



Published in final edited form as:

Vaccine. 2025 January 01; 43(Pt 1): 126537. doi:10.1016/j.vaccine.2024.126537.

Herpes zoster vaccination among Medicare beneficiaries with and without prescription drug coverage

Yuping Tsai^{a,*}, Jessica Leung^b, Tara C. Anderson^b, Fangjun Zhou^a, James A. Singleton^a

^a Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, GA, USA.

^b Division of Viral Diseases, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, GA, USA.

Abstract

Introduction: The Inflation Reduction Act (IRA) eliminated cost sharing for Medicare Part D-covered vaccines but did not address the cost burden faced by Medicare beneficiaries who did not have prescription drug coverage. This study aimed to determine the characteristics of beneficiaries without prescription drug coverage and to assess the association between the receipt of a herpes zoster vaccine and prescription drug coverage status.

Methods: We used the 2019–2023 National Health Interview Survey and included Medicare beneficiaries aged 65 years and older who enrolled in both Parts A and B or a Medicare Advantage plan. Descriptive statistics were used to examine beneficiaries' characteristics. Logistic regressions were used to examine the associations between the receipt of a herpes zoster vaccine and Medicare prescription drug coverage.

Results: The study included 33,578 beneficiaries and 93.5 % of beneficiaries had prescription drug coverage. The prevalence of lacking prescription drug coverage was higher among beneficiaries who did not have a college degree, had family income below the poverty level, had no flu shot and well visit within the past year, and had no usual place for care. The probability of receiving a herpes zoster vaccine was higher among beneficiaries with prescription drug coverage than those without prescription coverage (45.2 % versus 25.3 %).

Conclusions: Herpes zoster vaccination disparities between beneficiaries with and without prescription drug coverage existed before the IRA. Because the IRA only addresses the cost

* Corresponding author at: Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road NE, MS H24-4, Atlanta, GA 30329, USA. ytsai@cdc.gov (Y. Tsai).

Declaration of competing interest

The authors assure that no funding was given to produce this study and have no financial relationships relevant to this study and no conflicts of interest to disclose.

The authors assure that no funding was given to produce this study and have no financial relationships relevant to this study and no conflicts of interest to disclose. The findings and conclusions of this paper are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

CRediT authorship contribution statement

Yuping Tsai: Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jessica Leung:** Writing – review & editing, Validation. **Tara C. Anderson:** Writing – review & editing, Validation. **Fangjun Zhou:** Validation, Writing – review & editing. **James A. Singleton:** Writing – review & editing, Validation, Supervision.

barrier facing by beneficiaries with prescription drug coverage, vaccination disparities was greater after the IRA implementation.

Keywords

Medicare; Immunization; Inflation reduction act; Herpes zoster vaccine; Older adults

Out-of-pocket (OOP) costs for vaccination services are a barrier to adults' receipt of recommended vaccines [1]. Since 1981, Congress has amended the Medicare statute to cover influenza, pneumococcal, hepatitis B (for intermediate and high-risk populations), and COVID-19 vaccines without cost-sharing under Medicare Part B plans. All other commercially available vaccines that are recommended by the Advisory Committee on Immunization Practices (ACIP), such as herpes zoster, tetanus, diphtheria, and pertussis (Tdap), and tetanus and diphtheria (Td) vaccines, are covered under Medicare Part D prescription drug plans [2]. Part D may impose cost sharing for vaccines and a patient's OOP payment depends on the specific Part D plan coverage. To expand access to vaccination among older adults, the Inflation Reduction Act (IRA) of 2022 eliminated cost sharing for vaccines in Medicare Part D [3]; starting January 1, 2023, all ACIP-recommended vaccines covered by Medicare Part D are available to beneficiaries with zero OOP cost.

This study focused on the Part D-covered herpes zoster vaccine. Two herpes zoster vaccines are licensed in the US, zoster vaccine live (ZVL, Zostavax) and recombinant zoster vaccine (RZV, Shingrix). ZVL was recommended as a single dose for adults aged ≥ 60 years in 2006 [4] and is no longer available for use in the US as of November 18, 2020; RZV was recommended as a two-dose series for immunocompetent adults aged ≥ 50 years in 2017 and for immunocompromised adults aged ≥ 19 years in 2021 [5]. Previous studies examining vaccination coverage among older adults indicated that herpes zoster vaccine had lower vaccination coverage compared to Part B-covered vaccines, such as influenza vaccine [6,7]. Nevertheless, herpes zoster vaccine was the most commonly received vaccine among Medicare Part D enrollees; 81.6 % of Part D enrollees who received at least one vaccine received herpes zoster vaccine and only 22.1 % received Tdap or Td in 2021. Before the IRA, the average OOP cost per herpes zoster vaccine among the immunized Part D enrollee was \$76.9 and the cost was the highest among all Part D-covered vaccines [2]. The IRA could provide meaningful financial relief to improve access to herpes zoster vaccine among Medicare beneficiaries with prescription drug coverage.

There are two main ways that Medicare beneficiaries can obtain prescription drug coverage. First, by joining a Medicare Prescription Drug Plan (PDP), which is added to Original Medicare (i.e., Medicare Parts A and B fee-for-service plans), and second, by joining a Medicare Advantage (MA) plan that includes a prescription drug plan (MA-PD). Although it is not a requirement for Medicare MA plans to cover prescription drugs, most MA plans do offer coverage (89 % of MA plans covered prescription drugs in 2022) [8]. Some Medicare beneficiaries receive prescription drug coverage from sources other than Part D. For example, employers that sponsor retiree drug coverage outside of the Part D program and military health insurance also covers prescription drugs (beneficiaries can receive

ACIP-recommended vaccines without OOP costs if vaccines were received at participating network providers) [9].

