth weight and age at death

Age at death	≤ 2,499 grams	≥ 2,500 grams
Stillbirth Less than 28 gestational weeks	8 Least preventable	4
Early neonatal 0-6 days	7	3
Late Neonatal 7-28 days	6	2
Postneonatal 28 days - 1 year	5	1 Most preventable

Table 2. Comparison of birth weight-specific mortality rates in 1980 for United States, Sweden, Norway, England/Wales

Age at death	≤ 2,499 grams				≥ 2,500 grams			
	USA	SWE	NOR	UK	USA	SWE	NOR	UK
Stillbirths	84.3	50.8	110.1	66.2	2.8	2.1	2.8	3.1
Early Neonatal	71.9	62.2	63.9	61.7	1.4	1.2	1.3	2.4
Late Neonatal	9.7	NA	11.4	10.1	0.6	NA	0.7	1.0
Postneonatal	15.5	NA	14.0	14.0	3.0	NA	2.7	4.5
Low birth weight rate	6.4%	4.0%	3.4%	6.5%				

Table 3. Modified Wigglesworth classification of infant deaths with international classification of diseases (9th edition) codes

Modified Wigglesworth classification	ICD code
Infection	001-139, 320, 390, 460, 480, 510, 580
Congenital anomalies	740-759
Disorders relating to short gestation and unspecified low birth weight Respiratory Distress Syndrome (RDS)	630-676, 764, 765, 769
Birth trauma and intrauterine hypoxia and birth asphyxia	767, 768
Other condition orginating in perinatal period	760-763, 766, 770-799
Sudden infant death Syndrome (SIDS)	798
Motor injuries	E810-E825
Other injuries	E800-E809, E826-E949
Residual	All other codes

Table 4. Potential preventive services within the organized health care delivery system (HCDS) by age at death and birth weight groups

	≤ 1,499 grams	1,500 - 2,4999 grams	≥ 2,500 grams
Stillbirths	Identification of high risk Nutrition Family planning	Identification of high risk Antenatal care Nutrition	Obstetrical services Modes of delivery Intrapartum monitoring
Early neonatal deaths	Identification of high risk NICU services (pediatrics)	Identification of high risk NICU services (pediatrics)	Obstetrical services (Resuscitation) Community practice
Late neonatal deaths	Identification of high risk NICU services	NICU services Community practices	Community practice
Postneonatal deaths	Followup of high risk infant Community health services	Followup of high risk infant Community practices	Community health services

Table 5. Birth weight-specific perinatal mortality rates[1] for seven countries of WHO perinatal study - 1973

	Hungary	Cuba	Austria	New Zealand	Japan	USA (part)	Sweden
Birth weight < 1,000 grams	800	952	894	1,000	919	802	815
1,000-2,499 grams	166	144	199	168	160	94	165
≥ 2,500 grams	8	11.5	7.8	7.0	8.1	4.6	5.1
Low birth weight rate	10.8%	10.8%	5.7%	5.2%	5.5%	6.0%	3.9%
Perinatal mortality rate	33	29	24	19	18	16	14

[1] Per 1,000 total births

Table 6. Birth weight specific perinatal mortality rates for ≥ 2,500 grams for four main causes of death for seven countries of WHO perinatal study - 1973

Cause of death	Hungary	Cuba	Austria	New Zealand	Japan	USA	Sweden
Maternal	0.9	0.9	0.1	1.1	0.7	0.3	0.7
Obstetrical	2.6	3.0	0.7	2.4	3.2	1.4	1.4
Fetal	2.2	2.4	1.6	2.0	1.9	1.5	1.4
Fetal maternal	2.3	5.2	5.0	1.6	2.2	1.4	1.7
Total	8.0	11.5	7.8	7.1	8.0	4.6	5.2

Table 7. WHO perinatal collaborative study groupings of perinatal cause of death into four categories with corresponding International Classification of Disease 8 code

Maternal cause 7600-7603, 7611, 7612, 7614, 7619, 7610-7617, 7602-7605, 7609, 7630, 7631, 7639
Obstetrical cause 7640-7644, 7649, 7650-7654, 7659, 7660-7664, 7669, 7670-7674, 7679, 7680-7684, 7689, 7690-7695, 7699-7700, 7708, 7709, 7710-7711, 7719
Fetal cause 7400-7599, 001-036, E800-999
Fetal/maternal cause 7701-7702, 7720-7722, 7729, 7730-7739, 7761, 7762, 7764, 7769, 7760, 7763, 7770-7779, 7781, 7790, 7799, 7780, 7969

Table 8. Comparison of birth weight specific mortality rates for USA at four time periods

≥ 2,500 grams	1950	1960	1973	1980
Stillbirths	NA	NA	4.6	2.8
Early neonatal	6.0	3.3	2.1	1.4
Perinatal	NA	NA	4.6	2.8
Late neonatal	1.8	1.2	NA	0.6
Neonatal	7.8	5.5	NA	2.0
Postneonatal	NA	5.6	NA	3.0
Infant	NA	11.1	NA	5.0
Low birth weight rate	NA	6.0%	6.0%	6.4%

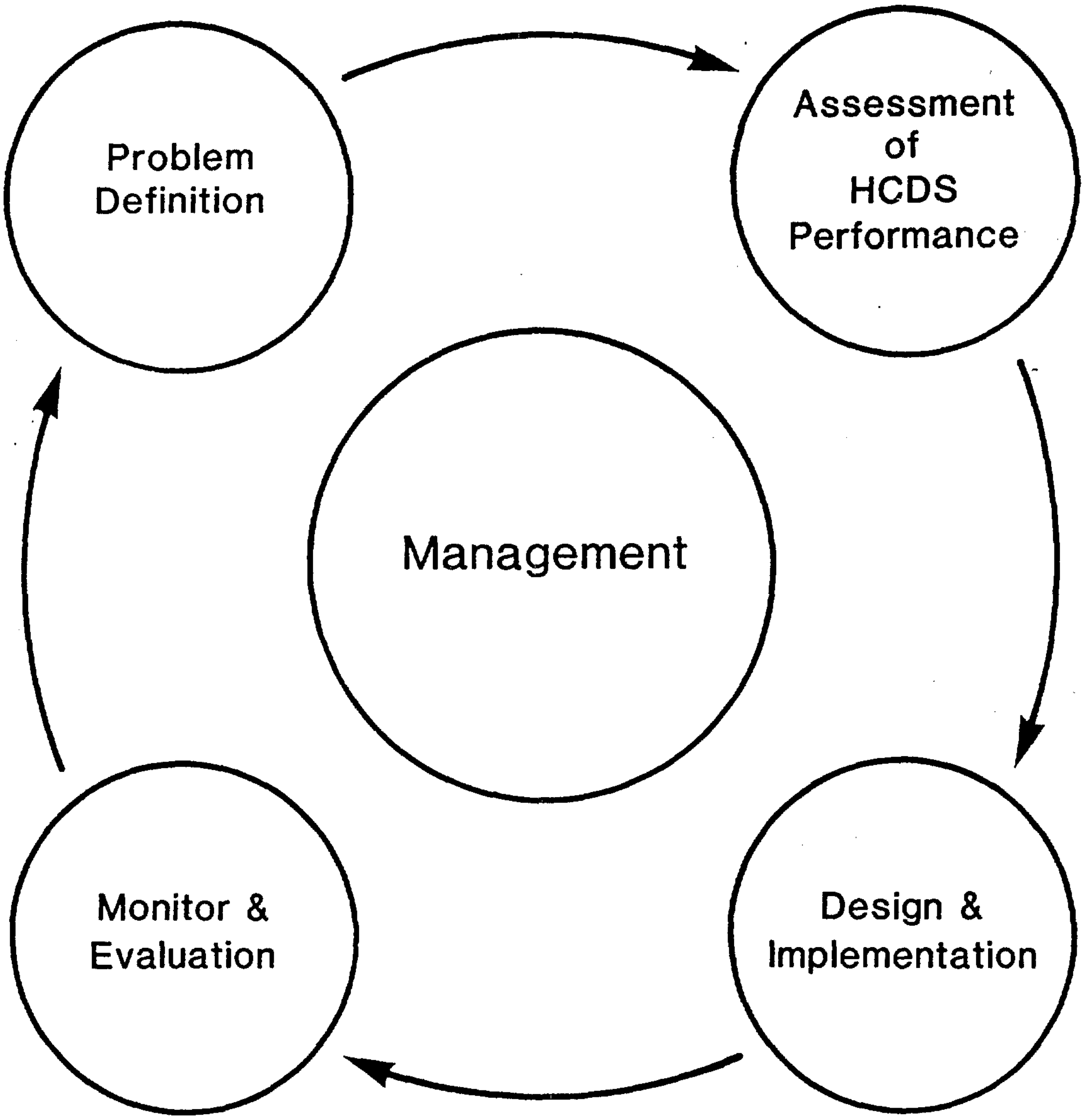

Figure 1. The sequence of the risk approach in MCH

Figure 2. Levels of the health care delivery system (HCDS)

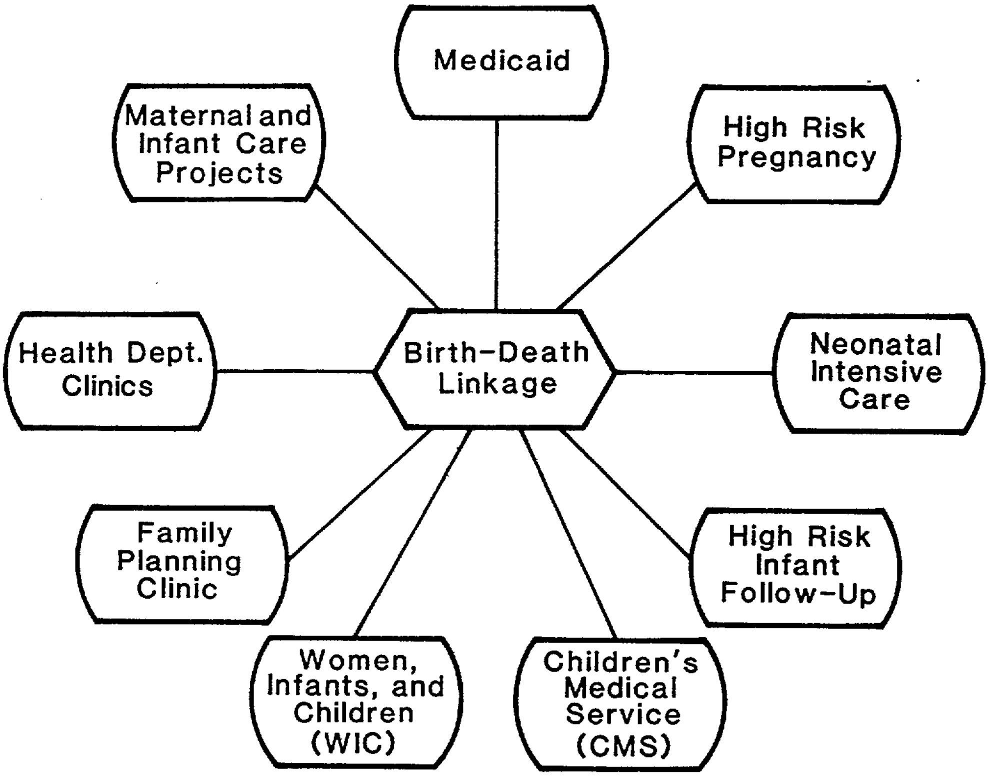

Figure 3. Schematic diagram of birth-death linkage with MCH interventions

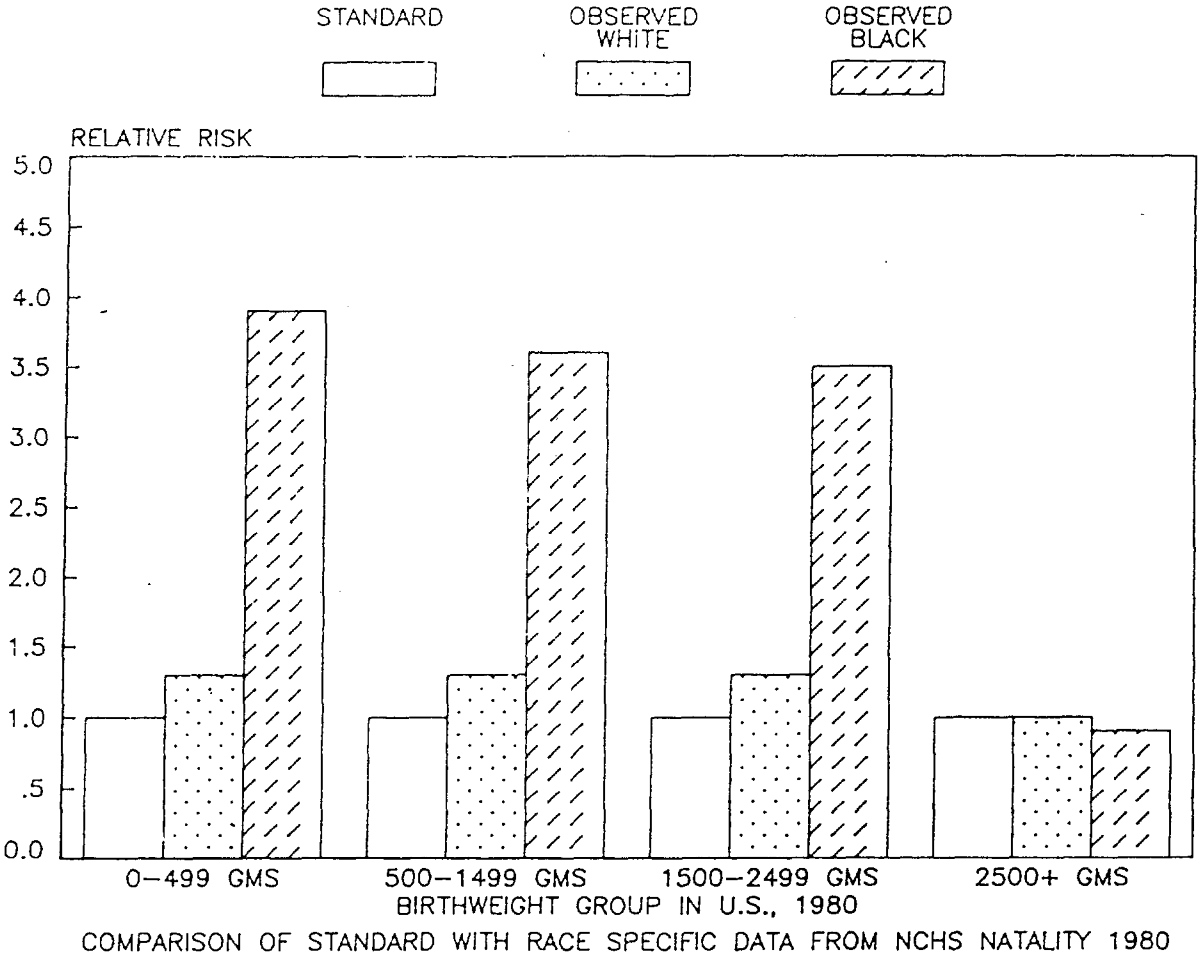

Figure 4. Defining the gap: relative risk of experiencing different birth weights, by race

Relative Risk: Ratio of the risk in one group to the risk in another. In this figure, if the relative risk is 1, the risk is equal to that of the standard. If the relative risk is 2, the risk is twice that of the standard.

The standard group: Infants of white women 20 years or more of age, with 13 years or more of education, who sought prenatal care in the first trimester. The birth weight-specific mortality rate of the $\geq$2500 gram birth weight group is further reduced by excluding from the rate computation deaths reportedly due to causes thought preventable (i.e. obstetrical trauma, hypoxia, infection, and injury) and by using rates in white infants for black infants.

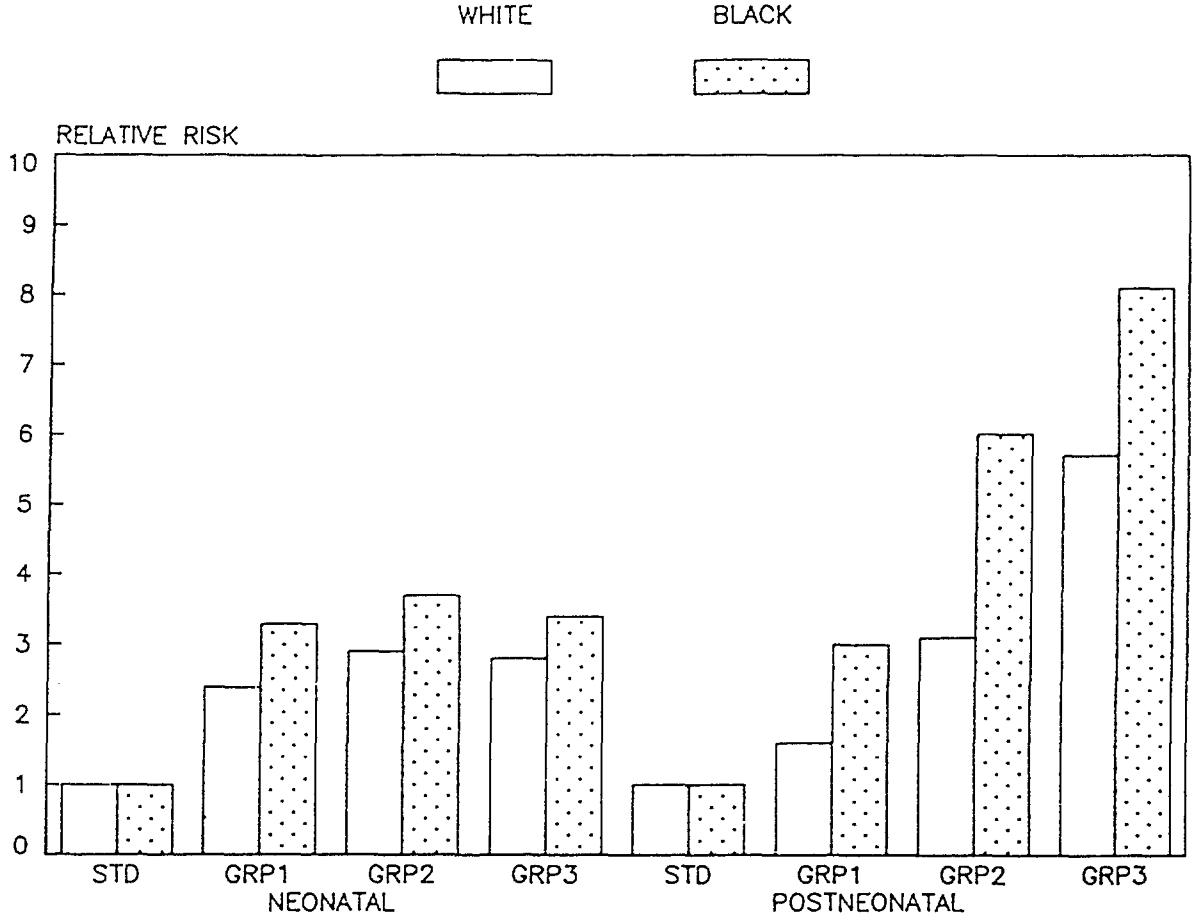

Figure 5. Relative risk of neonatal and postneonatal death for infants ≥ 2,500 grams, by sex and race

Relative Risk: Ratio of the risk in one group to the risk in another. In this figure, if the relative risk is 1, the risk is equal to that of the standard. If the relative risk is 2, the risk is twice that of the standard.

The standard group: Infants of white women 20 years or more of age, with 13 years or more of education, who sought prenatal care in the first trimester. The birth weight-specific mortality rate of the ≥2500 gram birth weight group is further reduced by excluding from the rate computation deaths reportedly due to causes thought preventable (i.e. obstetrical trauma, hypoxia, infection, and injury) and by using rates in white infants for black infants.

Group 1: Infants of women 20 years or more of age, with 13 years or more of education
Group 2: Infants of women 20 years or more of age, with 12 years or less of education
Group 3: Infants of women 19 years or less of age

Neonatal Period: Birth through 1 month of age
Postneonatal Period: 1 month through 1 year of age

Findings on Birth Outcome from the 1980 National Natality Survey and 1980 National Fetal Mortality Survey

by Paul J. Placek, Ph.D.

