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Title

Impact of Supplemental Insurance on Medicare Expenditures and Healthcare Disparities Among Elderly Populations in the United States

Introduction

Previous studies have raised concerns about the potential underutilization of care among those without supplemental insurance. This study aims to elucidate the impact of supplemental insurance on Medicare expenditures and healthcare disparities, potentially guiding policy to promote equality in healthcare services.

Methods

This is a cross-sectional study of individuals aged 65 and over in the US Medicare program, representative of the elderly population. Outcomes of medical care are measured by dollar expenditures of the Medicare program, where outcomes are compared between individuals with supplemental insurance (treatment group) and those without (non-treatment group). Multivariate linear regression with covariate adjustment is used as a means of "recovering" the counterfactual. Covariates in this study include age groups, sex, race, income tercile, educational attainment level, and general health status, which are expected to be associated with Medicare expenditures. First, I used chi-square statistics to explore any differences in characteristics between individuals with and without supplemental insurance. Then, I used a one-way ANOVA test to explore how Medicare expenditures vary based on insurance status and other characteristics. Finally, I applied adjusted multivariable linear regression to assess the impact of supplemental insurance on expenditures, controlling for other factors. The analysis uses Stata version 17, applies robust adjustments, and reports statistical significance at the 0.05 level.

Findings

a. Relationship Between Covariates and Supplemental Insurance

Of the 7297 sampled members, 921 (12.62%) had no supplemental insurance, and 6376 (87.38%) had it. As shown in Table 1, groups with and without supplemental insurance differ significantly in characteristics that could be associated with Medicare program expenditures. Individuals of Black or other races, those with lower income levels, those with no more than a grade school education, and those in poor general health have a significantly higher risk of not having supplemental insurance. For instance, 57% of individuals without supplemental insurance have a low-income level, in contrast to only 30% of those with it. This may be attributed to beneficiaries with lower incomes being unable to afford supplemental insurance and therefore taking the risk of not purchasing it.

b. Relationship between Covariates and Medicare Expenditure

Individuals without supplemental insurance have a mean program expenditure of $4399, which is significantly less than the mean annual Medicare expenditure of $5789, with a mean difference of $1390. However, the association between supplemental insurance and Medicare costs is not the only factor influencing Medicare costs. Beneficiaries aged 70 and over have higher mean Medicare expenditures than those under 70. Men have a higher mean Medicare expenditure than women, with a notable difference of $778. Low and middle-income individuals, as well as those in poor or fair health, have higher mean Medicare expenditures compared to high-

income individuals and those in better health, respectively.

c. Relationship Between Supplemental Insurance and Medicare Expenditure

The first column of Table 3 shows the unadjusted linear regression model. It indicates that individuals with supplemental insurance have, on average, $1391 more in Medicare expenditure than those without, a statistically significant difference. After adjusting for covariates in the second column, the difference rises to $2698, while remaining significant. The unadjusted model exhibits a downward bias, likely due to not accounting for certain factors. As illustrated by the diagram, covariates in the adjusted model account for their relationship with expenditure and relationship with having supplemental insurance, which affected the unadjusted model's estimation. For example, a poor health condition increases medical expenditure irrespective of insurance status and is associated with a lower likelihood of having supplemental insurance.

Conclusions

Having supplemental insurance is statistically associated with receiving more medical care under Medicare for US Medicare beneficiaries, controlling for age group, sex, race, total income tercile, educational level, and general health status. Individuals belonging to Black or other race categories, those with lower income levels, those with no more than a grade school education, and those in poor general health are significantly more likely to lack supplemental insurance. With additional supportive evidence, the government could consider policy adjustments to address these disparities, thereby aiding underrepresented groups in accessing Medicare benefits.

Limitations

First, there’s a threat to the internal validity of this study. Specifically, other unmeasured differences between groups with and without supplemental insurance, which are correlated with Medicare expenditures, may bias the estimates. Further research can also include interactions between treatment and covariates in regression models. Second, the external validity of this study is potentially limited due to its reliance on data from the year 2015. As the Medicare program and insurance landscape have likely changed since then, this could impact the applicability of the results. Third, the study should further investigate what higher Medicare expenditures signify: whether they reflect a lack of necessary care for disadvantaged groups or unnecessary additional care for advantaged groups.

Table 1. Distribution of supplemental insurance by sociodemographic and health characteristics for Medicare beneficiaries aged 65+

	No supplemental insurance n = 921	Supplemental insurance n = 6376
Age (years) (%)*		
65-69	20.96	23.56
70-74	18.46	21.68
75-79	20.41	21.14
80-84	19.76	19.24
85+	20.41	14.38
Sex (%)*		
Male	43.11	39.18
Female	56.89	60.82
Race/ethnicity (%)*		
Black	24.21	4.39
White	71.34	94.40
Other	4.45	1.21
Income tercile [1](%)*		
Low ($0 to $9617)	56.68	29.94
Middle ($9624 to $17885)	32.79	33.42
High ($17900 to Higher)	10.53	36.64
Educational attainment (%)*		
Grade school.	48.21	23.84
High school	38.33	48.38
Beyond high school	13.46	27.78
General health (%)*		
Excellent	13.68	17.19
Very good	18.24	25.94
Good	28.56	31.62
Fair	25.08	18.62
Poor	14.44	6.63

* $p < .05$ for a chi-square test of no association between supplemental insurance status and this characteristic.

Table 2. Annual Medicare expenditures by supplemental insurance, sociodemographic and health characteristics for Medicare beneficiaries aged 65+

	Mean Annual Medicare Expenditures ($)
Supplemental insurance *	
Has no supplement	4398.51
Has supplemental insurance	5788.58
Age (years) *	
65-69	4521.83
70-74	5442.38
75-79	5991.75
80-84	6421.90
85+	5969.38
Sex *	
Male	6082.22
Female	5304.63
Race/ethnicity	
Black	6369.02
White	5551.20
Other	5894.68
Income tercile *	
Low	5905.66
Middle	6020.46
High	4913.51
Educational attainment	
Grade school.	5514.26
High school	5799.88
Beyond high school	5376.80
General health *	
Excellent	2811.64
Very good	3671.78
Good	5161.11
Fair	7487.44
Poor	15204.80

* $p < .05$ for an ANOVA test of no difference between mean expenditures across groups defined by this characteristic.

Table 3. Regression coefficients from an OLS estimate of the impact of supplemental insurance on mean annual Medicare expenditures (Unadjusted, Adjusted) for Medicare beneficiaries aged 65+

	Unadjusted	Adjusted
Supplemental insurance		
No supplement	---	---
Has a supplement	1390.07*	2698.10*
Age (years)		
65-69		---
70-74		949.86*
75-79		1362.21*
80-84		1988.47*
85+		1794.4*
Sex		
Male		---
Female		-1275.00*
Race/ethnicity		
Black		---
White		-988.93
Other		-80.65
Income terciles		
Low		---
Middle		-58.37
High		-571.99
Educational attainment		
Grade school.		---
High school		1463.56*
Beyond high school		1654.26*
General health		
Excellent		---
Very good		927.89
Good		2450.27*
Fair		4996.33*
Poor		12966.27*
Constant	4398.51	-78.49

* $p < .05$ for t-test of the hypothesis that $b = 0$ for this regression coefficient.

Diagram. Relationships between treatment variable t, outcome variable y, and covariates x