2021 National Electronic Health Records Survey (NEHRS)

Public Use File Documentation

May 6, 2022

ABSTRACT

This material provides documentation for users of the public use micro-data file for the 2021 National Electronic Health Records Survey (NEHRS). This is the third NEHRS public use file (PUF). The purpose of NEHRS is to collect information on both office-based 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 2021 NEHRS reduced the questionnaire length from 8-pages to 4-pages and removed the computer assisted telephone interview data collection mode in an effort to improve response. The 2021 NEHRS collects some of the information that was collected in the 2019 NEHRS. However, it has new questions on the use of telemedicine technology and changes in terminology for some questions. Content common to the 2019 and 2021 NEHRS includes information on practice characteristics, prescribing practices for controlled substances, use of health information exchanges, and documentation associated with medical record systems and physician burden associated with the use of them. NEHRS is sponsored by the Office of the National Coordinator for Health Information Technology (ONC). NEHRS is conducted by the Division of Health Care Statistics (DHCS), National Center for Health Statistics (NCHS). Additional information about the history of NEHRS is available here.

The NEHRS public use file includes data from office-based physicians. No patient level data were collected. This documentation describes the PUF produced from data collected in NEHRS.

Section I, "Description of the National Electronic Health Records Survey" includes information on the scope of the survey, the sampling design, field activities, data collection procedures, weighting and estimation measures, and sampling errors. Section II, "Codebook Location and Physician Specialty List" provides the location of the codebook and a list of physician specialty groups represented in the survey. Appendix I contains information on standard errors and variance estimation that is useful when analyzing the 2021 NEHRS PUF data.

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I. DESCRIPTION OF THE NATIONAL ELECTRONIC HEALTH RECORDS SURVEY

A. INTRODUCTION

The National Electronic Health Records Survey (NEHRS) is a nationally representative probability sample survey of office-based physicians. The survey assesses physician adoption and use of electronic health record (EHR) systems, and progress towards meeting the policy goals of the Health Information Technology for Economic and Clinical Health Act (HITECH Act). NEHRS was conducted by the Division of Health Care Statistics, National Center for Health Statistics (NCHS). Data in this file must be weighted to produce national estimates that describe EHR adoption and use, practice information, prescribing practices for controlled substances, use of health information exchanges, use of telemedicine technology, and documentation associated with medical record systems and physician burden associated with the use of them among office-based physicians in the United States.

Two modes of data collection were used for the 2021 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 total of 1,875 completed questionnaires were received from physicians who participated in the 2021 NEHRS. Brief descriptions of the survey design and data collection procedures are below.

Please note the following important points concerning analysis of the 2021 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 is on page 9.

- 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 proportional estimates. For frequencies and rates, NCHS considers an estimate reliable if it has a relative standard error of 30 percent or less (i.e., the standard error is no more than 30 percent of the estimate). It should be noted that estimates of frequencies and rates based on fewer than 30 records are also considered unreliable, regardless of the magnitude of the relative standard error. For presentation or publication of NEHRS estimates, we recommend estimates be rounded to the nearest thousand.

B. SAMPLING FRAME AND SIZE OF SAMPLE

The basic sampling unit for NEHRS is the physician. The sampling frame for the 2021 NEHRS was composed of Master files for all American physicians who met the following criteria:

- Office-based;
- Principally engaged in patient care activities;
- Non-federally employed;
- Not in specialties of anesthesiology, pathology, or radiology; and
- Younger than 85 years of age at the time of the survey.

The 2021 NEHRS sample included 10,302 physicians. Sampled physicians were asked eligibility questions to ensure that they met the above-mentioned criteria. Of these 10,302 physicians, 913 physicians did not meet the inclusion criteria and were ruled ineligible (out-of-scope) for the survey (Table 1 final disposition, 3). The most frequent reasons for ineligibility included that the physician was no longer in practice or retired, that the physician did not work in an eligible setting or that the physician did not provide outpatient, office-based care. An additional 2,264 physicians were deemed ineligible because they could not be located despite active searches (Table 1 final disposition, 4). Eligibility status for 5,088 physicians could not be determined, including physicians who refused or partially completed the survey, but did not complete the eligibility questions (Table 1 final disposition, 5). Of the 2,037 physicians confirmed eligible (Table 1 final disposition, 1 + 2 + 6), 2,002 participated in the study by completing one or more subject matter item(s) on the questionnaire (Table 1 final disposition, 1 + 6); of these, 1,875 physicians participated completely by responding to all the key items on the survey (Table 1 final disposition, 1).