Introduction

This report highlights recent research on low birth weight, fetal death, and infant mortality based on the 1980 National Natality Survey (NNS) and 1980 National Fetal Mortality Survey (NFMS) conducted by the National Center for Health Statistics (NCHS). These two surveys are called followback surveys because we followback (by mail and telephone) one or more informants identified on vital records.

NCHS has a long history of conducting followback surveys. National Natality Surveys based on national samples of birth certificates were conducted in 1963, 1964-66, 1967-69, 1972 and 1980. The only National Infant Mortality Survey (NIMS) was in 1964-66, and was based on infant death certificates linked with questionnaires to the mothers. The 1980 National Fetal Mortality Survey is the first national survey of fetal mortality ever done by NCHS. The next time we plan to do these surveys will be in 1988, when we hope to conduct an NNS, NFMS, and NIMS simultaneously.

Purposes of surveys

Followback surveys are designed to build on the vital statistics program and expand on our knowledge of social, demographic, maternal and infant health, and radiation characteristics associated with vital events in response to changing data needs. A second purpose is to make national estimates of these characteristics. A third purpose is trend studies and comparisons with followback survey data collected in previous years. A fourth purpose is to establish a basis to evaluate the quality of information on vital records. A fifth purpose which I would like to encourage is collaborative cross-national comparative research.

1980 NNS/NFMS methodology

In the 1980 NNS, birth certificates, and in the 1980 NFMS, reports of fetal death of 28 weeks gestation or more, were sampled from 52 State and independent registration areas of the United States. We extracted the name and address of the mother, the hospital where the infant was delivered, and the attendant at delivery and then mailed questionnaires. We sampled 9,941 Certificates of Live Birth (including a four-fold over sampling of low birth weight infants so we could do special studies of high-risk births) and used a poststratified ratio estimation procedure to weight the sample up to the national count of 3,612,258 births in 1980. We followed a similar procedure in sampling 6,386 Reports of Fetal Death and we weighted this sample up to the national estimate of 19,202 fetal deaths of 28 weeks gestation or more in 1980.

Married mothers were sent an 8-page questionnaire with questions about health behavior during pregnancy, smoking and drinking, pregnancy history, prenatal care, marital history, socioeconomic factors, and the names and addresses of her medical providers of radiation in the 12 months preceding her delivery. We sent the same questionnaire to the mother whether she had a live birth or stillbirth (late fetal death). If there was no response from the mother after two mailings, we conducted an abbreviated telephone interview with her, and collected most of the same information as on the mailed questionnaire. Consent statements were obtained from the mothers whenever possible, and these were included with questionnaires mailed to medical sources to improve their response rates.

The hospital questionnaire is based on hospital records of the mother and her infant. It collects information on health status of the mother and the infant, prenatal care information, blood pressure, hematocrit and hemoglobin levels, type of delivery, and information on hospital-provided radiation to the mother in the year preceding her delivery.

We also mailed a questionnaire to the attendant-at-delivery; it had prenatal care questions and asked about medical radiation given the mother in the year preceding her delivery.

Finally, an x-ray or radiation questionnaire was mailed to medical sources which gave the mother ionizing and nonionizing radiation; these sources were named by the mothers, doctors, and hospitals. The questionnaire collected information about x-ray (including dental x-ray), ultrasound, nuclear medicine, microwave, and shortwave.

The NNS and NFMS data set thus consists of merged data from the certificate, mother, hospital, attendant at delivery, and radiation sources so we can analyze data items obtained from different sources. The methodology for the 1980 NNS/NFMS has been discussed in detail elsewhere (Placek, 1984).

Findings

Figure 1 (excerpted from Hutchins, et al., 1984) shows the reduction in the percent of low birth weight in the United States from 7.0 percent in 1972 to 5.8 percent in 1980. These reductions are apparent for various categories of race, underlying medical conditions, complications of pregnancy, complications of labor, duration of labor, type of delivery, postpartum sterilization, Apgar Score, and other variables. This figure also indicates the wide range of data characteristics available from followback surveys.

I'd like to comment on the rising cesarean rate, which the 1972 NNS indicated was 7.3 per 100 live births, and the 1980 NNS indicated was 17.2. One of the reasons for the rising inwedlock cesarean rate is the rapid reduction in forceps assisted deliveries, used in 36.8 percent of births in 1972 but only 17.8 percent of births in 1980. This major obstetrical change was to reduce the incidence of birth injuries to the fetus, but conversely it has increased cesareans (Placek, et al., 1983). Table 1 (from Hutchins, et al., 1984) shows that 6.9 percent of all 1980 deliveries were low birth weight, but if it was a first cesarean section, 13.3 percent were low birth weight; if a repeat cesarean, 6.5 percent; and if vaginal, 6.1 percent. The race differential in low birth weight is also apparent; all other mothers are twice as likely to have small infants than white mothers. Some have argued that scheduled repeat cesareans sometimes cause low birth weight or prematurity because the delivery is scheduled too early, even though the pregnancy is monitored to insure that the infant is large enough. Relevant to this thorny issue is the relationship of electronic fetal monitoring (EFM) to cesarean delivery. Figure 2 (excerpted from Placek, et al., 1984) indicates that 47.7 percent of live births and 42.7 percent of stillbirths involved the use of EFM. Our analysis permitted us to examine a controversial area, the relationship between primary cesarean rates and EFM. Table 2 shows that 22.8 percent of low birth weight infants were delivered by cesarean if EFM was used in the management of pregnancy, but only 20.3 percent were delivered by cesarean if EFM was not used. More indepth analysis is needed to settle the issue of whether EFM results in more cesareans, and whether cesareans cause iatrogenic prematurity.

In the 1963 NNS, we found that 22.5 percent of mothers of live births had x-rays during pregnancy; by 1980 this dropped to 15.0 percent. Table 3 (from Hamilton, et al., 1984) indicates that 53.9 percent of mothers of low birth weight infants got radiation during pregnancy, compared to 43.3 percent for mothers of infants weighing 2,500 grams or more at birth. Mothers of stillborn infants (see table 4) were even more likely to get radiation during pregnancy (63.0 percent), and subsequent research has indicated that most radiation was for pregnancy diagnostic purposes due to maternal or fetal complications. We have also studied maternal smoking and drinking before and during pregnancy, and found that over half of the married mothers of live births smoked and/or drank during pregnancy (figure 3 from Prager, et al., 1984). An analysis of white married women in the NNS by Kleinman and Madans (1985) concluded that the incidence of low birth weight would decline by 19 percent if all women stopped smoking during pregnancy. Graves, et al. (1983) found low birth weight associated with maternal consumption of two or more drinks per day, although there were relatively few heavy drinkers in the 1980 NNS sample.

Another area of concern in the United States is birth outcomes to teens and older mothers. Research by Ventura and Hendershot (1984), shown in table 5, indicates that the risks of fetal loss, low birth weight, and low Apgar Score are highest if the teen mother was not married at the time of her delivery. Furthermore, the risk of these adverse delivery outcomes was higher for mothers over 30 years of age if they were in a nonprofessional employment status, and particularly if they were smokers (table 6). These types of analysis help us build models which study biological risks and social risks and their impact on pregnancy outcome.

Some extremely innovative work on maternal weight gain and its impact on birth weight has been done by Taffel (1985), and is shown in figure 4. Weight gain of less than 16 pounds (compared to weight gain of 36 pounds or more) results in a birth weight differental of about 400 grams; maternal smoking causes a further differential of 200 grams.

Recently our staff has merged the American Hospital Association data set with the 1980 NNS/NFMS, and this allows us to look at hospital characteristics in relation to birth characteristics. The majority of hospitals report that they offer neonatal intensive care. Of course, one would expect different patterns of care in these hospitals due to the regionalization of high-risk cases and the referral patterns of high-risk mothers to hospitals with neonatal intensive care. This occurs for births which turn out to be first cesarean, repeat cesarean, and vaginal types of delivery. Johnston, et al. (1984) has examined the pattern of repeat cesareans by day of week according to whether the hospital had neonatal intensive care (figure 5). An index of 100.0 is the expected number of births for each day of the week, but there appear to be 50 percent birth deficits on weekends, and an excess of repeat cesarean deliveries particularly on Tuesday through Friday. This suggests the extent to which delivery is now scheduled in the birthing process.

Yet another way we've expanded the 1980 NNS is to build within it a numerically modest but comprehensive infant mortality survey. Since we oversampled low birth weight infants in the 1980 NNS, we have 2,214 high-risk infants in the survey. In the "1980 National Natality Survey/National Death Index Match" project (Placek, et al., 1984), we searched the National Death Index (NDI) for infants who died in the first year of life.

This allowed us to estimate 1980 infant mortality rate for new data characteristics not seen since the 1960 linked records study (NCHS, 1972). Table 7 compares the 1980 NNS/NDI infant mortality rates with 1960 rates according to infant birth weight (Keppel, et al., 1985). In 1960, out of every 1,000 infants who weighed less than 1,000 grams at birth, 919 died during the first year of life. In 1980 it is estimated that 729 out of every 1,000 died. The rate for infants weighing less than 1,000 grams therefore declined by only 20.8 percent. However, the mortality rate for infants in the next three weight groups declined by about 50 percent. The 1980 NNS/NDI Match provides the most recent source of nationally-representative estimates of infant mortality according to characteristics that are not available from death certificates. Although the number of 295 infant deaths in the NNS sample of 9,941 is modest, the depth of information available is much greater than that from linked records studies. Using the 1980 NNS, 1980 NFMS, and the 1980 NNS/NDI Match data, we are constructing fetal mortality, perinatal mortality, neonatal mortality, and infant mortality rates according to characteristics not previously available. Since the public use data tape for these data sets is now available for $140.00 (see National Technical Information Service reference) we at NCHS hope that researchers will help us further untangle the causes and correlates of adverse pregnancy outcome and that cross-national comparisons of our data with that of other countries will shed still more light on this important subject.

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Table 1. Percentage of live hospital births weighing less than 2,500 grams, by type of delivery and race of mother: 1980 National Natality Survey

Type of delivery	All races	White	All other
All deliveries	6.9	5.8	11.9
First cesarean	13.3	12.2	17.7
Repeat cesarean	6.5	4.9	12.7
Vaginal	6.1	5.0	10.9

Table 2. Primary cesarean section rates for in-hospital live births by electronic fetal monitoring (EFM) usage: United States, 1980 National Natality Survey

Characteristics	Rates[1] for **all** live births			Rates[1] for **first** live births		
	Total	EFM	No EFM	Total	EFM	No EFM
Total	11.2	12.7	9.8	17.6	18.7	16.4
Education of mother:						
0-11 years	10.1	12.1	8.3	16.0	19.4	12.6
12 years	10.9	12.2	9.6	16.5	16.9	16.1
13 years or more	12.6	13.9	11.3	20.2	20.5	19.7
Birth weight:						
Under 2,500 grams	21.5	22.8	20.3	26.6	27.2	26.0
2,500 grams or more	10.5	12.0	9.0	17.0	18.1	15.7

[1] Rates are first cesarean deliveries per 100 deliveries, excluding all repeat cesareans.

Table 3. Mothers of live-born infants who were exposed to radiation during pregnancy, according to marital status and birth weight, United States, 1980

Type of radiation exposure	Total			Married			Not married		
	Total	Less than 2,500 grams	2,500 grams or more	Total	Less than 2,500 grams	2,500 grams or more	Total	Less than 2,500 grams	2,500 grams or more
Number of women	3,612,000	247,000	3,365,000	2,945,000	170,000	2,775,000	660,000	77,000	590,000
Percent exposed:									
Any radiation	44.0	53.9	43.3	44.4	57.2	43.6	42.6	46.5	42.0
Medical x-rays	15.0	18.8	14.7	14.8	19.9	14.5	15.6	16.5	15.5
Dental x-rays	3.6	1.7	3.7	4.0	2.2	4.1	1.7	.7	1.8
Ultrasound	33.5	44.1	32.7	33.6	46.6	32.8	32.8	38.7	32.0
Nuclear medicine	[1].1	[1].3	[1].1	[1].1	[1].3	[1].1	[1].2	[1].4	[1].1
Shortwave	.9	[1].7	.9	.9	[1].7	.9	[1].7	[1].5	[1].7
Microwave	.6	[1].6	.6	.6	[1].6	.6	[1].5	[1].5	[1].5

[1] Figure does not meet standards of reliability or precision; that is, the relative standard error is 25 percent or more.

[redacted]

Table 4. Mother of stillborn infants who were exposed to radiation during pregnancy, according to marital status, United States, 1980

Type of radiation exposure	Total	Married	Not Married
Number of women	19,202	14,793	4,409
Any radiation	[redacted]	65.5	54.4
Medical x-rays	23.4	24.4	20.3
Dental x-rays	2.4	2.7	1.6
Ultrasound	53.4	55.8	45.6
Nuclear medicine	[1].3	[1].3	[1].3
Shortwave	1.4	1.4	[1]1.2
Microwave	1.1	1.1	[1]1.1

[1] Figure does not meet s[redacted]rds of reliability or precision; that is, the relative standard error is 25 percent or more.

Table 5. Outcome of first births in terms of three infant health measures for mothers[1] under 20 years, according to marital status at conception and birth, and trimester of pregnancy prenatal care began, United States, 1980

Trimester prenatal care began and infant health measure	Total, all marital statuses	Premarital conception		Marital conception
		Unmarried at birth	Married at birth	
All mothers				
Fetal losses per 1,000 births	5.2	5.6	3.8	5.9
Percent of infants weighing less than 2,500 grams	8.9	10.8	7.4	6.2
Percent of infants with 1-minute Apgar scores less than 7	10.4	11.1	10.1	9.2
First trimester				
Fetal losses per 1,000 births	4.8	6.1	3.2	4.8
Percent of infants weighing less than 2,500 grams	8.3	13.4	[2]6.1	[2]5.2
Percent of infants with 1-minute Apgar scores less than 7	12.1	15.7	[2]11.5	[2]9.1

[1] For married mothers, includes only those married once, husband present.

[2] Does not meet standards of statistical reliability; that is, the relative standard error is 25 percent or more.

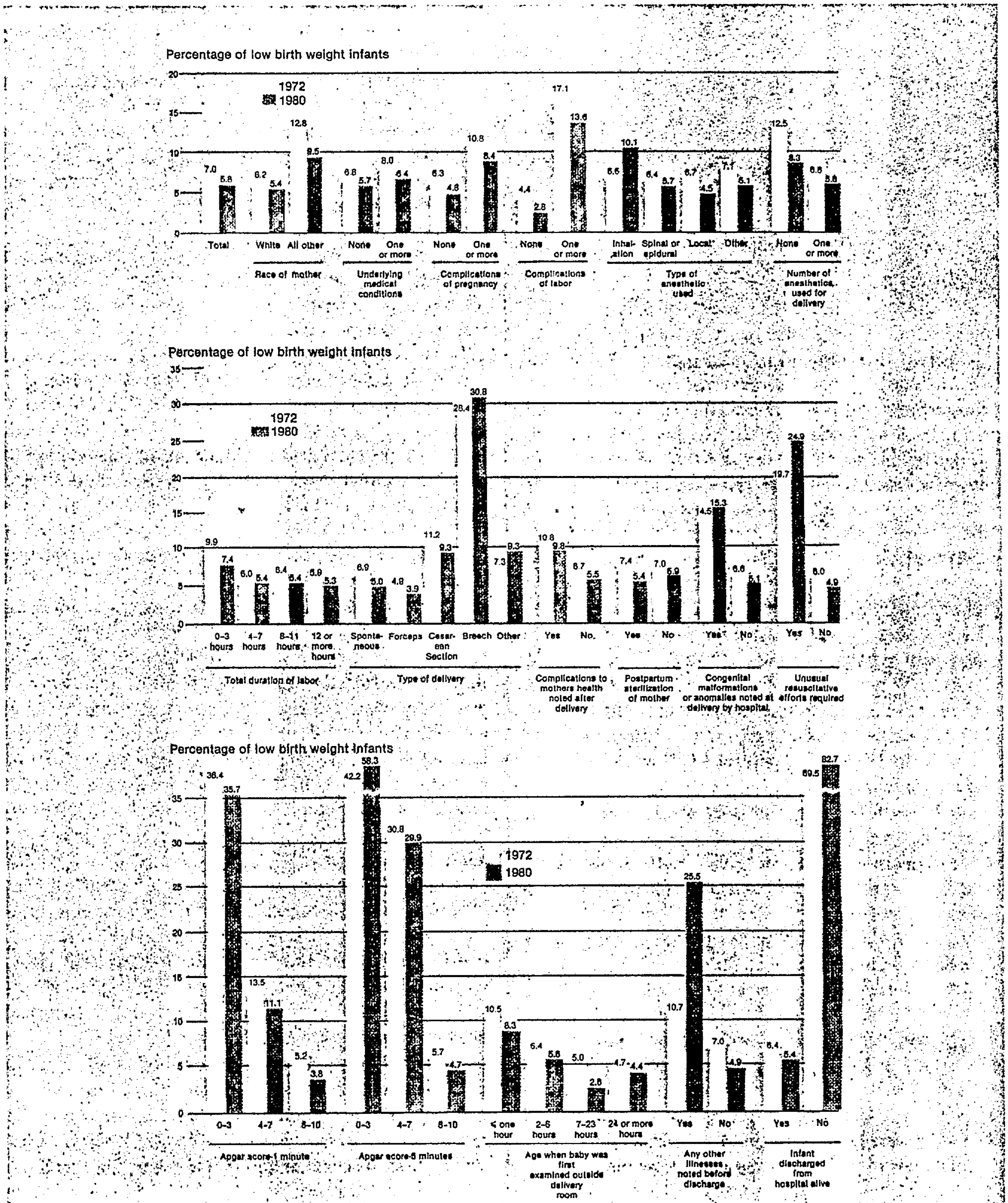
Table 6. Outcome of first births in terms of three infant health measures for married women 30 years and older, according to mother's smoking status, employment status, and occupational group during the year preceding childbirth, United States, 1980

Smoking status of mother and and infant health measure	Total	Not Employed	Professional	Sales clerical	Other
All mothers					
Fetal losses per 1,000 births	5.8	[1]8.9	3.7	6.9	8.6
Percent of infants weighing less than 2,500 grams	7.4	[1]5.9	[1]6.3	[1]9.2	[1]9.0
Percent of infants with 1-minute Apgar scores less than 7	10.4	[1]14.6	[1]8.6	[1]9.5	16.2
First trimester					
Fetal losses per 1,000 births	5.0	[1]7.6	3.4	6.7	[1]6.8
Percent of infants weighing less than 2,500 grams	6.5	[1]5.8	[1]5.9	[1]8.2	[1]6.3
Percent of infants with 1-minute Apgar scores less than 7	10.1	[1]8.9	[1]8.6	[1]12.3	[1]13.2

[1] Does not meet standards of statistical reliability; that is, the relative standard error is 25 percent or more.

Table 7. Infant mortality rates by birth weight: United States, 1960 and 1980

Birth weight	1960	1980	Percent decline
Total	25.1	13.1	47.8
Less than 1,000 grams	919.3	728.5	20.8
1,000-1,499 grams	548.5	256.7	53.2
1,500-2,499 grams	91.3	37.0	59.5
2,500 grams or more	11.2	5.9	47.3



NOTE: Low birth weight was defined as less than 2,500 grams in 1980 and as 2,500 grams or less in 1972. Likewise, there was a shift of 1 gram for other birth weight categories.

SOURCE: National Center for Health Statistics: final data from the 1972 National Natality Survey and data from the 1980 National Natality Survey.