About 5.7 million (9.1 %) Medicare beneficiaries did not elect to receive Medicare prescription drug coverage. The IRA does not apply to these beneficiaries and thus they are required to pay the full cost of all Part D-covered vaccines [10]. There is limited evidence on herpes zoster vaccination coverage among Medicare beneficiaries who do not have prescription drug coverage. Using the National Health Interview Survey (NHIS) data, our goals are to (1) describe the characteristics and the probabilities of receiving a herpes zoster vaccine among Medicare beneficiaries without prescription drug coverage, (2) identify gaps in herpes zoster vaccination coverage between Medicare beneficiaries with and without prescription drug coverage, and (3) examine whether Medicare prescription drug coverage was associated with beneficiaries' decision on whether to receive a herpes zoster vaccine.

1. Methods

We used data from the 2019–2023 NHIS [11]. The NHIS is an ongoing cross-sectional household interview survey of the civilian noninstitutionalized population residing within the 50 states and the District of Columbia. This analysis included Medicare beneficiaries aged ≥ 65 years. We restricted the sample to beneficiaries enrolled in both Medicare Parts A and B or in a MA plan. Because herpes zoster vaccine is routinely recommended for people starting at age 50, some adults received a herpes zoster vaccine before they enrolled in Medicare at age 65, and thus their Medicare prescription drug coverage was irrelevant to their vaccination decision. We determined whether the respondent received a herpes zoster vaccine before age 65 years using the survey question asking respondents the year of the most recent ZVL or RZV vaccination. We excluded 2761 respondents who received a herpes zoster vaccine before age 65 (among them, 1441 respondents had missing information on the most recent year of ZVL or RZV vaccination and 1320 respondents who received a herpes zoster vaccine before age 65 years).

1.1. Outcome variable

We examined the receipt of a herpes zoster vaccine, which was defined based on a series of survey questions: Survey respondents were asked if they ever received a shingles vaccine and, if so, whether they ever received ZVL or RZV. We conducted a secondary analysis focusing on the receipt of RZV vaccine because vaccination costs are expected to be higher for RZV than ZVL, since RZV is recommended as a 2-dose series, and RZV is also recommended regardless of prior ZVL vaccination.

1.2. Statistical analysis

Descriptive statistics were used to examine beneficiaries' characteristics overall and by whether the beneficiary had Medicare prescription drug coverage. Beneficiaries' characteristics included age group (65 to 74, 75 to 84, and ≥ 85 years), sex (male, female), race/ethnicity (non-Hispanic White, non-Hispanic Black, Asian, Hispanic, and other), education (whether the respondent had at least a college degree), poverty level (whether the family income was below the poverty level), underlying medical condition

(whether the beneficiary had at least one of the following chronic conditions: arthritis, hypertension, cancer, diabetes, and/or heart problems), health care utilization (whether the beneficiary received a flu shot or nasal spray during the past 12 months, whether the respondent made ≥ 1 well visit within the past year, and whether the respondent had a usual place to go for care), residence counties (urban, rural), and region (Northeast, Midwest, South, and West). We determined whether a county is urban or rural based on the National Center for Health Statistics (NCHS) classification schemes [12]. We defined rural counties as counties located in the two nonmetropolitan categories and urban counties as counties in the four metropolitan categories.

The associations between the receipt of a herpes zoster vaccine and Medicare prescription drug coverage were investigated using logistic regression adjusting for beneficiaries' characteristics described above; we used the estimates from the logistic regressions to estimate the adjusted probability of receiving a herpes zoster vaccine and the adjusted risk difference with respect to the reference group for each characteristic. We determined whether a beneficiary had Medicare prescription drug coverage based on three survey questions: (1) whether the respondent enrolled in Medicare Part D, (2) whether the respondent was covered by a separate plan that pays for prescriptions, and (3) whether the plan paid for prescription drugs if the respondent was covered by private health insurance. Because beneficiaries dually eligible in Medicare and Medicaid are automatically enrolled in a Medicare drug plan and military health insurance and the majority of MA plans also cover prescription drugs, we defined the beneficiary having prescription drug coverage if he/she reported having Medicaid coverage, military health care coverage, or being enrolled in a MA plan. All regressions were adjusted for beneficiaries' characteristics and year fixed effects (accounting for national trends in the receipt of herpes zoster vaccines among the Medicare population). The final sample excluded 2441 (6.8 %) beneficiaries who had missing information on the selected characteristics listed above.

1.3. Sensitivity analysis

In the main analysis, we assumed respondents who enrolled in a MA plan had prescription drug coverage. In the sensitivity analysis, we excluded 3598 MA beneficiaries for whom we could not determine whether they had prescription drug coverage based on the survey questions. For example, Medicare Health Maintenance Organization or Preferred Provider Organization plans usually offer prescription drug coverage though they are not required to offer it. We were unable to determine whether beneficiaries enrolling in these plans had prescription drug coverage based on the NHIS survey questions.

