Linkage of the 2024 National Electronic Health Records Survey (NEHRS) and 2023 Quality Payment Program (QPP) Data: Linkage Methodology and Analytic Considerations

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Division of Health Care Statistics,

National Center for Health Statistics,

Centers for Disease Control and Prevention

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Contents

1. Introduction

1.1 Purpose of the Document

This document describes the linkage of the 2024 National Electronic Health Records Survey (NEHRS) with the 2023 Centers for Medicare and Medicaid Services (CMS) Quality Payment Program (QPP) dataset. Specifically, it discusses the methodology used to create the linkage and provides information to consider when conducting analyses using this linked data file.

1.2 Rationale for Data Linkage

Linking national survey data on electronic health record (EHR) adoption with administrative performance data offers substantial analytic value. NEHRS provides nationally representative information on physician EHR capabilities, interoperability, and health information exchange practices, while the QPP dataset contains clinician-level performance information related to quality measurement, payment incentives, and program participation. By combining these data sources, researchers can explore the relationships between EHR adoption, interoperability, and clinician performance under federal payment programs. Please consult a statistician when using NEHRS physician-level analysis weight for producing nationally representative estimates. The linkage of NEHRS and QPP data creates a new resource that can support a wide array of physician-level analyses.

2. Data Source Descriptions

2.1 National Electronic Health Records Survey (NEHRS), 2024

NEHRS is an annual survey administered by the National Center for Health Statistics (NCHS), part of the Centers for Disease Control and Prevention (CDC). It was first fielded in 2008 as a mail supplement to the National Ambulatory Medical Care Survey (NAMCS) and in 2012 began being fielded as its own standalone survey.[1] Since 2008, NEHRS was sponsored by the Assistant Secretary for Technology Policy, Office of the National Coordinator for Health Information Technology (ASTP/ONC). Its primary purpose was to track the adoption and use of certified and non-certified EHR systems among office-based physicians across the United States, with particular attention to interoperability, health information exchange, and documentation burden.[2] Unless otherwise noted, the information in the remainder of this subsection is from the *2024 NEHRS Technical Documentation*.[3]

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[1] National Center for Health Statistics. Division of Health Care Statistics. *2024 National Electronic Health Records Survey (NEHRS).* Available at: https://www.cdc.gov/nchs/nehrs/index.html

[2] National Center for Health Statistics. Division of Health Care Statistics. *2024 National Electronic Health Records Survey (NEHRS) Technical Documentation.* December 2025. Hyattsville, MD. DOI: https://dx.doi.org/10.15620/cdc/174636

[3] National Center for Health Statistics. Division of Health Care Statistics. *2024 National Electronic Health Records Survey (NEHRS) Technical Documentation.* December 2025. Hyattsville, MD. DOI: https://dx.doi.org/10.15620/cdc/174636

The 2024 NEHRS was fielded from July through December 2024 using a nationally representative probability sample of non-federally employed, office-based physicians. Research Triangle Institute (RTI) International was the contractor for this data collection. The NEHRS sample was drawn using a one-stage, stratified list design, with physicians stratified by geographic area and medical specialty. The initial sample included 16,633 physicians. Of these, 835 were found to be ineligible or out-of-scope upon contact, most commonly because the physician was no longer in active practice or did not provide outpatient or office-based care. The 2024 cycle was designed to produce national-level estimates only and does not support state-level estimates. Physicians eligible for NEHRS were those physicians who provided outpatient or office-based care, principally engaged in patient care activities, were non-federally employed (except those in an Indian Health Service setting), did not specialize in anesthesiology, radiology, or pathology, and were younger than 71 years of age at the time of the survey.

Data collection relied primarily on self-administered paper and web-based questionnaires. Sampled physicians with a known email address received an introductory email approximately two days after an initial contact letter from the NCHS Director was mailed via the United States Postal Service. Follow-up email contact was made at approximately 1, 2, 3, 7, 11, and 14 weeks after initial outreach. Physicians who had not responded, including those without a known email address, received paper questionnaires. Completing the survey was estimated to take approximately 20 minutes. Survey weights were constructed so that a single physician represented many physicians within their geographic area and medical specialty.

