2019

Medical Innovation and the Employment of Cancer Patients

Vincent Pohl
University of Georgia

Citation

Pohl, R. Vincent. 2019. "Medical Innovation and the Employment of Cancer Patients." Policy Brief. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. https://doi.org/10.17848/pb2019-12

W.E. UPJOHN INSTITUTE

JUNE 2019

POLICY BRIEF

Medical Innovation and the Employment of Cancer Patients

R. Vincent Pohl

BRIEF HIGHLIGHTS

- *Innovations in cancer treatment may alleviate the economic costs of cancer diagnoses, such as a decline of labor supply.*
- *I measure innovation during the 1990s and 2000s by the number of approved drugs and patents related to cancer diagnosis and treatment.*
- *Using cancer registry and tax return data from Canada, we investigate the employment outcomes of breast and prostate cancer patients as a function of medical innovation.*
- *Medical innovation reduces the negative employment effect of cancer diagnoses by about 65 percent during the study period.*
- *The economic benefits of medical innovation are limited to cancer patients with postsecondary education, raising concerns about equal access to new treatments.*

For additional details, see the full working paper at https://research.upjohn.org/up_workingpapers/306/.

Cancer is the second-most common cause of mortality and morbidity in developed countries. In addition to its direct costs in terms of quality-adjusted life years lost, it also contributes to the economic costs of disease as cancer patients often reduce their working hours or cease employment completely.

Recent decades have seen increased innovation in the treatment of many types of cancer. Pharmaceutical innovation has resulted in new chemotherapy drugs—often used in combinations—that are more effective in targeting tumors while reducing harm for healthy body tissue. In addition, new surgical techniques alleviate side effects and lead to shorter recovery times.

I investigate whether medical innovation in the treatment of breast and prostate cancers, which are the most common types of cancers among women and men, respectively, also lead to a reduction in the economic costs of cancer. Specifically, I use large administrative databases from Canada to estimate how the employment effect of a cancer diagnosis is moderated by medical innovation. I employ a difference-in-differences strategy combined with matching to estimate the causal effect of a cancer diagnosis and how it changes with medical innovation.

Confirming previous research, I first find that a cancer diagnosis reduces employment by 2 to 4 percentage points. Second, the cumulative medical innovation that improved cancer treatment during the 1990s and 2000s led to a decrease in the negative employment effects of prostate and breast cancer by about 65 percent. Hence, the approval of additional drugs and the introduction of other medical technologies over this time period are associated with a substantial reduction in the economic costs of cancer. Finally, I consider the employment effects of cancer diagnoses and medical innovation by cancer patients' education. I find that the benefits of innovation are limited to individuals with postsecondary education, although cancer patients with lower levels of education experience a larger decline in employment.

The results suggest that innovations in cancer treatment may provide benefits beyond direct medical effects. As innovative cancer treatments can be very expensive, it is therefore important to account for economic benefits such as smaller reductions in labor income and, as a result, tax revenue when determining whether the benefits of a new treatment option outweigh its cost. The heterogenous effects by education indicate that the mere existence of new medical technology may not automatically lead to improved economic outcomes, but rather that there are barriers to access them.

Background

The most common types of cancers are breast and prostate, affecting about 26,000 women and 21,000 men, respectively, in Canada annually. While most cancers affect older individuals, a substantial subgroup of breast and prostate cancer patients is diagnosed during their working age. Because cancer treatment is lengthy and can cause severe side effects, patients undergoing treatment often reduce their labor supply or stop

The annual average earnings losses due to a prostate and breast cancer diagnosis are $1,100 and $600 lower, respectively, than they would have been without medical innovation.

working completely. These negative labor market effects may be alleviated by improved treatment options that are more likely to cure cancer in a shorter amount of time and lead to fewer side effects.

To investigate the effect of cancer diagnoses and medical innovation on employment, I combine data from several sources. First, I identify breast and prostate cancer patients from the Canadian Cancer Database. Second, I use individual tax returns from the Longitudinal Worker File to measure employment of cancer patients before and after their diagnosis, as well as employment of individuals who were never diagnosed with cancer and who serve as a control group. Statistics Canada merged these data sets to the 1991 population census, which contains individual characteristics such as education.

Finally, I measure medical innovation in two different ways. A first, more narrow measure is the number of drugs that are approved for the treatment of breast and prostate cancer. Pharmaceutical innovation is important, as chemotherapy is one of the main treatment options for cancer. Throughout the study period, the 1990s and 2000s, several important new drugs were approved, including the chemotherapy drug trastuzumab for the treatment of breast cancer, and triptorelin, a luteinizing hormone-releasing hormone analogue used to fight prostate cancer.

