APPENDIX

The Cost of Neglect

How Chronic Underinvestment in Primary Care Is Failing US Patients

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CONTENTS

OVERVIEW

The first section of this appendix briefly summarizes the data sources used to create the Scorecard measures in Year 3, as well as several measures created for Year 1. The second section presents a detailed discussion of how each of the measures were operationalized.

DATA SOURCES

Survey Data

The Medical Expenditure Panel Survey (MEPS, 2012–2022) is overseen by the Agency for Healthcare Research and Quality (AHRQ). MEPS currently has two major components: the Household Component (HC) and the Insurance Component (IC). MEPS-HC is a set of population-level longitudinal surveys of nonmilitary and noninstitutionalized individuals and families across the United States.[1,2] These data are collected through respondents' reports for themselves and their family members. The data are enriched with follow-up verification with physician offices for expenditures, diagnoses, and events. MEPS-HC was used for primary care spending (Measures 1.1-1.3), capitation (Measure 1.4), and usual source of care (Measures 2.1 and 2.2). Data were used from 2012 to 2022. While MEPS-HC is invaluable for national studies, it does not have sufficient sample sizes to produce state-level estimates nationwide. For reasons of confidentiality, state-level estimates can only be produced for 29 larger states, through AHRQ's research data center.

The American Community Survey (ACS, 2012–2022) is a population-level survey that contains updated US Census estimates of the US population at an annual level. The five-year ACS summary files were used to obtain ZIP Code Tabulation Area (ZCTA)–level populations from 2012 to 2022.

The Area Health Resources Files (AHRF, 2012-2022) compile information from more than 50 databases and other sources to provide comprehensive county-level information on a variety of health care utilization, health professions and facilities, environmental, and socio-demographic topics. The files are maintained by the Health Resources and Services Administration (HRSA) at an annual level. The AHRF data were used to obtain state- and national-level population estimates (derived from the five-year ACS summary files) from 2012 to 2022 (Measure 3.4).

Workforce Data

The American Medical Association (AMA) Physician Masterfile (AMA Masterfile, 2012-2022) was used for Measures 2.3 and 2.4 (primary care physicians [PCPs] in areas above and below median Social Deprivation Index [SDI]) and Measure 3.3 (percentage of new physician workforce entering primary care each year). The AMA Masterfile is a proprietary data set maintained by the American Medical Association that includes a nearly complete listing of all physicians in the US. The AMA Masterfile includes detailed information about each physician, including their age, gender, specialty, practice address, type of medical degree (doctor of medicine [MD] or doctor of osteopathic medicine [DO]), practice type, specialty, and home address. The Robert Graham Center (RGC) holds AMA Masterfile data for each year between

2000 and 2024 with the exception of 2003. The RGC geocodes the addresses in the file (98% match rate) and can readily match the addresses with other geographic data. The AMA Masterfile also includes a crosswalk between its physician identifier (MENUM, for medical education number) and the National Provider Identifier (NPI).

Provider Enrollment, Chain, and Ownership System (PECOS, 2016–2022) data were used to estimate the number of nurse practitioners (NPs) and physician assistants (PAs) in primary care (Measures 2.3, 2.4, and 3.2). This data set was also used to create an alternative measure of physicians in primary care (Measure 3.2). PECOS is a list of all providers enrolled in Medicare, including physicians, NPs, and PAs. Importantly, it allows linking of individual providers to the organizations to which they reassigned their billing rights. The PECOS data set also allows for multiple enrollments at any given time. Providers and organizations are required to validate their information in PECOS every five years. This data set has been publicly available since 2016 and released on a quarterly basis at no cost. Comparing the composition of PECOS data to that of other sources, it does appear that providers of types that would have few, if any, Medicare patients, such as pediatricians, nevertheless are enrolled in Medicare. Finally, as noted above, the PECOS system captures simultaneous enrollments in multiple positions, making it difficult to determine the allocation of effort across different settings.

The National Plan and Provider Enumeration System (NPPES, 2016–2022) was used, along with other data sources, for Measures 2.3, 2.4, and 3.2 to identify NPs and PAs in primary care practice. Available since 2006, the NPPES is an administrative data set that captures all individuals and organizations with an NPI. Included are basic attributes of the provider, such as gender, provider type, specialty, and location of practice (street, city, state, and zip code). One of the strengths of the NPPES data set is that it includes information on all providers required to have an NPI, including NPs and PAs. Another feature of the NPPES is that it includes training type for NPs (including family health, adult health, and mental health). While tempting, this information should not be used to identify NPs and PAs practicing in primary care, since many NPs with generalist training often work in specialist offices.[3,4] A new publicly available data set is currently available for download every month, at https://download.cms.gov/nppes/NPI_Files.html. A major limitation of NPPES data is the lack of an effective mechanism for validating activity status or updating critical information such as specialty and addresses. Year over year, only about 0.5% of physician NPIs are deactivated. These low rates are cumulative, so over time the quality of NPPES data has deteriorated.

Centers for Medicare and Medicaid Services Physician and Other Practitioners Public Use File (Medicare PartB PUF, 2012–2022) data were used to identify PCPs working as hospitalists and those billing mainly from emergency departments for Measures 2.3, 2.4, 3.2, and 3.3. It was also used for Measures 2.3, 2.4, and 3.2 to identify NPs and PAs billing from non-office settings. The data include information on use, payments, and submitted charges organized by NPI, Healthcare Common Procedure Coding System (HCPCS) code, and place of service. The data are available annually from CMS at https://data.cms.gov/provider-summary-by-type-of-service/medicare-physician-other-practitioners/medicare-physician-other-practitioners-by-provider-and-service/data. The Medicare PartB PUF data sets from 2012 to 2022 were used for this analysis.

The Accreditation Council of Graduate Medical Education (ACGME, 2012–2022) has several databases relevant to this report. First, as part of the AMA Masterfile held by the RGC, the Historical Residency File provides detailed information regarding physicians' graduate

medical education, including start and end dates of their residencies and fellowships. This information is used to construct Measure 3.3 (percentage of new physician workforce entering primary care each year). In addition, ACGME makes public information about sponsoring institutions, residency programs, and participating sites of residency programs (https://apps.acgme.org/ads/Public/Request/PublicDataRequest) for academic years 2012-2013 to 2022-2023. The residency program file includes the number of positions filled, thereby providing a count of residents nationwide and across states used for Measure 3.1 (percentage of all and primary care residents trained in rural areas and medically underserved areas [MUAs]) and Measure 3.4 (all and primary care residents per 100,000 population by state). The full street addresses of participating sites of ACGME-accredited residency programs were geocoded down to the census block level and used to identify sites located in either rural areas or MUAs for Measure 3.1.

The American Medical Association FRIEDATM database (AMA-FREIDA, 2013-2022) allows searching for a residency or fellowship from more than 13,000 ACGME-accredited programs. The data provide information on whether the program in which training takes place is university-based, community-based but university affiliated, community-based, military-based, or other. This information is used to construct Measure 3.1 (percentage of primary care residents trained in community-based settings in the broad definition, i.e., the majority of training does not take place in a university academic medical center, or a hospital with a medical school affiliation) for academic years 2013-2014 to 2022-2023.