Figure 1. Percentage of infants of low birth weight born to married mothers in hospitals, by selected maternal and infant characteristics: United States, 1972 and 1980

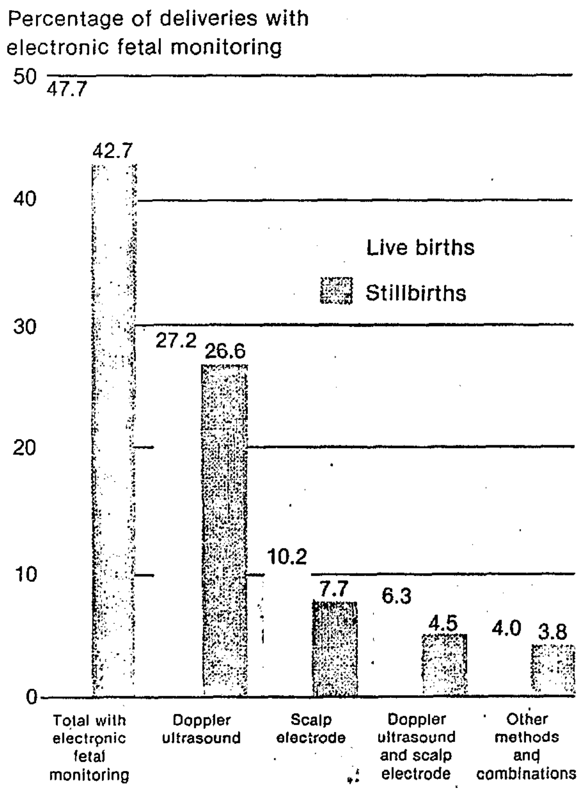
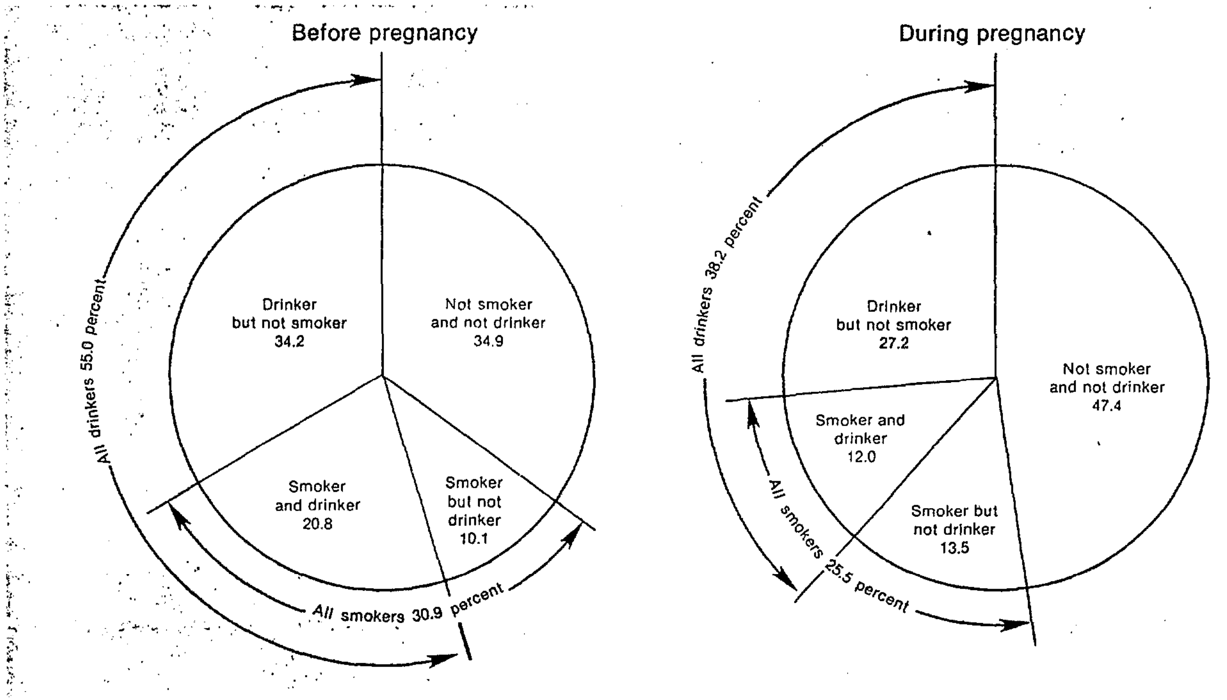


Figure 2. Percentage of live hospital births and stillborn hospital deliveries with electronic fetal monitoring: United States, 1980



SOURCE: National Center for Health Statistics data from the 1980 National Natality Survey

Figure 3. Percent distribution of married mothers of live-born infants, according to smoking and drinking behaviors before and during pregnancy: United States, 1980

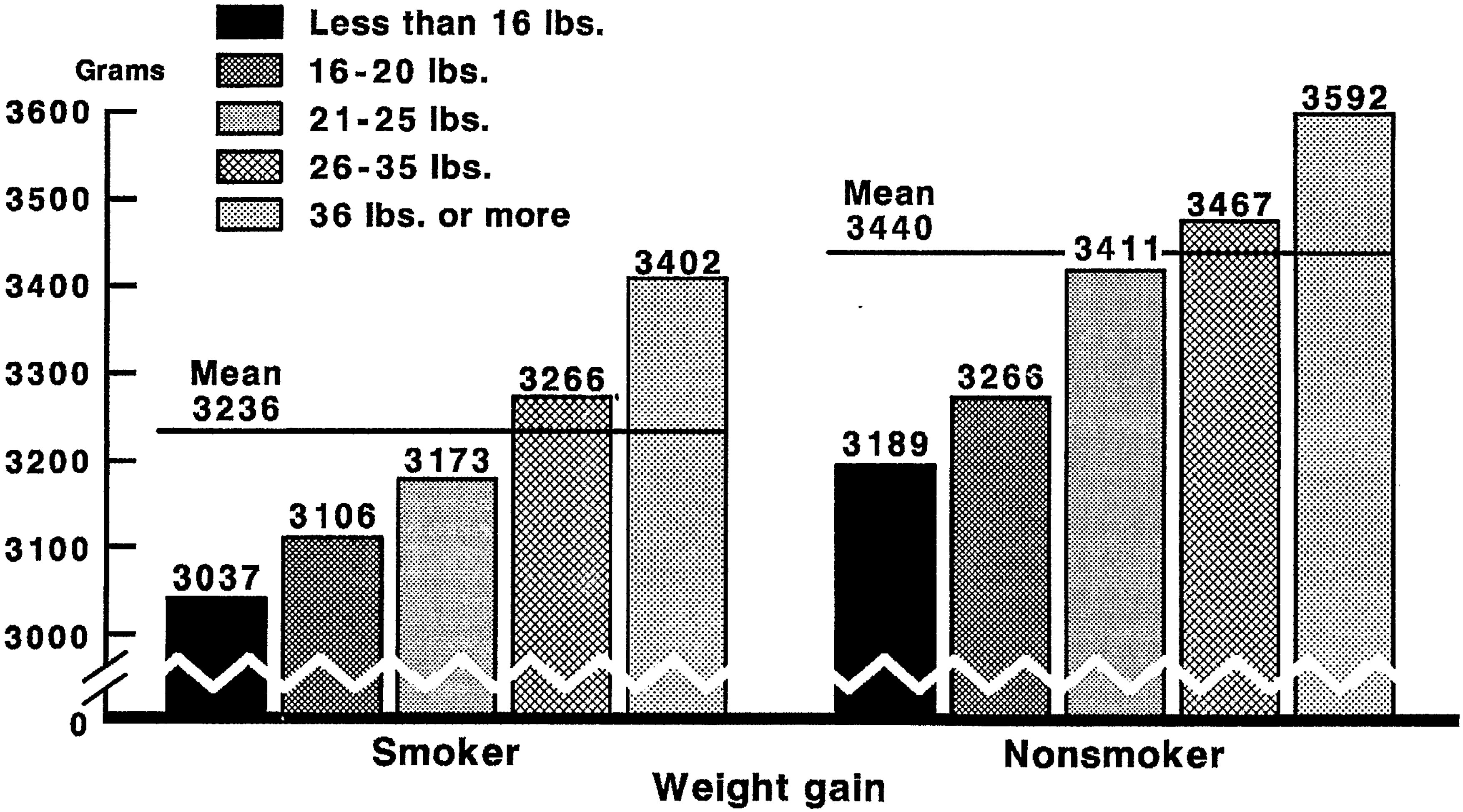


Figure 4. Mean birth weight by weight gain during pregnancy and smoking habit of married mothers

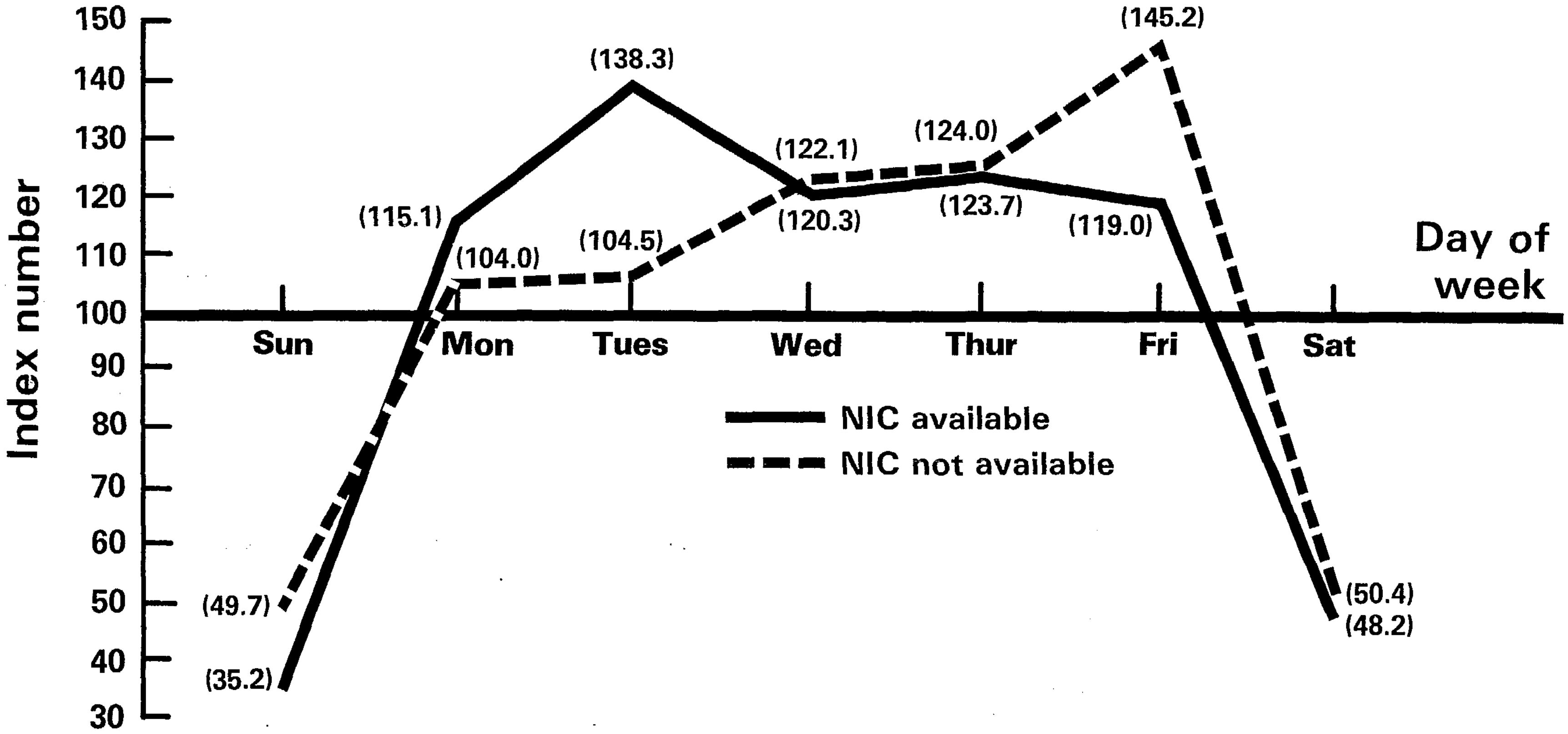


Figure 5. Daily index of repeat cesarean live births by availability of hospital neonatal intensive care: United States, 1980

Perinatal Mortality Rates in Relation to Preterm Birth and Intrauterine Growth Retardation

by Howard J. Hoffman

The United States has a higher perinatal and infant mortality rate than a number of other industrialized or developed countries, which may be due in large part to an excess number of low birth weight infants born in this country.[1-3] However, in comparing low birth weight-specific perinatal mortality rates, the United States has been shown to be among the lowest in the world.[4] While the latter favorable comparison could be due to our technology intensive approach to neonatal care, alternative explanations deserve attention.[5-9] For example, it is known that preterm babies are at higher risk than are babies having the same weight but born at term (small-for-gestational age infants).[10-11] It is possible that a higher proportion of low birth weight infants in the small-for-gestational age (SGA) category are born in the United States compared to other developed countries. This could then account for the favorable perinatal mortality rates found among low birth weight infants in this country. For instance, a large difference of this type has been documented between developing and developed countries, with the former having a much higher proportion of low birth weight infants in the SGA category.[12] In view of the expense associated with high technology neonatal care, it is important to ensure fair comparisons by adjusting for the different inherent risks in the infant populations involved.

Because much remains to be learned from epidemiologic studies of the perinatal period--particularly in reference to etiologic factors determining both mortality and morbidity risks--this report will illustrate several basic considerations in the epidemiology of perinatal mortality in developed countries. Perinatal mortality will be discussed primarily in relation to the two types of low birth weight infant: (1) preterm births, and (2) small-for-gestational age or interauterine growth retarded (IUGR) births. The data presented are based on comparisons between U.S. and Scandinavian data sets. For the most part, these comparisons have utilized existing vital records of medical birth registry data.

Birth weight-specific perinatal mortality rates

Table 1 illustrates birth weight-specific perinatal mortality rates for Norway, Sweden, and the United States (white and all other separately) in 1972-73. The U.S. data were obtained from three States--Minnesota, Missouri, and North Carolina. In the lower birth weight range (for example, 2,000-2,999 grams), U.S. nonwhite infants have the lowest perinatal mortality rates and the two Scandinavian countries have the highest perinatal mortality rates. However, the reverse is true for infants with birth weights exceeding 3,500 grams.

Figure 1 illustrates the cumulative distribution of births by weight for the Norwegian and U.S. white and black births. The entire distribution for black births is shifted to the left towards lower birth weights while the distribution of Norwegian births is shifted to the right, demonstrating more high birth weight deliveries. In figure 2, birth weight-specific perinatal mortality rates are plotted. Above 3,500 grams Norwegian births have lower perinatal mortality rates, but below 3,000 grams U.S. black births have the lowest perinatal mortality rates. For the U.S. data, this illustration is comparable to that shown by Dr. Kleinman earlier in this meeting. The data from Norway and Sweden extend the comparison and, also, imply that shifts in either direction, to the left or right, in the underlying birth weight distributions can markedly reduce or increase birth weight-specific perinatal mortality comparisons, respectively.

Such seemingly paradoxical results have been commented on previously in both the clinical and epidemiological literature, particularly as regards discrepancies between white and black births in the United States.[13-16] Because black infants have nearly twice the perinatal mortality rate of white infants throughout all time periods examined to date, it has often seemed surprising that for a given low birth weight category, black infants consistently have a better or lower low birth weight-specific perinatal mortality rate compared to white infants. Because black infants are also consistently smaller than white infants in the United States, an important question is raised of whether simple weight standardization techniques or birth weight-specific comparisons are appropriate given the different underlying birth weight distributions. In accounting for the observed differences between the United States and Scandinavian rates, it has been demonstrated that the differences in underlying birth weight distributions are critical to the comparison. Scandinavian births are consistently larger than U.S. white births. These differences seem to imply for Scandinavian births a more favorable perinatal mortality rate for large births (>3,500 grams), but a less favorable perinatal mortality rate for smaller births (<3,000 grams).

Table 2 illustrates that essentially the same pattern of results exists for a more recent time period, 1979-80, for the comparison of birth weight-specific perinatal mortality rates. Although birth weight-specific perinatal mortality rates have declined appreciably over the intervening 7 years, between 1972-73 and 1979-80, the relative differences have remained unchanged. Underlying birth weight distributions within each of these population groups have also been relatively stable during this time period. Thus, there appear to be intrinsic differences in the perinatal mortality and birth weight distributions for different populations that require further understanding.

Although these differences have been resistant to efforts aimed at amelioration, considerable improvement in the overall perinatal mortality rate has occurred in recent years in most developed countries that must be associated with improving medical practices and the delivery of care.

Preterm birth and perinatal mortality

The importance of preterm birth as a major obstetric and public health problem is easily appreciated when reference is made to the proportion of perinatal deaths attributable to preterm birth. This proportion varies between

50 and 70 percent in most published reports. In fact, Rush and colleagues have reported that after exclusion of births with congenital anomaly, preterm birth accounted for 85 percent of the remaining neonatal deaths in a hospital population of births in Oxford, England.[17]

The next few tables all relate to the occurrence of preterm birth and the associated perinatal mortality rates. Most of this material has been published in two earlier articles on the epidemiology of preterm birth in collaboration with Dr. Bakketeig.[18-19] In table 3, the cumulative distribution of singleton births by weeks of gestation (in 3 week groups) and the cumulative distribution of perinatal deaths are shown for Minnesota and Norwegian births. The most striking feature of this table is the concentration of perinatal deaths in the very preterm or low gestational ages. For example, although less than 2 percent of births have occurred prior to 30 weeks gestation, between 30 and 40 percent of all perinatal deaths are associated with these few births. Minnesota was chosen for this comparison with Norway because their birth files had very low rates of missing gestational age information based on the last menstrual period (LMP) for the years 1972-73. Indeed, Minnesota was the first State in the United States in 1967 to adopt use of the last menstrual period (LMP) date on the standard birth certificate to improve the validity of gestational age reporting. In the 2 or 3 percent of cases in which LMP dates were unknown, gestational age has been estimated based on known birth weights.

The comparison of Norwegian with Minnesota white infants reveals very similar distributions of births and perinatal deaths by these gestational age categories. When the "all other" data from Minnesota are added to the comparison an even greater contribution of preterm birth to total perinatal mortality is shown. Slightly more than 50 percent of all perinatal mortality among all other singleton births is contributed by deliveries occurring prior to 33 weeks gestation.

In figure 3, the Minnesota white and all other gestational age-specific perinatal mortality rates are shown. The pattern of results is similar to the more customary birth weight-specific perinatal mortality rates. At low gestational ages in the preterm birth range, all other mothers have lower perinatal mortality rates than white mothers. White multiple births are also shown in this figure. The minimal mortality occurs at 37-38 weeks and perinatal mortality is lower than for the singleton births at some weeks. This appears to be another illustration of how differences in the underlying birth distributions will affect gestational age-specific (or birth weight-specific) perinatal mortality rates.

The issue of changes over time is addressed in figure 4 for Norway. In terms of the logistic scale of this figure, there has been a nearly constant lowering of perinatal mortality rates at all gestational ages from the period 1972-73 to 1979.

Most of the remaining tables are based on the analysis of so-called "repeater" data from Norway and stem from joint collaborative research with Dr. Bakketeig. These "repeater" analyses are possible because the record linkage and person-number system makes it feasible to track successive pregnancy outcomes of mothers in Norway. Such information has been made available for research purposes only, and individual mother's identities are not known, as is the case in the research use of any vital statistics.

Table 4 illustrates that a prior preterm birth increases the risk for a subsequent preterm birth. The risk is 3.9 for a second preterm birth, and increases to 6.5 when two prior preterm births have occurred. Note that "preterm" birth corresponds to "less than 36 weeks" in this table rather than to the usual "less than 37 weeks." Because induced births were not excluded from the table, and the cutoff less than 36 weeks corresponds better to a <2,500 gram cutoff, this definition of preterm birth was selected.[20-21]

A more detailed illustration of this tendency to repeat similar outcomes among successive births is shown in table 5. It is clear from this table that births of similar gestational ages tend to be repeated, even post-term births are more common if the previous birth were postterm. In table 6, the relative risks of repeating similar (and dissimilar) outcomes are emphasized rather than the percent distribution. The most striking relative risks are shown for "very preterm" births (less than 28 weeks), and "preterm" births (28-35 weeks).

Table 7 displays the percent of preterm births as a function of parity and maternal age for a cohort of women having their first three singleton births over a 10-year period in Norway. Two major effects of maternal age and parity are suggested: (1) more than 20 percent of para 2 births with mother's age less than 20 are preterm (although the number of such births is quite small in Norway), and (2) except for maternal ages less than 20, the rate of preterm birth declines with increasing parity.

Table 8 is somewhat complicated but is shown here to illustrate the level of detail which can be obtained from this type of "longitudinal" data on pregnancy outcomes. To mention only a few of these details, it is clear from the top line in the table that even if no preterm births occurred in the first three deliveries, that perinatal mortality rates declined substantially with increasing parity. Among para 2 preterm births, there is also a lower perinatal mortality rate compared to para 0 and para 1 preterm births.

