Medicare and the Use of Dietary Supplements in Older Adults

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Introduction

According to recent data from the National Health and Nutrition Examination Survey (NHANES), 56% of all U.S. adults and 74% of those aged 60 or older used at least one dietary supplement in the past month (Mishra et al., 2021). Dietary supplement use has steadily grown among all ages in the last decade. This study uses data from the National Health and Nutrition Examination Survey and regression discontinuity design to assess the effect of Medicare on dietary supplement use among older adults in the United States. Although Medicare generally does not cover dietary supplements, specific vitamins and minerals are covered under Medicare Part B and Part D if prescribed by doctors to manage or treat certain medical conditions. Therefore, controlling for age and other demographic characteristics, medical conditions, and health insurance status, it is hypothesized that both the probability of supplement use and the number of supplements used will increase when an individual becomes eligible for Medicare.

Methods

The sample is drawn from the two most recent cycles of NHANES public use data: 2015-2016 and 2017-2018. The sample consists of 3,798 individuals within the age range of 55-75 at the time of the survey. After deleting observations with missing data on income, 3,419 observations were used for the final analysis. The dependent variables were: (1) whether any supplement was taken in the past 30 days and (2) the number of dietary supplements taken in the past 30 days. As Medicare eligibility is determined by age, this study uses age as the running variable and 65 as the cutoff point for the regression discontinuity design. Covariates included female, college degree, non-Hispanic White, married or partnered, income-to-poverty ratio, SNAP recipient, low or very low food security, self-rated healthy diet, medical conditions (arthritis, gout, heart failure, heart attack, stroke, thyroid problem, cancer, gallstones, asthma, and diabetes), number of prescription medicines taken, insurance status (private insurance, Medicaid, military health care, state-sponsored plan, other government insurance, and single-service plan), and prescription coverage. Table 1 reports the descriptive statistics, adjusted for survey design.

Table 1.
Descriptive Statistics

	All ages 55-75 (N=3,419)		Ages 59-71 (N=2,303)		Ages 61-69 (N=1,599)	
Taken any dietary supplement[A]	.688		.705		.702	
Total # DS	2.22	(2.89)	2.40	(3.19)	2.48	(3.35)
Key Explanatory Variables						
Age	63.42	(5.82)	64.41	(3.78)	64.7	(2.64)
Age>=65[A]	.416		.476		.519	
Medicare[A]	.426		.471		.497	
Covariates – Demographic						
Female[A]	.528		.517		.532	
College degree or higher[A]	.316		.344		.336	
Non-Hispanic White[A]	.723		.744		.743	
Married or partnered[A]	.671		.695		.684	
Income-to-poverty ratio	3.26	(1.61)	3.25	(1.60)	3.24	(1.60)

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SNAP recipient[A]	.136		.136		.132	
Low or very low food security[A]	.147		.137		.130	
Healthy diet[A]	.326		.320		.300	
Covariates - Medical Conditions						
Arthritis[A]	.475		.496		.511	
Gout[A]	.083		.094		.093	
Heart failure[A]	.097		.104		.105	
Heart attack[A]	.069		.068		.072	
Stroke[A]	.051		.049		.054	
Thyroid problem[A]	.183		.198		.206	
Cancer[A]	.188		.202		.204	
Gallstones[A]	.087		.097		.106	
Asthma[A]	.151		.152		.162	
Diabetes[A]	.192		.199		.210	
# Prescription medications taken	3.31	(3.23)	3.47	(3.20)	3.51	(3.21)
Covariates - Insurance						
Private insurance[A]	.613		.604		.593	
Medicaid[A]	.086		.088		.086	
Military health care[A]	.055		.062		.067	
State-sponsored plan[A]	.046		.047		.047	
Government insurance[A]	.030		.032		.028	
Single-service plan[A]	.155		.164		.165	
Prescription coverage[A]	.868		.873		.875	
Data cycle 2015-2016[A]	.484		.481		.483	
Data cycle 2017-2018[A]	.516		.519		.517	

Notes. Sample included individuals aged 55-75 from the 2015-2016 and 2017-2018 National Health and Nutrition Examination Survey. Mean and standard deviations adjusted for survey design. [A]Dichotomous variables.