The RTT Collaborative (RTT, 2013-2022) provides a list of rural residency programs that includes the location for the rural community, rural hospitals, and rural family medicine/internal medicine/pediatrics practice where residents acquire more than 50% of their training (https://rttcollaborative.net/rural-https://rttcollaborative.net/rttc-participating-programs). This information is used to construct Measure 3.1 (percentage of primary care residents trained in community-based settings in the narrow definition, i.e., more than 50% of their training in a rural place) for academic years 2013-2014 to 2022-2023.

The Health Resources and Services Administration Teaching Health Center Graduate Medical Education (THCGME, 2013-2022) program dashboards (https://data.hrsa.gov/tools/find-grants) were used to construct Measure 3.1 (percentage of primary care residents trained in community-based settings in the narrow definition, i.e., HRSA THGME grant programs) for academic years 2013-2014 to 2022-2023.

Other Data

The Robert Graham Center Graduate Medical Education For Teaching Hospitals (RGC Medicare GME, 2019) was used for examining an association between the Medicare GME investment and PCP production related to Measure 3.1. In this table, the Medicare GME payments (both direct graduate medical education and indirect medical education) received by teaching hospitals for fiscal years 2000 to 2021 (https://www.graham-center.org/maps-data-tools/gme-data-tables.html). These data were submitted by those hospitals as cost reports to the CMS. The table also includes the full-time equivalent for primary care residents; the updated primary care per resident amount; and the number of beds in the hospital.

The Association of American Medical Colleges Medicaid Graduate Medical Education Payments: A 50-State Survey (AAMC Medicaid GME, 2015) was used for examining an association between the Medicaid GME investment and PCP production related to Measure 3.1.

The Association of American Medical Colleges (AAMC) surveyed state Medicaid programs and their policies for financing GME. (published in 1999, 2003, 2006, 2010, 2013, 2016, 2019, and 2023, respectively). This report used the climate for state Medicaid GME support in 2015, including the total amount of GME payments made directly to teaching programs under both fee-for-service and managed care, including state-reported and consultant-estimated amounts.

The American Board of Family Medicine Continuing Certification Questionnaire (ABFM CCQ, 2022-2023) survey was used for Measure 4 (family physicians' attitudes toward electronic health records [EHRs]). ABFM recently added interoperability questions to the recertification survey in 2022, in collaboration with the Office of the National Coordinator for Health Information Technology, in order to create an interoperability index.

The National Institutes of Health Research Portfolio Online Reporting Tools Expenditures and Results (NIH RePORTER, 2017-2023) module was used for Measure 5.1 (federal investment in primary care research). NIH RePORTER is a data tool that was used to query the publicly available database of all federally funded research projects. Data collected include grantee name and location (including state), department affiliation, type of grant, and dollar amounts. Data were available from fiscal year 2017 to 2023, at **https://reporter.nih.gov**.

Rural-Urban Continuum Codes (RUCC, 2013), developed and maintained by the United States Department of Agriculture (USDA) Economic Research Service, distinguish metropolitan counties by population size (50,000-249,999; 250,000-999,999; and 1,000,000 and up) and nonmetropolitan counties by their size (0-2,499; 2,500-19,999; and 20,000-49,999) and adjacency to metropolitan counties. For Measure 3.1 (percentage of all and primary care residents trained in rural areas and MUAs), we defined rural as nonmetropolitan counties (RUCC 4 through RUCC 9).

The Health Resources and Services Administration Data Warehouse Medically Underserved Area (HRSA MUA, 2012-2022) data were used for Measure 3.1 (percentage of all and primary care residents trained in rural areas and MUAs). The data used for this analysis were obtained from the HRSA Data Warehouse in CSV format, accessed July 3, 2023, at **https://data.hrsa.gov/data/download**. To construct trends, we used designation dates and withdrawal dates of MUAs to determine whether a particular area was designated as an MUA at a particular point in time from 2012 to 2022.

The Robert Graham Center Social Deprivation Index (RGC SDI, 2012-2022) is a composite measure developed and maintained by the RGC. It is based on factor analysis of the seven demographic characteristics collected in the ACS: percent living in poverty, percent with less than 12 years of education, percent single-parent households, the percentage living in rented housing units, the percentage living in the overcrowded housing unit, percent of households without a car, and percentage nonemployed adults under 65 years of age (**https://www.graham-center.org/maps-data-tools/social-deprivation-index.html**). The SDI measure is calculated annually at the four geographic areas: county, census tract, aggregated Zip Code Tabulation Area (ZCTA), and Primary Care Service Area (PCSA, v 3.1). For Measures 2.3 and 2.4 (PCPs, NPs, and PAs in areas above and below median SDI), we used the ZCTA-level SDI from 2012 to 2022.

OPERATIONALIZATIONS OF MEASURES

The measures described in this section are organized according to the five recommendations outlined in the National Academies of Sciences, Engineering, and Medicine (NASEM) report ***Implementing High-Quality Primary Care: Rebuilding the Foundation of Health Care***. The measures were predefined by the NASEM committee in Appendix E of their report and were operationalized by the RGC research team. Most measures were calculated using the same method developed in Year 2 and were updated with more recent data. In Year 3, some measures were refined to better address the NASEM committee's recommendations. Changes made in Year 3 are summarized in Supplemental Table.

Recommendation 1: Pay for Primary Care Teams to Care for People, Not Doctors to Deliver Services

Measure 1.1: Percentage of total spending going to primary care: commercial insurance

Measure 1.2: Percentage of total spending going to primary care: Medicare

Measure 1.3: Percentage of total spending going to primary care: Medicaid

These three measures were constructed using data from the 2012-2022 MEPS. We calculated the amount spent for primary care using the office-based and outpatient event files. For each visit reported in these files, there is detailed information about the provider of care and how the services were billed. Consistent with prior work, we use both a narrow definition and a broad definition of primary care. Narrowly, primary care includes physicians practicing in family medicine, general practice, geriatrics, internal medicine, pediatrics, and osteopathy. Please note that osteopathy is available as a separate category, but no further differentiation is available in the MEPS data. The broader definition also includes mental health providers – psychiatrists, social workers, and psychologists – nurses/NPs, and PAs as well as obstetricians/gynecologists. In MEPS, PCPs were identified using DRSPLTY and nonphysicians using MEDPTYPE.

With each definition and each payer type, we calculated our numerator – national or state total primary care spending – by summing spending across all visits. We used OPDPVXXX, OPFPVXXX (outpatient), and OBPVXXX (office-based) to identify commercial insurance spending; OPDMRXXX, OPFMDXXX (outpatient), and OBMRXXX (office-based) for Medicare; and OPDMDXXX, OPFMDXXX (outpatient), and OBMDXXX (office-based) for Medicaid.

The denominator is the total spending for each payer type aggregated to either the state or national level. These measures were calculated by MEPS for each individual surveyed and are in the consolidated files: commercial spending is measured by TOTPRVXX, Medicare insurance by TOTMCRXX, and Medicaid by TOTMCDXX.

All our analyses were weighted using the person weight (PERWT), and standard errors were adjusted for the complex survey design using VARPSU for primary sampling units and VARSTR for the stratum. To obtain state estimates using MEPS data requires access to a secure and restricted data center. Because of concerns about confidentiality, such estimates can only be obtained for 29 states.

