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## Is Preventive Care Worth the Cost? Evidence from Mandatory Checkups in Japan

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**P**revention of chronic disease has become a key health policy initiative in recent years. For example, the World Health Organization (WHO) provides a road map and menu of policy options that aim to reduce premature deaths due to chronic noncommunicable diseases such as cardiovascular disease, cancer, and diabetes. An important part of prevention is monitoring an individual's health condition and intervening early enough to make a difference in the course of a disease. Traditional approaches include routine health checkups, cancer screening, and disease-management programs. More recently, wearable and portable devices are gaining popularity, allowing people to monitor their own health in real time. Advocates suggest that such real-time health signals will lead to appropriate preventive care and improve health outcomes at a lower cost compared to conventional approaches, although others recognize that this is no panacea.

While the importance of disease prevention is hard to deny, relatively little attention has been paid to whether preventive care along different margins is worth its cost. The aim of this paper is to investigate this issue in the context of mandatory health checkups in Japan, focusing on risk for diabetes mellitus

(DM). We first examine whether health signals about the risk of developing DM embodied in health checkup reports affect individuals' medical care utilization, health behaviors, and health outcomes. We then examine whether the additional care triggered by a health signal is worth the cost.

To identify the cost effectiveness of preventive care, we exploit the fact that health checkup results just below and just above a threshold level of fasting blood sugar (FBS) may be viewed as random. People with measured values just above the threshold may receive more preventive care, such as further diagnostic tests and diabetes-related physician visits, compared to those with values just below the threshold. This additional care may lead to better health outcomes for the individuals just above the threshold, compared to those just below the threshold. By comparing outcomes of these people, we can assess the cost effectiveness of providing preventive care around the threshold.

Using Japanese data provides several advantages. First, we can construct unique individual-level data, consisting of medical claims data, health survey data, and health checkup data. These data sets can be linked by a patient ID. This rich longitudinal data set allows us to examine how health signals

embodied in a checkup affect the individual's medical care utilization and health outcomes after the checkup.

Second, an annual health checkup is mandatory in Japan; this mitigates concern about sample selection bias. Typically, health-conscious people are more likely to obtain health information by, for example, participating in health checkups or by using wearable devices, and this sample selection is likely to bias estimation results.

Third, we have health outcome variables suitable for prevention. We apply a Japan-specific risk prediction model to our data to predict the five-year risk of mortality and significant DM complications for each individual. These measures allow us to examine directly whether additional preventive care promotes health as measured by medium- and long-run health outcomes. This is an advantage compared to only examining intermediate health measures that are more easily available but are also more difficult to interpret.

Diabetes mellitus is an important case to study because it is a costly and incurable chronic disease of growing prevalence and, accordingly, one of the primary targets for prevention. It is often called a "silent killer" because individuals are not initially aware of the condition, but in the long-run they suffer serious complications, including eye, heart, kidney, and nerve problems. Recent research underscores the economic and human cost of DM: in 2014, approximately 422 million adults had diabetes worldwide, incurring health costs estimated to total \$825 billion per year. The disease can generally be prevented by early intervention to reduce lifestyle risk factors (such as smoking, unhealthy diet, sedentary lifestyle, and obesity). Diabetes mellitus and pre-diabetes can be detected by elevated blood sugar levels, a diagnostic test commonly included in regular health checkups. Indeed, in Japan, policymakers consider this so important that in 1972 they mandated that all employees receive an annual screening for elevated blood sugar.

We have three main findings. First, at a relatively low diagnosis threshold that corresponds to "borderline type" DM in Japan (sometimes called "pre-diabetes"), we find strong evidence that surpassing the threshold significantly increases medical care utilization as measured by DM-related physician visits and DM-related outpatient expenditures, including medications. This finding indicates that people do respond to health signals by undertaking follow-up visits with physicians and thus health signals can potentially promote preventive care. However, the absolute impact of the signal is small: exceeding the threshold increases the probability of visiting a physician for DM treatment by only 5 percentage

points (albeit representing a 50 percent increase, i.e., from 10 percent to 15 percent). This small magnitude indicates that health signals do not effectively translate into preventive care for the majority of individuals. Indeed, we also find no evidence that individuals improve their health-related behaviors (whether on their own or in response to physician advice during preventive care). One of the reasons for this low response rate may be the lack of intervention: currently, after receiving a warning, the decision of whether or not to visit a physician is entirely up to the individual; no one monitors response or reminds individuals about the importance of a follow-up visit.

Second, despite the significant increase in medical care utilization at the borderline threshold, we find no evidence that the additional care improves health outcomes. This is true both for intermediate health measures and for predicted risks of mortality and serious complications. Thus, we find no evidence that DM-related medical care is cost-effective around this threshold. The results hold both in the short-run (one year after a checkup) as well as in the medium-run (three years after a checkup). These results suggest that the threshold may need to be reexamined from the perspective of cost-effectiveness.

Third, at a higher diagnostic threshold, above which the person is a "diabetic type," we do not find robust evidence that crossing the threshold increases medical care utilization or improves health outcomes. At first glance, these results are surprising, because the results indicate that people are less responsive to a signal of higher risk. However, inspections of actual checkup reports revealed that employers rarely flag this threshold in their health reports, and thus most individuals do not receive a health signal when crossing that threshold. Since almost all employers focus on the lower threshold to signal a warning of pre-diabetes, and neglect the threshold signifying the higher risk category of diabetes, we interpret our empirical results as suggesting that policymakers should reconsider the importance of sending a separate signal at each threshold when multiple diagnosis thresholds are of independent clinical significance.

#### **NOTE:**

This research brief is based on Toshiaki Iizuka, Katsuhiko Nishiyama, Brian Chen, and Karen Eggleston, "Is Preventive Care Worth the Cost? Evidence from Mandatory Checkups in Japan," NBER Working Paper no. 23413, May 2017, <http://www.nber.org/papers/w23413>.