

2024 NATIONAL ELECTRONIC HEALTH RECORDS SURVEY (NEHRS) TECHNICAL DOCUMENTATION



**Division of Health Care Statistics
National Center for Health Statistics
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Overview Summary

This document provides detailed information and guidance for users of the 2024 National Electronic Health Records Survey (NEHRs) public use data files. This survey is a principal source of information on office-based and outpatient physicians adoption and use of electronic health record (EHR) systems, and progress towards meeting policy goals of the Health Information Technology for Economic and Clinical Health Act (HITECH Act). The 2024 NEHRs was conducted by the National Center for Health Statistics (NCHS) and is a member of the National Health Care Surveys – a family of surveys which measure health care utilization across a variety of health care providers and settings.

Section 1 of this document includes information on the scope of the survey, and the confidentiality protections related to the data. Section 2 contains details on the sampling process, data collection procedures. Section 3 provides information on the eligibility criteria and number of sampled physicians that were eligible to participate in NEHRs. Section 4 details the data processing procedures. Section 5 contains the estimation procedures, and weighting methodology used to produce national estimates. Section 6 provides an explanation of the procedures used to accurately produce variance estimates. National Center for Health Statistics presentation standards for proportions, counts, and rates, and their relation to NEHRs data are discussed in Section 7, and the survey content are provided in Section 8. Section 9 provides a list of preferred reporting items for complex sample survey analysis for the 2024 NEHRs. Section 10 provides information on the availability of the NEHRs restricted use data files in NCHS and Federal Research Data Centers. Finally, Section 11 contains references.

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Contact Information

Data users can find the latest information about NEHRS on our website, at:

<https://www.cdc.gov/nchs/nehrs/index.html>. If data users have queries about the public use data file, they may send their question through email to ambcare@cdc.gov, or call us at 301-458-4600. A response to data user inquiries is generally provided in 1-2 business days.

The National Center for Health Statistics has an ambulatory health care data listserv, where updates and information about recent ambulatory care data (including NEHRS) are sent out. Details on how to subscribe to the NCHS Listserv for ambulatory health care data can be found at:

https://www.cdc.gov/nchs/products/nchs_listservs.htm. Once on this webpage, select “Ambulatory Care List” to subscribe.

Contents

Section 1 About the National Electronic Health Records Survey.....	5
Section 1.1 Background.....	5
Section 1.2 Data Collection.....	5
Section 1.3 Data Confidentiality.....	6
Section 2 Methodology.....	7
Section 2.1 Brief Overview.....	7
Section 2.2 Sampling Frame and Sample Design.....	7
Section 2.3 Data Collection Procedures.....	7
Section 3 Eligibility, Sample Size, and Response Rate.....	9
Section 3.1 Eligibility and Sample Size.....	9
Section 3.2 Response Rate.....	10
Section 4 Data Processing.....	11
Section 4.1 Edits.....	11
Section 4.2 Quality Control.....	11
Section 5 Estimation Procedures.....	12
Section 5.1 Inflation by Reciprocals of Selection Probabilities.....	12
Section 5.2 Adjustment for Nonresponse.....	12
Section 5.3 Ratio Adjustment.....	12
Section 5.4 Physician Weight.....	13
Section 6 Standard Errors and Variance Estimation.....	14
Section 6.1 Variance Estimation Examples in R.....	14
Section 6.2 Variance Estimation Examples in Stata.....	15
Section 6.3 Variance Estimation Examples in SAS.....	15
Section 6.4 Variance Estimation Examples in SUDAAN.....	15
Section 6.5 Variance Estimation Examples in SPSS.....	15
Section 7 Presentation Standards.....	17
Section 8 Survey Content.....	18
Section 8.1 Item Nonresponse.....	18
Section 9 Preferred Reporting Items for Complex Sample Survey Analysis (PRICSSA) Document for the 2024 National Electronic Health Records Survey Public Use Data File.....	19
Section 10 Research Data Center.....	20
Section 11 References.....	21

Section 1 About the National Electronic Health Records Survey

Section 1.1 Background

The National Electronic Health Records Survey (NEHRS) has measured the progress U.S. physicians, and their offices have made in adopting electronic health records and health information exchange. Data collection began in 2008, as an annual mail supplement to the National Ambulatory Medical Care Survey (NAMCS); the survey then named the NAMCS Electronic Medical Record Supplement. In 2010, the survey expanded to measure EHR adoption rates across all 50 U.S. states and the District of Columbia. NEHRS became a standalone survey, conducted separately from NAMCS, in 2012.

