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New questions, new data, old interventions: The health effects of a guaranteed annual income

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ABSTRACT

Objectives: This study investigates whether administration data from universal health insurance can yield new insight from an old intervention. Specifically, did a guaranteed annual income experiment from the 1970s, designed to investigate labor market outcomes, reduce hospitalization rates?

Method: The study re-examined the saturation site of a guaranteed annual income experiment in Dauphin, Manitoba (CANADA) conducted between 1974 and 1979 (*MINCOME*). We used health administration data generated by the universal government health insurance plan to identify subjects (approximately 12,500 residents of Dauphin and its rural municipality). We used propensity-score matching to select 3 controls for each subject from this database, matched on geography of residence, age, sex, family size and type. Outcome measures were hospital separations and physician claims.

Results: Hospital separations declined 8.5% among subjects relative to controls during the experimental period. Accident and injury codes and mental health codes were most responsible for the decline.

Conclusions: Even though *MINCOME* was designed to measure the impact of a GAI on the number of hours worked, one can re-visit old experiments with new data to determine the health impact of population interventions designed for other purposes. We determined that hospitalization rates declined significantly after the introduction of a guaranteed income.

Introduction

Population health intervention research faces significant challenges. The intervention is rarely under the control of the researchers and therefore evaluations must be contrived to deal with less than ideal design elements. As a consequence, data collection is often designed expeditiously to take advantage of a fleeting opportunity. Rarely do researchers have the luxury to contemplate all questions that may ultimately be of interest.

This paper describes an attempt to bring new data to bear on new questions related to a population intervention, designed to investigate something else altogether, that took place almost four decades ago. We used health administration data unknown and unanticipated by the original experimenters to examine the effects on population health of an experiment (*MINCOME*) that was originally designed to determine what impact a guaranteed annual income (GAI) would have on labor market participation.[1] These methods, and in particular the use of data routinely collected in the administration of social programs, can be generalized to allow researchers to mine past experiments for answers to questions raised by new generations of social scientists.

Theory

Why would we expect a GAI to affect health outcomes? The literature on the social determinants of health is well developed (cf. Evans and Stoddart, 1994; Marmot and Wilkinson, 1999). The link between poverty and poor health is so fundamental that an income gradient appears in almost any health outcome measured. Others have identified an apparent link between income inequality and poor health outcomes, arguing that even if the mean level of income in two communities is identical, the community with less inequality will have better health outcomes (Marmot and Bell, 2009; Marmot et al., 2010; Pickett and Wilkinson, 2009). A GAI will both raise the absolute incomes of the poorest families and simultaneously, if the payout is reduced as incomes rise, reduce the level of inequality in a community.

The GAI, however, can also have an impact on health outcomes through a third route: the reduction of risk. One can imagine a GAI as an insurance policy. Very often, decisions are made without full knowledge of whether one will ultimately qualify for payments under the GAI. The existence of a GAI will affect the decision-making not only of those who collect stipends, but also those whose incomes are very close to the line. In the event, they may not qualify, but the simple existence of such a scheme allows a family to make long-term decisions without incurring the risk that would exist without a GAI. This might be expected in "mental health" outcomes. Finally, there is a fourth way that a GAI could, in principle, affect health outcomes in a community

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[1] Our full analysis, including education variables and the political and historical context of *MINCOME*, was first reported in Forget (2011).

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through "spill-over effects". These occur when the behavior or decisions of one member of society has an impact on others. For example, the decision to vaccinate or not to vaccinate a child has an impact on others through herd immunity. Similarly, one individual's decision to use illicit substances might affect the safety of others in a community, and be picked up in such measures as "accidents and injuries".

If a GAI policy were to be rolled out generally in society, an estimate of the full effect of a GAI through all these routes would be most useful and that is what this project is designed to do. It would be at least as interesting to know how a GAI would affect a community through each of these mechanisms, but there is no way to estimate the differential effects with the methods and data available to us.

Methods

The intervention: MINCOME

In 1974, the Canadian government in collaboration with the province of Manitoba implemented a GAI experiment modeled on the negative income tax experiments associated with the Johnson regime in the US (Forget, 2011, 2012). Two sites were chosen. Winnipeg, a city of 450,000 at the time, hosted a classical experiment. Subjects were randomized into several treatment groups, which received a variety of GAI interventions, and controls. Dauphin, with a population of approximately 10,000, and its rural municipality with a population of 2500, was chosen as a saturation site (Rhyne, 1979). That is, all families in Dauphin were eligible to participate in the experiment, and received income subsidies if they met the income test.

Dauphin residents with no income from any source were eligible to receive an annual payment set at 60% of Statistics Canada's low-income cut-off (LICO). This payment varied by family size. If a family received income from any other source, including wage income, *MINCOME* payments were reduced by one dollar for every two dollars of other income. Analysis at the time suggested that approximately 30% of Dauphin families were eligible for some level of support under the scheme, although for many support would have been quite modest because of the design of the scheme.

MINCOME ended in 1979, a victim of changing governments with different political priorities, and the economic challenges of the decade. Shortly after *MINCOME* ended, several papers making use of the Winnipeg labor market outcomes were published (Hum and Simpson, 1991; Rea, 1977). No research was published on health outcomes or on the Dauphin site. For a more complete description of the political context and the intervention, see Forget (2011, 2012).