Table 9 illustrates one method of summarizing the detailed information contained in tables similar in format to table 8. Each one of the conditions shown in table 9 were first examined in a format similar to table 8. Based on these analyses, a summary of selected maternal diseases and pregnancy complications is shown in relation to the number of preterm births in table 9. The most impressive of these associations is for first-trimester vaginal bleeding, that is 17.2 percent of mothers who had three successive preterm births had this pregnancy complication compared to only 1.9 percent of mothers having had no preterm deliveries among their first three successive births. On the other hand, the occurrence of preeclampsia appears not to be associated with preterm birth. Relative risks range from 1.2 for first births (a small relative risk but possibly of clinical significance) to 0.9 for mothers with three successive preterm births.

Table 10 illustrates associations between maternal occupational classifications and the risks of having had either one preterm birth (middle column) or two or three preterm births (right-hand column). The gradients across the occupational groups shown are similar, being more pronounced for the mothers who delivered two or three preterm births. The highest risks of preterm delivery found were for mothers employed in "services" or "manufacturing" industries. This grouping presumably reflects the socioeconomic standing of parents.

Small-for-gestational age births

Turning to results on small-for-gestational age births, table 11 demonstrates that these births also tend to repeat. One prior SGA birth increases the risk for a subsequent SGA births to 3.3. Two prior SGA births increase the risk for a third SGA birth to 5.0. These results demonstrate the same pattern as shown earlier for the tendency to repeat preterm births.

Table 12 is comparable to table 7 shown for preterm births. However, the number of associations between various combinations of parity and maternal age with the risk for SGA birth are fewer than those shown earlier for preterm births. First births are associated with a slight increase in SGA births.

However, it is interesting to note that "delayed" childbearing (first birth over 35 years of age) is associated with a significant increase in the proportion of SGA births to 17 percent. In general, the rate of SGA births declines slightly with increasing maternal age, except as just noted for "elderly" primigravida.

Perinatal mortality comparisons are shown in table 13 for SGA births depending on whether the prior birth was SGA, appropriate-for-gestational age (AGA), or large-for-gestational age (LGA). If the previous birth was LGA, then the risk of perinatal death is three times that for repeating SGA births. This result could be quite important clinically if a mother whose previous birth was large in size had a subsequent pregnancy with signs of growth retardation *in utero*.

Table 14 provides more detailed information regarding birth weight and perinatal mortality for subsequent births within a given birth weight stratum, 2,501-3,000 grams. These births are a mixture of "mildly preterm" but appropriate sized infants, and those which are either term or postterm but with some degree of growth retardation. The very best outcome results if the prior birth fell within limits of the next lower birth weight stratum, 2,001-2,500 grams. If the prior birth was either smaller or the same weight, then perinatal mortality was still less than the overall rate of 14.2 deaths per 1,000 births. However, if the weight of the prior birth exceeded 3,500 grams, then the mortality rate was doubled in comparison to the overall rate.

An investigation of cause-specific perinatal mortality rates for this same birth weight stratum is shown in table 15. In addition, crown-heel length is used to further classify infant's risk. A relatively "long" infant (in this case, $\geq$ 50 cm) is more likely to be a term or postterm infant.[16, 25-26] For these infants, perinatal mortality was more often associated with placental problems or maternal complications often found in association with intrauterine growth retardation.[27-28] Unusually short infants for this birth weight stratum (<46 cm) had increased perinatal mortality risks in association with congenital malformations and asphyxia.

Conclusion

Other researchers have also investigated the tendency to repeat low birth weight outcomes.[27-32] Yerushalmy took into account infant's gestational age through a simple bivariate classification scheme in his analysis of repeater data. Tejani has examined the risk for repeating SGA birth in a hospital population. All of these studies have found associations similar to those described here using data from the Norwegian Medical Birth Registry. The value of this Norwegian data base, compared to the other published data, is the broad population base from which inferences can be drawn. Not only is this information provided without the biases inherent in smaller regional or hospital-based studies, but the total number of births and perinatal deaths available make for comparisons and results which would not otherwise be possible. It is hoped that other data sources of comparable quality and extent will be utilized in the near future to extend the results in this report. The addition of information regarding maternal smoking status, degree of certainty in the reported LMP date, maternal prepregnant weight and height, weight-gain during pregnancy, and so forth, could greatly enhance the analyses previously performed on longitudinal pregnancy outcome data.

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Table 1. Perinatal mortality rates, 1972-73

Birth weight (grams)	United States[1]		Sweden[2]	Norway[1]
	All other	White		
- 999	868.5	905.3	818.6	948.9
1,000-1,499	437.2	519.5	529.8	592.8
1,500-1,999	159.1	222.3	211.5	285.8
2,000-2,499	46.7	54.4	61.6	72.0
2,500-2,999	9.9	12.9	15.4	20.4
3,000-3,499	6.9	4.9	5.0	5.7
3,500-3,999	8.1	4.2	3.3	3.2
4,000-4,499	12.7	4.6	3.7	3.3
4,500 or more	74.0	12.1		7.2
Not stated	858.1	735.3	480.9	340.3
Total	35.9	20.0	14.2	19.4

[1] Data from 3 States with approximately 7 percent of total United States births. Fetal deaths of 16 or more weeks gestation are included for Norway, and of 20 or more weeks gestation are included for the United States.

[2] Swedish data is for 1973 only, and includes only late fetal deaths of 28 or more weeks gestation.

SOURCE: From Hoffman et al.[16] Courtesy of Oxford University Press, New York.

Table 2. Perinatal mortality rates, 1979-80

Birth weight (grams)	United States[1]		Sweden[2]	Norway[2]
	Black	White		
- 999	694.7	744.4	(659.5)	770.7
1,000-1,499	183.6	278.2	255.4	400.9
1,500-1,999	83.9	106.4	131.2	169.6
2,000-2,499	26.8	34.7	42.3	54.7
2,500-2,999	6.7	9.0	9.5	14.2
3,000-3,499	3.6	3.4	3.0	4.6
3,500-3,999	4.1	2.5	2.1	2.6
4,000-4,499	6.5	2.9	2.5	2.4
4,500 or more	19.0	6.8	3.2	4.1
Not stated[3]	654.8	450.5	248.5	176.7
Perinatal mortality rate	21.7	12.0	8.3	11.5
Number of births	77,289	369,773	192,682	102,364

[1] Data from 3 States with approximately 7 percent of total United States births. Only fetal deaths of 28 or more weeks gestation are included for all three countries.

[2] Data from NOMESKO[33] and unpublished data from Task Force on Birth Registration (AFOD) of the Nordic Medical Statistical Committee (NOMESKO), plus the statistical yearbooks of the Central Bureau of Statistics of Norway. In this time period, Sweden did not register fetal deaths of less than 28 weeks gestation which undoubtedly affects rates for 1,000 grams and below.

[3] Birth weight was not stated in 0.1 percent of births for both U.S. Black and White and in 0.2 percent of births in both Sweden and Norway.

Table 3. Cumulative percentage distributions of gestational age in completed weeks since the last normal menstrual period for singleton births (both live and stillborn) and perinatal deaths for Minnesota and Norway, 1972-73.

Gestational age (weeks)	Singleton births			Perinatal deaths		
	Minnesota All other	Minnesota White	Norway	Minnesota All other	Minnesota White	Norway
21-23	.27	.18	.16	8.57	9.11	7.53
24-26	1.00	.45	.42	30.48	21.80	19.30
27-29	1.73	.83	.77	40.95	33.76	30.85
30-32	3.09	1.66	1.50	51.43	44.95	44.03
33-35	7.86	4.41	3.68	60.00	56.03	58.02
36-38	29.42	20.94	17.08	69.52	71.10	74.07
39-41	83.62	81.03	84.20	84.76	87.83	93.54
42-44	97.32	97.83	98.73	91.43	95.60	99.14
45 or more	99.80	99.94	99.97	93.33	96.63	99.91
Unknown	100.00	100.00	100.00	100.00	100.00	100.00
Total	4,402	106,998	124,584	105	1,931	2,337

SOURCE: Hoffman and Bakketeig.[19] Courtesy of Harper & Row Publishers, Inc., Philadelphia.

Table 4. The risk of preterm birth (less than 36 completed weeks) in subsequent births based on 27,677 mothers with their first three single births in Norway, 1967-76.

First birth	Second birth	Number of mothers	Subsequent birth preterm	
			Percent	Relative risk
Not preterm		25,817	4.4	1.0
Preterm		1,860	17.2	3.9
Not preterm	Not preterm	24,689	2.6	.6
Preterm	Not preterm	1,540	5.7	1.3
Not preterm	Preterm	1,128	11.1	2.5
Preterm	Preterm	320	28.4	6.5

SOURCE: Bakketeig and Hoffman.[18] Courtesy of Butterworths International Medical Reviews, London.

Table 5. Percent for the tendency to repeat gestational age in successive births based on 130,279 mothers with their first two singleton births in Norway, 1967-76.

First pregnancy	Number of mothers	Second pregnancy				
		Very preterm (16-27 weeks)	Preterm (28-35 weeks)	Mildly preterm (36-38 weeks)	Term (39-41 weeks)	Postterm (42+ weeks)
Very preterm	1,004	8.2	11.6	20.4	50.6	9.3
Preterm	4,680	1.5	10.6	26.4	53.2	8.2
Mildly preterm	16,516	.8	4.5	24.0	62.2	8.5
Term	85,121	.4	2.1	11.2	73.3	13.0
Postterm	22,958	.3	1.5	6.5	64.1	27.6

SOURCE: Modified from Hoffman and Bakketeig.[19] Courtesy of Harper & Row Publishers, Inc., Philadelphia.

Table 6. Relative risks for the tendency to repeat gestational age in successive births based on 130,279 mothers with their first two singleton births in Norway, 1967-76.

		Second pregnancy				
First pregnancy	Number of mothers	Very preterm (16-27 weeks)	Preterm (28-35 weeks)	Mildly preterm (36-38 weeks)	Term (39-41 weeks)	Postterm (42+ weeks)
Very preterm	1,004	20.5	5.5	1.8	.7	.7
Preterm	4,680	3.8	5.0	2.4	.7	.6
Mildly preterm	16,516	2.0	2.1	2.1	.8	.7
Term	85,121	1.0	1.0	1.0	1.0	1.0
Postterm	22,958	.8	.7	.6	.9	2.1

SOURCE: Modified from Hoffman and Bakketeig.[19] Courtesy of Harper & Row Publishers, Inc., Philadelphia.

Table 7. Percent of preterm births by parity and maternal age based on 27,677 mothers with their first three singleton births in Norway, 1967-76.

Parity	Maternal age	Number of mothers	Percent preterm
Para 0	<20	4,866	9.3
	20-34	22,643	6.1
	35+	168	7.7
	All		6.7
Para 1	<20	977	10.8
	20-34	26,318	5.1
	35+	382	5.2
	All		5.3
Para 2	<20	47	21.3
	20-34	26,486	3.4
	35+	1,144	3.0
	All		3.4

SOURCE: Modified from Bakketeig and Hoffman.[18] Courtesy of Butterworths International Medical Reviews, London.

Table 8. Perinatal mortality rates per 1,000 births (live plus stillborn) by parity and for maternal cohorts with different sequences of preterm (P) or not preterm (N) births based on 30,979 mothers with their first three singleton births in Norway, 1967-76.

First birth	Second birth	Third birth	Number of mothers	Para 0	Para 1	Para 2
No preterm births:						
N	N	N	24,052	30.6	15.8	6.3
One preterm birth:						
N	N	P	637	28.3	34.5	298.3
N	P	N	1,003	25.9	539.4	10.0
P	N	N	1,452	533.7	12.4	11.7
Two preterm births:						
N	P	P	125	24.0	552.0	400.0
P	N	P	88	443.2	45.4	352.3
P	P	N	229	545.9	436.7	13.1
Three preterm births:						
P	P	P	91	582.4	615.4	296.7
Unknown			3,302	63.3	40.3	23.6
Total			30,979	64.1	42.7	18.0

SOURCE: Bakketeig and Hoffman.[18] Courtesy of Butterworths International Medical Reviews, London.

Table 9. Percent (and relative risks) with selected maternal diseases and complications during pregnancy by the number of preterm births based on 27,677 mothers with their first three singleton births in Norway, 1967-76.

Number of preterm births	Number of mothers	Preeclampsia	Urinary tract infection	First trimester vaginal bleeding	Prior gynecol./ obstet. complications	Miscellaneous medical conditions
0	24,052	5.3	2.2	1.9	2.3	13.1
1	3,092	6.5 (1.2)	2.8 (1.3)	8.2 (4.3)	3.3 (1.4)	19.5 (1.5)
2	442	5.2 (1.0)	3.5 (1.6)	14.7 (7.7)	6.2 (2.7)	27.4 (2.1)
3	91	4.8 (0.9)	2.2 (1.0)	17.2 (9.1)	8.8 (3.8)	42.1 (3.2)
Total	27,677	5.5	2.3	2.9	2.5	14.1

SOURCE: Hoffman and Bakketeig.[19] Courtesy of Harper & Row Publishers, Inc., Philadelphia.

Table 10. Percent distribution and relative risks of 1 or more preterm births by mothers' occupation based on 30,979 mothers with their first three singleton births in Norway, 1967-76.

Mothers' occupation	Percent of mothers	Relative risk of 1 preterm birth	Relative risk of 2 or 3 preterm births
Housewife or or unemployed	60.3	.78	.59
Agriculture or fishing	3.3	.85	.62
Technical or professional	12.1	1.04	.99
Clerical and sales	13.9	1.21	1.29
Services	6.7	1.43	2.15
Manufacturing	3.8	1.38	2.47
All women	100.0	1.00	1.00

SOURCE: Hoffman and Bakketeig.[19] Courtesy of Harper & Row Publishers, Inc., Philadelphia.

Table 11. The risk of small for gestational age (SGA) births in subsequent births based on 26,162 mothers with their first three singleton births, Norway, 1967-1976.

First birth	Second birth	Number of mothers	Subsequent SGA birth	
			Percent	Relative risk
Not SGA		23,300	8.8	1.0
SGA		2,862	28.7	3.3
Not SGA	Not SGA	21,260	6.0	0.7
SGA	Not SGA	2,042	18.6	2.1
Not SGA	SGA	2,040	23.7	2.7
SGA	SGA	820	44.4	5.0

SOURCE: Bakketeig et al.[24]

Table 12. Percentage of small for gestational age (SGA) births, based on 26,162 mothers with their first three singleton births, Norway, 1967-1976.

Parity	Maternal age	Number of mothers	Percent preterm
Para 0	<20	4,561	11.3
	20-34	21,442	10.8
	35+	168	17.0
	All		10.9
Para 1	<20	866	13.2
	20-34	29,914	10.9
	35+	362	8.6
	All		10.9
Para 2	<20	38	10.5
	20-34	25,030	9.6
	35+	1,094	7.2
	All		9.5

SOURCE: Modified from Bakketeig and Hoffman.[18] Courtesy of Butterworths International Medical Reviews, London.

Table 13. Perinatal mortality for small for gestational age (SGA) second births by weight for gestation of their elder sibling based on 134,629 mothers with their first and second singleton births, Norway, 1967-1976.

Weight for gestation of elder sibling	SGA second births	
	Number	Perinatal mortality rate[1]
SGA	4,578	33.0
AGA	10,070	39.5
LGA	180	100.0
Unknown	466	38.6
Total	15,294	38.6

[1] Perinatal mortality is defined here as the number of fetal deaths (<16-week gestational age) and early neonatal deaths (0-6 days of age) per 1,000 total births. Total births include both live births and fetal deaths with gestational age of 16-weeks or more.

SOURCE: Bakketeig, et al. [24]

Table 14. Perinatal mortality for second births weighing between 2,501 and 3,000 grams by birth weight of the elder sibling

Elder sibling's birth weight (g)	Number of second births	Perinatal mortality rate[1]
≤ 1,500	398	10.1
1,501-2,000	364	11.0
2,001-2,500	1,185	2.5
2,501-3,000	4,531	10.6
3,001-3,500	5,405	13.3
3,501-4,000	1,823	32.4
4,001-4,500	267	26.2
> 4,500	28	35.7
Total	14,001	14.2

[1] Perinatal mortality is defined here as the number of fetal deaths (>16 week gestational age) and early neonatal deaths (0-6 days of age) per 1,000 total births. Total births include both live births and fetal deaths with gestational age of 16 weeks or more.

SOURCE: Hoffman and bakketeig.[23]

Table 15. Cause-specific perinatal mortality for second births weighing between 2,501 and 3,000 grams by crown-heel length.

	Crown-heel length (cm)[1]		
	Short (≤46 cm)	Medium (47-49 cm)	Long (≥50 cm)
Primary cause of death	Relative risk[2]	Perinatal mortality rate	Relative risk
Maternal complications	1	0.7	5
Placenta previa, Abruptio placenta, Complications of umbilical cord	1	3.1	6
Other complications of pregnancy and delivery, Birth injury	2	1.7	4
Congenital malformation	6	2.1	2
Asphyxia	7	0.1	--
Premature birth	--	0.2	--
All other causes	5	0.4	9
Perinatal mortality rate Number of births	22.7 1,451	8.3 10,496	38.1 1,994

[1] Excluding 60 births with unreported crown-heel length.

[2] Relative risks of short, or long, births are computed relative to medium length births.

SOURCE: Hoffman and Bakkegeig.[23]

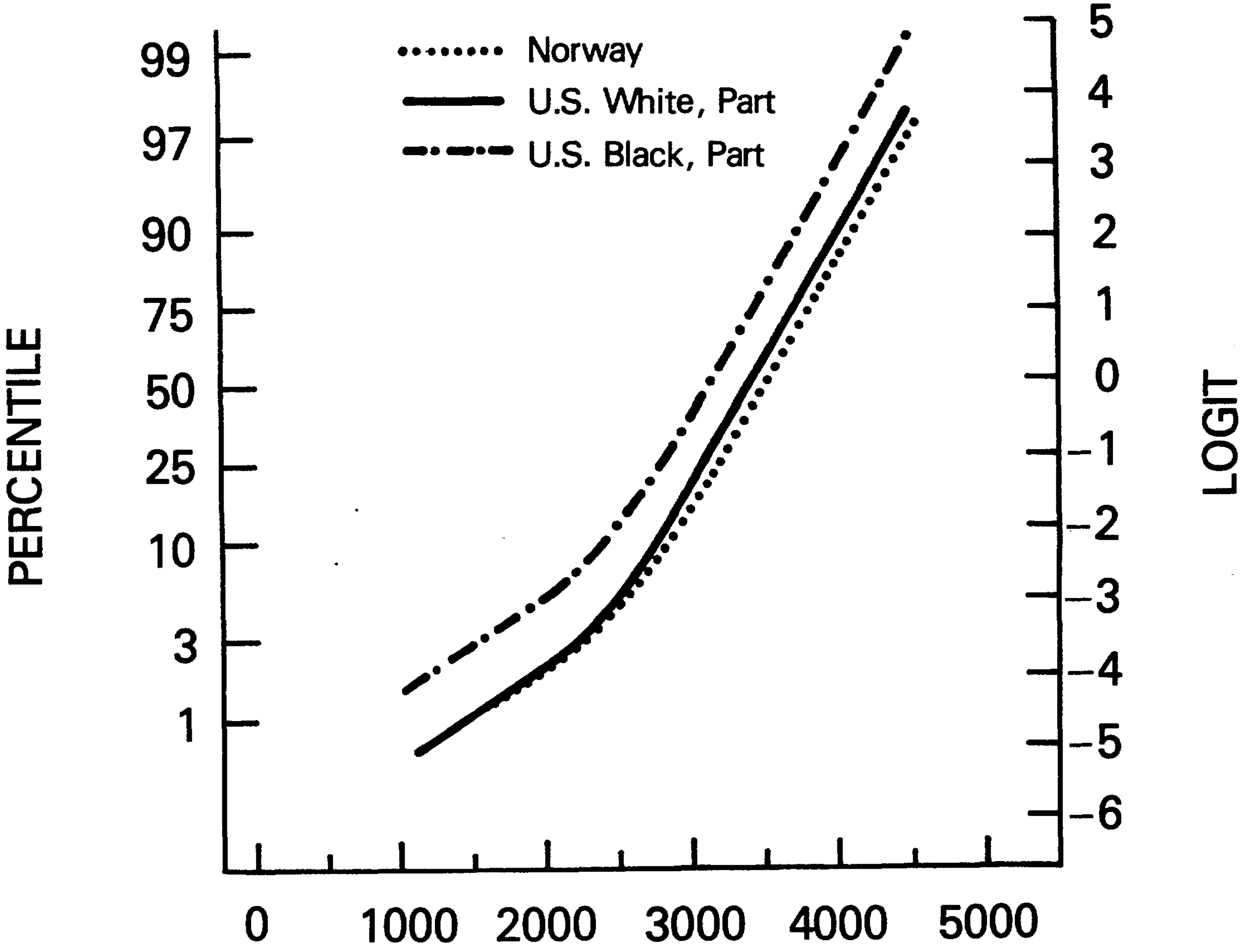


Figure 1. Cumulative birth weight distributions for Norway and U.S. white and black births, 1972-1973

The U.S. data is based on births in three States: Minnesota, Missouri, and North Carolina. A logit scale has been used to plot the cumulative birth weight distributions. For example, if these empirical distributions were of "logistic" type, then the plotted curves would be linear. Beyond 2,500 grams birth weight, these curves are linear which suggests that the center and right-hand tail of the cumulative distributions are well approximated by a logistic distributional assumption. (Figure is reproduced from Hoffman et al.[16] courtesy of Oxford University Press.)