The analytic model of this study is based on a reduced form regression-discontinuity (RD) model,

$$y_i = f(age_i, \alpha \mid X_i) + \beta \cdot Post65_i + \varepsilon_i$$

where y_i is the supplement use variables, age_i represents the individual's age in years, *f(.)* is a function that is continuous at age 65 with parameters α, $Post65_i$ is a dichotomous indicator for whether the individual is 65 or older at the time of screening, and ε_i is the error term. Following the literature, β is interpreted as the causal effect of Medicare coverage. In the fuzzy RD model, the scale factor is the difference in the probability of having Medicare coverage on either side of the threshold. For f(.), this study explores a linear model, a second-order polynomial, a linear spline model, a fuzzy RD using 2-stage least square (for a total number of supplements) or a maximum likelihood (for whether any supplements were used), and a local polynomial and partitioning method using the *rdrobust* package (Calonico et al., 2017) in Stata 16.1.

Results

The relationships between age (running variable), the cutoff point, and supplement use are illustrated in Figure 1. As hypothesized, there is a slight upward discontinuity at age 65, but in the six models illustrated, the discontinuity is not statistically significant. Table 2 summarizes the regression discontinuity estimates (β). For sensitivity check, three different bandwidths of ages were used. The β coefficients were mostly positive as hypothesized but were not statistically significant except in Probit model with linear spline specification. In that model, it was shown that Medicare increases the probability of taking any supplements by 27-32 percentage points ($p < .05$ or $p<.01$), depending on the bandwidth chosen.