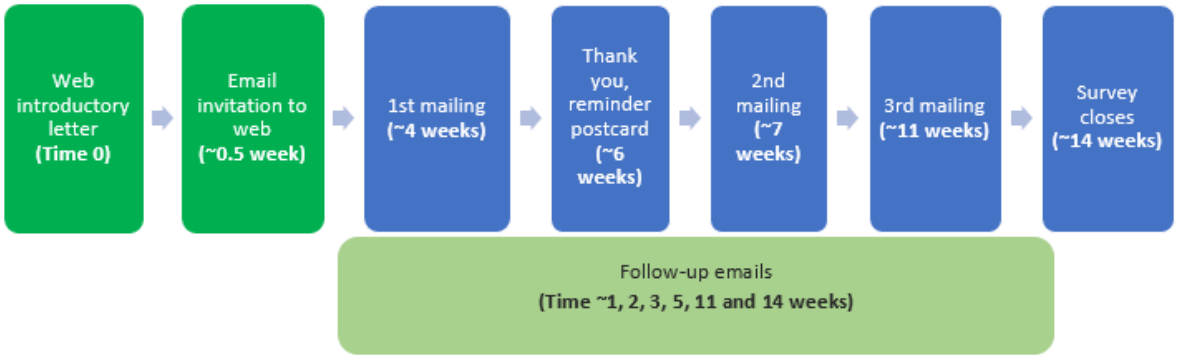
Table 1: Final disposition of the sampled physicians: NEHRS, 2021

Final Dispositions	Sample size, n	Unweighted Percent %
1. Eligible respondent, complete	1,875	18.2
2. Eligible, refused	35	0.3
3. Ineligible	913	8.9
4. Ineligible, not locatable	2,264	22.0
5. Unknown eligibility refusal & partial	5,088	49.4
6. Eligible, partially complete	127	1.2
Total	10,302	

The unweighted rate for determining eligibility status was 50.6 percent (49.9 percent weighted), based on the number of physicians whose eligibility status was determined (n=2,037). The unweighted response rate was 46.6 percent (45.9 percent weighted), based on the full responders (n=1,875) who provided non-blank responses to pre-determined items. The unweighted overall participation rate was 25.3 percent (24.6 percent weighted) which is the product of rates for determining eligibility status and full response.

C. FIELD ACTIVITIES

Figure 1. Timeline for the 2021 NEHRS fielding activities



RTI International (Research Triangle Park, NC) was the data collection contractor for the 2021 NEHRS. The 2021 NEHRS was fielded from March 18, 2021 to July 26, 2021. 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 5,575 physicians for whom we had an email address, a similar introductory email message was also sent about four 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, 5 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 2021 NEHRS questionnaire, a sticky note pad with the Department of Health and Human Services logo and NEHRS name and website address, an NCHS flyer, and a postage paid self-addressed return envelope to non-responding physicians. Approximately 6 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 also allowed sampled physicians to request additional information or another copy of the survey instrument. About 7 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 11 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 14 weeks after the initial contact.

D. DATA COLLECTION

The survey used mixed-mode data collection that included self-administered web questionnaire (n=425, 22.7%), and self-administered mail paper questionnaire (n=1,450, 77.3%). The preferred

respondent was the sampled physician (n=1,556, 83.0%); however, proxy respondents were allowed (n=319, 17.1%). Proxies were the sampled physician's office manager or another staff member of the sampled physician's office knowledgeable about general practice administration. The 2021 NEHRS instrument can be found on the NEHRS web page.

E. DISCLOSURE RISK EVALUATION

Prior to the release of the public use micro-data file, NCHS conducted an extensive disclosure risk analysis to minimize the chance of any inadvertent disclosure. Based on research conducted by NCHS for the 2021 NEHRS, some variables were subject to masking and others were top coded in accordance with NCHS confidentiality requirements. Masking was performed in such a way to cause minimal impact on the data. Data users who wish to use unmasked data can submit a proposal to the NCHS Research Data Center.

