Rational Self-Medication

BY MICHAEL E. DARDEN AND NICHOLAS W. PAPAGEORGE, JOHNS HOPKINS UNIVERSITY

Beginning with Michael Grossman's 1972 paper on the demand for health, economists have envisioned health as a form of human capital that increases survival rates, raises productivity, and improves the quality of life. Accordingly, behaviors that can improve health, such as exercise, healthy eating, abstaining from risky behavior, and medication usage, can be viewed as costly investments in human capital. Rational individuals invest in their health until the long-term benefits of doing so cease to outweigh the upfront costs. This basic model has been expanded to incorporate the realities of many health-related decisions. Examples of these realities include uncertainty and learning how well a drug will work, side effects that discourage the use of effective medications, addiction that encourages the use of harmful substances, and the interaction between better pharmaceuticals and other health behaviors.

Consistent with this framework is the idea that many individuals, lacking access to good medication, may take matters into their own hands by turning to substances that are potentially harmful in the long run (e.g., alcohol or opioids) in an effort to manage short-run symptoms of illnesses, such as chronic pain or depression. Seen this way, many individuals who use harmful or addictive substances are rationally choosing to self-medicate; that is, they optimally make use of available technologies to alleviate symptoms, albeit at the risk of future poor health, addiction, and other negative consequences. Understanding how people self-medicate and under what circumstances is important because self-medication is socially costly, especially if it leads to addiction. But treating the use of dangerous substances as an error in judgment or an act of desperation—rather than as a rational but risky attempt to mitigate health problems using prevailing technology—can lead to the wrong policy conclusions. For example, viewing problematic drinking as an error suggests policies to curb drinking. Viewing it as rational self-medication would suggest that such policies could backfire if people substitute for alcohol substances that are even more harmful. A better policy response would be to promote treatment innovations that obviate the need to self-medicate, thus inducing rational actors to use less harmful substances.

We test the rational self-medication hypothesis. Particularly, we ask whether the emergence of effective medication obviates the need to self-medicate with riskier substances. We leverage a technological advancement—the approval of Selective Serotonin Reuptake Inhibitors (SSRIs) by the Food and Drug Administration (FDA) in 1988—as an exogenous change in the choice set for the management of depression. Rational self-medication predicts that following the introduction of new medications, the use of riskier treatment alternatives should decline. In the case we study, if heavy drinking is in part a form of self-medication, we predict that heavy alcohol consumption should fall following the introduction of SSRIs. If we are unable to detect such substitution patterns as better medications emerge, heavy drinking is less likely to be a form of self-medication.

Depression is an ideal context to study self-medication for several reasons. First, it is prevalent. In the United States, Major Depressive Disorder (which we simply refer to as depression unless the meaning is unclear) affects 8.1 percent

of individuals over the age of 18. Second, prevalence is heterogeneous among socioeconomic groups. Depression is about four times more likely to affect poor individuals than nonpoor individuals. This is especially concerning in the context of self-medication if low-income individuals have less access to medical care, safer medications, or treatment options, such as therapy. Moreover, low-income individuals may face other challenges that encourage the use of addictive substances, compounding the risks of self-medication. Third, depression affects many facets of life, including human capital accumulation, productivity, family structure, risky behaviors, and employment, along with other physical health outcomes, such as cancer, cardiovascular disease, and diabetes. Therefore, it is little surprise that individuals would engage in costly attempts to alleviate their symptoms. Fourth, massive stigma surrounding mental health treatment might make self-treatment (e.g., heavy drinking) a more attractive option. Finally, and key to our empirical work, there have been large changes in treatment options over time, particularly the emergence of SSRIs, which replaced earlier drugs that, although effective, had massively adverse side effects that precluded widespread use.

To investigate self-medication empirically, we use data from the Framingham Heart Study (FHS) Offspring Cohort. The data set includes longitudinal information on alcohol, tobacco, and antidepressant consumption, as well as depression measures for roughly five thousand individuals over a 40-year period. Exploiting the arrival of SSRIs, we estimate a series of difference-in-differences models to provide strong prima facie evidence of substitution away from alcohol and toward antidepressants once they become available. Estimates suggest that taking an antidepressant is associated with a statistically significant 3.9 percentage point (12.5 percent) increase in abstinence from alcohol. Effects are stronger for men and potentially concentrated among individuals with moderate depression. The latter finding underscores the self-medication hypothesis because it suggests that until better options emerge, alcohol is an effective way to combat depression.

Simple regression estimates ignore potentially important dynamics, including the stock of addiction, which could affect how costly it is to switch from alcohol to SSRIs. Indeed, the self-medication hypothesis explicitly envisions possible addiction as a calculated risk. To address the dynamics inherent in self-medication, we estimate a system of dynamic equations that approximates a more general structural model. Specifically, we estimate dynamic equations for alcohol, tobacco, and antidepressants jointly, along with depression, attrition, and mortality to capture heterogeneity in uptake of antidepressants and to control for selective exit from the study.

Incorporating dynamics both corroborates initial estimates and allows us to examine counterfactual policies. First, following the introduction of SSRI pharmaceuticals, we examine a counterfactual scenario in which we impose antidepressants on the entire sample relative to our baseline simulation. Heavy drinking declines by 3.4 percentage points, primarily driven by men. Moreover, although we show that the reduction in heavy drinking is largest in those simulated to be moderately depressed, we find no change in heavy alcohol consumption at any period for those simulated to be in the highest tercile of depression. The lack of a decrease in heavy alcohol consumption for the most depressed individuals could be a result of significant addiction to alcohol.

To investigate the role of addiction, our second simulation sets lagged alcohol consumption to zero in the contemporaneous alcohol demand equation regardless of simulated behavior in the previous period. Overall, regardless of gender or mental health, heavy alcohol consumption drops enormously. Antidepressant usage (which is chosen endogenously in this simulation) increases by 5.5 percentage points by the final exam of FHS, and the magnitude of this substitution increases with depression severity. We interpret these results as a suggestion that alcohol addiction may significantly hinder substitution away from alcohol. Finally, we demonstrate that the simulated reduction in heavy drinking is equivalent to a roughly 20 percent increase in alcohol prices. Together, our results exploiting a large medical innovation provide compelling evidence of self-medication. When introduced to a new and better medical technology, individuals who self-medicate substitute it for more harmful substances.

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