Survey weights were used in all analyses to provide national estimates. Analyses were performed using Stata version 15 (StataCorp).

This study was reviewed by the Centers for Disease Control and Prevention (CDC) and was conducted in accordance with applicable federal law and CDC policy. As an analysis of secondary data without identifiers, the study did not require institutional review board review.

2. Results

The study population consisted of 33,578 Medicare beneficiaries. The sample composition was stable across years; most beneficiaries were female (55.6 %), non-Hispanic White (78.1 %), had less than a college degree (70.5 %), had income above the poverty level (92.5 %), and were residents of an urban area (82.0 %) (Table 1). Most beneficiaries included in the sample had ≥ 1 chronic condition (85.4 %), received a flu shot during the past 12 months (71.6 %), made ≥ 1 well visit within the past year (93.1 %), and had a usual place to go for care (97.8 %). Beneficiaries aged 65–74 years accounted for the largest proportion (57.8 %), followed by those aged 75–84 (32.6 %) and ≥ 85 (9.6 %) years. Most Medicare beneficiaries elected to receive prescription drug coverage (93.5 %). Compared to those with prescription drug coverage, those without prescription drug coverage had a higher proportion not having a college degree (70.0 % versus 77.5 %), family income below the poverty level (7.3 % versus 9.5 %), not having any chronic condition (14.1 % versus 21.5 %), no flu shot during the past 12 months (27.3 % versus 44.4 %), no well visit within the past year (6.4 % versus 14.3 %), not having a usual place of care (1.8 % versus 7.9 %), and living in a rural area (17.7 % versus 22.6 %). The proportion of beneficiaries without prescription drug coverage was the highest among those who did not have a usual place for care (23.0 %), followed by those who did not make any well visit during the past year (13.4 %) and those whose race/ethnicity group was in the other category (13.2 %).

During the study period, there was an increasing trend in the probability of receiving a herpes zoster vaccine, from 35.8 % in 2019 to 52.3 % in 2023; overall, 43.9 % (14,734) of beneficiaries ever received any herpes zoster vaccine and 16.2 % (5448) received RZV vaccine (Table 2). Beneficiaries with prescription drug coverage had a statistically significantly higher proportion of receiving a herpes zoster vaccine than those without prescription coverage; the gap was 19.8 percentage points (PPs) for herpes zoster vaccine and 8.2 PPs for RZV. Compared vaccination coverage across years, the gap was the largest in 2023 (23.3 PPs), the year when the IRA took effect. Compared with non-Hispanic White beneficiaries, the unadjusted probability of receiving a herpes zoster vaccine and RZV vaccine was 17.3 ($p < 0.01$) and 10.4 PPs ($p < 0.01$) lower among non-Hispanic Black and was 16.6 ($p < 0.01$) and 9.2 PPs ($p < 0.01$) lower among Hispanic beneficiaries. The proportion of receiving a herpes zoster or RZV vaccine was significantly lower among beneficiaries with lower incomes (18.5 and 9.9 PPs lower, $p < 0.01$) or lower levels of education (18.6 and 12.1 PPs lower, $p < 0.01$) and among beneficiaries who did not receive a flu shot during the past 12 months (35.1 and 15.1 PPs lower, $p < 0.01$), who did not have a usual place for care (22.1 and 10.0 PPs lower, $p < 0.01$) and who had not made a well visit during the past year (15.9 and 5.4 PPs lower, $p < 0.01$).

After adjusting for beneficiaries' characteristics and year fixed effects, the gap in the probability of receiving a herpes zoster or a RZV vaccine between beneficiaries with and without prescription coverage dropped from 19.8 to 12.9 PPs ($p < 0.01$) and from 8.2 to 5.6 PPs ($p < 0.01$), respectively (Table 3). Although the magnitude of the adjusted difference within each subgroup was smaller than that of the unadjusted difference in Table 2, the findings from the comparison within subgroups were similar.

2.1. Sensitivity analysis

After excluding beneficiaries for whom we could not determine whether they had prescription drug coverage based on survey questions, the numbers of Medicare beneficiaries with and without prescription drug coverage changed to 27,837 (92.9 %) and 2143 (7.2 %), respectively. The exclusion did not change our results in any significant way - the unadjusted probability of receiving a herpes zoster vaccine increased from 43.9 % to 44.2 % and the adjusted difference in the probability of receiving a herpes zoster vaccine between those with and without prescription drug coverage increased from 19.8 to 20.3 PPs.

3. Discussion

Using the NHIS data, this study showed that beneficiaries with less education and lower income and beneficiaries who did not receive a flu shot during the past 12 month, who did not make an annual well care visit within the past year, and who had no usual place for care were less likely to elect to receive Medicare prescription drug coverage. The probability of receiving a herpes zoster or a RZV vaccine was 12.9 and 5.6 PPs lower among those without prescription drug coverage than those with prescription drug coverage, respectively.

Another notable finding is that there was an 11.5 PP jump in RZV vaccination, from 12.0 % in 2019 to 23.5 % in 2021; in contrast, herpes zoster vaccination only increased 4.6 PPs, from 35.8 % to 40.4 % during the same time period. This finding is likely due to the ACIP's recent recommendations for the use of RZV and some older adults who received RZV were also people who previously vaccinated with ZVL. Moreover, ZVL has not been available in the US since November 2020.