The 2024 survey captured the following key domains:

- Physician specialty and practice characteristics, including practice size and practice ownership
- EHR adoption status, including whether physicians used any EHR system and whether the system held Meaningful Use/Promoting Interoperability Program certification
- EHR functionality and capabilities, including tools for patient identification, documentation, and care coordination
- Health information exchange and interoperability, including the ability to exchange patient information across systems
- Participation indicators relevant to CMS Promoting Interoperability Programs

NCHS publishes results from NEHRS through a combination of scientific reports, online web tables, and data files. The 2024 NEHRS cycle found that 95.0% of U.S. office-based physicians had adopted an EHR system, with 83.6% using a certified system.[4] NEHRS public-use files have had all personally identifiable information removed. Restricted data files are available to approved

[4] National Center for Health Statistics. Division of Health Care Statistics. *2024 National Electronic Health Records Survey (NEHRS) public use file national weighted estimates.* Available at: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NEHRS/2024/2024NEHRS-PUF-weighted-estimates.pdf

researchers through the NCHS Research Data Center (RDC). Confidentiality protections are governed by Section 308(d) of the Public Health Services Act and the Confidential Information Protection and Statistical Efficiency Act (CIPSEA).

Details on the specific variables included in the 2024 NEHRS data file, including the survey question number, variable name and description, and values and labels are located in the *2024 NEHRS Research Data Center Restricted File Layout,* located here: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NEHRS/2024/2024-NEHRS-RDC-restricted-file-layout.pdf.

2.2 Quality Payment Program (QPP) Dataset, 2023

The Quality Payment Program (QPP) was established under the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) and is administered by CMS. It replaced the Sustainable Growth Rate (SGR) formula[5] as the mechanism for adjusting Medicare Part B payments to clinicians, with the explicit goal of rewarding high-quality, efficient care.[6]

Data sources for the QPP public-use file include Medicare Part B claims; provider enrollment, chain and ownership system (PECOS); and measure, activity, and attestation data submitted by clinicians, practices, and their third party intermediaries.[7] The QPP public-use file contains 177 data variables and 524,998 unique Taxpayer Identification Number (TIN)/National Provider Identifier (NPI) combinations in the file, and is limited to the measures and activity data contributed to the MIPS eligible clinician's final score.[7] Under MIPS, clinician performance is assessed across four weighted categories, including quality, improvement activities, promoting interoperability, and cost.[8]

Beginning with the 2023 performance year, CMS expanded available participation frameworks beyond traditional MIPS to include the Alternative Payment Model (APM) Performance Pathway (APP) and MIPS Value Pathways (MVPs).[9] MVPs were a notable addition, offering specialty-specific groupings of quality measures, improvement activities, and cost measures designed to reduce reporting burden and provide more clinically meaningful comparisons. Twelve MVPs were available in 2023, including five newly finalized options.[10]

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[5] Centers for Medicare and Medicaid Services. Estimated Sustainable Growth Rate and Conversion Factor, for Medicare Payments to Physicians in 2015. Available at: https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/SustainableGRatesConFact/Downloads/sgr2015p.pdf

[6] Centers for Medicare and Medicaid Services. Quality Payment Program: History of QPP. Available at: https://qpp.cms.gov/get-started/what-is-qpp/qpp-history.

[7] Centers for Medicare and Medicaid Services. 2023 QPP Public Use File: Methodology. Available at: https://qpp-cm-prod-content.s3.amazonaws.com/uploads/3327/2023-QPP-PUF-Methodology.pdf

[8] Centers for Medicare and Medicaid Services. Quality Payment Program: Performance Categories. Available at: https://www.qpp.cms.gov/get-started/what-is-mips/performance-categories

[9] Centers for Medicare and Medicaid Services. Quality Payment Program: Reporting Options. Available at: https://www.qpp.cms.gov/get-started/what-is-mips/reporting-options

[10] Centers for Medicare and Medicaid Services. 2023 QPP Participation and Performance Results At-a-Glance. Available at: https://qpp-cm-prod-content.s3.amazonaws.com/uploads/3238/2023-QPP-Results-At-A-Glance.pdf

The 2023 QPP public-use file, released by CMS in 2025, includes records from physicians and non-physician clinicians. The file provides clinician-level participation and performance data structured at the TIN and NPI level. Each record captures a unique TIN/NPI combination, and therefore a clinician can have more than one record in the QPP. The following data elements (as listed in the data dictionary) are included:[11]

- National Provider Identifier (NPI), which is the standardized 10-digit identifier assigned to the provider when they enrolled in Medicare and the primary key for linking QPP data to external sources
- Practice size designation
- Clinician type designation for each unique TIN/NPI combination associated with an individual clinician
- Clinician specialty designation for each unique TIN/NPI combination associated with an individual clinician
- Program participation status, including whether the clinician participated in traditional MIPS, an MVP, the APP framework, or an Advanced APM
- MIPS eligibility indicators and low-volume threshold determinations
- Performance category scores for Quality, Cost, Promoting Interoperability, and Improvement Activities (where applicable)
- Final composite MIPS score and associated 2025 payment adjustment factor
- Small practice size status indicator

Note this is not an exhaustive list. Please refer to the QPP data dictionary for a complete variable list.