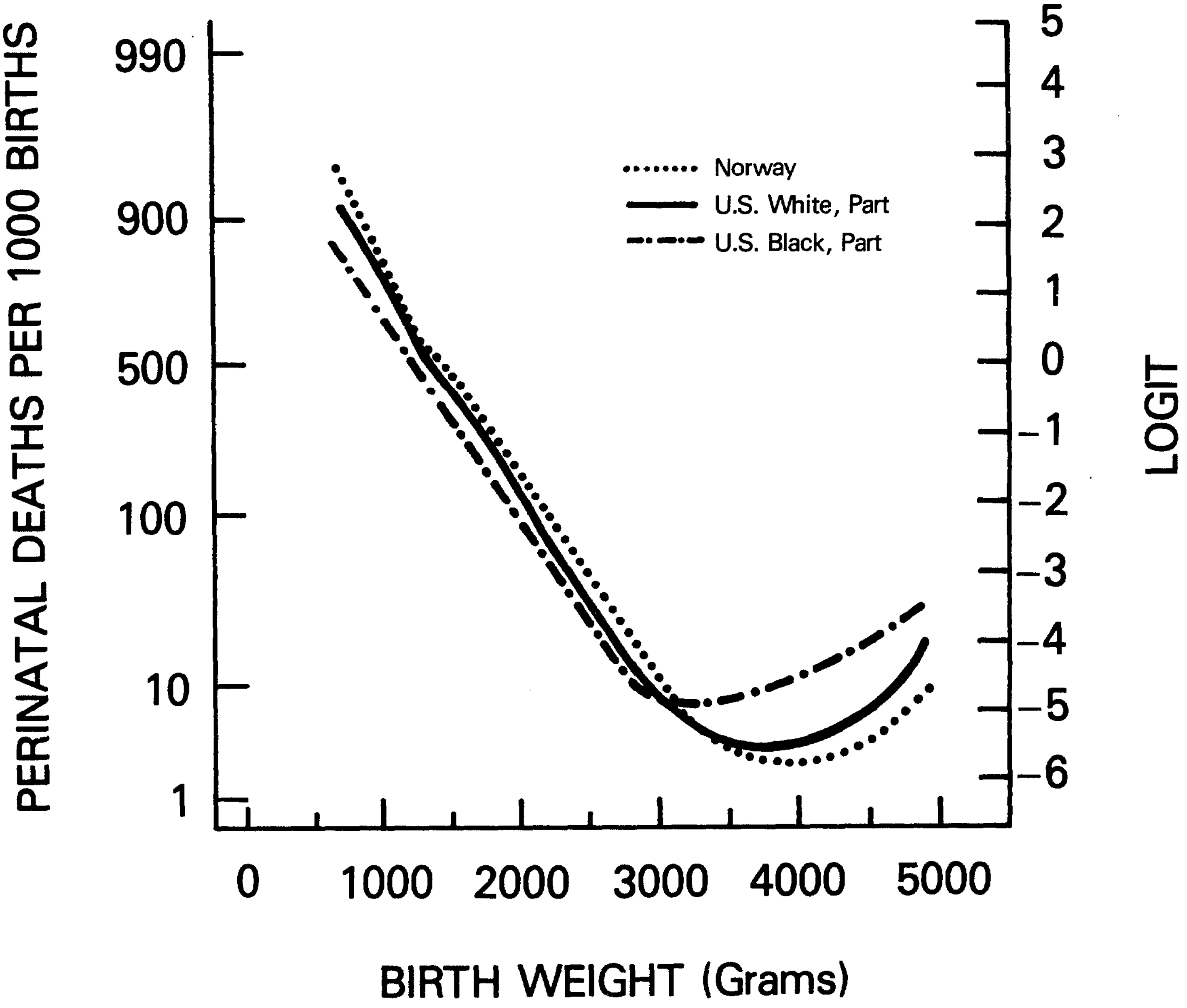


Figure 2. Birth-weight specific perinatal mortality rates for Norway and U.S. white and black births (based on data from three States: Minnesota, Missouri, and North Carolina), 1972-1973

A logit scale has been used in plotting the rates. This logarithmic-type transformation is symmetrical about a rate of 500 per 1000 births. For plotting birth weight-specific perinatal mortality rates this transformation is preferable to the simple log transformation since perinatal mortality rates near both 0 and 1000 are expected to occur when plotting against birth weight. Note that in the low birth weight range, U.S. Blacks have the lowest perinatal mortality but, in high birth weight range, Norwegian births have the lowest perinatal mortality. As shown in Figure 1, U.S. Blacks have the most low weight births and Norwegians have the most high weight births. Birth weight-specific perinatal mortality rates are apparently influenced by the underlying birth weight distributions. (Figure is reproduced from Hoffman et al.[16] courtesy of Oxford University Press.)

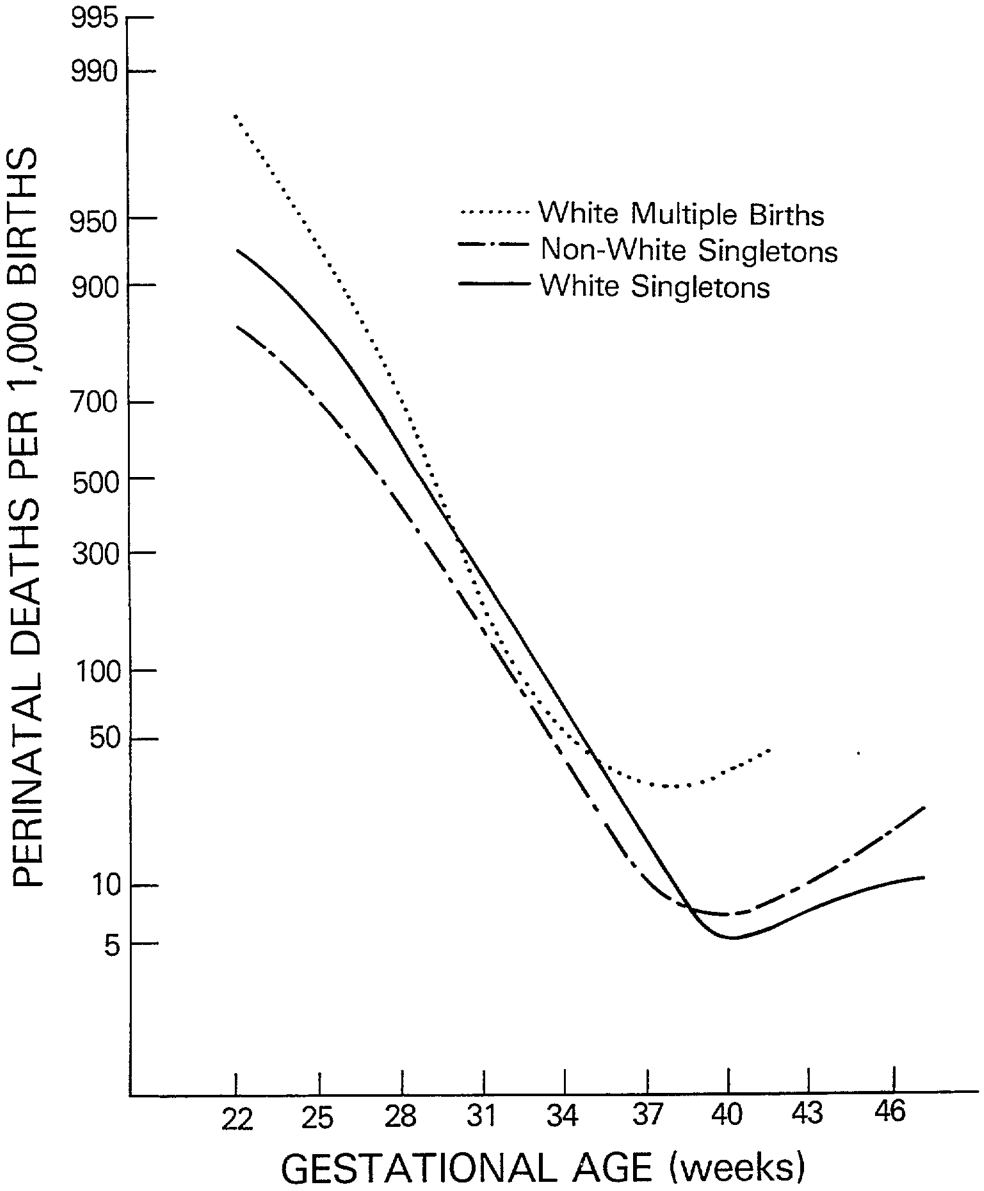


Figure 3. Gestational age-specific perinatal mortality rates (PMR) for Minnesota, 1972-1973

A logit scale is used for plotting the PMR. The nonwhite singleton births have the lowest gestational age-specific PMR through 38 completed weeks. Beyond 38 completed weeks, the white singleton births have the lowest gestational age-specific PMR. White multiple births have a lower PMR than do white singleton births between 30 and 36 completed weeks. Also, multiple births achieve their lowest PMR before term at approximately 37-38 completed weeks. There were too few total multiple births. However, in the range where it was possible to calculate rates for the nonwhite multiple births, between 30 and 35 completed weeks, the nonwhite multiple births had slightly lower PMR as compared with the white multiple births. (Figure is reproduced from Hoffman and Bakketeig[19] courtesy of Harper and Row Publishers, Inc., Philadelphia.)

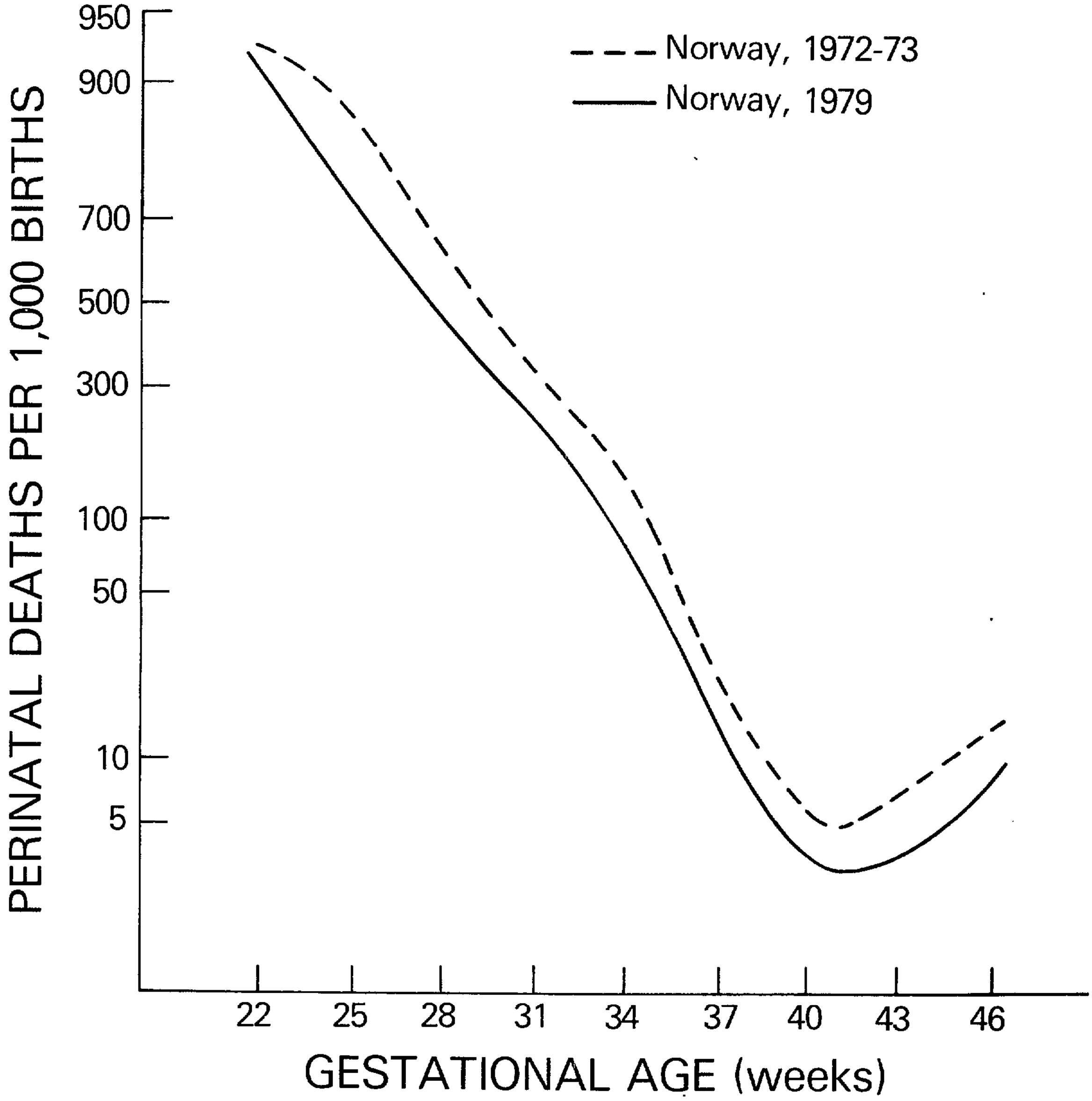
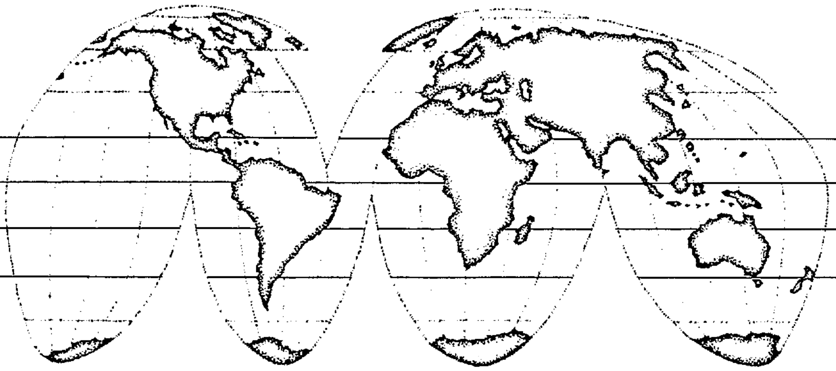


Figure 4. Gestational-age-specific perinatal mortality rates (PMR) for all births (both singleton and multiple) for Norway, 1972-73 and 1979

A "logit" scale is used for plotting the PMR. In this scale, the improvement in the PMR during the intervening 6 years is approximately the same constant magnitude at all weeks of gestation. (Figure is reproduced from Hoffman and Bakketeig[19] courtesy of Harper and Row Publishers, Inc., Philadelphia.)



Chapter V: Working Group Reports

Report of the Working Group on Risk Factors

By Harry M. Rosenberg, Ph.D., Chairperson; and Patricia Potrzebowski, Ph.D., Rapporteur

Introduction

The Working Group on Risk Factors has accomplished the following: we have identified groups of risk factors that we recommend be examined on a cross-national basis; we are making recommendations with regard to study designs and specific followup activities; and we are making recommendations on resources and key persons.

Risk Factors

First, with respect to specific risk factors, our group identified about 80, some of which were also identified by other working groups. We aggregated these into five broad groups as follows:

Background
External
Mother's Health
Life Style
Mother's Health Care During Pregnancy

The first three factors were included in the ICE planning document (appendix I); the last two were added by our working group. A detailed list of these factors is included in appendix II of this report.

Outcome Measures

Our Working Group also spent time discussing outcome measures. We believe that particular outcome measures have to be appropriately tailored to the hypotheses being explored. Some outcomes will, for example, be low birth weight; others will be infant mortality by age or cause of death; and others will be indices of child health such as hospitalization during the first year of life. A list of these is shown in appendix III.

Study Design

With respect to study designs, we recommended two approaches for cross-national studies of perinatal mortality and infant health. The first type, designated as Type I, would examine the extent to which each of the five broad categories of known risk factors specified above can account for national variations in outcome. The second type, Type II, would identify or obtain a better understanding of possible risk factors related to outcomes or it would elaborate with greater specificity known factors.

The approach of our working group was to focus attention at this time on studies of Type I. It should be noted at the outset that the Working Group did not wish to prioritize the broad groups of risk factors or individual risk factors. Rather, we recommend strongly that international comparative studies include variables representing each broad group of risk factors.

For each broad group of risk factors, we identified specific illustrative hypotheses that we believe can be tested. These hypotheses were described with respect to both risk factors--the independent variable--and pregnancy outcomes, as shown in figure 1.

As charged, we considered study designs to examine some of these relationships, also shown in figure 1. The working group decided, however, that is not practical at this time to specify general designs for each broad set of relationships between risk factors and outcomes. Moreover, for cross-national studies, the Group noted that study designs will vary from country to country. The point was made that in Israel a great deal of information is being collected on a prospective basis. Therefore it may not be necessary to mount de novo a prospective study. Thus a prospective study, which will have to be designed in a country like the United States, can be carried out by sampling existing ongoing administrative records which contain needed data.

Figure 1. Illustrative Hypotheses of the Effect of Risk Factors on Pregnancy Outcomes: Type I and Type II Studies

	Risk factor	Outcome	Possible study design
Type I Studies (Example: Life style)	Smoking	Low birth weight or Fetal death	Prospective study or Enhancement of existing data system
Type II Studies	Multiple induced abortion	Preterm delivery or Low birth weight	

The Working Group on Risk Factors did come up with some general principles as regards study designs and data sources, as follows:

> Prospective studies are to be preferred, other things being the same, to other designs. (Unfortunately, however, other things are never the same. Prospective studies are more costly, for example. They may be prohibitively expensive when the risk factor under study involves small frequency events. In some cases, the only feasible approach may be the case control method.) Compared with retrospective studies or with the use

of existing data systems, prospective studies can provide better specificity, comparability, and validity.

- Study designs and data sources should be appropriate to the specific hypotheses being tested.
- Use available data when appropriate rather than create new data bases.

Studies of Type II received less attention from our Working Group, but they are considered worthy of further study. An example of such a study is shown in figure 1.

Data Sources

Our Working Group also made the following recommendations regarding data sources:

- We recognize that data sources will vary by country for the same risk factors under study.
- We recommend that the Planning Group ask each country involved in this International Collaborative Effort to identify currently available and future data sources that are (or would be) available for examining these risk factors.
- In order to enhance the current data base in the United States, we recommend that the Planning Group provide input to the Committee to Evaluate the Standard Certificates and recommend specific revisions to the various U.S. standard certificates.
- We recommend that the Planning Group involve States in the United States in determining or identifying data sources available at the State level.

Key Persons

We are also making the following recommendation regarding key persons:

> Group should identify appropriate persons based on the specific risk factor or study being considered. The attendees at this symposium would be good contacts and referral sources, as a starting point for this effort.

Resources

- The NCHS International Health Data Guide should be developed or expanded focusing on perinatal mortality and infant health, and should include specific list of risk factor variables.