Measures 1.1, 1.2, and 1.3: Percentage of Primary Care Spending by Payer Type, 2012-2022

	Narrow				Broad			
Year	All Insurance	Commercial	Medicare	Medicaid	All Insurance	Commercial	Medicare	Medicaid
2012	5.4	6.1	3.9	4.8	9.4	11.1	6.0	9.0
2013	6.2	8.0	4.2	5.1	10.9	13.8	7.0	9.7
2014	5.7	7.1	4.1	5.3	10.9	13.1	7.3	13.3
2015	5.1	5.7	3.8	5.2	9.7	11.0	6.4	12.4
2016	5.4	6.3	4.3	4.8	10.5	12.1	7.7	12.1
2017	5.3	6.1	4.1	4.9	10.8	12.2	8.0	11.7
2018	5.5	6.5	4.2	4.8	11.6	14.1	7.4	12.0
2019	5.3	6.0	4.6	4.8	11.6	13.3	8.0	12.7
2020	4.6	5.6	3.5	4.2	12.1	15.1	7.4	12.7
2021	4.7	5.6	3.9	4.7	13.5	16.1	8.9	14.5
2022	4.6	5.5	3.4	4.3	13.0	14.7	8.3	13.9

Data Sources: Analyses of Medical Expenditure Panel Survey data, 2012-2022.

This year, we further examined per-visit revenues for primary care and compared with those for the five specialties (Psychiatry, Gastroenterology, Cardiology, OBGYN, and Dermatology) with the highest volume of ambulatory visits in MEPS. State-level comparison was unfeasible due to small sample size.

Measures 1.1, 1.2, and 1.3: Distribution of Total Revenues (in millions), Total Number of Ambulatory Care Visits (in millions), and Per Visit Revenues by Specialty, 2012-2022

	Primary Care			Psychiatry		
Year	Total Revenues	Total Visits	Per Visit Revenues	Total Revenues	Total Visits	Per Visit Revenues
2012	7,271	444	164	904	57	159
2013	8,668	455	191	707	49	143
2014	8,569	467	183	928	57	163
2015	8,239	468	176	699	48	145
2016	8,713	456	191	760	47	163
2017	9,166	458	200	1,130	58	194
2018	10,922	471	232	1,597	65	244
2019	10,760	458	235	1,389	64	217
2020	9,435	400	236	1,536	67	230
2021	10,807	397	272	2,046	75	273
2022	10,300	398	259	1,918	68	282

	Gastroenterology			Cardiology		
Year	Total Revenues	Total Visits	Per Visit Revenues	Total Revenues	Total Visits	Per Visit Revenues
2012	1,233	20	621	1,492	40	374
2013	1,304	20	656	1,621	42	385
2014	1,350	21	657	1,745	42	412
2015	1,397	21	674	1,701	39	440
2016	1,515	20	775	1,752	39	445
2017	1,562	21	758	1,859	40	467
2018	1,877	25	737	2,467	45	543
2019	1,955	24	801	2,815	49	577
2020	2,106	21	997	2,146	42	509
2021	2,481	23	1,057	1,766	41	435
2022	2,442	22	1,092	1,107	36	312

	OBGYN			Dermatology		
Year	Total Revenues	Total Visits	Per Visit Revenues	Total Revenues	Total Visits	Per Visit Revenues
2012	1,782	65	272	750	35	214
2013	1,985	69	287	757	33	227
2014	2,023	67	304	759	36	211
2015	2,213	63	354	861	36	239
2016	1,967	62	317	985	36	270
2017	2,223	59	375	908	37	248
2018	2,971	65	457	1,198	41	291
2019	2,671	60	445	1,259	43	293
2020	2,280	50	456	1,112	40	281
2021	3,355	54	620	1,264	43	296
2022	3,632	54	668	1,341	42	322

Data Sources: Analyses of Medical Expenditure Panel Survey data, 2012–2022.
Notes: Primary care as defined in this table follows the narrow definition and is restricted to primary care physicians only. Primary care specialties included family medicine, general practices, internal medicine, geriatrics, pediatrics, and osteopathy.

Measure 1.4: Percentage of primary care patient care revenue from capitation

This measure was constructed using the public-use event files with the imputation flag from the 2012-2022 MEPS, which has been used in previous research on capitation.[5] As noted for the primary care spending measures, we used DRSPLTY in the outpatient and office-based event files to differentiate visits to PCPs and non-PCPs. For this measure, we use a narrow definition only. Primary care includes family medicine, general practice, geriatrics, internal medicine, pediatrics, and osteopathy. The unit of analysis is a visit with a physician (SEEDOC_M18), seen at the location (DOCATLOC). We calculated the percentage of visits to PCPs that are fully capitated. So, the numerator is the total number of visits to PCPs where the imputation flag indicates that the visit was completely capitated (IMPFLAG=5) and the denominator is equal to the sum of fee-for-service visits and capitated visits to PCPs (IMPFLAG=2+IMPFLAG=5).

Measure 1.4: Percentage of Fully Capitated Physician Visits, 2012-2022

Year	All Physician Visits	PCP Visits	Non-PCP Visits
2012	5.5	8.1	3.5
2013	5.5	7.7	4.0
2014	5.1	7.4	3.5
2015	7.1	8.9	5.0
2016	6.8	8.6	4.7
2017	6.7	9.3	4.9
2018	6.5	9.6	4.4
2019	5.7	7.7	4.4
2020	6.2	7.6	5.3
2021	4.8	7.4	3.3
2022	5.7	7.9	4.4

Data Sources: Analyses of Medical Expenditure Panel Survey data, 2012-2022.

Recommendation 2: Ensure That High-Quality Primary Care Is Available to Every Individual and Family in Every Community

Measure 2.1: Percentage of adults without a usual source of health care

Measure 2.2: Percentage of children without a usual source of health care

For these two measures, we used the 2012-2022 MEPS. The percentage of adults and children without a usual source of care is defined by report by the respondent who answered the question "Is there a particular doctor's office, clinic, health center or other place that {you/{PERSON}} usually {go/goes} if {you/he/she} {are/is} sick or {need/needs} advice about {your/his/her} health?" In addition, we categorized individuals as not having a usual source of care if they first answered "yes" to the previous question, but on a subsequent question reported that such location was the emergency room. Note that respondents answered this question for themselves as well as for other family members. Adults were defined as 18 years or older; children were defined as less than 18 years old.

Again, our analyses are weighted using the person weight (PERWT), and standard errors were adjusted for the complex survey design using VARPSU for primary sampling units and VARSTR for the stratum. State estimates were possible for 29 states with access to AHRQ's research data center. For reasons of confidentiality, AHRQ does not allow estimates to be calculated for smaller states.

Measures 2.1 and 2.2: Percentage of Adults and Children without a Usual Source of Care, 2012-2022

Year	Adults	Children
2012	24.4	9.4
2013	24.8	7.8
2014	24.0	8.0
2015	23.9	7.1
2016	24.2	8.0
2017	24.4	6.9
2018	27.4	9.0
2019	29.0	10.8
2020	27.1	10.3
2021	28.7	13.6
2022	30.9	12.4

Data Sources: Analyses of Medical Expenditure Panel Survey data, 2012-2022.