The goal of the 2024 NEHRS data collection was to collect information about the use of electronic health record (EHR) systems, interoperability, exchange of patient health information with public health agencies, and use of telemedicine technology among office-based and outpatient physicians in the United States. The 2024 NEHRS sample included 16,633 office-based or outpatient physicians in the United States. In 2024, there were 1,725 physicians who provided information included in the public use file.

Section 1.2 Data Collection

Two modes of data collection were used for the 2024 NEHRS: (1) electronic submission via a self-administered web-based instrument, and (2) mail submission via a self-administered paper instrument. Most respondents completed the paper instrument.

A brief description of the survey design and data collection procedures are below.

Please note the following important points concerning analysis of the 2024 NEHRS PUF:

- **PHYSICIAN WEIGHT**

Micro-data file users should be fully aware of the importance and proper use of the physician weight (MAILWGT), and how it must be used. Information about physician weight can be found in Section 5.4.

- **RELIABILITY OF ESTIMATES**

Data users should also be aware of the reliability of survey estimates, particularly smaller estimates. NCHS has published standards for the assessment of reliability and presentation of proportions (or percentages) (https://www.cdc.gov/nchs/data/series/sr_02/sr02_175.pdf) and for the presentation of rates and counts (https://www.cdc.gov/nchs/data/series/sr_02/sr02-

[200.pdf](#)). For presentation or publication of NEHRS count estimates, we recommend estimates be rounded to the nearest thousand.

Section 1.3 Data Confidentiality

NCHS and its agents take the security and confidentiality of NEHRS data very seriously. Strict laws have been implemented to establish minimum Federal standards for safeguarding the privacy of individually identifiable health information. Assurance of confidentiality is provided according to Section 308(d) of the Public Health Services Act [42 United States Code 242m (d)]. Strict procedures of the Confidential Information Protection and Statistical Efficiency Act (44 U.S.C. 3561-3583) are used to prevent disclosure of personal identifiable information in NEHRS data. All information which could identify a participating physician or practice is confidential and seen only by persons associated with NEHRS; it is not disclosed or released to others for any other purpose. Prior to the release of public use data files, NCHS conducts extensive disclosure risk analysis to minimize the chance of inadvertent disclosure. As a result, selected characteristics and/or data elements may have been masked on the public use data files to minimize the potential risk of disclosure. Masking was performed to cause minimal impact on the data.

The protocol for NEHRS has been approved by the NCHS Research Ethics Review Board each year it was fielded.

Section 2 Methodology

Section 2.1 Brief Overview

The 2024 NEHRs used a national probability sample of outpatient or office-based physicians. The 2024 NEHRs public use data file sample was designed to allow U.S. national estimates.

Section 2.2 Sampling Frame and Sample Design

The sampling frame for the 2024 NEHRs was composed of all physicians listed in the master files maintained by the American Medical Association and American Osteopathic Association who met the following criteria:

- Outpatient or office-based;
- Principally engaged in patient care activities;
- Non-federally employed except those in an Indian Health Service setting;
- Not in specialties of anesthesiology, pathology, or radiology; and
- Younger than 71 years of age at the time of the survey.

The 2024 NEHRs sample included 16,633 physicians. Sampled physicians were asked several eligibility questions to assure that they met the above-mentioned criteria. Of these 16,633 physicians, 835 physicians did not meet all criteria and were ruled ineligible or out-of-scope for the survey. The most frequent reasons for being ineligible were that the physician was no longer in practice, the physician did not provide outpatient or office-based care, and that the physician did not work in an eligible setting. An additional 5,822 physicians could not be located and had unknown eligibility. Eligibility status for 8,114 physicians was not determined prior to the end of data collection. There were 1,862 physicians who were eligible; 38 refused to complete the survey, 99 partially completed the survey, and 1,725 completed the survey fully. The public use file only contains the 1,725 physicians who completed the survey fully.

