

**Primary Care's Historic Role in Vaccination and Potential Role in COVID-19
Immunization Programs.**

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Abstract

Purpose: COVID-19 pandemic recovery will require a broad and coordinated effort for infection testing, immunity determination, and vaccination. With the advent of several COVID-19 vaccines, the dissemination and delivery of COVID-19 immunization across the nation is of concern. Previous immunization delivery patterns may reveal important components of a comprehensive and sustainable effort to immunize everyone in the nation.

Methods: The delivery of vaccinations were enumerated by provider type using 2017 Medicare Part B Fee-For-Service data and the 2013-2017 Medical Expenditure Panel Survey. The delivery of these services was examined at the service, physician, and visit level.

Results: In 2017 Medicare Part B Fee-For-Service, Primary Care Physicians provided the largest share of services for vaccinations (46%), followed closely by Mass Immunizers (45%), then NP/PAs (5%). The Medical Expenditure Panel Survey showed that Primary Care Physicians provided most clinical visits for vaccination (54% of all visits).

Conclusions: Primary Care Physicians have played a crucial role in delivery of vaccinations to the U.S. population, including the elderly, between 2012-2017. These findings indicate primary care practices may be a crucial element of vaccine counseling and delivery in the upcoming COVID-19 recovery and immunization efforts in the United States.

Introduction

While the COVID-19 pandemic continues to wax and wane throughout the country, efforts must combine the best pandemic response with preparation for pandemic recovery. Experts have called for widespread testing, contact tracing, and case isolation as preconditions for safely reopening schools, lifting activity restrictions, and preventing future COVID-19 resurgence.^{1,2} Scientific knowledge of the immunity conferred by antibodies developed by infection with COVID-19 is evolving, but public health experts agree that herd immunity from infection is an unreasonable approach to tackling the pandemic.^{3,4,5} The arrival of safe and effective vaccines brings hope and may alleviate some of the complexities related to testing and treatment.^{6,7,8}

An important step towards recovery from COVID-19 is the mass distribution of a vaccine.^{9,10,11,12} While much attention has been on the development and manufacturing of a novel SARS-CoV-2 vaccine, it is now clear that the distribution and delivery also require careful planning.¹³ Many reports highlight the role of large chain pharmacies to deliver the COVID-19 vaccine. Complex and expensive shipping and storage requirements of the first approved vaccine require detailed planning. Additional vaccines entering the market may eliminate many of these more complex storage requirements. Access to the vaccination in large population centers as well as remote rural areas will require use of current and novel networks to reach adequate herd immunity levels.

Even if the United States is able to appropriately deliver the COVID-19 vaccine to all communities, vaccine hesitancy may slow herd immunity. A recent Kaiser Family Foundation survey found that over a quarter of adults in the United States are hesitant to get the COVID-19 vaccine, and this proportion is much higher in certain populations and geographies.¹⁴ Without

appropriate counseling about the vaccine, the potential for recovery is hampered. Surveys have shown that the most trusted source of information on the COVID-19 and other vaccines is a patient's own doctor or healthcare provider.¹⁵ But no studies, to our knowledge, have quantified where patients have historically received their vaccines.

This study examines the role of primary care physicians and other providers in delivering vaccinations in the United States. We used two main datasets to create an in-depth analysis of services delivered to the Medicare Part B Fee-For-Service (FFS) beneficiary population, followed by analysis of the Medical Expenditure Panel Survey to determine delivery patterns for immunizations among all age groups. The combination of these two datasets provides a robust analysis of a representative sample of adults of all ages living in the United States. Historic immunization delivery patterns may shed light on provider capacity for rapid deployment of COVID-19 vaccine counseling and delivery.

Methods

Medicare Fee-For-Service

This study uses Centers for Medicare and Medicaid Services (CMS) 2017 Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File (PUF) and CMS National Plan and Provider Enumeration System (NPPES) August 2017 Quarter 3 Update. The Physician and Other Supplier PUF includes services provided to beneficiaries enrolled in Medicare Part B FFS in 2017 at the provider level. We linked the data files using National Provider Identifier (NPI) and geocoded providers' addresses at the county level using NPPES. We calculated vaccination services by provider type and county. We categorized Primary Care Physicians (PCPs) in the Medicare PUF using the standard method that includes Family Practice,

General Practice, Geriatric Medicine, or Internal Medicine. “Mass Immunizers” include drugstore and grocery chains as well as community pharmacies and were identified using the provider terms of Centralized Flu, Mass Immunizer Roster Biller, Pharmacy, or Public Health or Welfare Agency. The Medicare PUF does not differentiate internal medicine physicians that are specialists from those that practice general internal medicine. The Medicare PUF includes non-physician provider types of Physician Assistant (PA), Nurse Practitioner (NP), and Certified Clinical Nurse Specialist, but does not provide specialty of PAs or NPs.