Measure 2.3: Primary care physicians, nurse practitioners, and physician assistants (and combined) per 100,000 people in areas above median Social Deprivation Index

Measure 2.4: Primary care physicians, nurse practitioners, and physician assistants (and combined) per 100,000 people in areas below median Social Deprivation Index

These two measures were calculated using the same method developed in Year 2 and were updated with more recent data. In the following pages we explain how to create these measures.

Identify PCPs:

For each year from 2012 to 2022, we started with data from the AMA Masterfile to identify PCPs in direct patient care. PCPs in direct patient care (AMA Practice Type 020) exclude residents and retirees. We also adjusted status based on age to adjust for the likelihood that physicians listed as being in direct contact with patients have actually retired.[6,7] Primary care includes physicians (doctor of medicine [MD] or doctor of osteopathic medicine [DO]) in family medicine (AMA specialty code FM), general practice (GP), geriatrics (IMG and FPG), internal medicine (IM), pediatrics (PD), and combined internal medicine and pediatrics (MPD).

A growing number of physicians listing a primary care specialty are working as hospitalists or in emergency departments. To identify these physicians, we used the Medicare PartB PUF from 2012 to 2022, which includes the volume of services rendered by provider and service. These data were then linked to the AMA Masterfile using the MENUM-NPI crosswalk. Physicians identified as primary care in the AMA Masterfile were reclassified as non–primary care if they billed 90% or more of their evaluation and management (E&M) services from either a hospital or an emergency department rather than an office setting. We applied a commonly used 90% threshold from prior literature. In the absence of more formal identification of hospitalists, researchers established approaches to identify hospitalists using thresholds of inpatient services billed, typically 90%, in claims data.[8-10]

We also used the Medicare PartB PUF to identify physicians with unspecified specialty (AMA specialty code US) and unknown practice type (AMA Practice Type 100). Specifically, if the AMA specialty was unknown, we used specialty information listed in the Medicare PartB PUF data. We also inferred that if a physician was billing Medicare, they were in direct patient care.

Identify NPs and PAs in primary care:

Since there is not a national workforce database comparable to the AMA Masterfile for NPs and PAs, we used the PECOS in conjunction with the Medicare PartB PUF and the NPPES data to identify NPs and PAs working in primary care. The approach used in this analysis builds on our earlier attempts to identify NPs and PAs working in primary care.[11]

PECOS is a system of records detailing providers enrolled in Medicare. It is relatively unusual in that it is possible to link most individual providers to a particular organization to which they reassigned their billing rights. Using the PECOS data from 2016 to 2022, NPs and PAs in primary care were identified based on the relative share of PCPs in the same practice with the assumption that the characteristics of the physicians in a practice can be used to infer the likely specialty of NPs and PAs in the same practice. We assumed that NPs and PAs working alongside PCPs specialized in primary care, while those in practices with no PCPs were not in primary care. For multispecialty practices, we assumed that the relative share of PCPs in the practice was equal to the relative composition of NPs and PAs. NPs and PAs working in rural health clinics and federally qualified health centers were classified as primary care. NPs and PAs working primarily with social workers and psychologists were reclassified to non–primary care. Furthermore, based on the "organization type" information in PECOS, we classified NPs and PAs working in retail clinics, critical access hospitals, and skilled nursing facilities as non–primary care.

The Medicare PartB PUF provides information regarding services and procedures performed on Medicare beneficiaries, which allowed us to further elucidate the type of practice based on billing code information. The Medicare PartB PUF was also used to identify NPs and PAs in non–primary care settings such as hospitals, emergency departments, nursing homes, assisted living facilities, home health, and mental health facilities based on billing codes.

In cases where NPs and PAs were not in a practice with physicians (mainly because they did not reassign their billing rights if their Medicare enrollment status was "order and referring" only), we used the x-y coordinates of their NPPES address to determine whether they were collocated with physicians. Lastly, we assumed that NPs and PAs working in practices not composed of physicians or other health care providers work in primary care if there was insufficient data to reclassify them as non–primary care.

Link workforce to the ZCTA-level SDI data:

Finally, we linked the ZCTA-level SDI data and population data with the geocoded PCP, NP, and PA files described earlier in this appendix. We first created a binary measure of SDI based on the population-weighted median as the cutoff. For every state and the District of Columbia, we then determined the total population and the number of PCPs, NPs, PAs, and total primary care clinicians in both above median (high SDI – more disadvantaged) and below median (low SDI – less disadvantaged) SDI areas. With these totals, we then calculated the number of PCPs, NPs, PAs, and total primary care clinicians per 100,000 population in areas above median SDI (Measure 2.3) and in areas below median SDI (Measure 2.4).

Measures 2.3 and 2.4: Primary Care Clinicians in High vs. Low SDI Areas, 2012 to 2022

		All							
		N				Rate per 100,000			
Year	Population	PCPs	PCNPs	PCPAs	PCCs	PCPs	PCNPs	PCPAs	PCCs
2012	309,122,560	209,122				67.7			
2013	311,520,992	210,806				67.7			
2014	314,092,480	213,525				68.0			
2015	316,503,296	217,049				68.6			
2016	318,545,344	216,943	46,905	24,379	288,227	68.1	14.7	7.7	90.5
2017	320,991,232	216,688	51,687	25,199	293,574	67.5	16.1	7.9	91.5
2018	322,889,568	217,933	57,431	26,890	302,255	67.5	17.8	8.3	93.6
2019	324,682,400	219,447	63,920	28,305	311,672	67.6	19.7	8.7	96.0
2020	326,549,600	221,493	72,329	32,790	326,612	67.8	22.1	10.0	100.0
2021	329,721,664	221,853	88,211	38,367	348,431	67.3	26.8	11.6	105.7
2022	331,093,504	222,003	87,205	34,464	343,673	67.1	26.3	10.4	103.8

		High SDI (SDI ≥ Median)							
		N				Rate per 100,000			
Year	Population	PCPs	PCNPs	PCPAs	PCCs	PCPs	PCNPs	PCPAs	PCCs
2012	152,706,658	104,691				68.6			
2013	153,926,612	105,227				68.4			
2014	155,241,673	106,042				68.3			
2015	156,475,046	107,743				68.9			
2016	157,508,983	107,839	28,287	13,712	149,838	68.5	18.0	8.7	95.1
2017	158,745,052	107,966	31,420	14,307	153,694	68.0	19.8	9.0	96.8
2018	159,757,297	108,869	35,015	15,437	159,320	68.1	21.9	9.7	99.7
2019	160,638,634	109,461	38,989	16,231	164,681	68.1	24.3	10.1	102.5
2020	161,642,549	110,784	44,150	18,140	173,074	68.5	27.3	11.2	107.1
2021	163,206,906	111,045	52,514	20,813	184,372	68.0	32.2	12.8	113.0
2022	163,897,608	112,463	52,403	19,032	183,897	68.6	32.0	11.6	112.2