Data and design

The experiment ended without the creation of a full electronically accessible database. Individual-level data were preserved in hard copy at the archives. Therefore, we decided to examine the Dauphin saturation site making use of the Population Health Data Repository maintained by the Manitoba Centre for Health Policy. Manitoba adopted universal health insurance in 1970 and, since that time, virtually every individual contact with the healthcare system has been recorded in the administrative data now housed in the Repository. De-identified individual-level data are housed in a series of separate, but linkable, databases. The data derive from information contained in the Manitoba Health Services Insurance Plan registry and from health insurance claims routinely filed by physicians and health care facilities with Manitoba Health. All individuals registered with the provincial health care system possess a 9-digit personal health identification number (PHIN), which exists only in encrypted form in the MCHP data bases. A 6-digit family identifier allows us to track family formation and dissolution. Utilization and follow-up information can be obtained for all Manitoba Health registrants. Marital status and 6-digit postal code of residence is updated twice yearly (Robinson et al., 1977; Roos and Nicol, 1999; Roos et al., 1993).

Hospitals are required to submit abstracts as part of the global operating budget funding process, which is covered by funding transfers from the provinces and the territorial Departments of Health. Abstracts are completed at the point of discharge from hospital and processed by Manitoba Health. Individual-level (de-identified) data include all separations for both Manitoba residents and non-Manitoba residents hospitalized in acute and chronic care facilities in Manitoba, and all separations for all Manitobans admitted to out-of-province facilities. Summary records of demographic and clinical information (up to 25 diagnosis codes and 20 procedure codes using ICD-10-CA and CCI) were related to inpatient and day surgery patients. Prior to April 1, 2004 the ICD-9-CM coding system was used.

Fee-for-service physicians submit claims to Manitoba Health for reimbursement and salaried physicians also submit claims (shadow billing). Tariffs, or codes assigned to specific procedures are provided as well as provider billing number. These data are also available at the de-identified patient level.

These data make it possible to identify everyone who lived in Dauphin or its rural municipality during the *MINCOME* experiment, as well as basic demographic information. Because everyone who lived in Dauphin was, in principle, eligible to participate in the experiment, we identified these individuals as subjects. Inclusion criteria included all individuals who lived in Dauphin and its rural municipality (identified by municipality code) between 1974 and 1979, all individuals living continuously in the saturation site between 1974 and their death if prior to 1979, and all individuals born in the saturation site between 1974 and 1979 who lived there continuously until 1979. Exclusion criteria included individuals living outside the site either continuously or for any period between 1974 and 1979.

There is no perfect way to establish controls for a saturation site. We decided to establish a dispersed control matched to subjects on the basis of individual, family and community characteristics. First, we hard-matched on geography. That is, we removed from the Repository all individuals who lived in urban settings, who lived in northern Manitoba or who lived on First Nations reserves. First Nations were removed because primary health care on a reserve is a responsibility of the federal government, and care received on a reserve does not appear in the Repository. Urban and northern residents were removed because lifestyles and access to healthcare are very different for these populations than for Dauphin residents. Our potential controls were drawn from those remaining. Then, we used propensity score matching to choose multiple controls for each subject, matched on age, sex, family size, whether they lived in a small town or rural setting, and whether they lived in a single-parent female-led family. We attempted to select four controls for each subject, but the quality of the controls declined significantly when we moved from three to four. Therefore, we chose three controls for each subject. Balance tests confirmed the quality of the match (Baser, 2006; Newgard et al., 2004).

Propensity-score matching can only match on characteristics contained in the database. Many potential confounders such as income, labor market activity, religion and ethnicity are not in the Repository. Therefore we turned to the long-form census to determine whether subjects and controls differed on community-level characteristics. We discovered only one potentially important and significant difference: Dauphin residents were significantly more likely to report Ukrainian descent than were controls (32% vs 18% of controls).

Statistical analyses

We created a segmented time series model for the period 1971 to 1985. Interrupted time series is a quasi-experimental technique for evaluating the longitudinal impact of an intervention (Wagner et al., 2002). Count data were modeled using a negative binomial distribution with the log of population as the link variable. This has the advantage of allowing a simple conversion to rates. Total hospital separations, hospital separations for "accidents and injuries", hospital separations for "mental health diagnoses", overall physician claims and physician claims for "mental health diagnoses" were separately modeled as outcome variables.

Results and discussion

Our segmented time series model was able to capture the changes in hospitalization rates subsequent to the introduction of a GAI (Table 1).

These results suggest that healthcare utilization declines when subjects are presented with a GAI. Hospital separations for Dauphin subjects fell 8.5% relative to the controls during the *MINCOME* period. This decline was significant at the 1% level.

Indeed, the actual hospitalization rates per 1000 people graphed over time show the decline in hospitalization coincident with the introduction of *MINCOME* (Fig. 1).

The statistical analysis described above allowed us to examine hospital separations in greater detail. Codes representing primary diagnoses of "accidents and injuries" and "mental health diagnoses" were largely responsible for the decline in hospital separations. Both fell significantly for Dauphin residents relative to the controls during *MINCOME*.