We used Healthcare Common Procedure Coding System (HCPCS) code descriptions to identify services in the Medicare PUF. To be included as a vaccination service, the description must have contained “vaccine” or “vaccination” and not have contained “detection” (Appendix Table 1).

Medical Expenditure Panel Survey

We merged medical conditions, office-based, outpatient and consolidated files from the Medical Expenditure Panel Survey (MEPS) to enumerate services delivered in office-based and outpatient visits in 2013 through 2017. We used multiple years to assure adequate sample size. MEPS provides nationally representative estimates of health care services and expenditures for adults of all ages. We used questions related to reasons for visit from the office-based and outpatient files to identify visits for vaccination (Online supplemental Appendix Table 2). We included physicians with specialties of Family Medicine, Internal Medicine, Pediatrics, and Geriatrics in the PCP category in MEPS. We calculated the number and proportion of visits for vaccinations seen by PCPs, NP/PAs and other non-physician providers using survey weights

averaged over the five years pooled from 2013-2017 which result in a nationally representative sample for one year.

A Medicare “service” is a unique billing code, and a clinical encounter might include multiple “services.” While MEPS uses different terminology for clinical care (visit, encounter, service), we used the term “visit” to represent any clinical encounter that included a vaccination. For MEPS, these visits might include multiple services, but each visit is only counted once. We used Stata version 16.0 (College Station, TX) for analysis. Percentages are rounded to the nearest whole number.

Results

Medicare Fee-For-Service

There were over 2.4 billion services included in the 2017 Medicare Physicians and Other Supplier PUF including nearly 34.3 million vaccinations (Table 1). There were 1,032,911 unique clinical providers of which 150,894 (15%) delivered vaccinations. Overall, PCPs provided the most vaccinations (46%), followed closely by Mass Immunizers (45%), then NP/PAs (5%).

An examination of vaccinations at the county level showed that PCPs administered between 25-50% of vaccinations in the majority of counties in Medicare Part B FFS in 2017. Additionally, there were clusters of counties that had over 50% of vaccinations provided by PCPs throughout states such as Louisiana, Pennsylvania, and Massachusetts. (Online supplemental Appendix Figure 1.)

Medical Expenditure Panel Survey

There were an average 69.7 million vaccination visits in office-based settings in the U.S. per year, according to the 2013-2017 MEPS (Table 2). The majority of visits for vaccinations were with PCPs (53.6%).

Discussion

Historically, primary care practice has played an important role in vaccine delivery. Because many patients have received their vaccines from their primary care practice, these same practices may play a crucial role in the COVID-19 immunization dissemination and delivery. Whether primary care physicians provide the vaccine, or only provide immunization counseling, their role may help assure successful delivery of the COVID-19 vaccines to communities across the nation, including rural and remote communities. In addition to physically administering vaccinations, PCPs can provide clinical and personal support to enable patients to understand their current COVID-19 immunologic status, how that may impact their vaccine decisions, and to counter vaccine hesitancy and misinformation.¹⁶ Manufactures already deliver vaccines and Medicare has individual provider and practice billing information for primary care practices that provide vaccines, therefore, a distribution list is ready-made. Using the current vaccine delivery in primary care may greatly improve COVID-19 vaccine distribution.

Given the political nature of the COVID-19 pandemic, including the vaccine development and approval process, there is a high level of distrust in the COVID-19 vaccine.¹⁷ The new vaccines may face more vaccine hesitancy, misinformation, and refusal than other vaccines. Primary care physicians are often considered a trusted source of medical information. And based on the historic immunization data, are evidently a trusted source for vaccine

information. In addition to delivering the actual vaccine, primary care practices may play an even more important role in vaccine counseling, building local community trust, and serving as a source of scientific knowledge about the COVID-19 vaccine.

The COVID-19 pandemic has not affected all populations equally - the Medicare Fee-For-Service (FFS) beneficiary population, comprised of over 40 million people who are mostly 65 and over, is disproportionately at risk for complication and death due from COVID-19.^{17,18} Delivering vaccinations to this older population is essential for mitigating the most devastating consequences of the virus. Closer examination of the provision of these services by patient race and ethnicity, while beyond the scope of this paper, is also critical, as the COVID-19 pandemic has disproportionately affected Black, Latino, and Indigenous Americans, who also experience lower rates of vaccination and higher likelihoods of concurrent COVID-19 risk factors.^{19,20,21,22,23}

The Medicare PUF used in this study does not allow for the identification of the originating provider who may have referred to a mass immunizer or other facility for vaccination. Additionally, the Medicare PUF limits aggregation of services to providers with 10 or more beneficiaries per HCPCS code. Further, the use of county-level data does not account for beneficiaries who traveled across counties to receive a service.