Studies have evaluated OOP costs of herpes zoster vaccination among Medicare Part D enrollees. Prior to the IRA, all Medicare PDP and over 90 % of MA-PD enrollees were required to pay OOP costs for Part D-covered vaccines [13]; OOP costs ranged from \$0 at the 10th percentile of the cost distribution to \$193 at the 90th percentile for a dose of herpes zoster vaccine. In 2021, Medicare beneficiaries were liable for 31.0 % (\$211 million) of the total costs that Medicare Part D paid for herpes zoster vaccines [2]. In a survey conducted in 2020, providers reported patients most often declined RZV due to insurance not covering the vaccine cost [14]. The IRA removed Part D enrollees' cost sharing responsibility and therefore could increase their herpes zoster vaccination uptake.

The Medicare program does not universally provide prescription drug coverage for enrollees. Beneficiaries who do not have prescription drug coverage are still required to pay the full cost for Part D-covered vaccines out of pocket after the IRA implementation. This study provided evidence that there were sizable vaccination disparities in Part D-covered herpes zoster vaccine between Medicare beneficiaries with and without prescription drug coverage and the vaccination gap was the largest in 2023, the year when the IRA took effect, compared to previous years. We expected to see increasing disparities in herpes zoster vaccination according to Medicare prescription drug coverage status because the IRA only addressed the cost barrier faced by Medicare beneficiaries who have prescription drug coverage.

Examining the characteristics of beneficiaries without prescription drug coverage, we found that these beneficiaries were more likely to have lower socioeconomic status and use medical care less frequently. These findings were consistent with existing studies that found having higher education and using medical care services more frequently (e.g., receiving influenza vaccine, more outpatient visits, and having a usual place of care) were associated with higher probability of receive herpes zoster vaccine [15–18]. The finding that herpes zoster vaccination uptake was lower among non-Hispanic Black and Hispanic beneficiaries when compared to non-Hispanic White beneficiaries was also corroborated by existing literature [15,17–21]. After adjusting for beneficiaries' characteristics and their receipt of influenza vaccine which, to some extent, accounts for unobserved factors (e.g., less confidence or interest in vaccination or lack of perceived need for the vaccine) that affected their decision on whether to receive a herpes zoster vaccine, we showed that Medicare prescription drug coverage associated with higher herpes zoster vaccination uptake.

Our findings showed that when compared to non-Hispanic White beneficiaries, non-Hispanic Black and Hispanic beneficiaries had lower herpes zoster vaccination coverage but the proportion of not having prescription drug coverage was comparable. These findings were likely due to the inclusion of dually eligible beneficiaries as racial and ethnic minority had a disproportionately higher proportion of being dually eligible but dually eligible beneficiaries were automatically enrolled in a Medicare drug plan. This finding suggested that Medicare prescription drug coverage was unlikely to be the main reason leading to racial/ethnic disparities in herpes zoster vaccination among older adults.

Though the national data showed stable and increasing uptake of herpes zoster vaccination during the study period, over half of the older adults included in the study remained unvaccinated. Continued work needs to be done to increase herpes zoster vaccination uptake among older adults. Although this study showed that Medicare prescription drug coverage was a key factor associated with older adults' vaccination decision, OOP costs are not the only barrier to vaccination. Strategies such as vaccination reminders, increasing public confidence in vaccine safety and effectiveness, expanding education and awareness efforts about the risk of developing herpes zoster, and stronger provider recommendations, are also needed to address other vaccination barriers [14,22,23].

This study was subject to limitations. First, the NHIS is survey data, which could be subject to common survey errors, such as selection bias, reporting errors, and measurement errors [24]. Moreover, the NHIS changed its survey approach during our study period. Prior to the Covid-19 pandemic, the survey was conducted by face-to-face interviews. Between April and June 2020, all interviews were changed to telephone only; and since July 2020, interviews were attempted by telephone first with follow-ups to complete interviews by personal visits [11]. Changes in data collection method may affect survey results. However, focusing on the data after 2020, our main results and conclusions did not change. Second, the NHIS sample only includes civilian noninstitutionalized population, which could have biased the coverage estimates upward or downward. Finally, our analyses assumed respondents' Medicare status as of the date of the interview and the status had not changed since the interview. However, over 95 % of adults aged 65 years and over were

covered by Medicare [25], we believe that this assumption was reasonable and would not affect our conclusions in any significant way.

4. Conclusions

Costs are a critical barrier to vaccination uptake among adults [26–28]. The IRA provides meaningful financial relief to 47 million older adults who have Medicare Part D, which improves their access to herpes zoster vaccination; however, full vaccination cost is still required for about 6 million beneficiaries who do not have Medicare prescription drug coverage. Differences in Medicare coverage status might increase the already existing disparities in herpes zoster vaccination between beneficiaries with and without prescription drug coverage reported in this study, and for other vaccines also covered under Medicare Part D, such as the newly recommended RSV vaccine. This study showed that having prescription coverage was associated with higher herpes zoster vaccination uptake; removing the cost barriers facing by all Medicare-covered adults would reduce vaccination disparities and ensure equal access to adult vaccination among the Medicare-covered population [13,29].

Data availability

Data will be made available on request.