F. DATA PROCESSING

1. EDITS

RTI reviewed all mailed questionnaires 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 the flagged entries and decided the appropriate response for the item. RTI staff referred to the 2021 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.

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 ensure that data were captured accurately. Any discrepancies were logged, reported, and amended in the "cleaned" dataset.

3. ITEM NONRESPONSE

Unweighted item nonresponse rates that exceed five percent are typically reported. There were zero items on the 2021 NEHRS public use file that exceeded five percent item nonresponse. Due to the nature of the questions, imputation was not used.

G. ESTIMATION PROCEDURES

The 2021 NEHRS data file contains a physician-level analysis weight (MAILWGT) for producing unbiased national estimates from the sample data. This 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 his/her geographic area and specialty group.

Statistics produced from the 2021 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.

1. INFLATION BY RECIPROCALS OF SELECTION PROBABILITIES

The sampling methodology in the 2021 NEHRS uses a list sample. The first weight component is the sampling weight or reciprocal of the physician's selection probability. Because the survey used a one-stage sample design, the sampling probabilities were determined by sampling strata defined by geographic area. For each sampling stratum, the selection probability is the number of sampled physicians in the stratum divided by the total number of physicians listed in the sampling frame for that stratum.

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, specialty type (primary care, surgical, medical care), and specialty group when practical. If response within a group defined by geographic area/specialty type/specialty group was insufficient, the group was collapsed with another for the adjustments. In the first adjustment which included physicians whose eligibility status was never determined, weights were shifted to only locatable physicians under the assumption that the physicians with unknown eligibility status could be either eligible or ineligible, unlike the unlocatable physicians who were all deemed to be ineligible.

3. RATIO ADJUSTMENT

A post-ratio adjustment was made to the sampling weights within each combination of the geographic area and physician specialty group in order 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 combination of geographic area and physician specialty group as the numerator, and the estimated number of physicians in that combination of geographical area and specialty group 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 numerator based on the sample.

H. PHYSICIAN WEIGHT

The 2021 NEHRS PUF contains a weight (MAILWGT) for producing national estimates from sample 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 PUF 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 PUF represents one physician in the sample. In order 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 1,875 sample records for 2021, the user can obtain the estimated total of 403,013 office-based physicians in the U.S.

These weights allow data users to calculate physician-level estimates and the associated variances (see example SAS, SUDAAN, Stata and SPSS code in Appendix I). There is one weight for each physician who met the definition of a complete responder.

REFERENCES

1. Parker JD, Talih M, Malec DJ, et al. National Center for Health Statistics Data Presentation Standards for Proportions. National Center for Health Statistics. Vital Health Stat 2(175). 2017. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_175.pdf

II. CODEBOOK LOCATION AND PHYSICIAN SPECIALTY LIST

A. CODEBOOK LOCATION

The codebook can be found here.

B. PHYSICIAN SPECIALTY LIST

The following 14 physician specialty groups were developed based on information from the American Medical Association (AMA). The listed AMA specialties were eligible for selection to the NEHRS sample.

GENERAL AND FAMILY PRACTICE (Primary Care)
- AMF Adolescent Medicine (Family Practice)
- AMI Adolescent Medicine (Internal Medicine)
- EFM Emergency Medicine/Family Medicine
- FM Family Medicine
- FMP Family Medicine/Preventive Medicine
- FP Family Practice
- FPG Geriatric Medicine (Family Practice)
- GP General Practice
- HPF Hospice & Palliative Medicine (Family Medicine)
- IFP Internal Medicine/Family Practice
- IMG Geriatric Medicine (Internal Medicine)
- IPM Internal Medicine/Preventive Medicine

INTERNAL MEDICINE (Primary Care)
- IM Internal Medicine

PEDIATRICS (Primary Care)
- ADL Adolescent Medicine (Pediatrics)
- MPD Internal Medicine/Pediatrics
- PD Pediatrics
- PSM Pediatric Sports Medicine