The QPP dataset covers clinicians who bill Medicare Part B for covered professional services and who met the low-volume threshold for the 2023 performance year. Clinicians with $90,000 or less in Medicare Part B covered professional services, or who see 200 or fewer Medicare patients, were generally exempt from MIPS participation and would not appear in the dataset as MIPS reporters.[12] Approximately 541,421 MIPS-eligible clinicians received a payment adjustment for the 2023 performance year.[13] The mean final score was 83.18 points, and the median was 85.49 points.[13]

Details on the specific variables included in the 2023 QPP data file, including the column, field, data type, and description can be found in the *2023 QPP Public Use File: Data Dictionary*, which can be downloaded from the following location: https://qpp-cm-prod-content.s3.amazonaws.com/uploads/3326/2023-QPP-PUF-Data-Dictionary.pdf For

[11] Centers for Medicare and Medicaid Services. 2023 QPP Public Use File: Data Dictionary. Available at: https://qpp-cm-prod-content.s3.amazonaws.com/uploads/3326/2023-QPP-PUF-Data-Dictionary.pdf
[12] Centers for Medicare and Medicaid Services. 2023 QPP: How is Eligibility Determined? Available at: https://qpp-cms.gov/eligibility-participation/eligibility/determination
[13] Centers for Medicare and Medicaid Services. 2023 QPP Participation and Performance Results At-a-Glance. Available at: https://qpp-cm-prod-content.s3.amazonaws.com/uploads/3238/2023-QPP-Results-At-A-Glance.pdf

confidentiality purposes, and to prevent the identification of physicians, the "NPI" and "Provider_Key" variables available in the 2023 QPP were excluded from the 2024 NEHRS and 2023 QPP linked data file.

3. Linkage Methodology

3.1 Linkage Eligibility Determination

The linkage of NEHRS physicians to records in the QPP public-use data file was attempted only for NEHRS physicians that met two specific criteria: (1) the NEHRS physician was an eligible respondent with complete items in the 2024 NEHRS (DISPEMR=1) and (2) the NEHRS physician provided a valid NPI. Of the 1,725 eligible physicians who responded completely to NEHRS, 7 did not provide a valid NPI. This resulted in the total count of physicians in NEHRS eligible for linkage to the QPP as 1,718 physicians.

To identify which NEHRS physicians were eligible for linkage, a variable named LINK_ELIG was created and included in the linked NEHRS and QPP data file. The values and categories of this variable are:

- 1 = eligible for linkage
- 2 = not eligible for linkage

3.2 Overview of Linkage

This section outlines linkage of the 2024 NEHRS data to the 2023 QPP data. This linkage was conducted at the physician level using the NPI collected during the NEHRS survey, and the NPI available in the QPP public-use data file. Specifically, linkage-eligible NEHRS physicians were linked to the QPP using NPI. This was performed using a deterministic approach, joining records on exact NPI. Of the 1,718 NEHRS physicians eligible for linkage, there were 1,717 who were linked to the 2023 QPP based on exact NPI (see Table 1 below).

In the 2024 NEHRS, each responding physician provided a single, unique NPI. However, in the QPP multiple rows can exist for the same NPI, which indicates that an individual has reassigned billing rights to multiple TINs, and was therefore MIPS eligible under multiple TIN/NPI combinations. As a result, in the linked 2024 NEHRS and 2023 QPP data file a NEHRS physician may have been linked to multiple QPP records. This occurred in 112 instances, among 53 unique NEHRS physicians. Analytic considerations for handling these one-to-many linkages when using the linked 2024 NEHRS and 2023 QPP data file for statistical analysis are detailed in Section 4.