Section 2.3 Data Collection Procedures

RTI International (Research Triangle Park, NC) was the data collection contractor for the 2024 NEHRs. The 2024 NEHRs was fielded from July 2024 to December 2024. The first attempt to contact the sampled physician was through an introductory letter from the NCHS Director. The introductory letter invited physicians to participate via the web-based questionnaire, informed them of the voluntary nature of the survey, protection of data confidentiality, and provided login instructions for the web version of the survey. For the 13,594 physicians for whom we had an email address, a similar introductory email message was also sent about two days after the introductory letter was mailed. Both

invitations provided physicians with login instructions for the electronic version of the survey, along with the elements of informed consent. Follow-up emails were sent about 1 week, 2 weeks, 3 weeks, 7 weeks, 11 weeks, and 14 weeks after the initial contact to physicians for whom we had email addresses.

About 4 weeks after the initial contact, the contractor mailed an introductory letter, a 2024 NEHRS questionnaire, a sticky note pad, a Morbidity and Mortality Weekly Report (MMWR) QuickStat on “Percentage of Office-Based Physicians using Telemedicine Technology by Specialty – United States, 2019 and 2021” (Myrick, McNeal, & DeFrances 2022), and a postage paid self-addressed return envelope to non-responding physicians. Approximately 8 weeks after the initial contact, all sampled physicians were sent a postcard thanking them for their participation or reminding them that their participation was still needed. The postcard allowed sampled physicians to request additional information or another copy of the survey questionnaire. About 10 weeks after the initial contact, non-responding physicians were sent a second mailing, which included a modified introductory letter, a paper questionnaire, and a postage paid self-addressed return envelope. About 14 weeks after the initial contact, non-responding physicians were sent a third mailing that included a modified introductory letter, the paper questionnaire, and a postage paid self-addressed return envelope. All letters informed respondents of the voluntary nature of the survey and protection of data confidentiality. The survey closed approximately 19 weeks after initial contact. The questionnaire is available at <https://cdc.gov/nchs/nehrs/documentation/index.html>.

Section 3 Eligibility, Sample Size, and Response Rate

Section 3.1 Eligibility and Sample Size

The 2024 NEHR sample included 16,633 physicians. Sampled physicians were asked eligibility questions to ensure that they were eligible. An eligible physician provided outpatient or office-based care, primarily engaged in patient care, was non-federally employed except physicians in the Indian Health Service, was in an eligible specialty, and worked in an eligible setting. Eligible settings were private or solo group practice; freestanding clinic or Urgent Care Center; Community Health Center (e.g., Federally Qualified Health Center [FQHC], federally funded clinics or “look-alike” clinics); mental health centers; Government clinic that is not federally funded (e.g., state, county, city, maternal and child health, etc.); family planning clinic (including Planned Parenthood); integrated delivery system, health maintenance organization, health system or other prepaid practice (e.g., Kaiser Permanente); faculty practice plan (an organized group of physicians that treats patients referred to an academic medical center); Indian Health Service; Rural Health Clinic (Federally Qualified); and hospital outpatient departments.

Of the 16,633 physicians, 835 physicians did not meet the inclusion criteria and were ruled ineligible (out-of-scope for the survey (Table 3.1, final disposition 3). An additional 5,822 could not be located despite active searches (Table 3.1, final disposition 4). Eligibility status for 8,114 physicians could not be determined, including physicians who refused or partially completed the survey, but did not complete the eligibility questions (Table 3.1, final disposition 5). Of the 1,862 physicians who were eligible (Table 3.1, final dispositions 1 + 2 + 6), 1,824 completed one or more subject matter items on the questionnaire (Table 3.1, final dispositions 1 + 6), and 1,725 physicians answered the key item. The public use file contains the 1,725 physicians who answered the key item (Table 3.1, final disposition 1). Table 3.1 presents the final dispositions, sample size, and unweighted percent of the sampled physicians.