Figure 1.
Regression Discontinuity

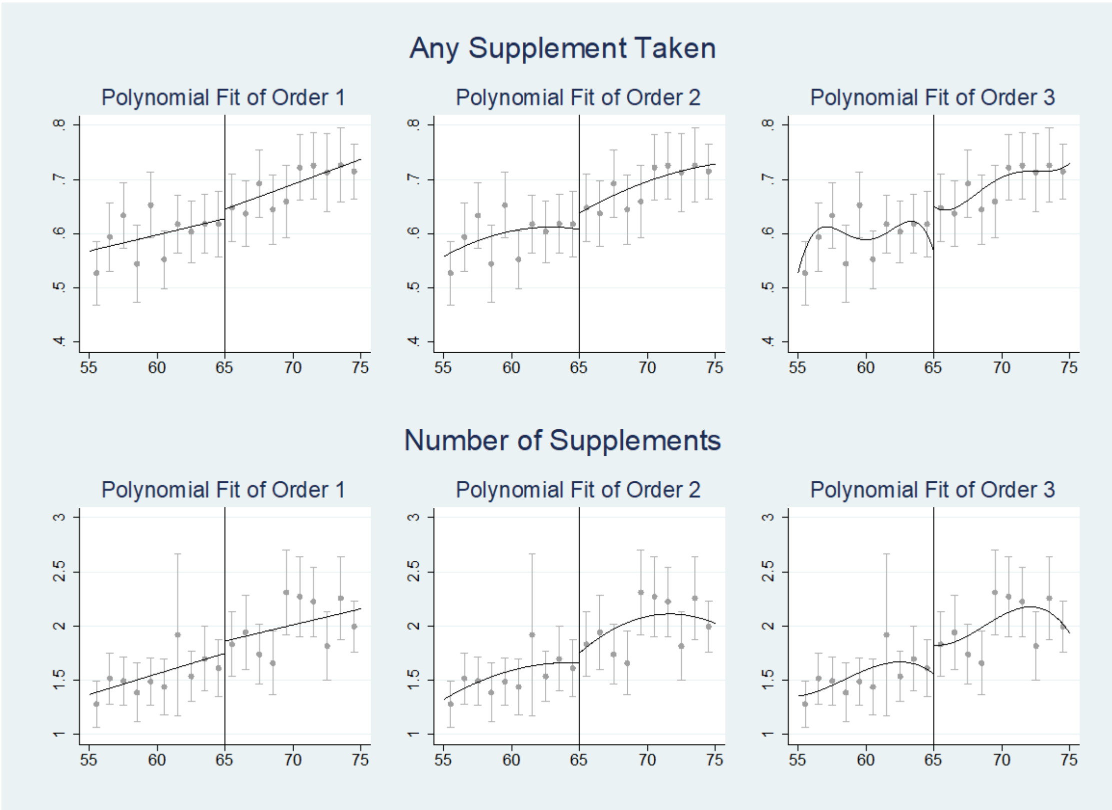

Table 2.
RDD Estimators

	All ages 55-75 (N=3,419)	Ages 59-71 (N=2,303)	Ages 61-69 (N=1,599)
Any supplement taken			
Linear Probit	.094 (.131)	.099 (.181)	.003 (.221)
Polynomial Probit (order 2)	.099 (.134)	.104 (.182)	-.032 (.215)
Linear Spline Probit	1.004 (.323)**	.920 (.320)**	.815 (.332)*
Fuzzy: IV Probit	.143 (.210)	.133 (.270)	-.054(.360)
Fuzzy: Robust RD	.050 (.063)	.056 (.078)	.081(.102)
Total # supplements			
Linear	.460 (.298)	.259 (.374)	.215 (.531)
Polynomial	.483 (.300)	.221 (.354)	.260 (.505)
Linear Spline	.654 (.827)	.593 (.833)	.473 (.872)
Fuzzy: IV Regression	.706 (.496)	.309 (.637)	.415 (.882)
Fuzzy: Robust RD	.174 (.314)	.304 (.384)	.705 (.557)

Notes. Sample included individuals aged 55-75 from the 2015-2016 and 2017-2018 National Health and Nutrition Examination Survey. Models were estimated adjusting for survey design. For "Any supplement taken," Probit coefficients and standard errors were obtained, except for Robust RD where linear probability model was assumed. For "Total number of supplements," OLS coefficients and standard errors were obtained. Covariates included female, college degree, non-Hispanic White, married or partnered, income-to-poverty ratio, SNAP recipient, low or very low food security, self-rated healthy diet, medical conditions (arthritis, gout, heart failure, heart attack, stroke, thyroid problem, cancer, gallstones, asthma, and diabetes), number of prescription medicines taken, insurance status (private insurance, Medicaid, military health care, state-sponsored plan, other government insurance, and single-service plan), and prescription coverage. A dummy for data cycle 10 was also included. ** $p < .01$, * $p < .05$

Although not reported in the tables, age, female gender, a college degree, non-Hispanic white race, and a self-reported healthy diet were positively associated with supplement use, which is consistent with the literature (Cowan et al., 2018; Kennedy, 2005; Radimer et al., 2004; Sebastian et al., 2007).

Food insecurity and certain medical conditions such as cancer, diabetes, and congestive or coronary heart failure were negatively associated with using supplements. Having been diagnosed with arthritis or thyroid issues was positively associated with supplement use. Interestingly, other insurance status or prescription coverage did not correlate with supplement use, holding demographic and medical covariates constant.

Discussion

The findings of this study provided inconsistent support for the hypotheses that Medicare increases the likelihood and the quantity of supplement use. When it did, Medicare was shown to increase the likelihood of supplement use by 27-32 percentage points among older adults. Although most models assessed did not present a statistically-significant causal effect of Medicare, one should note that the coefficients showed the hypothesized signs, and the effect sizes were quite substantial.

The RD design provides an alternative to randomized controlled trials in the real-world setting (Imbens & Lemieux, 2008); therefore, the coefficients reported in Table 2 can be interpreted as indicating that Medicare might make people more likely to use supplements on average. The unregulated supplement market and the untested truthfulness of claims surrounding the health benefits and effectiveness of supplement use could undermine the Medicare program costs. Further, supplement users tend to allow themselves more subsequent self-indulgent choices due to a delusion called self-licensing in behavioral economics (Chiou et al., 2011). Future research should investigate whether decreased nutrient intakes accompany the increased supplement use due to Medicare from food, potentially increasing the undue burden on the national health care system.

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