- A notice in appropriate international professional journals should be published to attempt to identify future or planned studies related to risk factors.

- Followup symposia should be held to promote future discussions, reports on progress of the Planning Group, and so forth. Where possible these meetings should be piggybacked onto other meetings, for example, 1985 NIMS, American Public Health Association, and PHCRS.

- As a follow-on activity, the Planning Group should thoroughly examine the literature to determine if certain risk factors can be eliminated on the basis of existing studies and if additional risk factors should be added.

Conclusion

In conclusion, the Working Group on Risk Factors feels that while we have initiated an important planning process, we have just scratched the surface. We were unable in the allotted time to respond to the challenge of all the charges. Thus, we did not establish highly specific, prioritized areas for investigation, although we gave specific illustrations of hypotheses that could be tested. We did not identify specific resource persons, because we are not yet ready to. We note that a lot of work has been done in this area, and a sorting out of findings is necessary. We took a global approach to the problem, but prioritizing is essential.

In a word, we have developed an agenda for the next meeting or the next two or three meetings of the Planning Group.

Appendix I. (From: International Symposium on Perinatal and Infant Mortality: Instructions to Working Groups)

Discussion Group Topics

- Risk factors--social, biological, behavioral, and environmental conditions affecting pregnancy outcome.

  Background factors: Parents' height, weight, race, socioeconomic level, mother's age and parity.

  External factors: Mother's work environment outside the home, residential proximity to toxic waste disposal.

  Mother's health factors: Hypertension, alcohol, tobacco and drug use (including medications not related to pregnancy), weight gain, exercise.

- Clinical interventions related to fetal health--clinical practices prior to birth that bear on pregnancy outcome (prevention of preterm delivery, INGR, birth defects, fetal death, and so forth).

  Family planning, counseling, identification of high-risk parents, monitoring techniques, and frequency, medications, abortion, sonogram.

- Clinical interventions related to infant health--clinical practices during and after birth to promote infant health (prevention of morbidity and mortality among live-born infants).

  Mode of delivery, anesthesia, medication, intensive care technology, postpartum checkups, home visits by health personnel, counseling.

- Community interventions--health care systems and population level interventions as relevant to pregnancy outcome and infant health.

  Health care quality, availability, utilization, financing; insurance coverage; identification and management of high-risk pregnancies including detection, referrals, frequency and type of followup, public health education.

Appendix II. Five Major Categories of Risk Factors

- Background factors

Parental characteristics
  SES (socioeconomic status)
  Education
  Income
  Occupation
  Height and weight
  Skin fold measurement
"Wantedness" of this pregnancy
Mother's birth weight
Parity
Age of mother
Race
Ethnicity
Country of birth of mother (nativity)
"Social supports" (for example, marital status, family composition, community support system)

- External factors

Occupation and work environment of mother and commuting to work
Physical environment (for example, toxic substances in air or water)
Occupational exposures to toxics
Proximity to sanitation
Urban-rural
Maternal leave policy
Attitude

- Lifestyle

Smoking
Alcohol use (more detail needed on consumption frequency and type)
Caffeine
Aspirin
Diuretics
Drug use
Exercise
Dietary habits
Salt
Vitamins
Stress
Well health checkups (for example, preconceptual care as a measure of health seeking behavior)
Contraceptive history
Coital practice during pregnancy
Infant feeding practices (breast/bottle)

Appendix II (cont.)

Maternal and infant health

Weight gain of mother: component of weight gain, timing and pace during pregnancy
Vaginal birth after cesarean delivery
Multiple births
Obstetric history (including in vitro fertilization, interval between births)
Interval from mother's menarche to first birth
Menstrual pattern
Rh incompatibility
Concurrent illnesses (ICD)
  e.g.: gestational diabetes
    hypertension
    STD
    anemia
    malnutrition
    bleeding
    abruptio and placenta previa
    premature rupture of membranes
    weight loss or weight gain
    viral disease (rubella, CMV, for example)

Vaccination status
Pre-existing or underlying medical conditions (ICD)
  e.g.: diabetes
    hypertension
    STD (CMV, syphilis, herpes, hepatitis)
    epilepsy
    previous gynecological operations
    heart disease (congenital or not)
    endocrine disorders
    cancer
    mental conditions
    obesity/underweight
    genetic and hereditary factors (including consanguinity)
    kidney disease
    sickle cell trait and anemia
    familial Mediterranean fever
Previous pregnancy outcomes (abortions, spontaneous and induced, and type of induced)

Health care (during pregnancy and during infancy)
Payment system (level and type of reimbursement)
Content of prenatal care (pelvic exams, medical advice, time and milieu of prenatal care, prenatal education relating to childbirth and childcare)
Number of prenatal care visits
Attendant at birth
Place of delivery (hospital/nonhospital)
Proximity to health care and type of facility available

Appendix III. Pregnancy Outcome

Pre-term delivery

Post-term delivery

Low birth weight

Congenital malformation

Apgar Score--vitality

Birth weight distributions

Physical characteristics of the newborn
    (for example, crown-heel length, head circumference, PH)

Mortality

- birth weight specific mortality
- infant (by age and cause)
- fetal (during and prior to labor)
- perinatal
- neonatal
- post-neonatal

Small for gestational age (SGA)

Large for gestational age (LGA)

Long term outcomes

- long term development
- mental retardation
- cerebral palsy
- morbidity and infant health

Appendix IV

Suggestions were made to the Working Group on Risk Factors by persons from other working groups. Among the suggestions were the following:

- How is health defined?
- Begin analyses by looking first at easy variables. Then try to understand differences, as well as the power of different types of explanatory variables.
- Make the distinction between attributable and relative risk.
- Consider as external factors the availability of food.
- Make the distinction between whether the fetal death took place during labor or before, the distinction between prenatal or intrapartum.
- Validation studies are needed cross-nationally on the consumption of alcohol.
- Take into account the characteristics of the father such as his occupation.
- Add SGA or LGA to low birth weight.
- Examine the mortality for infants weighing 2500 grams or more.
- Examine the nature of care during the first year of life.

Report of the Working Group on Clinical Interventions Related to Fetal Health

by Heinz Berendes, M.D., MHS

The working group engaged in a wide ranging discussion of the numerous variables which may account for the differences in perinatal and infant outcome of the various countries presented at this meeting. Earlier during the meeting representatives of the seven countries reported in some detail about their system of health care, particularly as it relates to the prenatal and perinatal areas. It was apparent to all that the two countries with the lowest infant mortality rate, Japan and Sweden, have rather divergent health care systems. The health care system in Japan centers around the physician, whereas the health care in Sweden centers around the midwife.

There are clearly marked differences in the characteristics of the population of reproductive age in the different countries. The presentation from Japan indicates that most women in Japan now have their children between ages 25 and 30, and there are very few teenage pregnancies. In contrast to this, the United States has a high teenage pregnancy rate, and at present it is experiencing an increase in rate of births to women over 30. Abortion rates in most of the seven countries seem to be about the same: approximately one abortion for every three live births. It would help our understanding considerably if we had more information on the characteristics of women of reproductive age in the various countries. Also, since much could be learned by addressing the content of prenatal and intrapartum care as it is provided in various countries, our first and foremost recommendation is the development of information on the content of prenatal and intrapartum care in each of the seven countries.

Recommendation I

The development of information on the content of prenatal and intrapartum care.

This includes obtaining information on existing guidelines on the content of prenatal care, and/or recommendations on content of care in the prenatal and intrapartum periods from care providers, professional organizations, or state agencies who develop standards of care in each country.

We would also like to know more about the actual prenatal and intrapartum care provided: procedures used, timing of visits, where care is provided (home, clinic, and so forth) and by whom the care is provided.

Existing data sets could address a range of relevant questions concerning prenatal and intrapartum care. The same data sets may also provide more information about the basic characteristics of women or reproductive age in the various countries. Examples of data desired include the use of prenatal screening for diabetes, the use of alpha fetoprotein, amniocentesis, sonogram, indications for its use, the use of electronic fetal monitoring, and of tocolytic drugs, the use of cesarean section and its indications, especially repeat cesarean sections. Characteristics of women of reproductive age of interest include socioeconomic status, age, parity, smoking and drinking habits, use of family planning and of prenatal care.

If at all possible, major changes in content of care which occurred during the last two decades should be identified and the time when these occurred noted. An example that came to mind to the U.S. participants was the change from limiting weight gain in pregnancy to no more than 20 pounds, fertility rates, and the increasing use of family planning methods in various countries during the last 15 years.

Recommendation II

The development of a paper by the group on birth weight-specific perinatal and infant mortality and on trends in low birth weight from all countries where such information is readily available. In some instances the data may not be available for the country as a whole; therefore geographical areas of the country for which such information is available should be used. The committee thought that this type of report would be useful as a means of publicizing the activities of the ICE, and, at the same time, provide information currently not available.

In a discussion of certain research projects and clinical trials which are currently ongoing in various countries, members of the working group emphasized the desirability and advantages of sharing research protocols. In order to make this possible we recommend:

Recommendation III

The establishment of a repository for research protocols of studies in maternal child health.

This would enhance the comparability of the data collected and the pooling of results, particularly of studies which are difficult to conduct. The working group was reminded that Dr. Ian Chalmers in Oxford has a register of clinical trials during the prenatal and perinatal period. It may therefore be desirable to check with him on the specifics of the register to avoid unnecessary duplication.

Recommendation IV

The working group recommends the development of availability of abortion services data in various countries and the relationship of these services to trends in perinatal mortality. This is one of many sets of data in which the working group expressed interest.

Recommendation V

Data should be developed from data sets available in different countries regarding trends in primary cesarean section and its indications.

This should cover also practices with respect to repeat cesarean sections and trends over time if possible.

The working group discussed the issue of smoking during pregnancy and its effect on intrauterine fetal growth, the risk of low birth weight, and intrauterine growth retardation. Dr. Matsuyama reported that fewer Japanese women smoke than United States women and they also usually refrain from smoking during pregnancy. Dr. Matsuyama attributed this behavior to the fact that it is socially unacceptable in Japan for pregnant women to smoke. While there appears to be a trend towards a reduction in smoking during pregnancy in some areas of the United States (the recent data from the Natality Survey of 1980 in the United States, suggests that 17 to 18 percent of women may stop smoking during pregnancy), a very large proportion of smokers continue to smoke during pregnancy. Therefore, the working group recommends:

Recommendation VI

The evaluation of smoking cessation strategies in various countries.

The working group did discuss various strategies which might be used, including randomization of individuals versus areas of the country, but felt that details of strategy and research design should be left to the ICE committee. Also, the working group is aware of the lack of funding for such an activity at the present time.

Recommendation VII

A clinical trial of ultrasound to identify intrauterine growth retardation, twinning, congenital malformations and to aid in the management of post term pregnancies.

The working group is aware of the need to develop data on the short term benefits and risks as well as possible long-term effects on the child of the use of prenatal ultrasound.

The design of the clinical trial might follow the trial of ultrasound which was recently conducted in Norway and was referred to in a presentation by Dr. Bakketeig during an earlier part of this meeting.

Stimulated by the presentation of the Japanese representatives on the use of a maternal child health handbook as part of perinatal and infant care in Japan, the working group discussed ways in which mothers may be motivated to more actively participate in their own care, the care of their fetus, and of their infants. We discussed the use of educational materials, of a medical passport and of a handbook, and how this might aid mothers to more actively participate in her own care and that of her fetus. We therefore recommend:

Recommendation VIII

A demonstration project to evaluate the effect of more active maternal participation in fetal and infant care on pregnancy and infant outcome. The evaluation should include different forms of enhancing maternal participation such as through the use of the maternal child health handbook, medical records passport, or other kinds of educational material.

Investigators in different countries, especially Israel, Sweden, and the United States, have for some time been involved in evaluating the use of measures of fetal movements as predictors of fetal well-being. The utility of such measurements in predicting fetal well-being is presently not fully understood and the working group therefore recommends:

Recommendation IX

The evaluation of the utility of fetal movements in predicting fetal well-being.

This might be done through the identification and analysis of review of findings from data sets belonging to individual investigators.

Recommendation X

An international audit of perinatal outcomes.

Dr. Bakketeig reported on the value of an audit of perinatal records in Norway and in China as part of a trip sponsored by WHO. We realize that this is a very provocative and possibly difficult to implement recommendation. It would have to be conducted by an internationally recognized group of individuals representing the various countries whose records are subjected to an audit. Such an audit would not necessarily have to be based on representative sets of records, but might be drawn from the hospitals or practices of individuals who are sympathetic to the goals of ICE.

Throughout the discussion of the working group, numerous references were made to the importance of variations in lifestyles in reproductive outcomes. This includes such behaviors as smoking, drinking, and drug abuse, as well as various nutritional and dietary habits, physical activity and exercise, other types of health related behaviors, and attitudes towards one's own health and towards childbearing. The group felt that a major part of the differences between countries in reproductive outcomes may be related to differences in various lifestyle behaviors. Interdisciplinary research related to lifestyles should be encouraged. Therefore the working group recommends:

Recommendation XI

Efforts should be made to enhance interdisciplinary collaborative research related to the study of lifestyles in relation to reproduction. Such enhanced collaboration would involve sociologists, psychologists, demographers, anthropologists, and other behavioral scientists.

Because of differences in behavior in different countries, there may be special opportunities for comparative studies. Dr. Matsuyama indicated that in Japan, the condom is the preferred method of contraception, and about 70 percent of contracepting couples are using the condom. The intrauterine device is used by about 10 percent. The pill is not officially on the market although available and used by about 1-3 percent. Male or female sterilization is not popular and therefore is used very infrequently. Since some feel the use of condoms may protect against vaginal and cervical infection, we identified this as a special opportunity for comparative study. The rate of vaginal and cervical infection for samples of women from Japan and the United States should be compared.

Recommendation XII

To explore and exploit special opportunities for comparative study of difference in health habits, lifestyles, and so forth, between population groups of different countries.

The working group did not discuss in detail the question of resources required for the proposed clinical trials or the possible mechanisms for application for support which may be used. These are clearly important issues which the coordinating committee should address early in its deliberation. The working group feels that if no resources can be made available, there would be no point in pursuing these proposed activities. This issue came up repeatedly in our discussion, and clearly affected the recommendations.

Report of the Working Group on Clinical Interventions to Improve Infant Health

by Peter C. Van Dyke, M.D., MPH

I am going to go from the specific to the more general and describe three relatively specific kinds of studies that we felt were important, and then describe three more descriptive studies that we thought were important, that were necessary to help understand the problem.

First, we suggested and spent most of our time talking about a followup study, prospective and population based, on a group of very low birth weight infants, asphyxiated infants, and infants who were small for gestational age or who had intrauterine growth retardation.

Now, the reason we thought this was important: (1) there are no common definitions of very low birth weight and asphyxia, as we all know; (2) there are no common followup protocols; and (3) there are no common definitions of cerebral palsy (CP), of neurological deficits, vision, or hearing defects.

One of the things thought to be common to all discussions is that there are, generally, no standardized records among countries or States, or standardized ways of keeping records. Our group felt this was one of the most important considerations.

Who has the data? Germany has state data for tracking children from zero to one; Holland had national tracking data on all liveborns less than 1,500 grams and/or less than 32 weeks gestation age, as part of a prospective cohort study. Only births in 1983 are included however. The United Kingdom had two sources of data, one in Scotland and one in Oxford.

Sweden has a low birth weight cohort study from 1978 to 1980, and we heard, yesterday, about the U.S. natality study that was being matched or linked with a death file. And although the numbers were small, this might represent a start in developing common data sets. We had nobody from Japan in our group and so I am not sure what is available there.

Much time was spent talking about definitions before we decided that ours probably was not the group to decide on the definitions of low birth weight and asphyxia, nor on the other categories that people have been trying to agree on for a number of years.

But as a guideline and as, perhaps, a beginning toward a working recommendation, very low birth weight should include, "children less than 1,500 grams; gestational age, less than 32 weeks; and small for gestational age should include children less than 2,000 grams who were over 36 weeks gestation." Again, this is only an idea, a suggestion, a recommendation, that should have more discussion.

At the very least, though, we thought there should be a convention established across countries that information be collected for weight, in 250 gram increments, and for gestational age, in one-week increments. And if all countries accepted that kind of a convention, we would be more able to do standardized studies. This is recommended rather than using a Lubchenco Chart, or some other kind of chart, which precatagorizes children specifically to that individual chart, which inhibits the cross-national interpolation and interpretation of data.

The definition of asphyxia, again, has to be left to a working group, but could include Apgar Scores, whether the child was intubated or not, the time of intubation, the time of the first spontaneous respiration, the length of the resuscitation, and other similar items.

For the followup the group would include children from all of those categories. It should be longer than 1 year, and should look for the various kinds of deficits in development, once they are defined; there should be a control group. The study should include two groups, those children that contribute to infant mortality in the first year, and then those children who do not die and live on, to study morbidity. We really felt morbidity studies were important, even though this conference is related to infant mortality.

Therefore, we recommended that a small group be formed to work out the definitions described earlier. Furthermore, there is a meeting of the European community in Dublin next month. Dr. Schmidt and one or two others from this meeting may be attending and they should transmit some of these ideas and recommendations for further discussion and possible agreements.

Second, we thought a study was important in the area of mortality by age at death, and we thought that a cross-national comparison (possibly descriptive in nature) would be extremely important.

The problem is that information is not common on the birth certificate across countries, nor across States, and the information is not collected or analyzed in the same categories. There is a tremendous need to enhance the collection of information on birth certificates, as well as to make the information on the birth certificate more precise.

Most countries link birth and death records and most States link birth and death records. All newborns would be selected and the groups or categories to include would be infants less than a day, less than a week, less than a month, and then every month in the post-neonatal period.

This could set the stage for a study like Brian McCarthy described to us in his first set of slides the first day. The purpose would be to look at those countries that have differences in the various rates: Early and late neonatal and postneonatal rates, to try to analyze those differences and then to suggest intervention strategies as a result of those differences.

The third area that would be extremely important would be postneonatal mortality and morbidity, a case analysis. The problems are--and we have heard them repeatedly in the conference--that there is a wide variation in postneonatal death rates, as well as a leveling-off of improvement in postneonatal death rates in practically every country that has presented. In addition, there are differences in SIDS rates, we believe, in several of the countries, most particularly the oriental community, where the diagnosis of SIDS is not common.

Who has this kind of data? Sweden has a 1973 to 1977 group of children, representing all infants. The United Kingdom has a 3-year study of all infants, and the United States has a study, in 1980 and 1981 of SIDS infants.

The selection criteria, again, would be all infants who died in the postneonatal period. The study would be a cross-national study of selected countries and States, to better understand the problem of postneonatal mortality.

Fourth, there were three areas that we felt were more descriptive in nature, that were really necessary to help all of us understand what is being done in each country. Much of this background material would probably be necessary in order to carry out the earlier studies.

First, we should know about genetic disorders and what is being done in the countries as far as birth defects. We need a description of what is available and what data is available in each of the countries. There is an international clearinghouse for birth defects.

We need to know the utilization of amniocentesis and other forms of prenatal or postnatal diagnosis, and we need to better understand newborn metabolism. I think this was pointed out to us by the Japanese data that were presented where we saw differences from what we expected, in histidinemia.

A second area included attitudinal and social issues, which we feel are significant contributors to infant death and infant mortality. Perhaps Group Four will discuss these more, but we need to have more information in the various countries about the medical care provider, as well as the parent provider who offers the primary parenting for that particular infant. Other areas of interest include breast-feeding and other feeding practices, maternity leave and paternity leave, day care, home visiting, and early intervention programs. The problem of migrant worker or the immigrant force in many countries is important as are the environmental issues: Lead or lead-screening, pesticides, housing radiation, and toxic materials.

The third area was perinatal care by levels of care: Can we describe what level of care each child received during delivery? And we need to know the the outcomes by level of care received by that mother and child. We need to know about birth attendant, the level of technology, regionalization, and transport of both the mother and the baby. Also important in this kind of a descriptive study would be length of stay.

Problematic would be that hospitals self-declare their level, tertiary, secondary, or primary, and also problematic would be that some institutions can offer care at more than one level. A tertiary center may have a birth in an alternative birth wing and offer level one care, while, at the same time, offering level three care in the same institution.