		Low SDI (SDI < Median)							
		N				Rate per 100,000			
Year	Population	PCPs	PCNPs	PCPAs	PCCs	PCPs	PCNPs	PCPAs	PCCs
2012	156,415,911	104,430				66.8			
2013	157,594,369	105,579				67.0			
2014	158,850,817	107,483				67.7			
2015	160,028,249	109,306				68.3			
2016	161,036,370	109,104	18,618	10,667	138,389	67.8	11.6	6.6	85.9
2017	162,246,172	108,721	20,267	10,892	139,880	67.0	12.5	6.7	86.2
2018	163,132,280	109,063	22,417	11,454	142,934	66.9	13.7	7.0	87.6
2019	164,043,778	109,986	24,931	12,074	146,991	67.0	15.2	7.4	89.6
2020	164,907,066	110,709	28,179	14,650	153,538	67.1	17.1	8.9	93.1
2021	166,514,754	110,808	35,697	17,555	164,059	66.5	21.4	10.5	98.5
2022	167,195,887	109,540	34,803	15,433	159,776	65.5	20.8	9.2	95.6

Data Source: Analyses of American Medical Association Masterfile (2012-2022), Centers for Medicare and Medicaid Services Medicare Provider Enrollment, Chain, and Ownership System data (2016-2022), National Plan and Provider Enumeration System data (2016-2022), Centers for Medicare and Medicaid Services Physician and Other Practitioners data (2012-2022), Robert Graham Center Social Deprivation Index (2012-2022), and the American Community Survey Five-Year Summary Files (2012-2022).

Recommendation 3: Train Primary Care Teams Where People Live and Work

Measure 3.1:

Percentage of all and primary care residents trained in rural areas and medically underserved areas

Percentage of primary care residents trained in community-based settings

For this measure, we used site-level residency program data from academic years 2012-2013 to 2022-2023 publicly available from ACGME (**https://apps.acgme.org/ads/Public/Request/PublicDataRequest**). The full street addresses of participating sites of ACGME-accredited residency programs were geocoded down to the census block level and linked to our MUA file at the census block level. We used the Geocorr engine at the Missouri Census Data Center to identify all blocks in ZCTAs. We classified a ZCTA as an MUA if more than 25% of its population was also in an MUA. We used the same approach to determine whether a ZCTA was rural.

In the ACGME program-level data, we used the "number of positions filled" field to obtain a count of the number of residents from academic years 2012-2013 to 2022-2023 in each program. The denominators of the measure are the total number of residents in an ACGME-accredited program for each year and each state. The numerators represent those residents in programs that included at least one site that was in a rural county and located in an MUA.

We also calculated the percentage of primary care residents trained in rural areas and MUAs using the same approach. The denominators are total number of primary care residents aggregated to either the state or national level. The numerators represent those primary care residents trained in rural areas and MUAs. Primary care specialties included family medicine, internal medicine, geriatrics, and pediatrics. Please note that historically, the ACGME counts are restricted to counts of residents in the ACGME-accredited programs, thus excluding residents in programs accredited by the American Osteopathic Association.

We further elucidated the type of training in community-based settings. We adopted two definitions. In the broad definition, community-based training was identified if the majority of training did not take place in a university academic medical center or a hospital with a medical school affiliation, according to the American Medical Association's FRIEDA database. In the narrow definition, community-based training was identified if it utilized programs with a rural training track or a Health Resources and Services Administration Teaching Health Center Graduate Medical Education grant

With each definition, we used the "number of positions filled" field in the ACGME program-level data to obtain a count of the number of residents from academic years 2013-2014 to 2022-2023 in each program. The denominators are total number of primary care residents aggregated to either the state or national level. The numerators represent those primary care residents in programs with each definition of community-based training. Primary care specialties included family medicine, internal medicine, geriatrics, and pediatrics.

Measure 3.1: Primary Care Residents Trained in Rural Settings, MUAs, and Community-Based Settings, 2012-2022

		N					%				
Academic Year	Total PC Residents	Rural	MUA	Both	Community (Broad)	Community (Narrow)	Rural	MUA	Both	Community (Broad)	Community (Narrow)
2012-2013	43,668	2,894	27,194	27,811			6.6	62.3	63.7		
2013-2014	44,393	3,046	27,738	28,356	3,988	965	6.9	62.5	63.9	9.0	2.2
2014-2015	44,954	2,986	27,736	28,394	4,185	1,034	6.6	61.7	63.2	9.3	2.3
2015-2016	46,006	3,086	28,183	28,859	4,391	1,160	6.7	61.3	62.7	9.5	2.5
2016-2017	47,963	3,490	29,191	29,942	4,617	1,309	7.3	60.9	62.4	9.6	2.7
2017-2018	50,308	3,877	30,746	31,543	5,836	1,670	7.7	61.1	62.7	11.6	3.3
2018-2019	52,068	4,250	31,489	32,326	6,243	2,012	8.2	60.5	62.1	12.0	3.9
2019-2020	53,656	4,713	32,647	33,534	7,424	2,155	8.8	60.8	62.5	13.8	4.0
2020-2021	54,825	4,557	32,644	33,754	7,970	2,427	8.3	59.5	61.6	14.5	4.4
2021-2022	56,215	4,846	33,607	34,829	8,603	2,578	8.6	59.8	62.0	15.2	4.6
2022-2023	57,434	4,370	29,394	30,831	9,150	2,906	7.6	51.2	53.7	15.9	5.1

Abbreviation: MUA, medically underserved area.
Data Sources: Analyses of Accredited Council of Graduate Medical Education (2012-2022); American Medical Association FRIEDA database (2013-2022); a rural residency program list from the RTT Collaborative (2013-2022); Health Resources and Services Administration Teaching Health Center Graduate Medical Education program dashboards (2013-2022); Rural-Urban Continuum Codes (2013); and Health Resources and Services Administration Data Warehouse Medically Underserved Area (2012-2022).

This year, we further examined if more Medicare or Medicaid GME funding was associated with percentage of new physician workforce entering primary care (Measure 3.3). The Pearson correlation coefficient (r) measures the strength and direction of the relationship between Medicare or Medicaid GME payments per 100,000 population in a state in a given year and percentage of new physician workforce entering primary care after 3 years. The Robert Graham Center Graduate Medical Education For Teaching Hospitals in 2019 was used for examining an association between the Medicare GME investment and new primary care physician workforce production in 2022. The Association of American Medical Colleges Medicaid Graduate Medical Education Payments in 2015 was used for examining an association between the Medicaid GME investment in 2015 and new primary care physician workforce production in 2018.

Measure 3.2: Percentage of physicians, nurse practitioners, and physician assistants (and combined) working in primary care

For this measure, we identified NPs and PAs working in primary care using the same method and the same data described in Measures 2.3 and 2.4. As for physicians in primary care, instead of using the AMA Masterfile, we used the PECOS in conjunction with the Medicare PartB PUF to create an alternative measure of physicians in primary care from 2016 to 2022. PCPs were identified using the provider type description measure that includes information about the provider enrollment and enrollment specialty type description in the PECOS data. Primary care specialties included family medicine, family practice, general practice, internal medicine, and pediatric medicine. All other specialties were considered non–primary care. In calculating the percentage of physicians, NPs, and PAs (and combined) working in primary care, we used the total number of clinicians (each clinician type and combined) aggregated to either the state or national level as the denominators. The numerators represent those clinicians working in primary care.