Table 3.1. Final disposition of the sampled physicians: NEHR, 2024

Final Disposition	Sample Size	Unweighted Percent
1. Eligible respondent with complete items	1,725	10.4
2. Eligible and refused	38	0.2
3. Ineligible, out-of-scope	835	5.0
4. Not locatable	5,822	35.0
5. Unknown eligible and refusal	8,114	48.8
6. Eligible with partially complete items	99	0.6
Total	16,633	100.0

Section 3.2 Response Rate

The response rates were calculated using The American Association for Public Opinion Research's Response Rate 3 approach (AAPOR, 2023). The unweighted response rate was 47.4%. The weighted response rate was 47.5%. Both response rates were based on the full responders (n=1,725) who provided non-blank responses to pre-determined items.

Section 4 Data Processing

Section 4.1 Edits

RTI International reviewed all mailed questionnaire for potential errors as they were received. After review, the questionnaires were sent to data capture using TeleForm. TeleForm is a software product that electronically scans forms and captures the data without manual data entry. As questionnaires were scanned, the program flagged any entries outside the norm of expected responses. A person then performed a visual review of flagged entries and decided the appropriate response for the item. RTI staff referred to the 2024 NEHRS Processing Instructions developed by NCHS staff for guidance on editing the questionnaires. Some questionnaires required editing to clarify and standardize ambiguous or inconsistent responses. If a question arose outside of the standard editing guidance, RTI conferred with NCHS for a final determination, and the processing instructions were updated as needed. Specifications for checking, configuring, and transmitting the data files were developed by NCHS and RTI, and applied to the electronic data from the web-based questionnaires. Files containing data from the paper and electronic questionnaires were combined and transmitted to NCHS for further processing. At NCHS, the data underwent multiple consistency checks and review before additional cleaning and editing.

Section 4.2 Quality Control

All mailed questionnaires were scanned. RTI staff performed quality checks of the TeleForm data, including checking 10% of the scanned forms against the stored data to confirm that data were captured correctly. Any discrepancies were logged, reported, and amended in the “cleaned” dataset.

Section 5 Estimation Procedures

The 2024 NEHRs data file contains a physician-level analysis weight (MAILWGT) for producing unbiased national estimates from the sample data and the interview data. This weight is a vital component of the survey data, and micro-data file users should understand how to use and apply it correctly. Each record on the data file represents one physician in the sample, and that single physician represents many physicians within their geographic area and medical specialty.

Statistics produced from the 2024 NEHRs use a multistage estimation procedure. The procedure has three components: (1) inflation by reciprocals of the selection probabilities, (2) adjustment for nonresponse, and (3) a calibration ratio adjustment to fixed totals. Each of these components is described below.

Section 5.1 Inflation by Reciprocals of Selection Probabilities

The sampling methodology in the 2024 NEHRs uses a list sample. The first weight component is the sampling weight or reciprocal of the physician's selection probability. The survey used a one-stage sample design. For each sampling stratum, the selection probability is the number of sampled physicians in the stratum divided by the total number of physicians listed on the sampling frame for that stratum.

Section 5.2 Adjustment for Nonresponse

NEHRs estimates were adjusted to account for nonresponse in two steps: (1) adjustments were made first to account for those physicians whose eligibility for the survey was not determined, and then (2) adjustments were made to account for eligible physicians who did not participate in the survey or did not complete the questionnaire if they did participate.

Adjustments for nonresponse were made by shifting the weights of non-respondent physicians to those who were deemed respondents within the same geographic area and medical specialty when practical. If response within a group defined by geographic area and medical specialty was insufficient, the group was collapsed with another for the adjustments.

Section 5.3 Ratio Adjustment

A post-ratio adjustment was made to the sampling weights within each sampling stratum to adjust for changes in the physician population represented in the sampling frame between the time of sample

selection and when the survey was conducted. The ratio adjustment is a multiplication factor which consists of the number of physicians eligible for the sampling frame in each sampling stratum as the numerator, and the estimated number of physicians in that sampling stratum as the denominator. The numerator was based on figures obtained from the physician master files for the survey period, and the denominator was the estimate of the figures of the sampling frame based on the sample.

Section 5.4 Physician Weight

The 2024 NEHR public use data file contains a weight (MAILWGT) for producing national estimates from sample data and the interview data. As stated before, this is a vital component of the survey data and data users should understand how to use and apply it correctly.

