The impact of Medicare Part D on cognitive functioning at older ages

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ABSTRACT

Research has shown that the establishment of Medicare prescription drug benefit in 2006 leads to improvement in medication adherence and mortality outcomes. Despite a clear connection between physical/mental health and the risk of dementia, little is known about the extent to which this reform has affected the cognitive functioning of the elderly. Using data from the Health and Retirement Study and difference-in-differences approach, this study provides the first evidence on the cognition-enhancing effects of Medicare Part D. Our estimates show that Part D implementation is associated with 1.6% increase in cognitive functioning or 1.1-year delay of cognitive aging among benefit-eligible persons. Further analyses indicate that most of the cognitive benefits accrue to the vulnerable populations who previously lacked prescription drug coverage, and that a reduction in cardiovascular mortality is the most likely pathway through which the expansion improved cognitive functioning.

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1. Introduction

Memory-related disease including dementia and Alzheimer's disease is considered primarily a vascular disorder in which interrupted blood flow impairs the neurologic function of the brain (de la Torre, 2004; de la Torre and Mussivand, 1993). Research has shown that deficiency of oxygen and nutrients reaching the brain triggers neuronal cell death (Aliev et al., 2003), and results in brain shrinkage and cognitive dysfunction (de la Torre, 2002). While temporary oxygen deficit exerts a limited influence on the brain, damage over the extended period leads to a progressive decline in cognitive functioning and manifest as vascular dementia. In general, the risk factors for heart and vascular failures are associated with increased risk of dementia in later life (Launer et al., 1995; Skoog et al., 1996; Kivipelto et al., 2001). Likewise, appropriate treatment of cardiovascular disease is known to delay cognitive decline or improve the related symptoms (Gardener et al., 2016).

In a chronic stage of cardiovascular disease, pharmacologic treatment is often recommended if no improvement occurs with healthy diet and exercise (Kavey et al., 2003). Studies have shown that innovation in antihypertensive agents - such as the introduction of angiotensin-converting enzyme (ACE) inhibitors, beta-blockers, and oral diuretics - leads to a significant reduction in cardiovascular morbidity and mortality (Cutler, 2005; Cutler et al., 2007). Despite the benefits of pharmacotherapy on cholesterol and blood pressure control, adherence to antihypertensive medications remains low in elderly patients (Benner et al., 2002). A recent meta-analysis on prescription refill frequency finds that nearly one-third of patients with coronary heart disease do not take their medications as prescribed (Naderi et al., 2012). People who skip medications name several cost-related reasons, including high drug prices and copayment, limited prescription drug coverage, and the financial burden of long-term drug use (Cole et al., 2006; Kronish and Ye, 2013; Steinman et al., 2001).

Medicare Prescription Drug program (Part D) provides prescription drug coverage through private drug plans approved by the federal government. The program is established as a part of the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003, with a goal of extending prescription drug coverage to Medicare beneficiaries and making prescription medications affordable. Medicare Part D went into effect in 2006 with an immediate increase in enrollment. Enrollment grew to 22.5 million beneficiaries by June 2006 (53% of Medicare beneficiaries) and reached up to nearly 39.2 million in 2015 (73%) (Kaiser Family Foundation, 2015). Although the drug coverage expansion is established as voluntary benefits, the rate of participation has been high, especially for those who previously lacked drug coverage (Heiss et al., 2006; Levy and Weir, 2010).

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The effect of Medicare Part D on prescription drug utilization is well documented. The 2006 expansion of Medicare has been linked to 12.8% rise in prescription drug use and 18.4% reduction in user cost among beneficiaries (Lichtenberg and Sun, 2007), likely due to 20% lower increase in drug price (Duggan and Morton, 2010). Among different subclasses of pharmaceuticals, the demand for previously under-utilized but essential medications such as anti-diabetic and antihypertensive drugs increased the most (Polinski et al., 2011). Studies on pharmacy claim data show that prescription fillings for angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARB), and beta-blockers - the top three dispensed antihypertensive drug classes - increased significantly among beneficiaries who had no drug coverage prior to 2006 (Donohue et al., 2010; Huh and Reif, 2017; Zhang et al., 2011). Several studies find a similar increase in the use of cholesterol-lowering drugs in terms of both amount and adherence (Schneeweiss et al., 2009; Zimmer, 2015). These medications include blood thinners and lipid-lowering medications such as statins, warfarin, clopidogrel, and proton pump inhibitors - all of which likely to improve vascular health by preventing clots formation in blood vessels.

Given the increased access to medications treating high cholesterol and heart disease, several studies have examined the effect of Medicare Part D on cardiovascular conditions. Dunn and Shapiro (2015) find that cardiovascular-related deaths dropped immediately after Part D expansion in 2006, while mortality rates for non-cardiovascular causes remain unchanged. Their estimate shows that nearly 7,000–26,000 Americans above age 65 could survive by mid-2007 as a result of drug coverage provision. In a similar study, Huh and Reif (2017) find 2.2% annual mortality decline in Part D enrollees, driven by 4.4% drop in cardiovascular mortality. This study estimates approximately $5 billion annual welfare gain from Medicare Part D due to mortality reduction.