The Medical Expenditure Panel Survey is based on self-reported patient data and is subject to recall bias; however, a third of the sample is validated using a sample of providers and delivery sites. Its non-institutionalized civilian population sample may not reflect the vaccination rates of the entire U.S. population. MEPS is widely used and considered a reliable source for health services research.

None of the datasets allow for differentiating specialist internal medicine from general internal medicine, nor do they provide the level of detail necessary to determine specialty of NP/PAs or if NP/PAs may have been ordering immunizations but billing under a physician code. In addition, NPs could not be distinguished from nurses since MEPS groups these clinicians into a single category. Therefore, these data may overestimate the contribution of vaccination by general internal medicine and underestimate the contribution of vaccination by NP/PAs.

Primary care physicians deliver preventive care as well as address acute and chronic medical needs. They are equipped to provide clinical guidance to help patients interpret results from COVID-19 testing and immunity determinations and answer vaccine questions. Given its historic role in immunization counseling and vaccine delivery, primary care, in concert with public health agencies and community health organizations, is essential for immediate and sustainable population health efforts to address COVID-19 recovery.

Conflict of Interest: The authors have no conflicts of interest to report.

Tables, Figures and Appendices

Table 1. Medicare Part B Fee-For-Service Billable Services and Vaccinations by Provider Type.

2017

Provider Type	Total Number of Services		Unique Providers		Vaccination		Unique Vaccine Providers	
	n	%	n	%	n	%	n	%
Mass Immunizer	15,476,697	0.6	40,246	3.9	15,474,448	45.2	40,242	26.7
Centralized Flu	6,382,129	0.3	9,793	1.0	6,382,129	18.6	9,793	6.5
Mass Immunizer Roster Biller	8,979,771	0.4	30,144	2.9	8,978,511	26.2	30,142	20.0
Pharmacy	7,484	0.0	29	0.0	6,564	0.0	27	0.0
Public Health or Welfare Agency	107,313	0.0	280	0.0	107,244	0.3	280	0.2
Primary Care Physician	315,693,224	13.1	183,475	17.8	15,834,619	46.2	77,627	51.4
Family Practice	122,477,653	5.1	81,809	7.9	7,704,970	22.5	41,777	27.7
General Practice	6,989,241	0.3	4,943	0.5	198,196	0.6	1,264	0.8
Geriatric Medicine	2,442,902	0.1	1,811	0.2	87,031	0.3	478	0.3
Internal Medicine	183,783,428	7.6	94,912	9.2	7,844,422	22.9	34,108	22.6
NP/PA/CCNS	102,676,780	4.3	171,180	16.6	1,592,519	4.7	20,861	13.8
Certified Clinical Nurse Specialist	949,837	0.0	1,979	0.2	3,897	0.0	40	0.0
Nurse Practitioner	63,649,600	2.6	104,098	10.1	1,198,546	3.5	15,391	10.2
Physician Assistant	38,077,343	1.6	65,103	6.3	390,076	1.1	5,430	3.6
Clinical Laboratory	314,641,419	13.1	2,838	0.3	126	0.0	3	0.0
Other	1,662,710,608	69.0	635,172	61.5	1,364,870	4.0	12,161	8.1
Total	2,411,198,729	100	1,032,911	100	34,266,581	100	150,894	100

Source: Centers for Medicare and Medicaid Services Medicare Provider Utilization and Payment

Data: Physician and Other Supplier Public Use, 2017; Centers for Medicare and Medicaid

Services National Provider Payment Enumeration System, August 2017 Quarter 3 Update.