Measure 3.2: Percentage of Clinicians Working in Primary Care, 2016-2022

Year	Physicians	PCPs	%	NPs	PCNPs	%	PAs	PCPAs	%	Clinicians	PCCs	%
2016	709,687	197,977	27.9	147,697	46,905	31.8	89,718	24,379	27.2	947,102	269,261	28.4
2017	722,718	198,697	27.5	164,497	51,687	31.4	96,214	25,199	26.2	983,429	275,583	28.0
2018	740,817	201,945	27.3	185,425	57,432	31.0	104,034	26,891	25.8	1,030,276	286,268	27.8
2019	759,185	205,685	27.1	208,847	63,920	30.6	112,160	28,305	25.2	1,080,192	297,910	27.6
2020	781,680	211,684	27.1	235,491	72,329	30.7	120,865	32,790	27.1	1,138,036	316,803	27.8
2021	801,834	213,625	26.6	259,456	88,211	34.0	129,028	38,368	29.7	1,190,318	340,204	28.6
2022	847,782	226,925	26.8	290,908	87,205	30.0	141,827	34,464	24.3	1,280,517	348,594	27.2

Abbreviations: NP, nurse practitioner; PA, physician assistant; PCC, primary care clinician; PCNP, primary care nurse practitioner; PCP, primary care physician; PCPA, primary care physician assistant.
Data Sources: Analyses of Centers for Medicare and Medicaid Services Medicare Provider Enrollment, Chain, and Ownership System data, National Plan and Provider Enumeration System data, and Centers for Medicare and Medicaid Services Physician and Other Practitioners data, 2016-2022.

Measure 3.3: Percentage of new physician workforce entering primary care each year

For this measure, we used the 2024 AMA Historical Residency File, the 2024 AMA Masterfile, and the 2012-2022 Medicare PartB PUF data. The Historical Residency File allowed us to identify the end years of primary care physicians' training as a proxy for when they entered the workforce (end year + 1). We examined trends using end years from 2011 to 2021. Because we used the 2024 AMA data instead of 2022 data, we are relatively confident that nearly all had actually finished their training by 2022.[12,13] Primary care includes physicians in family medicine (AMA specialty code FM), general practice (GP), geriatrics (IMG and FPG), internal medicine (IM), pediatrics (PD), and combined internal medicine and pediatrics (MPD). The Medicare PartB PUF data were used to identify hospitalists with a primary care specialty and reclassify them as non–primary care.

In calculating the percentage of new physicians entering primary care, we used as the denominator the number of physicians who completed their training each year and as the numerator, the number of non-hospitalist PCPs. Note that the AMA Masterfile includes

"preferred" and "alternative" addresses. The preferred address was used when it was the physician's office address, and the alternative address was used when the preferred address was their home address.

Measure 3.3: Percent of New Physician Workforce Entering Primary Care, 2012-2022

Year	New Entrants	PCP (incl. Hospitalists)	PCP (excl. Hospitalists)	PC Hospitalists	%PCP (incl. Hospitalists)	%PCP (excl. Hospitalists)
2012	24,378	7,169	5,295	1,874	29.4	21.7
2013	24,112	7,085	5,166	1,919	29.4	21.4
2014	24,731	7,242	5,191	2,051	29.3	21.0
2015	25,467	7,533	5,399	2,134	29.6	21.2
2016	25,384	7,541	5,463	2,078	29.7	21.5
2017	25,619	7,351	5,192	2,159	28.7	20.3
2018	25,880	7,561	5,292	2,269	29.2	20.4
2019	26,663	7,712	5,417	2,295	28.9	20.3
2020	26,941	7,805	5,555	2,250	29.0	20.6
2021	27,729	7,686	5,959	1,727	27.7	21.5
2022	26,636	6,492	5,269	1,223	24.4	19.8

Abbreviations: PC, primary care; PCP, primary care physicians.
Data Sources: Analyses of the 2024 American Medical Association Historical Residency File, the 2024 American Medical Association Masterfile, and the 2012-2022 Center for Medicare and Medicaid Services Physician and Other Practitioners data

Measure 3.4: All and primary care residents per 100,000 population by state

We used publicly available ACGME program-level data for academic years 2012-2013 to 2022-2023. Residents per program are defined as the number of filled positions in an academic year. State counts were obtained by rolling up program counts to the state level. We used census population estimates for 2012-2019 and 2021-2022, and actual census counts for 2020 available from the AHRF. Primary care specialties included family medicine, internal medicine, geriatrics, and pediatrics. Because the data we used for this measure are from the ACGME, we did not include the AOA-accredited residency programs.

Measure 3.4: All Residents and Primary Care Residents per 100,000 Population, 2012-2022

		N		Rate per 100,000	
Academic Year	Population	All Medical	Primary Care	All Medical	Primary Care
2012-2013	313,914,040	116,847	43,668	37.2	13.9
2013-2014	316,128,839	119,163	44,393	37.7	14.0
2014-2015	318,857,056	120,643	44,954	37.9	14.1
2015-2016	321,418,820	123,449	46,006	38.4	14.3
2016-2017	323,127,513	128,706	47,963	39.9	14.9
2017-2018	325,719,178	134,293	50,308	41.3	15.5
2018-2019	327,167,434	139,235	52,068	42.6	15.9
2019-2020	328,239,523	144,019	53,656	43.9	16.3

2020-2021	329,484,123	147,199	54,825	45.0	16.7
2021-2022	331,893,745	151,629	56,215	46.0	17.0
2022-2023	329,661,352	157,059	57,434	47.6	17.4

Data Sources: Analyses of Accredited Council of Graduate Medical Education program-level data to get counts for medical residents and Area Health Resource File for the population data, 2012-2022.

Recommendation 4: Design Information Technology That Serves the Patient, Family, and Interprofessional Care Team

Similar to Year 2, data from the American Board of Family Medicine were used for Measure 4 (family physicians' attitudes toward electronic health records [EHRs]). Family physicians' self-reported frequency in EHR usability across two domains (ease of finding information and usefulness of alerts) and overall satisfaction were reported.

Recommendation 5: Ensure That High-Quality Primary Care Is Implemented in the United States

Measure 5.1: Investment in primary care research by federal agencies in dollars spent and percentage of total projects funded

In measuring investment in primary care research, our focus was to capture grant funding given to departments of family medicine at US medical schools because these institutions have traditionally housed such researchers and their staff, thereby serving as the research infrastructure of primary care.

Furthermore, family physicians have clinical practices that treat disparate populations, and their resultant community ties make them suited for not only providing quality primary care, but also translating research into practice. Hence, we treated federal research grant funding for departments of family medicine as a proxy for primary care research. Federal agencies in this measure included the AHRQ, the CDC, FDA, and NIH.

We began by benchmarking results from the downloaded database to available statistics in a study by Lucan and colleagues that analyzed data on all grants to departments of family medicine in 2006.[14] The researchers found not only that NIH grants to family medicine accounted for 0.2% of all awards in the period of analysis, but also that family medicine was underrepresented on NIH advisory committees, indicating underrepresentation in funding and in shaping NIH direction. We found concordance in the funding for family medicine, as well as the share of overall NIH grant funding.