PEDIATRICS (Medical)
- CAP Child Abuse Pediatrics
- CCP Pediatric Critical Care Medicine
- DBP Developmental – Behavioral Pediatrics
- EMP Pediatrics – Emergency Medicine
- HPP Hospice & Palliative Medicine (Pediatrics)
- NDN Neurodevelopmental Disabilities (Psychiatry & Neurology)
- NDP Neurodevelopmental Disabilities (Pediatrics)
- NPM Neonatal-Perinatal Medicine
- PDA Pediatric Allergy
- PDC Pediatric Cardiology
- PDE Pediatric Endocrinology
- PDI Pediatric Infectious Diseases
- PDP Pediatric Pulmonology
- PDT Medical Toxicology (Pediatrics)
- PEM Pediatric Emergency Medicine (Pediatrics)
- PG Pediatric Gastroenterology
- PHO Pediatric Hematology/Oncology
- PMG Pediatrics/Medical Genetics
- PN Pediatric Nephrology

PEDIATRICS (Medical)
- PPR Pediatric Rheumatology
- PTP Pediatric Transplant Hepatology

GENERAL SURGERY (Surgical)
- GS General Surgery

OBSTETRICS AND GYNECOLOGY (Primary Care)
- GYN Gynecology
- OBG Obstetrics and Gynecology
- OBS Obstetrics

OBSTETRICS AND GYNECOLOGY (Surgical)
- FPR Female Pelvic Medicine and Reconstructive Surgery (Obstetrics and Gynecology)
- GO Gynecological Oncology
- HPO Hospice & Palliative Medicine (Obstetrics & Gynecology)
- MFM Maternal & Fetal Medicine
- OCC Critical Care Medicine (Obstetrics & Gynecology)
- UPR Female Pelvic Medicine & Reconstructive Surgery (Urology)

ORTHOPEDIC SURGERY (Surgical)
- HSO Hand Surgery
- OAR Adult Reconstructive Orthopedics
- OFA Foot and Ankle Orthopedics
- OMO Musculoskeletal Oncology
- OP Pediatric Orthopedics
- ORS Orthopedic Surgery
- OSM Sports Medicine (Orthopedic Surgery)
- OSS Orthopedic Surgery of the Spine
- OTR Orthopedic Trauma

CARDIOVASCULAR DISEASES (Medical)
- CD Cardiovascular Diseases

DERMATOLOGY (Medical)
- D Dermatology

UROLOGY (Surgical)
- U Urology
- UP Pediatric Urology

PSYCHIATRY (Medical)

ADP	Addiction Psychiatry
CHP	Child and Adolescent Psychiatry
CPP	Pediatrics/Psychiatry/Child & Adolescent Psychiatry
NUP	Neuropsychiatry
P	Psychiatry
PFP	Forensic Psychiatry
PYA	Psychoanalysis
PYG	Geriatric Psychiatry
PYM	Psychosomatic Medicine

NEUROLOGY (Medical)

CHN	Child Neurology
CN	Clinical Neurophysiology
ENR	Endovascular Surgical Neuroradiology (Neurology)
EPL	Epilepsy
ESN	Endovascular Surgical Neuroradiology
N	Neurology
NRN	Neurology/Diagnostic Radiology/ Neuroradiology
VN	Vascular Neurology

OPHTHALMOLOGY (Surgical)

OPH	Ophthalmology
OPR	Ophthalmic Plastic and Reconstructive Surgery
PO	Pediatric Ophthalmology

OTOLARYNGOLOGY (Surgical)

NO	Neurotology (Otolaryngology)
OTO	Otolaryngology
PDO	Pediatric Otolaryngology
PSO	Plastic Surgery within the Head & Neck (Otolaryngology)
SMO	Sleep Medicine (Otolaryngology)

ALL OTHER (Surgical)

AS	Abdominal Surgery
ASO	Advanced Surgical Oncology
CCS	Surgical Critical Care (Surgery)
CFS	Craniofacial Surgery
CHS	Congenital Cardiac Surgery (Thoracic Surgery)
CRS	Colon & Rectal Surgery
CS	Cosmetic Surgery
DS	Dermatologic Surgery
ES	Endovascular Surgical Neuroradiology (Neurological Surgery)
FPS	Facial Plastic Surgery

ALL OTHER (Surgical)