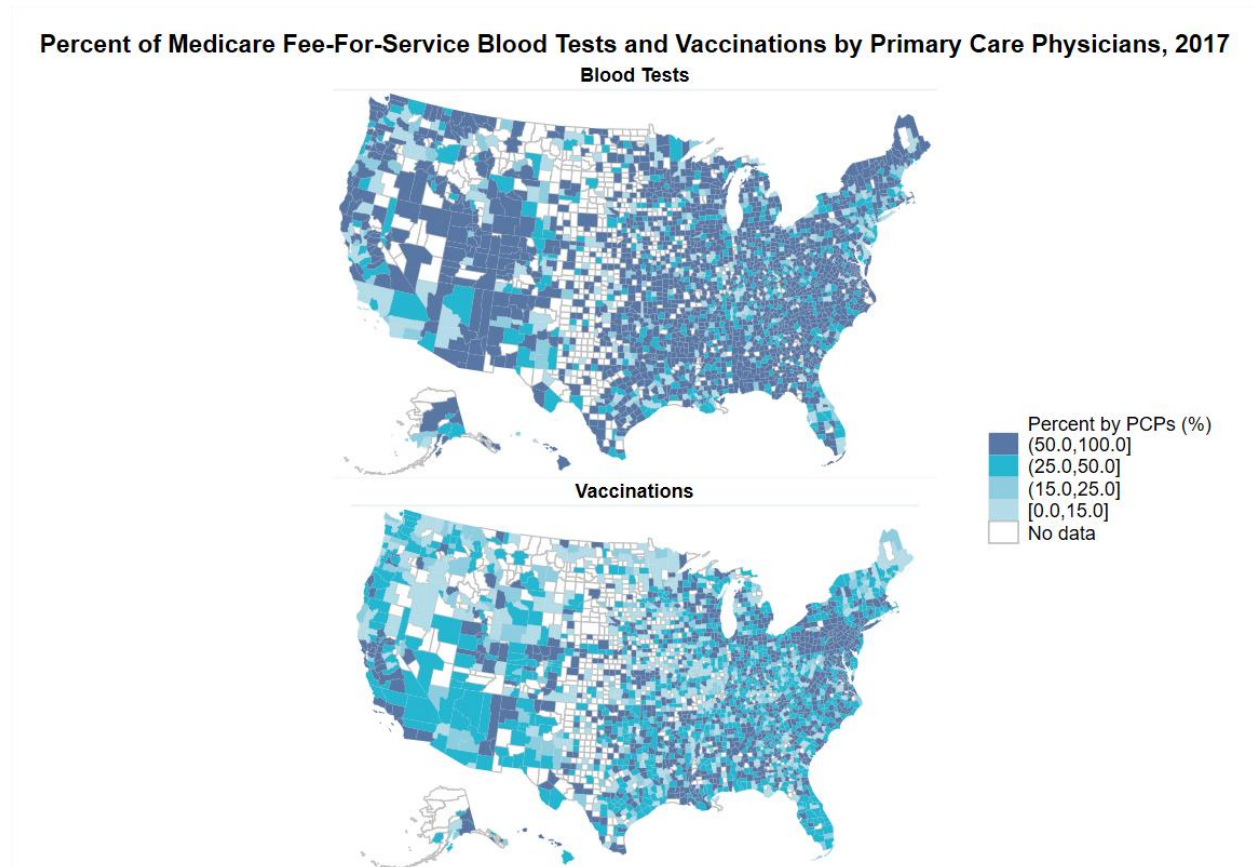
Table 2. Vaccination Visits by Provider Type in Medical Expenditure Panel Survey, 2013-2017

Provider Type	Vaccination Visits	
	n (Weighted)	%
Primary Care Physicians	37,332,602	53.6
Family Medicine	13,618,734	19.5
Internal Medicine	2,971,356	4.3
Pediatrics	20,664,522	29.6
Geriatrics	77,990	0.1
NP/PA	15,584,875	22.4
Non-Primary Care Physician	7,859,141	11.3
Other Non-Physician	8,934,141	12.8
Total	67,299,316	100

Source: Medical Expenditure Panel Survey, 2013-2017

Appendix 1 – Supplemental Material. (For inclusion as online supplemental material.)

Appendix - Figure 1. Percent of Medicare Fee-For-Service Blood Tests and Vaccinations by Primary Care Physicians, 2017



Source: Centers for Medicare and Medicaid Services Medicare Provider Utilization and Payment Data: Physicians and Other Supplier Public Use File, 2017; Centers for Medicare and Medicaid Services National Provider Payment Enumeration System, August 2017 Quarter 3 Update.

PCP: Primary Care Physician.

Appendix - Table 1. Healthcare Common Procedure Coding System Codes Used to Identify Services in CMS Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use, 2017

Service Type	Healthcare Common Procedure Coding System Codes
Vaccination	90460, 90471, 90472, 90630, 90632, 90654, 90662, 90668, 90670, 90672, 90673, 90685, 90686, 90697, 90714, 90715, 90732, 90740, 90746, 90747, 90749, G0008, G0009, G0010, Q2034, Q2035, Q2036, Q2037, Q2038, Q2039

Appendix - Table 2. ICD-9 Codes, ICD-10 Codes, and Medical Provider Questions Used to Identify Services in Medical Expenditure Panel Survey, 2013-2017

Service Type	ICD-9 Codes (2013-2015)	ICD-10 Codes (2016-2017)	Medical Provider Question
Vaccination	V03, V04, V05, V06	Z23	"This visit, did patient receive an immunization?"

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