Secondary data from the NIH RePORTER tool were collected for use in this analysis. This online tool provides users access to reports and raw data of the entire set of grant-awarded projects for a given fiscal year, going back to 1985. Using the **ExPORTER** feature, we downloaded information from 2017 to 2023, where each observation is a funded proposal, with identifying detail. It was then possible to calculate total funding (direct costs, indirect costs, subproject costs) across all grant types, for all primary investigator–affiliated academic departments of family medicine located in the US, and to calculate what proportion this accounts for across total funding for each fiscal year. Note that these dollar figures are not adjusted for inflation.

One limitation is the risk of misclassification of research by errors of either omission or commission. Other entities or departments outside of family medicine may also have funded research that aligns with the tenets of primary care but was excluded from this measure. Another limitation is that the current measure does not capture research affiliated with national organizations for primary care or family medicine (such as the North American Primary Care Research Group) that also aim to build research capacity, especially as it relates to practice-based research.[15]

In future iterations of this Scorecard, this metric may incorporate methods that can better identify projects relating to primary care that are housed outside departments of family medicine or funded by these national primary care organizations, which are becoming well established in the primary care research infrastructure.

Measure 5.1: Federal Research Funding for Primary Care, 2017-2023

Year	All Funding	Primary Care	% Primary Care
2017	$25,554,067,152	$79,000,283	0.31
2018	$27,284,240,763	$79,579,939	0.29
2019	$30,803,775,188	$88,676,901	0.29
2020	$35,598,274,893	$102,763,979	0.29
2021	$32,463,492,743	$108,444,986	0.33
2022	$38,247,461,134	$118,317,535	0.31
2023	$38,850,190,248	$133,222,002	0.34

Data Sources: NIH RePORTER, 2017-2023.

SUPPLEMENTAL TABLE: MEASURES AND DATA SOURCES IN YEAR 3 SCORECARD

Recommendation 1: Pay for Primary Care Teams to Care for People, Not Doctors to Deliver Services

	Measures	Operationalization	Data Sources
1.1-1.3	Percentage of total spending going to primary care – commercial insurance/Medicare/Medicaid (Notes) This year, we further examined per-visit revenues for primary care (narrow) and compared with those for the five specialties with the highest volume of ambulatory visits in MEPS – Psychiatry, Gastroenterology, Cardiology, OBGYN, and Dermatology.	$PC\ Spend = \frac{Total\ PC\ Expenditures}{Total\ Health\ Care\ Expenditures}$ • Numerator: All billed expenses for office-based and outpatient visits to primary care physicians including family medicine, general practice, geriatrics, internal medicine, pediatrics, and osteopathy (narrow) *or* primary care physicians plus nurses/nurse practitioners, physician assistants, behavioral health providers, and obstetricians/gynecologists (broad), by payer type – commercial insurance/Medicare/Medicaid • Denominator: Sum of billed expenditures for total health care	MEPS 2012–2022
1.4	Percentage of primary care patient care revenue from capitation	$PC\ Capitation = \frac{Total\ Fully\ Capitated\ PCP\ Visits}{Total\ PCP\ Visits}$ • Numerator: Total number of office-based and outpatient visits to primary care physicians (narrow) that were completely capitated • Denominator: Sum of fee-for-service visits and capitated visits to primary care physicians (narrow)	MEPS 2012–2022

Recommendation 2: Ensure That High-Quality Primary Care Is Available to Every Individual and Family in Every Community			
	Measures	**Operationalization**	**Data Sources**
2.1-2.2	Percentage of adults/children without a usual source of health care	$No\ USC = \frac{Total\ Respondents\ without\ a\ USC}{Total\ Respondents}$ • Numerator: Total number of adults (≥18yrs) and children (<18yrs) reporting no usual source of care and those who reported emergency rooms as the usual source of care • Denominator: Total number of adults (≥18yrs) and children (<18yrs) respondents	MEPS 2012–2022

2.3-2.4	Primary care physicians, nurse practitioners, and physician assistants (and combined) per 100,000 people in areas above and below median Social Deprivation Index	• Identify PCPs: The AMA Masterfile was used to identify primary care physicians providing direct patient care (excluding residents and retirees). Primary care specialty includes family medicine, general practice, geriatrics, internal medicine, pediatrics, and med-peds. Physicians identified as primary care in the AMA Masterfile were reclassified as non–primary care if they billed 90% or more of their evaluation and management (E&M) services from a hospital or an emergency department rather than an office setting based on CMS Physician and Other Practitioners data (hereafter Medicare PartB PUF).
		• Identify NPs and PAs in primary care: Since there is not a national workforce database comparable to the AMA Masterfile for NPs and PAs, we used the PECOS in conjunction with the Medicare PartB PUF and the NPPES data to identify NPs and PAs working in primary care.
		  • Using the PECOS data, NPs and PAs in primary care were identified based on the relative share of PCPs in the same practice with the assumption that the characteristics of the physicians in a practice can be used to infer the likely specialty of NPs and PAs in the same practice. NPs and PAs working in rural health clinics and federally qualified health centers were reclassified as primary care, while those working primarily with social workers and psychologists or working in retail clinics, critical access hospitals, and skilled nursing facilities were reclassified as non–primary care.
		  • The Medicare PartB PUF was used to identify NPs and PAs in non–primary care settings such as hospitals, emergency departments, nursing homes, assisted living facilities, home health, and mental health facilities based on billing codes.
		  • In cases where NPs and PAs were not in a practice with physicians (mainly because they did not reassign their billing rights if their Medicare enrollment status was "order and referring" only), we used the x-y coordinates of their NPPES address to determine whether they were collocated with physicians.
		• We linked the ZCTA-level SDI data and population data with the geocoded PCP, NP, and PA files created above.
		• For each state, we then determined the total population and the number of PCPs, NPs, PAs, and total primary care clinicians in both above- and below-median SDI areas. With these totals, we then calculated the number of PCPs, NPs, PAs, and total primary care clinicians per 100,000 population in areas above median SDI (more disadvantaged areas) and in areas below median SDI (less disadvantaged areas).
			AMA Masterfile 2012-2022
			PECOS 2016-2022
			NPPES 2016-2022
			Medicare PartB PUF 2012-2022
			ACS 2012-2022
			RGC SDI 2012-2022

Recommendation 3: Train Primary Care Teams Where People Live and Work

	Measures	Operationalization	Data Sources
3.1	Percentage of all residents and primary care residents trained in rural areas and medically underserved areas Percentage of primary care residents trained in community-based settings (Notes) This year, we further examined if more Medicare or Medicaid GME funding was associated with percentage of new physician workforce entering primary care (Measure 3.3). The Pearson correlation coefficient (r) measures the strength and direction of the relationship between Medicare or Medicaid GME payments per 100,000 population in a state in a given year and percentage of new physician workforce entering primary care after 3 years.	$Residents\ in\ Rural\ and\ MUA = \frac{Total\ Residents\ in\ Rural\ and\ MUA}{Total\ Residents}$ • Numerator: All ACGME-accredited program participating site addresses were geocoded to the census block level to identify sites located in rural areas and MUAs. Counts of all residents and primary care residents in programs with at least one rural or MUA site were obtained for each state where program was located. • Denominator: Total number of all and primary care residents in an ACGME-accredited program for each state $PC\ Residents\ in\ Community = \frac{Total\ PC\ Residents\ in\ Community}{Total\ PC\ Residents}$ • Refined definition of community-based training: We further identified community-based training if the majority of training (1) did not take place in a university academic medical center or a hospital with a medical school affiliation (broad) or (2) included programs with rural training track or THCGME (narrow). *GME Investment and PCP Production* • Input: $ Medicare or Medicaid GME payments per 100,000 population in a state in a given year • Output: % of new physician workforce entering primary care after 3 years	ACGME 2012-2022 AMA-FREIDA 2013-2022 RTT 2013-2022 THCGME 2013-2022 RUCC 2013 HRSA MUA 2012-2022 RGC Medicare GME 2019 AAMC Medicaid GME 2015