References

- [1]. Hurley LP, Lindley MC, Harpaz R, et al. Barriers to the use of herpes zoster vaccine. *Ann Intern Med* 2010;152(9):555–60. [PubMed: 20439573]
- [2]. Sayed BA, Finegold K, Ashok K. et al. Medicare Part D enrollee savings from elimination of vaccine cost-sharing. <https://aspe.hhs.gov/sites/default/files/documents/329fd579ada6515d3be404f06821c361/aspe-ira-vaccine-part-d.pdf>.
- [3]. H.R.5376 - Inflation Reduction Act of 2022, <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>. Accessed July 26, 2023.
- [4]. Harpaz R, Ortega-Sanchez IR, Seward JF. Advisory Committee on Immunization Practices Centers for Disease C, Prevention. Prevention of herpes zoster: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* 2008;57(RR-5). 1–30; quiz CE32–34.
- [5]. Dooling KL, Guo A, Patel M, et al. Recommendations of the advisory committee on immunization practices for use of herpes zoster vaccines. *MMWR Morb Mortal Wkly Rep* 2018;67(3):103–8. [PubMed: 29370152]
- [6]. Agarwal S, Shankar N, Alsan M. To improve access and equity, move vaccine coverage to Medicare part B. *Health Affairs Forefront* Aug 11 2022.
- [7]. Shen AK, Warnock R, Selna W, MaCurdy TE, Chu S, Kelman JA. Vaccination among Medicare-fee-for service beneficiaries: characteristics and predictors of vaccine receipt, 2014–2017. *Vaccine* 2019;37(9):1194–201. [PubMed: 30683507]
- [8]. Freed M, Damico A, Neuman T. Medicare advantage 2022 spotlight: First look. <https://www.kff.org/medicare/issue-brief/medicare-advantage-2022-spotlight-first-look/>.
- [9]. Tricare Covered Services: Immunizations, <https://www.tricare.mil/immunizations>. Accessed July 26, 2023.
- [10]. Tarazi W, Welch P, Nguyen N. et al. Medicare beneficiary enrollment trends and demographic characteristics, <https://aspe.hhs.gov/reports/medicare-enrollment>.
- [11]. National Health Interview Survey, <https://www.cdc.gov/nchs/nhis/index.htm>. Accessed July 28, 2023.

- [12]. NCHS. Urban-Rural Classification Scheme for Counties. https://www.cdc.gov/nchs/data_access/urban_rural.htm. Accessed October 19, 2023.
- [13]. June 2021 report to the Congress: Medicare and the health care delivery system, <https://www.medpac.gov/document/june-2021-report-to-the-congress-medicare-and-the-health-care-delivery-system/>. Accessed August 21, 2023.
- [14]. Hurley LP, O'Leary ST, Dooling K, et al. Survey of physician practices, attitudes, and knowledge regarding recombinant zoster vaccine. *J Gen Intern Med* 2023;38(4):986–93. [PubMed: 35794307]
- [15]. Lu PJ, O'Halloran A, Williams WW, Lindley MC, Farrall S, Bridges CB. Racial and ethnic disparities in vaccination coverage among adult populations in the U.S. *Vaccine* 2015;33(Suppl. 4):D83–91. [PubMed: 26615174]
- [16]. Zhang D, Johnson K, Newransky C, Acosta CJ. Herpes zoster vaccine coverage in older adults in the U.S., 2007–2013. *Am J Prev Med* 2017;52(1):e17–23. [PubMed: 28340974]
- [17]. Lewis CY, Mishra K, Sun Y, Sechrist SJ, Arnold BF, Acharya NR. Recombinant zoster vaccine coverage in the United States: an analysis of claims-based data. *Vaccine* 2023;41(23):3493–6. [PubMed: 37150621]
- [18]. Hechter RC, Tartof SY, Jacobsen SJ, Smith N, Tseng HF. Trends and disparity in zoster vaccine uptake in a managed care population. *Vaccine* 2013;31(41):4564–8. [PubMed: 23928461]
- [19]. Lu PJ, Hung MC, Srivastav A, Williams WW, Dooling KL. Shingles vaccination of U. S. adults aged 50–59 years and ≥ 60 years before recommendations for use of recombinant zoster vaccine. *Am J Prev Med* 2020;59(1):21–31. [PubMed: 32389533]
- [20]. Wang H, Xu R, Qu S, Schwartz M, Adams A, Chen X. Health inequities in COVID-19 vaccination among the elderly: case of Connecticut. *J Infect Public Health* 2021;14(10):1563–5. [PubMed: 34326008]
- [21]. Jain B, Paguio JA, Yao JS, et al. Rural-urban differences in influenza vaccination among adults in the United States, 2018–2019. *Am J Public Health* 2022;112(2):304–7. [PubMed: 35080958]
- [22]. Wang Q, Yang L, Li L, Liu C, Jin H, Lin L. Willingness to vaccinate against herpes zoster and its associated factors across WHO regions: global systematic review and Meta-analysis. *JMIR Public Health Surveill* 2023;9:e43893. [PubMed: 36892937]
- [23]. Eiden AL, Barratt J, Nyaku MK. A review of factors influencing vaccination policies and programs for older adults globally. *Hum Vaccin Immunother* 2023;19(1):2157164. [PubMed: 36656057]
- [24]. Dietz V, Venczel L, Izurieta H, et al. Assessing and monitoring vaccination coverage levels: lessons from the Americas. *Rev Panam Salud Publica* 2004;16(6):432–42. [PubMed: 15673487]
- [25]. SHADAC analysis of American Community Survey (ACS) Public Use Microdata Sample, <https://statehealthcompare.shadac.org/table/4/health-insurance-coverage-type-by-age#1/5,4,1,10,86,9,8,6,11/37/7>. Accessed August 21, 2023.
- [26]. Bridges CB, Hurley LP, Williams WW, Ramakrishnan A, Dean AK, Groom AV. Meeting the challenges of immunizing adults. *Am J Prev Med* 2015;49(6 Suppl 4): S455–64. [PubMed: 26382294]
- [27]. Hurley LP, Lindley MC, Allison MA, et al. Primary care physicians' perspective on financial issues and adult immunization in the era of the affordable care act. *Vaccine* 2017;35(4):647–54. [PubMed: 28024954]
- [28]. Lu PJ, O'Halloran A, Kennedy ED, et al. Awareness among adults of vaccine-preventable diseases and recommended vaccinations, United States, 2015. *Vaccine* 2017;35(23):3104–15. [PubMed: 28457673]
- [29]. Hughes R CMS can fix Medicare vaccine coverage to protect seniors from RSV. *Health Affairs Forefront*.