In addition to chemotherapy, surgery and radiation are used as cancer treatment. Notable innovations include laparoscopic radical prostatectomy, a minimally invasive surgical technique, and breast-conserving surgery, both of which reduce recovery time and potential side effects after surgery. To broadly capture innovation in these areas, I use international patent data. From these records, I construct a quality-weighted patent index that measures the aggregate and cumulative innovative activity related to breast and prostate cancer treatment.

Before I estimate the effect of cancer diagnoses and medical innovation on employment, I use a matching technique to create a control group consisting of individuals without cancer that is identical to cancer patients along all observed dimensions. I then employ a difference-in-differences strategy—I compare employment rates of cancer patients and the matched control group both before and after the cancer diagnosis. I consider a five-year window before and after the diagnosis and allow the employment effects of cancer diagnoses and medical innovation to vary over time, as it is plausible that these effects do not remain constant within this time frame.

Results

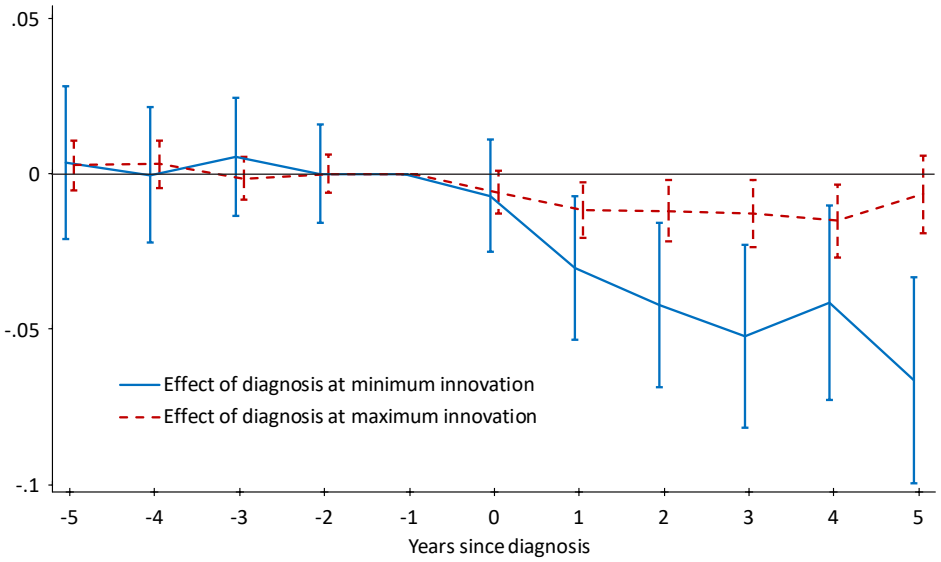
I find that some breast and prostate cancer patients reduce their employment after the diagnosis when compared to the matched control group. Men are 1.8 percentage points less likely to be employed after a prostate cancer diagnosis, and women are 3.9 percentage points less likely to be employed after a breast cancer diagnosis.

Medical innovation substantially reduces the negative employment effects of cancer diagnoses. Figure 1 shows the effect of a prostate cancer diagnosis on employment as a function of the number of drugs available for the treatment of this disease. In 1992 when 14 drugs were approved, employment of prostate cancer patients drops by a few percentage points initially, and the decline reaches more than 5 percentage points after three years (solid blue line; I show the effects prior to the diagnosis to rule out any preexisting trends). In contrast, when 27 approved drugs were available in 2010, a prostate diagnosis reduces employment by only about 1 percentage point during the first five years (dashed red line).

For the employment effects of breast cancer diagnoses and the role of medical innovation, Figure 2 shows a similar pattern. As the number of drugs approved for the treatment of breast cancer increased from 17 to 39 between 1992 and 2010, the decline in employment following a diagnosis became smaller. At the lowest level of pharmaceutical innovation, breast cancer reduces employment by about 2.5 percentage points initially and up to 5 percentage points three years after the diagnosis and beyond (solid blue line). At the highest number of drugs available, the initial decline in employment is similar, but

The fact that only highly educated individuals profit from innovative cancer treatments suggests that the economic benefits of medical innovation are distributed unequally.