3.2	Percentage of physicians, nurse practitioners, and physician assistants (and combined) working in primary care	$Clinicians\ in\ PC = \frac{Total\ Clinicians\ in\ PC}{Total\ Clinicians}$
		• Numerator: Total number of PCPs, NPs, PAs, and total primary care clinicians for each state
		  • Identify PCPs: PCPs were identified using a provider type description measure that includes information about the provider enrollment and enrollment specialty type description in the PECOS data. Primary care specialties included family medicine, family practice, general practice, internal medicine, and pediatric medicine.
		  • Identify NPs and PAs in primary care: see Measures 2.3 and 2.4 for details
		• Denominator: Total number of clinicians (physicians, NPs, and PAs) for each state
			PECOS 2016-2022
			NPPES 2016-2022
			Medicare PartB PUF 2016-2022

3.3	Percentage of new physician workforce entering primary care each year	$New\ Entrants\ in\ PC = \frac{Total\ New\ Entrants\ in\ PC}{Total\ New\ Entrants}$ • Numerator: Counts of all new primary care physicians (excluding hospitalists) for all states (using AMA practice address state) • Denominator: Total number of physicians who completed their training each year	AMA Masterfile 2024 AMA Historical Residency File 2024 Medicare PartB PUF 2012-2022
3.4	All residents and primary care residents per 100,000 population by state	• Residents in an ACGME-accredited program were defined as the number of filled positions in an academic year. State counts were obtained by rolling up program counts to the state level. • We used census populations for 2012–2022 to calculate the number of all and primary care residents per 100,000 population by state.	ACGME 2012-2022 AHRF 2012–2022

Recommendation 4: Design Information Technology That Serves the Patient, Family, and Interprofessional Care Team

	Measures	Operationalization	Data Sources
4	Electronic health record usability and overall satisfaction	• Family physicians' self-reported frequency in EHR usability across two domains (ease of finding information and usefulness of alerts) • Family physicians' self-reported overall satisfaction with their EHR	ABFM CCQ 2022-2023

Recommendation 5: Ensure That High-Quality Primary Care Is Implemented in the United States

	Measures	Operationalization	Data Sources
5.1	Investment in primary care research by federal agencies in dollars spent and percentage of total projects funded	$PC\ Funding = \frac{Total\ Federal\ Funding\ in\ FM}{Total\ Federal\ Funding}$ • Using the NIH RePORTER tool, we calculated total funding (direct costs, indirect costs, subproject costs) across all grant types, for all PI-affiliated academic departments of family medicine located in the US. • We calculated what proportion this accounts for across total funding for each fiscal year.	NIH RePORTER 2017-2023

NOTES

1 Cohen SB. Sample design of the 1997 Medical Expenditure Panel Survey, Household Component. Agency for Healthcare Research and Quality. http://meps.ahrq.gov/data_files/publications/mr11/mr11.pdf. Published 2000.

2 Cohen JW, Cohen SB, Banthin JS. The Medical Expenditure Panel Survey: a national information resource to support healthcare cost research and inform policy and practice. *Med Care*. 2009;47(Suppl):S44-S50. doi:10.1097/MLR.0b013e3181a23e3a.

3 Spetz J, Fraher E, Li Y, Bates T. How many nurse practitioners provide primary care? It depends on how you count them. *Med Care Res Rev*. 2015;72(3):359-375. doi:10.1177/1077558715579868.

4 Harrison JM, Germack HD, Poghosyan L, Martsolf GR. Surveying primary care nurse practitioners: an overview of national sampling frames. *Policy Polit Nurs Pract*. 2021;22(1):6-16. doi:10.1177/1527154420976081.

5 Zuvekas SH, Cohen JW. Fee-for-service, while much maligned, remains the dominant payment method for physician visits. *Health Aff (Millwood)*. 2016;35(3):411-414. doi:10.1377/hlthaff.2015.1291.

6 Petterson SM, Rayburn WF, Liaw WR. When do primary care physicians retire? Implications for workforce projections. *Ann Fam Med*. 2016;14(4):344-349.

7 Petterson SM, Liaw WR, Phillips RL, Rabin DL, Meyers DS, Bazemore AW. Projecting US primary care physician workforce needs: 2010–2025. *Ann Fam Med*. 2012;10(6):503-509. doi:10.1370/afm.1431.

8 Kuo YF, Goodwin JS. Association of hospitalist care with medical utilization after discharge: evidence of cost shift from a cohort study. *Ann Intern Med*. 2011;155(3):152-159. doi: 10.7326/0003-4819-155-3-201108020-00005.

9 Welch WP, Stearns SC, Cuellar AE, Bindman AB. Use of hospitalists by Medicare beneficiaries: a national picture. *Medicare Medicaid Res Rev*. 2014;4(2):E1-E8.

10 Lapps J, Flansbaum B, Leykum LK, Bischoff H, Howell E. Growth trends of the adult hospitalist workforce between 2012 and 2019. *J Hosp Med*. 2022;17(11):888-892. doi:10.1002/jhm.12954.

11 Blanchard J, Petterson S, Bazemore A, Watkins K, Mullan F. Characteristics and distribution of graduate medical education training sites: are we missing opportunities to meet US health workforce needs? *Acad Med*. 2016;91(10):1416-1422. doi:10.1097/ACM.0000000000001184.

12 Petterson SM, Burke MT, Phillips RL, Teevan B. Accounting for graduate medical education production of primary care physicians and general surgeons: timing of measurement matters. *Acad Med*. 2011;86(5):605-608. doi:10.1097/ACM.0b013e3182134634.

13 Chen C, Petterson S, Phillips RL, Mullan F, Bazemore A, O'Donnell SD. Toward graduate medical education (GME) accountability: measuring the outcomes of GME institutions. *Acad Med*. 2013;88(9):1267-1280. doi:10.1097/ACM.0b013e31829a3ce9.

14 Lucan SC, Phillips RL, Bazemore AW. Off the roadmap? Family medicine's grant funding and committee representation at NIH. *Ann Fam Med*. 2008;6(6):534-542. doi:10.1370/afm.911.

15 Hester CM, Jiang V, Bartlett-Esquilant G, et al. Supporting family medicine research capacity: the critical role and current contributions of US family medicine organizations. *Fam Med*. 2019;51(2):120-128. doi:10.22454/FamMed.2019.318583.