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The impact of financing of screening tests on utilization and outcomes: The case of amniocentesis☆

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ABSTRACT

We use a 1993 policy change in Israel's public healthcare system that lowered the eligibility age for amniocentesis to 35 to study the effects of financing of screening tests. Financing is found to have increased amniocentesis testing by about 35%. At ages above the eligibility threshold, utilization rates rose to roughly 33%, reflection nearly full takeup among prospective users of amniocentesis. Additionally, whereas below the age-35 threshold amniocentesis utilization rates increase with maternal age, this relation is muted above this age. Finally, no evidence is found that financing affects outcomes such as pregnancy terminations and births of children with Down syndrome. These results support the view that women above the eligibility threshold tend to refrain from acquiring inexpensive information about their degree of risk that absent the financing they would acquire, and instead, undergo the accurate and costly test regardless of additional information that noninvasive screening would provide.

1. Introduction

Screening tests—the testing of seemingly well people to find those at increased risk of a disease or disorder (Grimes and Schulz, 2002)—figure importantly in various aspects of contemporary medical practice.[1] It is widely accepted that due to various market and individual failures, there is too little takeup of screening tests. Therefore, it is not surprising that many developed countries have national screening programs in place for various diseases and disorders. Screening tests, however, are associated with substantial costs.[2] Thus, it is important to understand the effects of screening programs in order to ensure their cost-effectiveness.

This study examines the issue of financing of screening tests in regard to amniocentesis (or "amnio"), a routine prenatal test in which chromosomal disorders may be diagnosed. This setting is of particular interest because while amnio is an accurate invasive diagnostic test that is expensive in terms of financial cost and risk of miscarriage, other noninvasive screening tests[3] are available at low cost, albeit with less accuracy. Such a context may elicit an "unintended" behavioral response among eligible women. Financing of amniocenteses may induce women to skip noninvasive prenatal screening tests and undergoing amnio regardless of information about the extent of personal risk that noninvasive screening would provide. This behavioral response may lead to over-utilization of

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[1] According to Cutler (2008), for example, cancer screening, mainly mammography for breast cancer and colonoscopy for colorectal cancer, is the main reason for the decline in cancer mortality since 1990. In the context of prenatal care, Boyd et al. (2008) posit that improvement in prenatal screening is responsible for the increase in detection rates of birth defects.

[2] The costs of screening for breast cancer and colorectal cancer, for example, are estimated at more than 30% of the cost of treating these conditions Cutler (2008). The cost of prenatal screening in the United States, is around $800 on average for the large majority of the four million women who give birth each year (see Song et al. (2013)).

[3] Such as nuchal translucency and the triple test.

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amniocentesis and, in turn, greater spending on invasive testing, and other costs such as more post-procedure miscarriages.

More generally, such behavioral response may arise when financing is provided to expensive screening tests such as amniocentesis, chorionic villus sampling, colonoscopy, bone-density testing or transrectal ultrasonography. Since financing lowers the cost of the expensive test to those eligible for it, eligibles may refrain from acquiring inexpensive information about their degree of risk—information that they would acquire were it not for the program—and instead have the accurate and costly test. As a result, financing may result in takeup by low-risk individuals. To the extent that this issue is important empirically, it may challenge the cost-effectiveness of financing of screening tests.

It is important to stress, however, that this issue is not unique to the financing of expensive screening tests. It may arise in any context where a subsidy may distort individuals' incentives to acquire information about their condition or degree of risk. Interestingly, a recent study investigates a very different setting in which a similar interplay arises. Cohen et al. (2015) ran a field experiment in Kenya in which they subsidized a malaria medication (ACT) that, without accurate diagnosis, may be used presumptively, as well as a rapid malaria diagnostic test (RDT). This controlled setting allowed them to study the effect of the ACT subsidy on utilization and the effect of RDT subsidy on demand for ACT. Their results show that making information about the nature of the illness less expensive—namely, subsidising RDT—substantially increased the demand for RDT but did not lessen the demand for ACT. The former result suggests that individuals' demand for information about their condition is price-sensitive; the latter result is surprising because it suggests that in the case of ACT, information about the nature of the illness does not affect demand for the medication.[4]

The specific context in which this problem is studied below, prenatal screening, is important in its own right. Many developed countries run national prenatal screening programs. Private insurers, too, often cover invasive prenatal screening.