Within the 2023 QPP data file, not all records had MIPS data reported. For these records, data for a few physician characteristics were included in the QPP (e.g., variables such as "NPI," "Clinician_Type," and "Clinician_Specialty"), but data for the MIPS-related variables were absent. As a result, for these instances NPI was available in the QPP, and there was a successful linkage that occurred between the 2024 NEHRS and 2023 QPP, but not all these NEHRS physicians linked to the QPP data file had MIPS-related data present in the QPP file. Of the 1,717 NEHRS

physicians linked to the QPP, 620 of these physicians had QPP records with MIPS-related data reported.

To provide detail on the results of the linkage process, an additional variable was created for the linked 2024 NEHRS and 2023 QPP data file titled LINKN. This variable can be used to distinguish instances where the NEHRS physician had a one-to-one linkage, one-to-many linkage, was linked to a QPP record without MIPS-related data, was eligible for linkage but not linked, or was not eligible for linkage. The values and categories of the variable LINKN are:

- 1 = one-to-one linkage (i.e., one record in NEHRS, one record in QPP) with MIPS-related data reported in the QPP
- 2 = one-to-many linkage (i.e., one record in NEHRS, multiple records in QPP) with MIPS-related data reported in the QPP
- 3 = linked, but to a QPP record without MIPS-related data
- 4 = eligible for linkage, but no linkage made
- 5 = not eligible for linkage

3.3 Quality Assessment

After the linkage was completed, NCHS staff conducted assessments of the linked data. The first assessment was an examination of the string values for the QPP variable named "Clinician_Type" among all linked records. This assessment would confirm that all NEHRS physicians linked to records in the QPP had a "Clinician_Type" of "Doctor of Medicine" or "Doctor of Osteopathy," and indicated that the linkage was to a physician in the QPP. In performing this assessment, there was one instance when a physician in NEHRS was listed as a non-physician clinician in the QPP, and therefore this linkage was removed from the final linked data file (and assigned a value of LINKN=4).

Second, physician specialty in the 2024 NEHRS (variable name: SPECR) and in the 2023 QPP (variable name: Clinician_Specialty) underwent expert review for all linked records. Given specialty was reported differently in both the NEHRS and QPP, and that different specialty categories were available in these different data sources, it was not expected that the values of these two variables would be identical in both data sources. However, experts reviewed these two variables for each linked record to identify any non-feasible combinations. No instances of non-feasible combinations were found.

Table 1 below presents the number and distribution of 2024 NEHRS physicians by age group and physician specialty group, the number and distribution who were eligible for linkage, the number and distribution who were linked to the 2023 QPP data, and the number and distribution who were linked to the 2023 QPP data and had MIPS data reported in the QPP file.

Table 1. Linked 2024 NEHRS and 2023 QPP: Sample Sizes and Distributions Linked, by Age and Physician Specialty Group

2024 NEHRS	Sample Size 2024 NEHRS	Distribution Sample Size 2024 NEHRS	Sample size 2024 NEHRS Eligible for 2023 QPP Linkage	Distribution Sample size 2024 NEHRS Eligible for 2023 QPP Linkage	Sample Size in Linked 2024 NEHRS & 2023 QPP	Distribution Sample Size in Linked 2024 NEHRS & 2023 QPP	Sample Size in Linked 2024 NEHRS & 2023 QPP With MIPS Data Reported	Distribution Sample Size in Linked 2024 NEHRS & 2023 QPP With MIPS Data Reported
Physician age								
<50 Yrs.	6,765	40.67	497	28.93	497	28.95	177	28.55
≥50 Yrs.	9,868	59.33	1,221	71.07	1,220	71.05	443	71.45
Total	16,633	100.0	1,718	100.0	1,717	100.0	620	100.0
Physician specialty group								
Primary Care	5,727	34.43	614	35.74	614	35.76	113	18.23
Surgical Care	4,821	28.98	618	35.97	618	35.99	314	50.64
Medical Care	6,085	36.58	486	28.29	485	28.25	193	31.13
Total	16,633	100.0	1,718	100.0	1,717	100.0	620	100.0

4. Analytic Considerations

4.1 Data Dictionaries

As noted above, the linked 2024 NEHRS and 2023 QPP data file included two additional variables created during the linkage process: LINK_ELIG and LINKN. These two variables can be used to indicate linkage eligibility and the results of the linkage process. However, the remainder of the variables contained in the linked file are from the 2024 NEHRS restricted data file, and the 2023 QPP public-use data file. Data users wishing to see the specific variables available in these files should consult the 2024 NEHRS and 2023 QPP data dictionaries, respectively. Links to both data dictionaries are provided above in Section 2.