Table 1

Characteristics of study population, overall and by whether the Medicare beneficiary had coverage on prescription drugs.

	All beneficiaries	Beneficiaries had prescription drug coverage		Weighted % of beneficiaries without prescription drug coverage for each characteristic
	N = 33,578	No (6.5 %, N = 2169)	Yes (93.5 %, N = 31,408)	
Age, %				
65–74 y	57.8	55.8	57.9	6.2
75–84 y	32.6	31.6	32.7	6.3
≥85 y	9.6	12.6 ***	9.4	8.4
Sex, %				
Female	55.6	56.9	55.5	6.6
Male	44.4	43.1	44.5	6.3
Race/ethnicity, %				
Non-Hispanic White	78.1	76.5	78.2	6.3
Non-Hispanic Black	8.9	10.4	8.8	7.5
Asian	4.0	2.5 ***	4.1	4.1
Hispanic	7.6	7.6	7.6	6.5
Other	1.5	3.0 ***	1.4	13.2
College degree or higher, %				
No	70.5	77.5 ***	70.0	7.1
Yes	29.5	22.6 ***	30.0	4.9
Family income below the poverty level, %				
No	92.5	90.5 ***	92.7	6.3
Yes	7.5	9.5 ***	7.3	8.2
Had ≥ 1 Chronic condition, %				
No	14.6	21.5 ***	14.1	9.5
Yes	85.4	78.5 ***	85.9	5.9
Received a flu vaccine during the past 12 months, %				
No	28.4	44.4 ***	27.3	10.1
Yes	71.6	55.6 ***	72.8	5.0
Made ≥ 1 well visit within the past year, %				
No	6.9	14.3 ***	6.4	13.4
Yes	93.1	85.7 ***	93.6	5.9
Had a usual place to go for care, %				
No	2.2	7.9 ***	1.8	23.0
Yes	97.8	92.1 ***	98.2	6.1
Residence location, %				
Urban	82.0	77.4 ***	82.3	6.1
Rural	18.0	22.6 ***	17.7	8.1

	All beneficiaries	Beneficiaries had prescription drug coverage		Weighted % of beneficiaries without prescription drug coverage for each characteristic
	N = 33,578	No (6.5 %, N = 2169)	Yes (93.5 %, N = 31,408)	
Region, %				
Northeast	18.0	19.3	17.9	6.9
Midwest	22.2	21.6	22.2	6.3
South	38.6	40.7	38.4	6.8
West	21.3	18.3 ***	21.5	5.6
Year, %				
2019	18.2	20.7 **	18.0	7.4
2020	18.9	19.7	18.8	6.7
2021	19.2	19.5	19.2	6.6
2022	21.4	20.4	21.5	6.2
2023	22.3	19.7 ***	22.5	5.7

SOURCE The 2019–2023 National Health Interview Survey. NOTES This analysis included 33,578 Medicare beneficiaries who were aged ≥65 years, enrolled in both Medicare Parts A and B or a Medicare Advantage plan. Estimates were weighted using the NHIS sampling weights.

*** Differences between those with and without prescription drug coverage were statistically significant at the 1 % level.

** Differences between those with and without prescription drug coverage were statistically significant at the 5 % level.

Table 2

Herpes zoster and RZV vaccination by Medicare beneficiaries' characteristics.