The information contained in the public use data file reflects both adoption and use of EHR systems, as well as progress towards meeting the policy goals of the HITECH Act, among office-based physicians in the U.S. Each record on the public use data file represents one physician in the sample. To obtain national estimates from survey data, each record is assigned an inflation factor called MAILWGT. By aggregating the weights contained in the MAILWGT variable on the 1,725 sample records for 2024, the user can obtain the estimated total of 415,475 office-based physicians in the U.S. These weights allow data users to calculate physician-level estimates and the associated variances (see example R, SAS, SUDAAN, Stata, and SPSS code in Section 6). There is one weight for each physician who met the definition of a complete responder.

Section 6 Standard Errors and Variance Estimation

The standard error is primarily a measure of the sampling variability that occurs by chance because only a sample is surveyed, rather than the entire universe.

This section provides an overview on how data users can obtain estimates and compute variances to produce standard errors for 2024 NEHRS data. The examples provide statistical software statements for R, Stata, SAS, SUDAAN, and SPSS that incorporate the design variables and sampling methodology of NEHRS. R relies on the “survey” package to conduct survey data analysis. Stata uses the “svy” command. SAS software provides a set of procedures whose names begin with SURVEY for survey analysis. All examples use a data set named “NEHRSdata” that represents the 2024 NEHRS public use data file.

Section 6.1 Variance Estimation Examples in R

The R packages “survey” and “surveytable” can be used for complex survey analysis (<https://cran.r-project.org/web/packages/survey/index.html>, <https://cran.r-project.org/web/packages/surveytable/surveytable.pdf>). The R programs below demonstrate how to use weights and calculate variance estimates in the “survey” and “surveytable” package.

```
install.packages("survey")
Install.packages("surveytable")

#provide design variables
Mysurvey = survey::svydesign(ids = ~ PHYID_P
, strata = ~ STRATA_P
, weights = ~ MAILWGT
, data = NEHRSdata)

library(survey)
library(surveytable)
```

For categorical variables:

```
# Use surveytable package
# Replace "VAR1" with the categorical variable of interest
# Replace "NEHRSdata" with filename
# Conduct survey weighted frequency analysis
tab("VAR1")
```

Section 6.2 Variance Estimation Examples in Stata

The command as follows: svyset pweight (mailwgt), stratum (strata_p), and psu (phyid_p)

Stata 12 and later:

```
svyset phyid_p [pweight=mailwgt], strata(strata_p)
```

Section 6.3 Variance Estimation Examples in SAS

Below is an example of the PROC CROSSTAB SUDAAN analysis (shown above) using the SAS SURVEYFREQ procedure.

```
PROC SURVEYFREQ DATA=NEHRdata;
STRATA STRATA_P;
WEIGHT MAILWGT;
TABLES SPECCAT*EMEDREC;
run;
```

Section 6.4 Variance Estimation Examples in SUDAAN

The linearized Taylor series procedure in SUDAAN software is used to approximate variances for the 2024 NEHR estimates. SUDAAN's 1-stage With Out Replacement (WOR) Option is used. This example code provides a WOR ultimate cluster (1-stage) estimate of standard errors for a cross-tabulation with a dataset called NEHRdata. SAS-callable SUDAAN software requires that the dataset be sorted by the NEST variable prior to analysis.

An example to produce frequency tables using the CROSSTAB procedure in SAS-callable SUDAAN, the following statements are used:

```
PROC CROSSTAB DATA=NEHRdata filetype=SAS Design=WOR;
NEST STRATA_P / MISSUNIT;
TOTCNT POPDOC;
WEIGHT MAILWGT;
CLASS SPECCAT EMEDREC;
TABLES SPECCAT*EMEDREC;
run;
```

Section 6.5 Variance Estimation Examples in SPSS

To obtain variance estimates which take the sample design into account, IBM SPSS Inc.'s Complex Samples module can be used. This description applies to version 24.0. From the main menu, first click on 'Analyze', then 'Complex Samples,' then 'Prepare for Analysis.' The 'Analysis Preparation Wizard' can be

used to set STRATA_P as the stratum variable, PHYID_P as the cluster variable, and MAILWGT as the weighting variable. The WR design option may be chosen. This will create the PLAN FILE syntax, which should resemble the code below; where PLAN FILE reflects the location you have selected to store the file on your computer:

```
CSPLAN ANALYSIS  
/PLAN FILE='DIRECTORY\PLANNAME.CSAPLAN'  
/PLAN VARS ANALYSISWEIGHT=MAILWGT  
/PRINT PLAN  
/DESIGN STAGELABEL= 'ANY LABEL' STRATA=STRATA_P CLUSTER=PHYID_P  
/ESTIMATOR TYPE=WR.
```