We thought, since Holland has a planned home delivery proportion of more than 30 percent of all births, that including Holland in a study like this would broaden our spectrum. We felt this would be difficult to do, but extremely important.

Report of the Working Group on Community Interventions

by Charles J. Rothwell

Introduction

The deliberations of this work group were difficult because we were not faced with intervention strategies relative to an individual human condition, but with the human conditions and their manifestations in diverse societies. These problems were made more difficult because

- Many of the members had not had an opportunity to talk until the convening of the work group.
- Of the many different countries and thus health delivery systems represented by its members.
- Of the different orientation (health responsibilities) of its members.

However the diversity of the members could have proved to have been a positive attribute with more time for stage setting.

The work of the group can be divided into five steps: Stage Setting; Statements of Major Community Intervention Issues by Members; Consolidation of Issues; Group Splitting; and Synthesis. This report will highlight the issues of these stages.

Stage Setting

During this period members expressed their relationship with the health delivery system in their country and the constructs of health delivery relative to their country in the area of maternal and infant care. There seemed to be some misgivings by members concerning the audience of the project. Statements were made concerning the bureaucratic layering of the U.S. membership and whether our "community" was service delivery personnel or just another level of bureaucracy. There seemed to be considerable confusion on the relationship between government health professionals in the United States and actual service delivery. Looking back, briefing papers on organizations and professions impacting on the delivery of maternal and infant care in each of the countries would have been most helpful.

Statements of Major Community Issues

In order to better understand the motivations of each member, Dr. Kessel asked each member to briefly state issues relating to community interventions that were of most concern. This discussion provided the basis for further deliberations. The following provides a summary of those issues, consolidated in groupings agreed on in the afternoon session. The issues relate to data/outcome measures (D) and information concerning service delivery constructs (I).

A. Preventability (D)

- Why do apparently well babies die? For example babies $\geq$ 2,500 grams with no obvious problems. What are the contributions of medical service and social programs to these occurrences?
- Which are the preventable deaths, how can they be identified and reported?

B. Risk (I,D)

- Do all countries have high risk groups?
- What positive community intervention strategies have been developed?
- Can these strategies be applied to other communities/countries?

C. Data-Information-Action-Evaluation (D)

- At the community level how do we detect departures from trends?
- What are appropriate components of a local surveillance system?
- How are existing data bases used to guide community efforts?
- Are there existing models that can be employed that are meaningful and understandable for local providers?

D. Structural Aspects (I)

- How does the provider of care, the type and quantity of providers relate to outcome? What measures (rates, ratios) should be used to depict these aspects?
- Who are the providers of care for mothers and infants in each of the counties and what are the reasons for selecting these professional mixes?
- How are well baby services provided?

E. Social Institutions (I)

- What social benefits exist that seem to have a positive impact on maternal and infant outcomes?
- What supporting systems outside health delivery seem to have a positive impact?

- What are the educational benefits available to service providers and what are their emphases?

F. Data Issues

- Where have linkage systems been developed with existing data bases?
- What comparable data are possible to collect, analyze, and disseminate?
- In order to use comparable data we need to make sure of our definitions and those definitions should be based on data availability and not how things "should be measured."
- Data dissemination is by itself a community intervention. How can we use it to motivate providers and community leaders?

Split in Emphasis

After the discussion on community intervention issues, the work group split on how best to start collaborative efforts. For lack of a better description, I will call one the hypothesis seekers and the other the care givers. This distinction was not based on nationality but on professional background. For this reason "ICE" should be extremely careful to insure a mix of professional backgrounds in any collaborative effort or the results of such studies will have less of a chance for acceptance.

The researchers felt that the approach taken by "ICE" in the area of community intervention should be as follows:

Step 1	Collection of a minimum basic data set to identify specific health outcome issues/differentials.
Step 2	Seek descriptions of service delivery systems/intervention strategies that <u>may</u> relate to those differentials.
Step 3	Institute collaborative studies based on hypotheses derived from steps 1 and 2.

The care givers felt that the steps need not be sequential and that first efforts should be gathering additional information on service delivery components and relationships in our countries. They felt that we should not be seeking a common data base without knowing what we are looking for and that outcome differentials derived from a data base may not be meaningful without simultaneously examining health delivery structures. Members of the first group felt that seeking such descriptions without direction could cause an unnecessary burden on participating countries.

Synthesis

The groups agreed that no matter what order data or descriptive material are sought that we need to know <u>more</u> about: Service delivery structures, and outcome differentials before appropriate proposals for international research in community interventions can be specified.

The recommendations for steps in seeking a common data base were as follows:

A. ICE with the help of symposium members would develop common definitions of the terms to be collected and those definitions should be based more on availability issues and not necessarily on the most appropriate measure.

B. ICE with the help of symposium members should determine a minimum basic data set for TAPE submission and analysis. Those data sets should be:

- Matched infant birth and death files based on birth cohort for two recent periods of time approximately 5-10 years apart. A spread of 10 years would require different ICD's. We would suggest 1979 and 1983.

- Fetal death files for similar years.

C. Data analysis can be done in the United States, or if precluded by confidentiality the analysis can be done by the provider country.

D. Countries unable to provide data tapes or analysis should be provided table shells with definitions for those countries to complete.

E. At the same time we seek these common data items, countries should be asked about unique data systems that are actively being used in community intervention.

The items to be considered for the minimum basic data set are:

- Age of mother
- Prenatal care indicator
- Social class indicator
- Nationality/race/ethnicity indicator
- Birth weight
- Gestational age
- Age at death (24 hours being the smallest interval)
- Birth multiplicity
- Cause of death (ICD and one cause)
- Parity
- Occurrence of birth/death (level of hospital)
- Residence of birth/death

In the gathering of information about health delivery structures it was felt that in order to

- Understand how national/community health care services and policies are related to outcome measurements.

- Gain mutual understanding and comparability of health care system elements and processes.

ICE should develop a systematic description of critical health care system elements hypothesized to be related to healthy outcome of pregnancy and infancy. Among the elements to be considered are the following:

- Access availability: What health services are provided free of charge as a public service--preventive, curative, outpatient, hospital, home followup.
- Maternal and child health care personnel: Who gives prenatal care? Who does delivery, well and sick baby care, home followup and other kinds of care?
- Health care benefits: Types of benefits and the proportion of population covered.
- Poverty or disadvantaged populations: What special arrangements are made for these groups? Define and quantify poverty groups.
- Social and occupational benefits: What benefits are available for pregnant women and mothers of infants? (maternity leave, birth payments, special working hours, and so forth).
- Components of care: What does prenatal care consist of? (labor and delivery care, infant and maternal followup, combinations, and so forth).
- Community interventions: What interventions that relate to maternal child health are provided outside the health care system?

Discussant Report

by Per Bergsjo, M.D.

As an obstetrician or care-provider, I have the daily task of making decisions that may affect the lives of newborns.

The application of cardiotocography, whether to induce or not to induce labor, to perform a cesarean section or to wait and see, are such decisions.

We also tend to believe that by intervening we save lives, and, in clear-cut cases, we certainly do. Still, statistics tell us that the outcomes can be quite similar in spite of differing rates and modes of interventions, at least if you use mortality as an outcome measure.

A look at interregional differences within the single country or interhospital differences will testify to that. We have had enough examples to indicate that differing cesarean section rates, at least above a certain level, which I feel to be quite low, will, at best, have a marginal effect.

I will, therefore, support the recommendations for comparing the practice of cesarean section and other interventions across the borders in more detail. However, experience from the European Perinatal Study Group, of which Eberhard Schmidt and I were members, tells me that the knowledge of what goes on within one's own borders is frighteningly low, even on so easily defined events as a cesarean section.

Therefore, it is all the more reason to use what information we have for comparisons in order to promote further research. Repeated cesarean sections should be studied as a integral part of such studies.

When it comes to other interventions, the question of data validity comes up. I have no doubt that cesarean section and forceps delivery are reported when asked for, but events and interventions like premature rupture of the membranes, induction of labor versus spontaneous onset of labor, not to speak of fetal and newborn asphyxia, must be defined before you can optimistically hope to arrive at an approximately true picture.

In the Nordic countries, we have produced a common set of tables, based on the more traditional variables of birth weight, gestational length, parity, and so forth.

These tables, which have been published, will be followed by others for which definitions are essential. I could give you a more detailed account of that, but the emphasis here is that if we want to embark upon something similar, definitions must be clear if comparisons are to have any meaning at all.

Which brings me to the next point, namely that the information on which our statistics are based is no better than the person who provides it. This is perhaps more obvious to the clinician than to the person on the receiving end. Permit me to say, from long and painful experience, that doctors are notoriously bad in filling out forms. Clinical staff, nurses and midwives are much more conscientious and tidy than are the doctors who think that their jobs are done and who want to go to bed when the child is out.

One comment about gestational age; birth weight is easily measured, but stillbirths are often not weighed. Furthermore, different populations may have different birth weight distributions, however, you care to define your normal population. These are pitfalls in the comparisons of birth weights. I do believe that gestational age specific data should be tabulated in spite of the difficulties in definitions of gestational age, for if you do not take gestational age into account, all information pertaining to weight per age would be lost and an important yardstick thrown away.

However, the definition of gestational age is fraught with problems. Using the age-old starting point of the last menstrual period, the computer will present pregnancies lasting for 50 weeks or more, which most people will dismiss as untrue.

Ignoring the possibility here of dating by ultrasound, which is also questionable, we can choose the Swedish solution to split the pregnant population in two, those with reliable and those with unreliable menstrual dates. To be sound, such a distinction must be made on a set of clear criteria. Finally, let us not fool ourselves into believing that reporting will ever be complete.

I am particularly concerned about the early pregnancy terminations, that is the stillbirths of, say, around and below 1,000 grams, among which, for various reasons, underreporting is common. This is an important point, as it may distort the official statistical comparisons of perinatal mortality in the low birth weight ranges.

Let me add that the study and reporting of stillbirths is quite important, as the stillbirths and early neonatal deaths form a continuum, and you can't really study one without taking the other into account.

I will conclude with a more optimistic note on the importance of international collaboration like this and I'm fairly certain that further international collaboration will be the result of these proceedings.

I was greatly impressed by the reports of the working groups this morning. There were so many recommendations that there is work ahead for hundreds of years. The recommendations are clearly too numerous for this one Planning Group to take up and implement, but I am sure that some of the recommendations will be pursued to a successful and useful end.

Finally, I want to take this opportunity to thank Dr. Feinleib and Dr. Hartford for having given me the opportunity to take part in this symposium, and to all of you for the benefit I've had from it, and from the friendly cooperation which I feel that we all experienced.

Discussant Report

by David Rush, M.D.

We all owe thanks to the organizers of this conference for the privilege of sharing with, and learning from, each other. We come from different places, and are immersed in different disciplines; such diversity, when openly shared, can only lead to fresh ideas, and rekindled energy.

Our concerns with accurate compilation of statistics reflecting perinatal health as long ago as 1750: how refreshing to learn that the study of perinatal statistics has such an important and rich history. We have been given detailed, and very helpful, descriptions of different ways of organizing of health care in different countries, with the realistic expectation that perinatal health care does contribute important benefits. The four working parties have struggled to synthesize this rich array of information. Given so much prior thought and work, my thoughts may be redundant, but possibly I can connect some of the seemingly disparate themes that have run through many of these valuable and serious contributions. This may help us to reach some tentative priorities for future progress in our mission of serving all families, mothers and children.

Are there some special contributions of international statistical collaboration to our search for ways to improve maternal and child health? There is the classic task of epidemiology: the search for causes. Four ways in which international collaboration might enrich such searching come to mind. One is to extend the range of biologic variation: do we observe different biologic experience among mothers and children living in different places? This certainly must be true, but probably to a limited extent. Human development from conception onwards is likely to have far more similarities than differences from place to place.

Possibly the numbers of individuals studied can be increased, yet this does not appear to be a reason of great urgency, special to international collaboration. The societies about which we have learned are of such disparate size that the most important contribution of comparative study that includes small countries cannot be simply to accumulate greater numbers. Rather, what would appear to be the special value of such collaboration would be to extend the range of causal and mediating factors under study. Some of these factors are behavioral, such as differences in family size or age of child bearing, in smoking or alcohol use, in patterns of contraceptive use, in the type and extent of work during pregnancy, and so forth. The range of such differences is very great, and it would be difficult to disentangle the effects of such variation in behavioral differences within any one country. However, the special emphasis of this conference is the effect of health services, which we now know vary remarkably across societies. To study such differences across countries simultaneously is not only interesting, but probably essential, since perinatal audit, or the patient held record, or a system of feedback of hospital performance, only exist in some of our countries and not others. The innovating society thus has the role of generating hypotheses; only with international collaboration can these hypotheses be tested, since it is very hard indeed to both innovate and comprehensively test the value of such innovation in the same place. This, then, may be the greatest value of our collaborative efforts: to describe, and then test and refine, interventions in maternal and child health care.

The effect of innovations such as perinatal audit, or the patient held record, or the feedback of hospital performance, cannot be easily disentangled from all the other simultaneous changes, known and unknown, going on in any one place. Such effects can, however, be estimated if systematically and purposefully introduced.

Further, comparative perinatal statistics have demonstrated great variation in outcomes, that appear to be effects searching for causes. The remarkable decrease in neural tube defect in the United Kingdom was described to us. Another provocative observation is that decreases in neonatal death rate was preceded by decreases in postneonatal death rate. Why has the decrease in fetal death rate been primarily among normal birth weight children, while the decrease in neonatal death rate concentrated among low birth weight children? It is an urgent, and imperative, responsibility to reframe these observations into operational and testable hypotheses, with consequent tests, and later, practical application. They are not hypotheses now, but merely interesting and unexplained observations. Possibly, by serious and intensive international collaboration, some light can be shed on these issues with the potential for improvement in the public health.

Realistically, a meeting such as this one can only be a preliminary, and somewhat primitive, exercise in the search for causes and the evaluation of interventions. Most speculation at this meeting, and this is typical whenever contemplating aggregate statistics gathered over a fairly long period, is provoked by concomitant variation. Death rates change, and so do other things. Most introductory epidemiology courses pose the question whether lung cancer rates better reflect the change in the diffusion of the telephone, or the automobile, or the cigarette. Without additional information, the answer is indeterminate. Concomitant variation leads to the weakest sort of inference, certainly not strong enough to justify reallocation of resources into large scale health programs.

Similarly, the comparison of health systems across countries does not lead to a strong test of causation, but rather helps to pose questions and formulate hypotheses. There are seven countries sharing experience here. Even with my primitive statistical resources, that seems to leave us with only six degrees of freedom, and it seems reasonable that there are more differences across these countries than the few variations in health care that we have been able to identify. Behavior, history, age, ethnicity, affluence, education, prejudices; the list is sometimes daunting, and even if all these factors do not need to be controlled, many do. Thus, it is essential we use our best judgment to identify what factors are operative, especially those amenable to intervention and change, and to test them properly. Our time today is limited, and it is inappropriate here to debate on how to execute analytic, observational studies of causality. Needless to say, they are plagued by the complex interrelations of some presumably causal factor with many other things. For instance, malnutrition and cigarette smoking do not exist in a random subset of the population. Those who smoke are different from those who don't in a variety of ways (Rush and Callahan, 1984), and mothers of children who have been diagnosed as malnourished are very different from mothers whose children are not starved (Rush, 1984).

Another reason that central emphasis should not be on historical analytic studies, based only on observation and not intervention, is that our obligation is to the public health, to improving outcome, to changing those things amenable to improvement. While some factors are not obviously amenable to change, it might be best to be somewhat humble before assuming we can predict with any certainty that we know what they are. I would have guessed, before I learned differently from our Japanese colleagues, that the age of childbearing was not amenable to much change. I would have been wrong. That the age of reproduction in Japan is radically different now from 30 years ago is not only remarkable and fascinating, but forces us to reconsider what can be changed, and what, on the other hand, must be accepted as inevitable.

It may be helpful to consider all health services as experimental interventions, just as it can be intellectually fruitful to consider all episodes of medical advice or therapy as experiments, albeit ones that are usually not very well controlled.

Leiv Bakketeig yesterday made a plea for wider application of the randomized controlled trial in maternal and child health. I do not wish to address the ethical limitations to the execution of randomized trials: that is a complex and by no means obvious problem to which justice could be done only with much more time than we have available, and with the participation of a wider range of skills and interests than has been gathered in this room. Certainly, the incantation of the word "ethics" often seems to foreclose any further rational and balanced thought. Is it ethical, for instance, to continue using wasteful, or harmful, procedures or therapies, or to not be able to devote full resources to the dissemination of useful ones, because they remain poorly tested?

On the other hand, randomized controlled trials are limited in application, usually only to issues in which individuals can be randomly allocated, since area or group randomization is not very satisfactory. (See below.) There are only some issues amenable to individual randomization: for instance, ultrasound, cervical cerclage, or individual counseling to help women reduce or stop smoking. Group interventions, say the use of the media in health education, or area-wide changes in health services, such as opening a new hospital, or the implementation of a new form of prenatal care, or the regionalization of services, cannot usually be studied optimally by randomized controlled trials. Another problem with randomized controlled trials is that they are typically explanatory trials, and not trials of program application: their results cannot necessarily be replicated in large scale applied programs. Further evaluation is required to quantify the program benefits from interventions proved to be useful in most small scale randomized trials.

You might find of some value one of the approaches we have used to study the effects over the last decade of the Special Supplemental Food Program for

Women, Infants and Children (WIC) Rush et al., 1985. This substudy was of some 12,000,000 births in 19 States over 9 years. We now have a much better sense of not only the limitations, but the not so obvious special strengths, of aggregate or ecological studies of health care interventions. One is that covariation probably can be better accounted for than in individual level studies, with the one proviso that there is not appreciable in or out migration from the area under study, since basal rates of reproductive performance at the time of intervention are known, and it is thus possible to account for covariation quite effectively. Such basal rates, prior to intervention, are often not known for, or have not been expressed by, the individual woman. A second advantage is that we can assess the impact of real, and presumably generalizable, programs. It thus promises to be more relevant to the formulation of policy: the results of a real program in a real population. Also, aggregate studies are not limited to the assessment of individual level inputs. Area wide changes in health services, institutional changes, or widespread educational changes are amenable to evaluation.

This leads to one of the links between some separate themes of this conference. In order to pursue ecological, area based evaluation, it is necessary to have available accurate, complete area-wide outcome statistics, i.e., the availability of routine, dependable, ongoing perinatal vital statistics. Many of the people at this conference are responsible for the collection and maintenance of such statistics. Their efforts, if properly used, can thus be used to understand the ongoing performance of the health care system, as well as of innovations in health care.

The smaller the area to which the statistics apply, and the concordance of such areas with those to which units of service also apply, or in which innovations are implemented, the more specific and efficient the evaluation.

Thus, interchange, such as this meeting, between clinicians, providers of health services, public health administrators and investigators, and those responsible for perinatal vital statistics, is not only stimulating: it is essential to educate us in the strengths and limits of our various approaches to public health, and to coordinated efforts aimed at doing a better job for those whom we serve.

Without regular, ongoing interchange across countries, and across disciplines, it will not be possible to optimally hypothesize and then test which factors or innovations are of potential value, how they operate, how to best test them, and where. Thus good vital statistics are the basis that justify the kind of discussion in which we are engaged.

If this logic is correct, there are some implied priorities for the perinatal vital statistics system. First, the central and obligatory task is to collect uniform, complete outcome data, and if priorities must be asserted, this must take precedence over the routine collection of other information. The next priority would be population characteristics that may be important covariates for outcomes, such as ethnicity, or education, or cigarette smoking. Lower in the list of priorities are area-wide indices of health services, such as hospital of delivery. Last would be individual level indices of health care. These may have to be collected ad hoc, and tend in any case not to be the highest priority items for vital statistics. (Which datum can be better trusted: Whether a baby died, or was delivered by mid forceps?)

We have found that simultaneous use of several data sets describing a population (vital statistics, the census, program service statistics) can be very powerful evaluative tools. The smaller the areas aggregated, the better. Of course, they must have the same area and population boundaries.

The essential role of the vital statistics system and its quality and efficiency should not, therefore, be compromised by a somewhat unconsidered, if quite natural, desire to add more and more information to that already routinely collected.

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Discussant Report

by Myron E. Wegman, M.D.