Here, we examine empirically the causal role of government financing on the takeup and outcomes of amniocentesis tests. We investigate this issue by exploiting a 1993 policy change in Israel's public healthcare system that lowered the eligibility age for amniocentesis tests from 37 to 35 (hereinafter: "the reform"). We use two aspects of the reform to quantify the impact of government financing on the use of amniocentesis. The first is the change in eligibility over time. We examine the change in takeup of amniocentesis by women aged 35–36, the "treatment" age group, relative to that among comparison groups comprised of women in "untreated" age groups, following a standard DD approach. The second is the sharp eligibility threshold that the reform created. Since 1993, women aged 35 years or above at the time of conception have been eligible for public coverage.[5] We use this abrupt change in eligibility to compare the behavior of women who became pregnant within a narrow band on either side of the threshold, that we quantify using an RDD method.

The DD analysis indicates that utilization of amniocentesis by the treatment group increased by roughly 38%, relative to the comparison group. Our RDD analysis detected an increase of about 35% in the number of amniocentesis tests at the age-35 threshold—very similar to the DD estimate. In the period before the reform, we find a similar increase in the number of tests around age 37, the pre-1993 threshold, with no evidence of an increase in the number of tests around age 35. This confirms the interpretation of the results as tracing to government financing rather than physicians' "standard practice".

In addition to the extent of amniocentesis takeup, we study the impact of the reform on the relation between utilization rates and maternal age. Under the age-35 threshold, amniocentesis utilization rates, in natural log terms, grow, roughly linearly, with maternal age at the rate of about 25% per maternal age year, to approximately 22% just under the age-35 threshold. Just above the age-35 threshold, amniocentesis takeup rates jump discretely to roughly 33% and the slope of the utilization rate drops discretely and is statistically indistinguishable from zero. Importantly, about 60% of the population in the area we study (the Jerusalem vicinity), defines itself as religiously observant (mostly Jewish and Muslim) and do not typically consider amnio as an integral part of prenatal care. Thus, the observed above-threshold takeup rate roughly corresponds to the proportion of women who are "prospective users" of amnio. Given that risk of Down syndrome increases substantially with maternal age, these results support the view that under age 35, the positive relation between maternal age and amniocentesis takeup rates exists because women tend to base their decision to undergo amnio on information about their degree of personal risk, which they acquired by noninvasive screening. Above age 35, in contrast, the relation between maternal age and the utilization rates is muted; this suggests that once the test is paid for, women tend to take it irrespective of their age conditional Down syndrome pregnancy risk.

It would be interesting to corroborate our results by directly examining the crowd-out in utilization of noninvasive prenatal tests, namely to examine whether eligibility for amnio decreases women's take-up of noninvasive tests. Unfortunately, a caveat of this paper is that we do not observe utilization of noninvasive prenatal tests.

We use a similar RDD approach to examine the effect of the age-35 threshold on outcomes. We find no evidence that the age-35 threshold is associated with higher rates of pregnancy terminations or lower rates of Down syndrome births. These results are consistent with the view that, on average, paying for the test encourages low-risk women to take it. Notably, however, small sample size makes it impossible to distinguish between lack of statistical power and the absence of an effect on outcomes.

In a recent pair of studies Bitler and Carpenter (2016, 2012) examine the effects of state health-insurance mandates that require coverage of screening mammograms and Paps smears, respectively. They find that the mandating insurance coverage increases takeup rates substantially and that mammography mandates increase early in-situ ductal carcinoma (DCIS) detections. Whereas Bitler and Carpenter (2016, 2012) investigate the impact of mandates relating to noninvasive and relatively inexpensive screening tests, this study focuses on the interplay between the price distortion of an invasive and expensive test and individuals' demand for inexpensive information about their degree of risk. As shown below, this interaction has important consequences.

The results of the study provide insights on the effects of financing in screening programs. They show that, consistent with the foregoing literature, financing induces uptake substantially. The main contribution of this study, however, is its emphasis on the problem of distortion in individuals' incentives to acquire information about their personal risk or condition. The results show that in weighing the financing of screening tests, it is important to keep the availability of other screening options in mind. When an inexpensive screening test exists, financing may crowd-out individuals' propensity to acquire information about their degree of risk in a way that may impair the cost-effectiveness of the financing provided. Conditioning financing on the results of the inexpensive test may help resolve this issue.

[4] Cohen et al. (2015) are aware of this issue and point out that this response may gather strength over time as households learn that RDT is reliable.

[5] Before 1993 the age of eligibility was 37.