Section 7 Presentation Standards

Data users should be aware of the reliability of survey estimates, particularly smaller estimates. NCHS has published standards for the assessment of reliability and presentation of proportions (or percentages) (https://www.cdc.gov/nchs/data/series/sr_02/sr02_175.pdf) and for the presentation of rates and counts (https://www.cdc.gov/nchs/data/series/sr_02/sr02-200.pdf). For presentation or publication of NEHRS count estimates, we recommend estimates be rounded to the nearest thousand.

These presentation standards apply to products published by NCHS. If, according to the presentation standards, an estimate is not reliable, data users should examine the confidence interval carefully before using the estimate.

Section 8 Survey Content

The 2024 NEHRS public use data file has 1,725 records and 69 variables. Please refer to the 2024 NEHRS public use data file codebook for detailed information on the variables including variable names, variable type, variable descriptions, and variable values.

Section 8.1 Item Nonresponse

Unweighted item nonresponse rates that exceed 5% are typically reported. There were zero items on the 2024 NEHRS public use file that exceeded 5% item nonresponse. Due to the nature of the questions, imputation was not used.

Section 9 Preferred Reporting Items for Complex Sample Survey Analysis (PRICSSA) Document for the 2024 National Electronic Health Records Survey Public Use Data File

Table 9.1 below provides a Preferred Reporting Items for Complex Survey Analysis (PRICSSA) document (Seidenberg, Moser, & West 2023) for users of the 2024 NEHRs public use data. This information may be helpful to users when analyzing the 2024 NEHRs.

Table 9.1 Preferred Reporting Items for Complex Sample Survey Analysis

Preferred Reporting Items for Complex Sample Survey Analysis (PRICSSA)	Description
Name of survey	National Electronic Health Records Survey
Data collection dates	July 2024 to December 2024
Data collection mode	Self-administered web questionnaire or self-administered mail questionnaire in English
Target population	Outpatient or office-based physicians in the United States who primarily provide direct patient care
Populations excluded	Outpatient or office-based physicians who practice radiology, pathology, or anesthesiology, are over 71 years old, and are federally funded but not employed by the Indian Health Service
Sample design	Random sample
Unweighted survey response rate	47.4% unweighted, using AAPOR Response Rate 3
Weighted survey response rate	47.5%, using APPOR Response Rate 3
Unweighted total sample size	1,725 physicians
Weighted total sample size	415,475
Variance and standard error estimation	Without Replacement (WOR) variance estimation
Weight	MAILWGT
Presentation standards	Proportions or percentages: https://www.cdc.gov/nchs/data/series/sr_02/sr02_175.pdf Rates and counts: https://www.cdc.gov/nchs/data/series/sr_02/sr02-200.pdf
Location of example code	See Section 6

Section 10 Research Data Center

NCHS operates the Research Data Center (RDC) to allow researchers access to restricted-use data. The RDC is responsible for protecting the confidentiality of survey respondents, study subjects, and institutions while providing access to restricted-use data for statistical purposes. The 2024 NEHRs restricted use data file, which contains data excluded from the public use data file due to disclosure risks and NCHS confidentiality requirements, can be accessed through the Federal and NCHS RDC. For information on how to access the 2024 NEHRs restricted use data file through the RDC, please see: <https://www.cdc.gov/rdc/restricted-nchs-variables/nehrs.html>

Section 11 References

National Center for Health Statistics. Division of Health Care Statistics. National Center for Health Statistics Research Data Center National Electronic Health Records Survey 2024 Public Use File Data Dictionary. Hyattsville, Maryland. Available at: <https://www.cdc.gov/nchs/nehrs/documentation/index.html>.

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Seidenberg AB, Moser RP, West BT, Preferred Reporting Items for Complex Sample Survey Analysis (PRICSSA), Journal of Survey Statistics and Methodology, 11(4), 2023, Pages 743–757. Available at: <https://academic.oup.com/jssam/article/11/4/743/7136601>.