	Ever had a herpes zoster vaccine, N (weighted %)	Difference, PPs (P-value)	Ever had a RZV vaccine, N (weighted %)	Difference, PPs (P-value)
Overall	14,734 (43.9)		5448 (16.2)	
Had prescription drug coverage, %				
No (ref)	543 (25.3)	-	183 (8.5)	-
Yes	14,197 (45.2)	19.8 ($P < 0.01$)	5268 (16.8)	8.2 ($P < 0.01$)
Age, %				
65–74 y (ref)	7673 (41.7)	-	3062 (16.6)	-
75–84 y	5503 (48.5)	6.8 ($P < 0.01$)	1881 (16.6)	0.1 ($P = 0.87$)
≥85 y	1586 (41.5)	-0.2 ($P = 0.81$)	481 (12.6)	-4.1 ($P < 0.01$)
Sex, %				
Female (ref)	8625 (43.9)	-	3171 (16.2)	-
Male	6111 (43.8)	- 0.2 ($P = 0.77$)	2276 (16.3)	0.2 ($P = 0.70$)
Race/ethnicity, %				
Non-Hispanic White (ref)	12,755 (46.8)	-	4879 (17.9)	-
Non-Hispanic Black	857 (29.5)	-17.3 ($P < 0.01$)	219 (7.5)	-10.4 ($P < 0.01$)
Asian	436 (45.2)	-1.6 ($P = 0.26$)	170 (17.6)	- 0.3 ($P = 0.77$)
Hispanic	585 (30.2)	-16.6 ($P < 0.01$)	168 (8.7)	- 9.2 ($P < 0.01$)
Other	223 (43.0)	- 3.8 ($P = 0.09$)	79 (15.3)	- 2.6 ($P = 0.11$)
College degree or higher, %				
No (ref)	8538 (38.4)	-	2812 (12.6)	-
Yes	6461 (57.0)	18.6 ($P < 0.01$)	2809 (24.8)	12.1 ($P < 0.01$)
Family income below the poverty level, %				
No (ref)	14,019 (45.3)	-	5254 (17.0)	-
Yes	697 (26.8)	-18.5 ($P < 0.01$)	185 (7.1)	- 9.9 ($P < 0.01$)
Having ≥ 1 Chronic condition, %				
No (ref)	1819 (38.0)	-	718 (15.0)	-
Yes	12,924 (44.9)	6.8 ($P < 0.01$)	4732 (16.4)	1.4 ($P = 0.01$)
Received a flu vaccine during the past 12 months, %				
No (ref)	1751 (18.7)	-	503 (5.4)	-
Yes	13,047 (53.8)	35.1 ($P < 0.01$)	4972 (20.5)	15.1 ($P < 0.01$)
Made ≥ 1 well visit within the past year, %				
No (ref)	699 (29.1)	-	270 (11.2)	-
Yes	14,021 (45.0)	15.9 ($P < 0.01$)	5173 (16.6)	5.4 ($P < 0.01$)
Had a usual place to go for care, %				
No (ref)	173 (22.2)	-	50 (6.4)	-
Yes	14,556 (44.4)	22.1 ($P < 0.01$)	5395 (16.4)	10.0 ($P < 0.01$)
Residence location, %				
Urban (ref)	12,102 (44.6)	-	4571 (16.8)	-
Rural	2616 (40.7)	- 3.9 ($P < 0.01$)	864 (13.4)	- 3.4 ($P < 0.01$)

	Ever had a herpes zoster vaccine, N (weighted %)	Difference, PPs (<i>P</i> -value)	Ever had a RZV vaccine, N (weighted %)	Difference, PPs (<i>P</i> -value)
Region, %				
Northeast (ref)	2426 (42.8)	-	925 (16.3)	-
Midwest	3751 (47.5)	4.7 (<i>P</i> < 0.01)	1447 (18.3)	2.0 (<i>P</i> < 0.01)
South	4865 (39.3)	- 3.5 (<i>P</i> < 0.01)	1806 (14.6)	-1.7 (<i>P</i> < 0.01)
West	3766 (49.3)	6.4 (<i>P</i> < 0.01)	1292 (16.9)	0.6 (<i>P</i> = 0.39)
Year, %				
2019	2303 (35.8)	-	772 (12.0)	-
2020	2812 (40.0)	4.2 (<i>P</i> < 0.01)	1447 (20.6)	8.6 (<i>P</i> < 0.01)
2021	2460 (40.4)	4.6 (<i>P</i> < 0.01)	1429 (23.5)	11.5 (<i>P</i> < 0.01)
2022	3227 (48.5)	12.7 (<i>P</i> < 0.01)	889 (13.4)	1.3 (<i>P</i> = 0.04)
2023	3855 (52.3)	16.5 (<i>P</i> < 0.01)	920 (12.5)	0.5 (<i>P</i> = 0.45)

SOURCE 2019–2023 National Health Interview Survey.

NOTES PP, percentage point. Herpes Zoster vaccines included zoster vaccine live (ZVL, Zostavax) and recombinant zoster vaccine (RZV, Shingrix). This analysis included 33,578 Medicare beneficiaries who were aged ≥65 years, enrolled in both Medicare Parts A and B or a Medicare Advantage plan.

Table 3

Associations of Medicare beneficiaries' characteristics with herpes zoster and RZV vaccination.