HNS	Head & Neck Surgery
HPS	Hospice and Palliative Medicine (Surgery)
HS	Hand Surgery
HSP	Hand Surgery (Plastic Surgery)
HSS	Hand Surgery (Surgery)
NS	Neurological Surgery
NSP	Pediatric Surgery (Neurology)
OMF	Oral & Maxillofacial Surgery
PCS	Pediatric Cardiothoracic Surgery
PDS	Pediatric Surgery (Surgery)
PRD	Procedural Dermatology
PS	Plastic Surgery
PSH	Plastic Surgery within the Head & Neck
PSI	Plastic Surgery—Integrated
PSP	Plastic Surgery within the Head & Neck (Plastic Surgery)
SO	Surgical Oncology
TRS	Traumatic Surgery
TS	Thoracic Surgery
TSI	Thoracic Surgery—Integrated
TTS	Transplant Surgery
VS	Vascular Surgery
VSI	Vascular Surgery-Integrated

ALL OTHER (Medical)

A	Allergy
ADM	Addiction Medicine
AHF	Advanced Heart Failure and Transplant Cardiology
AI	Allergy and Immunology
ALI	Clinical Laboratory Immunology (Allergy & Immunology)
AM	Aerospace Medicine
BIN	Brain Injury Medicine (Psychiatry & Neurology)
BIP	Brain Injury Medicine (Physical Medicine and Rehabilitation)
CBG	Clinical Biochemical Genetics
CCG	Clinical Cytogenetics
CCM	Critical Care Medicine (Internal Medicine)
CG	Clinical Genetics
CHD	Adult Congenital Heart Disease (Internal Medicine)
CID	Clinical Informatics (Pediatrics)
CIE	Clinical Informatics (Emergency Medicine)
CIF	Clinical Informatics (Family Medicine)
CIM	Clinical Informatics (Preventive Medicine)
CLI	Clinical Informatics (Internal Medicine)
CMG	Clinical Molecular Genetics
DDL	Clinical and Laboratory Dermatological Immunology
DIA	Diabetes
EM	Emergency Medicine
END	Endocrinology, Diabetes and Metabolism

ALL OTHER (Medical)

EP	Epidemiology
ESM	Sports Medicine (Emergency Medicine)
ETX	Medical Toxicology (Emergency Medicine)
FPP	Psychiatry/Family Practice
FSM	Family Practice/Sports Medicine
GE	Gastroenterology
GPM	General Preventive Medicine
HEM	Hematology (Internal Medicine)
HEP	Hepatology
HO	Hematology/Oncology
HPE	Hospice & Palliative Medicine (Emergency Medicine)
HPI	Hospice & Palliative Medicine (Internal Medicine)
HPM	Hospice & Palliative Medicine
HPN	Hospice & Palliative Medicine (Psychiatry & Neurology)
HPR	Hospice & Palliative Medicine (Physical Medicine)
IC	Interventional Cardiology
ICE	Clinical Cardiac Electrophysiology
ID	Infectious Disease
IEC	Internal Medicine/Emergency Medicine/Critical Care Medicine
IG	Immunology
ILI	Clinical and Laboratory Immunology (Internal Medicine)
IMD	Internal Medicine/Dermatology
IRI	Interventional Radiology—Integrated
ISM	Internal Medicine – Sports Medicine
LM	Legal Medicine
MDM	Medical Management
MEM	Internal Medicine/Emergency Medicine
MG	Medical Genetics
MBG	Medical Biochemical Genetics
MDG	Internal Medicine/Medical Genetics
MN	Internal Medicine/Neurology
MP	Internal Medicine/Psychiatry
MPM	Internal Medicine/Physical Medicine and Rehabilitation
NC	Nuclear Cardiology
NEP	Nephrology
NMN	Neuromuscular Medicine
NMP	Neuromuscular Medicine (Physical Medicine & Rehabilitation)

ALL OTHER (Medical)