4.2 2024 NEHRS Survey Weights and Variance Estimation

The 2024 NEHRS contains a weight variable (MAILWGT) that can be used to produce national estimates from the NEHRS sample data. Before attempting to make national estimates, survey users should understand how to use and apply this weight. In addition, data users should also understand how to use NEHRS survey design variables to ensure variances are correctly computed. Details on properly weighting and calculating variance using NEHRS data can be found in the *2024 NEHRS Technical Documentation*, at the following location: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NEHRS/2024/NEHRS2024Doc.pdf.

4.3 National Estimates With the 2024 NEHRS and 2023 QPP Linked File

The survey weight and design variables can be used with the linked 2024 NEHRS and 2023 QPP to calculate national estimates and corresponding variances of linkage-eligible physicians when using the linked data file. In addition to ensuring proper use of the NEHRS survey weight and design variable, several additional considerations need to be recognized/taken by the user.

The first consideration is that data users must ensure that NEHRS physicians who were linked to multiple records in the QPP file are not duplicate counted in their analysis. To do this, a new variable was created named (LINKN); it can be used to identify the 53 physicians that have multiple records (i.e., a one-to-many linkage) in the QPP data. For those physicians that had multiple QPP records, the data user would need to identify which of the multiple record(s) for that physician would be deleted from their dataset and excluded from their analysis. This could be done by selecting one record for the physicians with many linkages in the QPP file (LINKN=2) and creating an analysis dataset that keeps one record for each physician based on the analysis goal. Without taking this action, a NEHRS physician with multiple records in the linked data file could be double, triple, or quadruple counted, and ultimately assigned double, triple, or quadruple the weight, leading to an overestimate.

Duplicate records for 2024 NEHRS physicians that linked to multiple records in the 2023 QPP were purposely left in the linked data file. While this results in additional actions need to be taken by the user to remove duplicate records for the 53 NEHRS physicians who had more than one record in the QPP, it simultaneously allows data users additional flexibility in planning and conducting their analysis. A data user can review the data from the 2023 QPP and make their own decision on which duplicate record in the linked file they prefer to delete based on their own specific research objectives and analysis. Note that of the 53 NEHRS physicians in the linked file, 49 physicians have two QPP records, 2 physicians have three QPP records, and 2 physicians have four QPP records.

A second consideration for data users is that the 2024 NEHRS survey weight (MAILWGT) was created for national estimates of physicians from those responding NEHRS physicians. However, when using the linked 2024 NEHRS and 2023 QPP data file to conduct statistical analysis, there are 1,717 responding NEHRS physicians who were linked to the QPP data. Furthermore, of these 1,717 physicians, only 620 that had MIPS-related data reported in the 2023 QPP. Eligibility-adjusted weights, or weights adjusted for NEHRS physicians who have MIPS-related data present in the 2023 QPP were not created. Researchers interested in generating national estimates from this linked file should conduct their own weight adjustments for their analysis, or consult with a statistical expert on the best weighting approach for their planned statistical analysis.

A final consideration does not require any action to be taken by the data user, but should be understood to ensure proper interpretation of the linkage of these two data sources. Because QPP enrollment is limited to clinicians who bill Medicare Part B above the low-volume threshold, and NEHRS captures a nationally representative sample of office-based physicians who may see few or no Medicare patients and would not have a QPP record, there are potential selection effects for any linked analyses. In addition, the two datasets span different reference periods (2024 for NEHRS, 2023 for QPP), which may introduce temporal misalignment for physicians

whose practice characteristics changed during these two years. Finally, NEHRS excludes anesthesiologists, radiologists, and pathologists, which should be accounted for when interpreting any comparisons with the full QPP universe. Again, while this final consideration does not require any action on behalf of the data user, understanding it is important when interpreting estimates resulting from the linked data file.

5. Access to Data Files

To ensure confidentiality, NCHS provides safeguards including the removal of all personal identifiers, such as NPI, from analytic data files. Additionally, linked data files are only accessible through the NCHS Research Data Center network for approved research projects. Researchers who wish to access the restricted 2024 NEHRS survey file and the linked 2024 NEHRS-2023 QPP data file must submit a research proposal application to the NCHS RDC. The RDC staff will review all submitted proposals to determine if the proposed project is feasible and to identify any potential disclosure risks. More information regarding the NCHS RDC network and the RDC proposal application process are available from: http://www.cdc.gov/rdc/.