The evidence suggests that Medicare Part D may have contributed to slowing down cognitive aging, by expanding access to cardiovascular agents and improving heart and vascular efficiency. While there has been no research linking Part D expansion directly to cognitive improvement, previous studies show a significant cognitive benefit of antihypertensive therapy in patients with cardiovascular disease. For instance, the Systolic Hypertension in Europe (Syst-Eur) study estimates that active treatment of systolic hypertension using antihypertensive agents is associated with 50% decrease in the incidence of dementia (Forette et al., 2000; Staessen et al., 1997). The follow-up study finds a larger reduction in dementia risk among patients who received antihypertensive therapy over the longer-term (Forette et al., 2002). In a similar vein, the Perindopril Protection Against Recurrent Stroke Study (PROGRESS) finds 30–40% reduction in cognitive decline associated with perindopril and indapamide therapy for patients with stroke or ischemic heart disease (The PROGRESS Collaborative Group, 2003).

In addition to the management of circulatory system, Part D's cognitive benefit is expected to operate through relaxed financial strain and improved mental health. Medicare Part D resulted in a reduction in out-of-pocket drug spending (Yin et al., 2008), and this financial protection aspect could improve physical and cognitive health by expanding medication consumption (Engelhardt and Gruber, 2011) or through the increase in disposable income that allows better access to health care (Ayyagari and Frisvold, 2016). Moreover, previous research reports increased use of psychotropic drugs (Donohue et al., 2011) and clinically meaningful improvement in mental health among Part D eligible persons (Ayyagari and Shane, 2015). Depression is a well-known risk factor for short-term cognitive decline and dementia in later life (Jorm, 2000). To the extent antidepressants improve mental health, Part D expansion is likely to have a positive impact on cognitive functioning.

This study evaluates the cognition-enhancing effect of Medicare Part D using data drawn from the Health and Retirement Study (HRS). We estimate the impact of Part D on cognition by comparing pre vs. post-2006 changes in mean episodic memory score between the age-eligible and ineligible respondents. Results show that the expansion is associated with 1.6% increase in episodic memory score among those who qualify for the benefits relative to the younger ineligible group. Compared to the mean yearly reduction in episodic memory calculated from wave-to-wave variation, this improvement corresponds to the 1.1-year delay of cognitive aging. Further investigations show that this cognitive benefit of Part D is more pronounced for beneficiaries with high blood pressure, diabetes, and heart problem, indicating cardiovascular disease treatment using prescription drugs as the most likely pathway.

2. Method

2.1. The health and retirement study

The HRS is a biannual longitudinal study of 37,000 American adults aged 51 or older from 23,000 households. The study collects information on demographic and socioeconomic characteristics including health, insurance coverage, and medical care utilization, which are essential to understanding individual circumstances in later life. The first study began in 1992 with an interview of persons who were born between 1931 and 1941. Beginning in 1998, the study expands with the 1993 Assets and Health Dynamics (AHEAD) cohort whose birth date lies between 1890 and 1923. In 1998, Children of Depression Age cohort (born 1924–1930) and War Baby cohort (born 1924–1930) entered the HRS to form a fully representative sample of U.S. population above age 50. Additional birth cohorts born between 1948 and 1953 (Early Baby Boomer cohort) and between 1954 and 1959 (Mid Baby Boomer cohort) are added to the 2004 and 2010 survey to supplement the loss of observations due to attrition.

The study period spans 11 years and six waves from 2000 to 2010. We exclude more recent data in 2012 and 2014 to avoid potentially confounding effect of the Affordable Care Act (ACA) reform on health and pharmaceutical industry. The sample is first limited to respondents aged between 60 and 70 at any wave during the study period. This sample selection allows us to construct the "treatment" and "control" groups of roughly comparable size. Mid Baby Boomer cohort is excluded as they joined the survey after the implementation of Part D program in 2006. We further drop individuals under age 65 with Medicare coverage. This group is predominantly disabled persons who could qualify for Medicare benefit before turning age 65. Including these respondents leads to a violation of the identifying assumption that only those age-eligible are affected by Part D implementation. Dropping observations with no responses or miscoded values leads to a final sample of 33,953 person-year observations.

2.2. Measures of cognitive functioning

This study examines immediate and delayed recall tasks in the HRS to capture cognitive functioning. While the survey instruments provide information on other cognitive domains, only these two recall tasks are asked of all HRS respondents regardless of their age. Immediate recall is assessed by reading a list of 10 specific nouns and asking the respondents to recall as many words as possible in any order. After answering other cognition questions for 5 min, the respondents are instructed to recall the phrases previously presented in the immediate recall task to measure delayed recall ability. Each recall score is the count of the correctly remembered words and ranges from 0 to 10. The sum of these two scores is