NTR	Nutrition
OM	Occupational Medicine
OMM	Osteopathic Manipulative Medicine
ON	Medical Oncology
OS	Other Specialty
PA	Clinical Pharmacology
PCC	Pulmonary Critical Care Medicine
PDD	Pediatric Dermatology
PDM	Pediatric/Dermatology
PE	Pediatric Emergency Medicine (Emergency Medicine)
PHL	Phlebology
PHM	Pharmaceutical Medicine
PHP	Public Health and General Preventive Medicine
PLI	Clinical and Laboratory Immunology (Pediatrics)
PLM	Palliative Medicine
PM	Physical Medicine and Rehabilitation
PME	Pain Management
PMM	Pain Medicine
PMN	Pain Medicine (Neurology)
PMP	Pain Management (Physical Medicine and Rehabilitation)
PPM	Pediatrics/Physical Medicine & Rehabilitation
PPN	Pain Medicine (Psychiatry)
PRO	Proctology
PRS	Sports Medicine (Physical Medicine and Rehabilitation
PTX	Medical Toxicology (Preventive Medicine)
PUD	Pulmonary Disease
PYN	Psychiatry (Neurology)
REN	Reproductive Endocrinology and Infertility
RHU	Rheumatology
RPM	Pediatric Rehabilitation Medicine
SCI	Spinal Cord Injury Medicine
SME	Sleep Medicine
SMI	Sleep Medicine (Internal Medicine)
SMN	Sleep Medicine (Psychiatry & Neurology)
SMP	Sleep Medicine (Pediatrics)
THP	Transplant Hepatology (Internal Medicine)
UCM	Urgent Care Medicine
UM	Underseas Medicine (Preventive Medicine)
UME	Underseas Medicine (Emergency Medicine)
VM	Vascular Medicine
US	Unspecified

C. PHYSICIAN SPECIALTIES REGROUPED INTO PRIMARY CARE, SURGICAL, AND MEDICAL SPECIALTIES

Below is a list of the AMA physician specialties regrouped into primary care, surgical, and medical specialties for analytic purposes (see SPECCAT variable on the file layout).

PRIMARY CARE SPECIALTIES

ADL	Adolescent Medicine (Pediatrics)
AMF	Adolescent Medicine (Family Practice)
AMI	Adolescent Medicine (Internal Medicine)
EFM	Emergency Medicine/Family Medicine
FM	Family Medicine
FMP	Family Medicine/Preventive Medicine
FP	Family Practice
FPG	Geriatric Medicine (Family Practice)
GP	General Practice
GYN	Gynecology
HPF	Hospice & Palliative Medicine (Family Medicine)
IFP	Internal Medicine/Family Practice
IM	Internal Medicine
IMG	Geriatric Medicine (Internal Medicine)
IPM	Internal Medicine/Preventive Medicine
MPD	Internal Medicine/Pediatrics
OBG	Obstetrics & Gynecology
OBS	Obstetrics
PD	Pediatrics
PSM	Pediatric Sports Medicine

SURGICAL SPECIALTIES

AS	Abdominal Surgery
ASO	Advanced Surgical Oncology
CCS	Surgical Critical Care (Surgery)
CFS	Craniofacial Surgery
CHS	Congenital Cardiac Surgery (Thoracic Surgery)
CRS	Colon & Rectal Surgery
CS	Cosmetic Surgery
DS	Dermatologic Surgery
ES	Endovascular Surgical Neuroradiology (Neurological Surgery)
FPR	Female Pelvic Medicine and Reconstructive Surgery
FPS	Facial Plastic Surgery
GO	Gynecological Oncology
GS	General Surgery
HNS	Head & Neck Surgery
HPO	Hospice and Palliative Medicine (Obstetrics & Gynecology)
HPS	Hospice and Palliative Medicine (Surgery)
HS	Hand Surgery

SURGICAL SPECIALTIES

HSO	Hand Surgery (Orthopedics)
HSP	Hand Surgery (Plastic Surgery)
HSS	Hand Surgery (Surgery)
MFM	Maternal & Fetal Medicine
NO	Neurotology (Otolaryngology)
NS	Neurological Surgery
NSP	Pediatric Surgery (Neurology)
OAR	Adult Reconstructive Orthopedics
OCC	Critical Care Medicine (Obstetrics & Gynecology)
OFA	Foot and Ankle, Orthopedics
OMF	Oral and Maxillofacial Surgery
OMO	Musculoskeletal Oncology
OP	Pediatric Orthopedics
OPH	Ophthalmology
OPR	Ophthalmic Plastic and Reconstructive Surgery
ORS	Orthopedic Surgery
OSM	Sports Medicine (Orthopedic Surgery)
OSS	Orthopedic Surgery of the Spine
OTO	Otolaryngology
OTR	Orthopedic Trauma
PDO	Pediatric Cardiothoracic Surgery
PO	Pediatric Ophthalmology
PS	Plastic Surgery
PSI	Plastic Surgery—Integrated
PSH	Plastic Surgery within the Head & Neck
PSO	Plastic Surgery within the head & neck (Otolaryngology)
SMO	Sleep Medicine (Otolaryngology)
SO	Surgical Oncology
TRS	Trauma Surgery
TS	Thoracic Surgery
TSI	Thoracic Surgery—Integrated
TTS	Transplant Surgery
U	Urology
UP	Pediatric Urology
UPR	Female Pelvic Medicine & Reconstructive Surgery (Urology)
VS	Vascular Surgery
VSI	Vascular Surgery-Integrated