I propose to introduce a somewhat different perspective in these summary comments by discussing several factors that seem to me directly relevant to the inter-national aspects of this meeting.

In the first place I want to emphasize that there are many considerations other than those relating to health that come into play when one crosses a national boundary, rather than just an internal separation of one State or one city from another. These considerations often receive inadequate recognition in international health planning, yet they may be intensified when several countries are involved, either in a formal organization or in the more focused situation of collaborative work as that being planned by this meeting. Today's world of international relations is very different from just a few years ago. The world is both larger, in terms of numbers of people and of independent countries and governments, and smaller in terms of increasing ease of travel and communications. While information exchange is far faster and simpler than previously, international protocol seems to grow more complicated and is sometimes tied more closely with political considerations, sometimes to availability of data.

Besides the obvious differences in political organization, however, it is in the area of social organizations, cultures and customs that differences may more easily affect the kinds of studies under discussion here, differences which must be kept in mind as particular studies are planned. The differences go beyond the factor of language, about which I shall have more to say later, or such obvious considerations as differences in border controls and freedom of movement. In some countries registration of live births and of infant deaths may be affected in various ways by the social benefits or, in some cases, the social disincentives, that attach to the presence of children in a family. Variation in registration systems and which governmental agency is responsible for vital statistics may also affect completeness and accuracy of published data.

Thus, it seems to me particularly praiseworthy that in this multicountry effort, ICE is playing the role of facilitator, convener, bringer-together of several countries interested in the cooperative effort, without trying to develop a separate organization. Maintenance of the individuality of each country's approach can strengthen its contribution, promote the concept of joint effort expressed in the dictionary definition of collaboration and enhance the potential benefit of international planning and analysis.

Inclusion of a number of countries carries advantages and disadvantages. It is more complicated to work on a multicountry scale yet sometimes easier to steer clear of the foreign policy involvement usually part of bilateral agreements.

Participation of several countries also provides for more flexibility in individual investigations. Some studies may be carried out by all the collaborating countries and others by two or three. Still others might be undertaken by a single country and still be truly international if designed with thought of the lessons all might draw from the results in one.

A specific example of how a single country's experience can be significant for others has been brought out in this meeting by Dr. Matsuyama's analysis of the changes over the past 30 years in the age distribution of Japanese mothers at the time of their first childbirth. His data demonstrate that during a period of dramatic decline in the Japanese infant mortality rate there was a growing shift of mothers towards the age groups generally observed to have fewer infant deaths. Even without inferring a direct causal relationship from this observation, there are clear implications for mother and child mortality everywhere. The how and the why the changes in natality and mortality took place need much more study and analysis, particularly as to the interaction of cultural and medical factors, but implications for other countries are obvious.

Another aspect of cross-country collaboration relates to the different viewpoints a disinterested observer from outside can bring to a given situation. To be sure, in a large country "outside" might mean just another city or another state or another region, but a foreign national may still have greater impact. Yesterday, Dr. Elena Hemminki described how a report on prenatal care in Finland by a Norwegian colleague opened the Finns' eyes to conditions and factors they had not previously appreciated. In the United States we had demonstrated to us a century and a half ago, in the writing of DeTocqueville, that a visitor from another culture might have a useful perspective, different from that of homefolks. For example, many Americans criticize our "nonsystem" of health care but Dr. Hemminki believes that she sees more points of consistency and more structure than we can. She may or may not be right, but bringing this fresh point of view has a distinct value.

My next comment has to do with what I would call the unity/diversity balance to be sought in international studies. Usually there are pressures for everyone to study the same problem, in the same way, with an identical protocol, to make eventual analysis easier. On the other hand, there are advantages in exploiting the individual attributes of any country by encouraging variations, when uniformity in every respect may not be required, so long as they are part of a mutually designed plan.

It is easy to overlook the difficulties in achieving uniformity of data collection on an international scale. For instance, differences in national terminology and in national administrative procedures may be serious obstacles to a single protocol. It seems to me better to agree on minima that everyone will meet and then allow, even encourage, variety in approaches beyond the minima. In defining birth weight groups, for example, if there is agreement that the minimal measure will be 500 gram intervals, it makes little difference if some of the investigators want to standardize at 250 grams and others at 100 grams; in either event there would be no problem in combining the results into 500 gram groups.

A similar comment may be made as to causes of death. The International List of Causes of Death (ICD) has certain limitations and difficulties, but it is the

WHO standard and using it as a base is the most direct way of achieving comparability on cause analysis. Obviously, any investigator should be free to use also another disease classification, provided everyone uses at least ICD.

One permanent and general concern is how the collection and reporting process affects reliability and comparability of data. This problem is not by any means limited to the international scene but it is likely to be exaggerated there. In the many steps between the occurrence of an event and its appearance as a number in a table, a major factor is the person who fills out the record form that starts the process. For example, the United States, like many other countries, requires the signature of the attendant on a birth certificate. In most hospitals, however, the details are filled out by a ward clerk; this may indeed be an advantage because the clerk may well be more careful and accurate than a busy physician. In other instances, especially in home deliveries, the father or other relative may fill out the certificate. My own birth certificate is clearly in my father's handwriting, except for the physician's signature, and, while most of the information, to the best of my knowledge, is accurate, he has my mother's birthplace wrong!

Clearly, before undertaking international comparisons one needs to know about possible national differences in the way basic reporting forms are filled out. Furthermore, one must keep in mind the possibility, even the likelihood, of confusion stemming from facile assumptions about the meaning of words in different languages that may be spelled and even pronounced the same. For instance, the word "control," has a quite different meaning in French, Spanish, and German from the common meaning in English. "Eventual" and "revise" are other words often mistranslated. As one more example, a significant number of infant deaths from many Latin-American countries used to be erroneously classified internationally because the common practice in those countries was to enter "toxicosis" as the cause of death for children dying from extreme dehydration following diarrhea. Under the classification rules, such a diagnosis in a child under 1 year was classified as "ill-defined," thus putting into a "wastebasket" deaths that should have been classified as due to diarrheal disease.

Given these complications in expanding data banks, it might be wiser at the start of this ambitious international collaboration, to limit the number of objectives to those that can be relatively specific. I would extend the goal of specificity to such areas as background documents. It was suggested, for instance, that a comprehensive description of health services related to maternity care in each participating country should be prepared. My fear is that such a collation of material will entail a very large amount of work and be so voluminous as to be counter-productive. It seems to me preferable to limit this type of background, at least at the outset, to items more likely to be uniformly describable, such as the content of the prenatal care visit.

The principle that I am advocating is based on experience that, when one begins to work internationally, ambitions expand, horizons tend to be broadened and there is a strong temptation to include everything in the first study in order not to have to retrace one's steps. My favorite Spanish proverb is apropos--"El que mucho abarca poco aprieta"--translated freely as, "He who tries to embrace too much holds damned little."

Finally, a point that came up in at least one working group discussion but has not been brought out in the reports this morning is that standard, routinely collected vital data on infant mortality may be very useful as a tool in health planning and administration. At first blush, this might seem irrelevant to the research purpose of the meeting, but I mention it because administration utility might well be a consideration in devising research objectives. To go back to the association between having a higher proportion of births in certain maternal ages and lower infant mortality, comparative analyses might show the way for one country to profit from another's experience in achieving change by looking carefully at how the data collection and reporting were affected or not affected by community efforts to bring about a change in previously existing customs.

I find it a matter of personal excitement to take part in a meeting that opens up as many vistas as this one has. The potential information from already available data is tremendous and newer methods can bring even further expansion. To paraphrase Willy Sutton, the bank robber, there is a great deal of "gold" to be mined in our data banks. This conference has been an important step towards using international comparisons as an effective method to bring the gold to the surface.

Closing Discussion

Dr. Kleinman: I'm not sure how specific this section of the final discussion should get, but one of the things that I've been very concerned about in the past few years is the decline in the incidence of low birth weight which, as a result of this meeting, I've learned is fairly universal, at least among the countries that are included here.

I think one of the things that would be very helpful is if any of the countries have data that might shed some light on the extent to which this lack of decline in low birth weight among live-born infants could be due to the decline in fetal mortality. I've done some work here using the United States data to see how the inclusion of fetal death might affect the incidence of low birth weight among the total birth cohort. Conclusions are limited by the lack of data on early fetal death, because as the fetal death rates decline, it might be that there's progressive movement at each gestation into a further gestation.

I guess I would just like to throw open the possibility of investigating data sets that might shed some light on the total pregnancy history, starting with whether there are any data sets around that might follow women from their first sign of pregnancy throughout the entire duration of pregnancy.

Dr. Rothwell: More procedural than anything else. Each of the working groups will be presenting or giving a writeup of their meetings to the advisory committee, if you will--ICE. But where do we go from there? What's the next step? Will any of us know what the next step is? How will we be informed about the progression? Is this a one-time shot, never to be done again?

In other words, what I'm getting at is, although personally I feel that this has been very, very useful to me in expanding my limited knowledge, it would be a shame if this was the end, if there isn't a plan for further action.

Dr. Feinleib: I can assure you, this is only the first step, that there will be many more steps to come.

Let me ask Bob Hartford to tell us about some of them.

Dr. Hartford: I can best answer your question by saying that you're going to regret having asked it, because we're going to be coming to you and to many others here.

Seriously, we intend to take our first step this evening. The ICE Planning Group is meeting in my home before we disperse to the different cities and different countries to start sketching out what steps we intend to take in the very near future. I hope we can set our next meeting date of the committee.

We will need to discuss the idea of should the symposium be a regular or repetitive thing. These sort of issues will be discussed tonight, and we hope to eventually have proceedings of this symposium published. I will try to get out an executive summary, as it were, very soon, within the next 2 or 3 weeks, so you certainly will be hearing from us.

Let me urge you, that if you have ideas that occur to you after you go back to your homes, to your offices, please contact us again, let us know of your ideas or ideas that your colleagues may suggest to you.

Dr. Starfield: I have a question about low birth weight. I didn't hear much discussion this morning about the extent to which differences of low birth weight represented can be attributed to prematurity or growth retardation.

Is this something that came up in any of the groups, that was considered a priority?

Dr. Berendes: We discussed it to some extent; we discussed it in the sense of the importance of adding to birth weight, gestational age. Some of us felt that there's a good likelihood that the apparent differences in birth weight, specific mortality, different countries, particularly at the low end of the birth weight scale, may really be more due to a different mix with respect to preterm versus intrauterine growth retardation. The intrauterine growth retarded child at a given birth rate has, by and large, a better survival opportunity than the preterm delivered child.

That's about the extent to which we discussed it. We thought it was very important to emphasize the collection of data on gestation age to be able to separate that out.

Dr. Rush: Dr. Kleinman's question brings up another related issue. These are our analyses of birth weight, mean birth weight between 1971 and 1980 for 15 States in the United States, for white and black infants stratified by years of maternal education, under 12, 12-plus, at least the means which are not remarkable. Black infants are much lighter than white infants, and there's a gradient of education of about 100 grams. So that if you look at the change per year, this is grams per year, the change over the course of 10 years is exclusively among those with higher education. It's some six times as large in those with higher education, and highly significant - 6, 7 grams versus 1.5 grams of white infants, 6 grams versus 1 gram in black infants.

My own sense of this is that some behavioral factor is most likely to have contributed to this, and as a first guess--my hypothesis might be smoking--so that the rates for birth weight change have not been, in effect, stable and rigid as one starts to look among specific subgroups at risk in the population.

Dr. Little: I'd like to make one comment with respect to future activities, as the work group meets this evening.

Certainly, at a conference of this length and the quality of the debate and proceedings, it's impossible to cover all bases. The work shops were structured in an appropriate fashion, but there are some specific areas I think that might be explored in terms of interrelationships of the debate and the outcomes of specific work shops.

As basically a clinician and an implementor of program and so forth, I'd just like to point out a couple of things.

There's been a very appropriate emphasis placed upon gestational age assessment. In fact, it's been refreshing to see that, in conjunction with the birth weight specific emphasis.

The difficulty is, of course, that much of the gestational age assessment to date has been derived from products of gestation that are delivered and, yet, now, obviously, with ultrasound and other technologies, we are emerging into a time when we have parameters that are being measured by clinicians and investigators, Dr. Bakketeig and others, that will place us into a much different perspective.

And I think that perhaps in future meetings of this group that that perspective and interrelationship between fetal and neonatal information and data, and the application of new technologies is going to have to be emphasized more than was able to in this particular meeting.

Also, one area that I know is of interest that I did not hear come up at this particular discussion, was the issue of cut-off points for reporting, and specifically 500 gram versus 350 gram cut-off points that--I have heard discussed at great length. Surprisingly, I did not hear that come up.

Dr. Bergsjo: Yes, I just wanted to comment on the same thing, firstly, concerning gestational age and reporting of gestational age specific data.

Everyone who has seen curves of birth weight versus gestational age knows that the distribution in the lower gestational age groups is too, too wide due to faulty reporting of menstrual dates and everything.

And secondly, as you said, the curves we have derived from pathological events that are very often pathological preterm births, so that they are unduly low in the lower ranges, I think; and, secondly, the cut-off point effect should not be ignored.

If you don't report stillbirths before 28 weeks of gestation, you are bound to have some underreporting past 28 weeks, too, because they just say, "Well, well, well, let's forget about this and say it wasn't 28 weeks," so you have that effect.

When Japan reports everything above 12 weeks, you're sure to have much better reporting in those ranges, but if you have countries like any other country almost, except a few, you will get this error.

The second thing I would mention concerns comments both by Dr. Wegman and Dr. Rush, about the age distribution of mothers at time of birth and the changing trends, which obviously, result in changing perinatal mortality rates, which was brought out by Japan.

I have a similar example from Norway and the Nordic countries concerning maternal mortality, which is not the theme of this conference, but which I think is a good example.

Over time, the maternal age at delivery has narrowed into the range of 25 to 30 years and there is fairly little variation outside that range, however, 30 years ago you had the total range of maternal ages much more widely scattered. Today there is hardly a mother over 45.

This may be different in different countries, and I'm quite sure that if you go to Ireland, for example, you will have the whole age range of maternities still, which may account for whatever you may find, of differences in perinatal mortality rates in Ireland.

Now, what we found in the maternal mortality study was that although the maternal mortality rates went down, if you looked at the age specific mortality rates, they went soaring up in the higher maternal ages.

In other words, in Norway it's much more dangerous for a woman over 35 years today, for her own sake, to become pregnant than it was 30 years ago, relatively speaking; and this is also something that might be brought into this group's thinking.

Dr. Cole: I think I'd like to say something about picking specific birth weights to compare across countries.

I'm fairly sure that we all ought to be creating our own birth weight distribution, and possibly not looking at narrow bounds of birth weight, but looking at narrow bounds of central distributions.

And, possibly, looking at your black-white difference, in your own country, that might say more about the true well being over a small range of birth weight distribution rather than picking the same birth weight distribution to look at.

Dr. Feinleib: An important suggestion that will probably be taken up in the postconference discussions.

Dr. Williams: I'd like to congratulate the discussants on an excellent summary of the proceedings that we had.

I was especially impressed by Dr. Rush's excellent taxonomy on research techniques, and I couldn't agree with him more on the importance of ecological studies and somewhat of a neglected national resource of using vital statistics between the various States to do these types of studies.

There's one little minor point I'd like to make, however, relative to randomized control trials, and it's something I talked to Dr. Wegman last night about, and that is twin pregnancies are randomly distributed, with a few exceptions that we know pretty well, in terms of age, race, and they may be able to provide us with another national resource or international resource for evaluating some of the questions that were raised here.

The idea is that they kind of rain uniformly from heaven and some of them get into some tracks and some of them get into others, and so we might be able to utilize that as another --

Participant: I would agree completely, and I think that on the outside of a group like this, it's rarely perceived that some 20 percent of fetal loss and infant loss is from these relatively rare multiple pregnancies.

It's a very important issue. It's an important issue in its own right and it's an important issue--these are very important pregnancies as indices of the quality of high risk care that's being received.

I think the study of twins is very important and it tends to have been neglected because, in our smallish studies, where we have studied small cohorts, the numbers of twins have never been adequate to test issues and, therefore, we've tended to leave them off.

And, indeed, if we were talking about issues of importance in maternal and child health in the next decade, I think the survival and wellbeing of multiple pregnancies is one of the issues of highest importance.

Dr. McCarthy: I'd like to make a comment about something that seems--in the presentations today I have been very impressed with everything that has gone on this morning as well as the rest of the conference, but it seems to me that an outsider coming in and looking at the proceedings would really see a great emphasis on low birth weight, and I would just like to remind people that there are several other major causes of infant mortality that are important to keep in mind.

And, in fact, birth defects, their surveillance systems, the international collaboration among surveillance systems of birth defects is a very good example of an ongoing international collaboration, so there may be things to be learned from that.

I also would like to make a comment about morbidity. We've talked about that this morning as well, but I think that it's hard to talk about mortality without really giving very hard consideration to the issues of morbidity.

We talked about it a great deal in the infant health group, and that there are really major problems with trying to deal with issues of cerebral palsy, mental retardation, and other developmental disabilities. I think that some of the things that were implied in some of the group presentations this morning were that there were problems of definitions, other consensus sort of issues, and I think the way that ICE could facilitate developments in these fields would be to support or encourage conferences to define different classification systems for cerebral palsy, for example, or other things along this line.

Dr. Hartford: I don't know how to adequately express my thanks to each and every one of you for this magnificant participation in this symposium.

I think that you realize that doing business this way to launch our ICE effort was a bit of an experiment, and I think it's been a most successful experiment, and the success resides in, of course, your participation, not only in the excellent presentations given the first two days, but in the extremely hard work that each and every one of you gave to us in the working groups yesterday, and it's very obvious, the very hard work and dedicated work that you provided for us in the excellent presentations we got this morning.

I'd also like to give a special thanks to our three discussants who I think have done a tremendous job in setting the planning group on the right course. Thank you, thank you all.

Dr. Karlberg: Dr. Feinleib, I allow myself on the behalf of the participants from the other countries to address to you and to Dr. Hartford our gratitude to have been given the opportunity to participate in this symposium on the perinatal and infant mortality in your wonderful institute of National Center for Health Statistics.

It has been invaluable to meet and exchange experiences between statisticians, epidemiologists, obstetricians, and pediatricians, or what we call ourselves.

It has stimulated a lot of new thinking, and I am sure it has stimulated new work in our own countries, and as Dr. Wegman said, when you have other people helping, it's a good help to see what we should look for; so, for sure, we will go home and work, but continuation will be most welcome. Thank you so much.

Dr. Feinleib: Thank you very much, Mr. Chairman. I would like to thank the participants in this morning's symposium, the working group leaders, and all those who participated in making this a successful symposium.

It is only recently that I have begun examining the data on infant mortality rates since I have spent most of my career studying factors in older age groups, particularly cardiovascular disease and cancer. Upon looking at the data on infant mortality, my first impression was that we have made tremendous progress in the United States during the last 30 years in lowering infant mortality by 50 to 60 percent, and that we should take a good deal of pride at having cut the rate to such a low level. Yet, as I became more familiar with the data, I saw that we could not rest on the progress that has been made over the last 30 years, and that there were certain trends in the data that actually indicated specific areas for concern.

One question that arose is why the United States is not at the very forefront among nations for achieving low infant mortality rates. On an international comparative basis, as we saw in some of the earlier presentations, the United States has been surpassed in its improvements in infant mortality rates by most of the countries that are represented at this meeting and by several others. American investigators might ask themselves, "Even though we are doing a good job, many other countries are doing an even better job, so how can we improve our situation?"

The second aspect that caught our eyes was that not all the subpopulations in the United States have fared equally well. This has become a very important issue, both scientifically and socially, especially since it involves the status of specific ethnic and economic groups, and raises the issue of their access to various aspects of our health care system. There are a wide variety of issues--political, social, economic, and scientific--that affected a great deal of the policy decisions that had to be made by the government as well as by individual practitioners and health care providers.

I think that this symposium has gone far in providing grounds for optimism, from the parochial point of view of those in the United States, that these problems can be solved and that we can continue the progress that has already been made by learning from our colleagues in other countries and trying to emulate some of the things that they have done so well. This conference is but a first step in learning from our colleagues abroad. I personally will look forward to many more contacts with all of you here, and with your colleagues back home, and hope that we will have fruitful collaboration for many years in the future. Thank you all very much.

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