	Herpes Zoster Vaccines		RZV	
	Adjusted probability (95 % CI), %	aRD (95 % CI), PPs	Adjusted probability (95 % CI), %	aRD(95 % CI), PPs
Had prescription drug coverage, %				
No (ref)	31.7 (29.4 to 34.0)	-	10.9 (9.3 to 12.6)	-
Yes	44.6 (44.0 to 45.2)	12.9 (10.5 to 15.3)	16.5 (16.1 to 17.0)	5.6 (3.9 to 7.3)
Age, %				
65–74 y (ref)	42.9 (42.1 to 43.6)	-	17.2 (16.6 to 17.8)	-
75–84 y	46.7 (45.7 to 47.6)	3.8 (2.6 to 5.1)	15.8 (15.1 to 16.5)	-1.4 (-2.3 to -0.5)
≥85 y	40.4 (38.8 to 42.1)	-2.4 (-4.3 to -0.6)	12.3 (11.1 to 13.4)	4.8 (-6.1 to -3.6)
Sex, %				
Female (ref)	44.6 (43.8 to 45.3)	-	16.6 (16.1 to 17.2)	-
Male	43.0 (42.2 to 43.9)	-1.5 (-2.7 to -0.4)	15.7 (15.1 to 16.4)	-0.9 (-1.7 to 0.0)
Race/ethnicity, %				
Non-Hispanic White (ref)	45.7 (45.1 to 46.4)	-	17.3 (16.8 to 17.8)	-
Non Hispanic Black	35.4 (33.3 to 37.4)	-10.3 (-12.4 to -8.1)	9.2 (7.9 to 10.4)	-8.0 (-9.3 to -6.6)
Asian	40.5 (37.0 to 44.0)	-5.1 (-8.6 to -1.7)	16.0 (13.7 to 18.3)	-1.3 (-3.5 to 1.0)
Hispanic	34.3 (31.8 to 36.8)	-11.3 (-13.9 to -8.7)	10.8 (9.0 to 12.6)	6.3 (-8.1 to -4.5)
Other	48.6 (43.9 to 53.2)	2.8 (-1.8 to 7.4)	18.0 (14.1 to 21.8)	0.6 (-3.1 to 4.3)
College degree or higher, %				
No (ref)	39.9 (39.2 to 40.6)	-	13.4 (12.9 to 13.9)	-
Yes	52.9 (52.0 to 53.9)	13.0 (11.8 to 14.2)	22.1 (21.3 to 22.9)	8.7 (7.7 to 9.6)
Family income below the poverty level, %				
No (ref)	44.5 (43.9 to 45.1)	-	16.5 (16.1 to 17.0)	-
Yes	35.7 (33.5 to 38.0)	8.7 (-11.1 to -6.4)	10.9 (9.2 to 12.5)	5.7 (-7.4 to -4.0)
Having ≥ 1 Chronic condition, %				
No (ref)	41.3 (39.7 to 42.8)	-	15.7 (14.5 to 16.9)	-
Yes	44.3 (43.7 to 44.9)	3.0 (1.3 to 4.7)	16.3 (15.9 to 16.8)	0.6 (-0.6 to 1.9)
Received a flu vaccine during the past 12 months, %				
No (ref)	21.1 (20.1 to 22.0)	-	6.1 (5.5 to 6.7)	-
Yes	52.4 (51.6 to 53.1)	31.3 (30.1 to 32.5)	19.8 (19.2 to 20.3)	13.7 (12.9 to 14.5)
Made ≥ 1 well visit within the past year, %				
No (ref)	37.9 (35.5 to 40.2)	-	14.1 (12.3 to 15.9)	-
Yes	44.3 (43.7 to 44.8)	6.4 (3.9 to 8.9)	16.4 (15.9 to 16.8)	2.3 (0.4 to 4.2)
Had a usual place to go for care, %				
No (ref)	34.6 (30.7 to 38.5)	-	10.2 (7.5 to 12.9)	-
Yes	44.0 (43.5 to 44.6)	9.5 (5.5 to 13.4)	16.3 (15.9 to 16.7)	6.1 (3.4 to 8.8)
Residence location, %				

	Herpes Zoster Vaccines		RZV	
	Adjusted probability (95 % CI), %	aRD (95 % CI), PPs	Adjusted probability (95 % CI), %	aRD(95 % CI), PPs
Urban (ref)	44.2 (43.6 to 44.9)	-	16.6 (16.2 to 17.1)	-
Rural	42.3 (41.0 to 43.6)	-1.9 (-3.4 to -0.5)	14.2 (13.2 to 15.2)	-2.4 (-3.5 to -1.3)
Region, %				
Northeast (ref)	40.9 (39.5 to 42.3)	-	15.3 (14.3 to 16.3)	-
Midwest	46.1 (45.0 to 47.3)	5.2 (3.4 to 7.0)	18.0 (17.1 to 18.9)	2.7 (1.3 to 4.2)
South	41.0 (40.1 to 41.9)	0.1 (-1.6 to 1.8)	15.4 (14.7 to 16.1)	0.2 (-1.1 to 1.4)
West	49.2 (47.9 to 50.4)	8.2 (6.4 to 10.1)	16.6 (15.7 to 17.5)	1.4 (0.0 to 2.8)
Year, %				
2019	36.6 (35.3 to 37.9)	-	12.5 (11.6 to 13.4)	-
2020	40.7 (39.4 to 42.0)	4.1 (2.3 to 6.0)	21.2 (20.1 to 22.2)	9.5 (7.8 to 11.2)
2021	39.8 (38.5 to 41.1)	3.2 (1.4 to 5.0)	22.9 (21.8 to 24.0)	11.2 (9.5 to 13.0)
2022	48.0 (46.8 to 49.2)	11.3 (9.6 to 13.1)	13.1 (12.2 to 13.9)	0.7 (-0.8 to 2.2)
2023	51.9 (50.7 to 53.1)	15.3 (13.5 to 17.0)	12.3 (11.5 to 13.2)	-0.1 (-1.6 to 1.3)

SOURCE 2019–2023 National Health Interview Survey. NOTES aRD, adjusted risk difference; PP, percentage point. This analysis included 33,578 Medicare beneficiaries who were aged ≥65 years, enrolled in both Medicare Parts A and B or a Medicare Advantage plan. Estimates were weighed using the NHIS sampling weights.