Figure 1 Effect of Prostate Cancer on Employment by Number of Approved Drugs

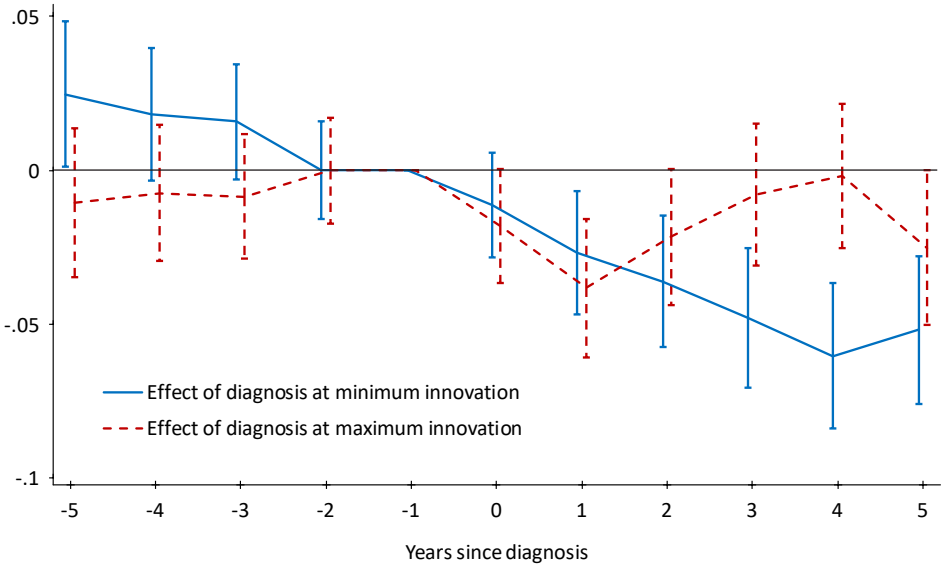


SOURCE: Statistics Canada and author's calculations.

after three years, the employment effect becomes indistinguishable from 0 (dashed red line).

When repeating this exercise with the quality-weighted patent index instead of the number of approved drugs, I find similar patterns (not shown). Hence, I provide evidence suggesting that medical innovation in the form of new drugs and medical technology alleviates the economic costs of breast and prostate cancer diagnoses. On average, medical innovation reduces the decline in employment among cancer patients by about 65 percent between 1992 and 2010. These effects imply that the annual average earnings losses due to a prostate and breast cancer diagnosis are $1,100 and $600 lower, respectively, than they would have been without medical innovation. Therefore, a

Figure 2 Effect of Breast Cancer on Employment by Number of Approved Drugs



SOURCE: Statistics Canada and author's calculations.

Encouraging and subsidizing medical innovation may have the dual benefit of mitigating both the medical and economic consequences of cancer and other diseases.

substantial economic benefit arises from these innovations, in addition to any resulting reductions in mortality and morbidity.

To better understand how education interacts with medical innovation in the employment of cancer patients, I split the sample by education into individuals without a high school degree, those who have graduated from high school but have no further education, and those with at least some postsecondary education. Among these subsamples, I only observe a mitigating impact of medical innovation on the negative employment effect of cancer diagnoses for breast and prostate cancer patients with postsecondary education. In contrast, individuals with lower levels of education reduce their employment by more than those with postsecondary education.

Although the data do not allow me to determine the underlying mechanism, there are several potential explanations for the observed heterogeneity by education. First, higher levels of education may help cancer patients identify medical providers who use innovative treatments. Second, education may enable cancer patients to obtain information on treatment options and demand that their medical providers use up-to-date treatments. Third, adherence to complex treatment regimens could be facilitated by higher educational attainment. Finally, it is possible that cancer patients with low education levels work in physically more demanding jobs where it is more difficult to undergo a modern high-intensity cancer treatment while remaining employed. Independent of the actual mechanism, the fact that only highly educated individuals profit from innovative cancer treatments suggests that the economic benefits of medical innovation are distributed unequally.

Implications

The empirical findings have several important implications. First, they highlight the importance of accounting for indirect (economic) benefits in a cost-benefit analysis of new medical technologies. Although the benefits in terms of lower earnings losses are smaller by an order of magnitude than the annual cost of an intensive cancer treatment, which can exceed $100,000, the benefits are substantial. Therefore, they should be considered in addition to potential improvements in terms of mortality and morbidity.

Second, the findings suggest potential policies that can alleviate the economic costs of disease. It is of particular concern that cancer patients experience lower employment rates and hence earnings losses in addition to the pain and suffering caused by their disease. Thus, encouraging and subsidizing medical innovation may have the dual benefit of mitigating both the medical and economic consequences of cancer and other diseases. Investments in research that lead to new treatment options may very well have a positive return if the resulting innovation has economic in addition to medical benefits.

Last, the fact that medical innovation does not yield economic gains for cancer patients with lower levels of education raises concerns about unequal access to up-to-date treatment options. Especially when medical research is publicly financed, it is reasonable to expect that resulting innovation should benefit cancer patients irrespective of their demographic or socioeconomic background. Moreover, in the case of the employment effects of cancer diagnoses, individuals with the lowest levels of education suffer the highest economic cost. Therefore, policymakers may need to ensure that new and innovative treatment options are accessible to all patients who would benefit from them, such as through information campaigns targeted at these individuals. In addition, medical education could increasingly emphasize the importance of accounting for patients' socioeconomic backgrounds in choosing appropriate cancer treatments.

In sum, these findings highlight the importance of considering interactions between labor markets and health care and point out several policy options aimed at reducing the economic burden of disease.