MEDICAL SPECIALTIES

A	Allergy
ADM	Addiction Medicine
ADP	Addiction Psychiatry
AHF	Advanced Heart Failure and Transplant Cardiology
AI	Allergy & Immunology
ALI	Clinical Laboratory Immunology (Allergy & Immunology
AM	Aerospace Medicine
BIN	Brain Injury Medicine (Psychiatry & Neurology)
BIP	Brain Injury Medicine (Physical Medicine and Rehabilitation)
CAP	Child Abuse Medicine
CBP	Clinical Biochemical Genetics
CCG	Clinical Cytogenetics
CCM	Critical Care Medicine (Internal Medicine)
CCP	Pediatric Critical Care Medicine
CD	Cardiovascular Disease
CG	Clinical Genetics
CHD	Adult Congenital Heart Disease (Internal Medicine
CHN	Child Neurology
CHP	Child and Adolescent Psychiatry
CID	Clinical Informatics (Pediatrics)
CIE	Clinical Informatics (Emergency Medicine)
CIF	Clinical Informatics (Family Medicine)
CIM	Clinical Informatics (Preventive Medicine)
CLI	Clinical Informatics (Internal Medicine)
CMG	Clinical Molecular Genetics
CN	Clinical Neurophysiology
CPP	Pediatrics/Psychiatry/Child & Adolescent Psychiatry
D	Dermatology
DBP	Developmental – Behavioral Pediatrics
DDL	Clinical and Laboratory Dermatology Immunology
DIA	Diabetes
EM	Emergency Medicine
EMP	Pediatrics/Emergency Medicine
END	Endocrinology, Diabetes and Metabolism
ENR	Endovascular Surgical Neuroradiology (Neurology)
EP	Epidemiology
EPL	Epilepsy
ESM	Sports Medicine (Emergency Medicine)
ESN	Endovascular Surgical Neuroradiology
ETX	Medical Toxicology (Emergency Medicine)
FPP	Psychiatry/Family Practice
FSM	Family Practice/Sports Medicine

MEDICAL SPECIALTIES

GE	Gastroenterology
GPM	General Preventive Medicine
HEM	Hematology (Internal Medicine)
HEP	Hepatology
HO	Hematology/Oncology
HPE	Hospice & Palliative Medicine (Emergency Medicine)
HPI	Hospice & Palliative Medicine (Internal Medicine)
HPM	Hospice & Palliative Medicine
HPN	Hospice & Palliative Medicine (Psychiatry & Neurology)
HPP	Hospice & Palliative Medicine (Pediatrics)
HPR	Hospice & Palliative Medicine (Physical Medicine)
IC	Interventional Cardiology
ICE	Clinical Cardiac Electrophysiology
ID	Infectious Disease
IEC	Internal Medicine/Emergency Medicine/Critical Care Medicine
IG	Immunology
ILI	Clinical and Laboratory Immunology (Internal Medicine)
IMD	Internal Medicine/Dermatology
IRI	Interventional Radiology-Integrated
ISM	Internal Medicine – Sports Medicine
LM	Legal Medicine
MBG	Medical Biochemical Genetics
MDG	Internal Medicine/Medical Genetics
MDM	Medical Management
MEM	Internal Medicine/Emergency Medicine
MG	Medical Genetics
MN	Internal Medicine/Neurology
MP	Internal Medicine/Psychiatry
MPM	Internal Medicine/Physical Medicine and Rehabilitation
N	Neurology
NC	Nuclear Cardiology
NDN	Neurodevelopmental Disabilities (Psychiatry & Neurology)
NDP	Neurodevelopmental Disabilities (Pediatrics)
NEP	Nephrology
NMN	Neuromuscular Medicine
NMP	Neuromuscular Medicine (Physical Medicine & Rehabilitation)
NPM	Neonatal Perinatal Medicine
NRN	Neurology/Diagnostic Radiology/Neuroradiology
NTR	Nutrition
NUP	Neuropsychiatry
OM	Occupational Medicine
OMM	Osteopathic Manipulative Medicine
ON	Medical Oncology

MEDICAL SPECIALTIES

OS	Other Specialty
P	Psychiatry
PA	Clinical Pharmacology
PCC	Pulmonary Critical Care Medicine
PDA	Pediatric Allergy
PDC	Pediatric Cardiology
PDD	Pediatric Dermatology
PDE	Pediatric Endocrinology
PDI	Pediatric Infectious Disease
PDM	Pediatric/Dermatology
PDP	Pediatric Pulmonology
PDT	Medical Toxicology (Pediatrics)
PE	Pediatric Emergency Medicine (Emergency Medicine)
PEM	Pediatric Emergency Medicine (Pediatrics)
PFP	Forensic Psychiatry
PG	Pediatric Gastroenterology
PHL	Phlebology
PHM	Pharmaceutical Medicine
PHO	Pediatric Hematology/Oncology
PHP	Public Health and General Preventive Medicine
PLI	Clinical and Laboratory Immunology (Pediatrics)
PLM	Palliative Medicine
PM	Physical Medicine & Rehabilitation
PME	Pain Management
PMG	Pediatrics – Medical Genetics
PMM	Pain Medicine
PMP	Pain Management (Physical Medicine & Rehabilitation)
PN	Pediatric Nephrology
PPM	Pediatrics/Physical Medicine & Rehabilitation
PPN	Pain Medicine (Psychiatry)
PPR	Pediatric Rheumatology
PRO	Proctology
PRS	Sports Medicine (Physical Medicine & Rehabilitation
PTP	Pediatric Transplant Hepatology
PTX	Medical Toxicology (Preventive Medicine)
PUD	Pulmonary Disease
PYA	Psychoanalysis
PYG	Geriatric Psychiatry
PYM	Psychosomatic Medicine
PYN	Psychiatry/Neurology
REN	Reproductive Endocrinology
RHU	Rheumatology
RPM	Pediatric Rehabilitation Medicine
SCI	Spinal Cord Injury Medicine
SME	Sleep Medicine

MEDICAL SPECIALTIES

SMI	Sleep Medicine (Internal Medicine)
SMN	Sleep Medicine (Psychiatry & Neurology)
SMP	Sleep Medicine (Pediatrics)
THP	Transplant Hepatology (Internal Medicine)
UCM	Urgent Care Medicine
UM	Underseas Medicine (Preventive Medicine)
UME	Underseas Medicine (Emergency Medicine)
VM	Vascular Medicine
VN	Vascular Neurology
US	Unspecified Specialty

APPENDIX I

A. 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.

The sampling methodology in the 2021 NEHRS uses a list sample. The design variables reflect this sampling methodology. Examples of SUDAAN, SAS, Stata, and SPSS statements that incorporate these design variables for variance estimation are below. All examples use a data set named "NEHRSdata" that represents the 2021 NEHRS PUF.

1. VARIANCE ESTIMATION EXAMPLES IN SUDAAN

The linearized Taylor series procedure in SUDAAN software is used to approximate variances for the 2021 NEHRS 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 NEHRSdata. 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=NEHRSdata filetype=SAS Design=WOR;
NEST STRAT_P / MISSUNIT;
TOTCNT POPDOC;
WEIGHT MAILWGT;
CLASS SPECCAT EMEDREC;
TABLES SPECCAT*EMEDREC;
run;
```

2. VARIANCE ESTIMATION EXAMPLE IN SAS

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

```
PROC SURVEYFREQ DATA=NEHRSdata;
STRATA STRAT_P;
WEIGHT MAILWGT;
TABLES SPECCAT*EMEDREC;
run;
```

3. VARIANCE ESTIMATION EXAMPLES IN Stata

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

Stata 12 and later:
svyset phyid_p [pweight=mailwgt], strata(strat_p)

4. 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 STRAT_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=STRAT_P CLUSTER=PHYID_P
/ESTIMATOR TYPE=WR.
```