

Social Benefit Payments and Acute Injury in Poor Mothers

Donald A. Redelmeier MD, FRCPC, MSc, FACP [1, 2, 3, 4, 5]

William K. Chan BHSc [1, 3, 5] <williamc1987@hotmail.com>

Sendhil Mullainathan PhD [6] <mullain@fas.harvard.edu>

Eldar Shafir PhD [7, 8] <shafir@Princeton.EDU>

[1] Professor of Medicine, University of Toronto

[2] Clinical Epidemiology Program, Sunnybrook Research Institute

[3] Institute for Clinical Evaluative Sciences

[4] Division of General Internal Medicine, Sunnybrook Health Sciences Centre

[5] Centre for Leading Injury Prevention Practice Education & Reserch

[6] Professor of Economics, Harvard University

[7] Professor of Psychology, Princeton University

[7] Woodrow Wilson School of Public and International Affairs

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Correspondence: Donald A. Redelmeier
Sunnybrook Health Sciences Centre, G-151
2075 Bayview Ave, Ontario, CANADA M4N 3M5

voice: (416) 480-6999 fax: (416) 480-6048

e.mail: dar@ices.on.ca

ABSTRACT

Background: Human error due to risky behaviour is a common and important contributor to the incidence of acute injury related to poverty. We studied whether social benefit payments mitigate or exacerbate risky behaviours that lead to acute injury emergencies among poor mothers with dependent children.

Methods: We analyzed consecutive emergency department visits throughout Ontario to identify women between age 15 and 55 years who were mothers of children younger than age 18 years, living in the lowest income quintile, and presenting for acute injury ($n = 153,377$). Analyses of universal health care databases evaluated the specific day of a social benefit payment (child benefit distribution) compared to control days over a seven-year interval (April 1, 2003 to March 31, 2010).

Results: We observed fewer emergencies per day for women on child benefit payment days compared to control days (56.4 vs 60.1, $p = 0.008$). The decrease was primarily explained by reductions among those age 35 years or younger (relative reduction = 7.3%, 95% confidence interval: 1.7 to 12.9), living in urban areas (relative reduction = 7.1%, 95% confidence interval: 3.1 to 11.1), and treated at community hospitals (relative reduction = 6.8%, 95% confidence interval: 2.5 to 11.2). No significant differences were observed for days immediately before or after the child benefit payment.

Interpretation: Contrary to political commentary, small reductions in relative poverty can mitigate rather than exacerbate risky behaviours that contribute to acute injury among poor women with dependent children.

Key Words: risky behaviour; human error; unintentional injury; vulnerable populations; poverty and health; social benefit payments; socio-economic inequity

BACKGROUND

Traumatic injury is a common cause of death, disability, and acute demands for emergency medical care. The circumstances are diverse and include occupational, recreational, house-hold, community, military, and commuting activities. The consequences are large and amount to economic losses equal to about one trillion dollars annually on a worldwide basis ¹. Medical outcomes can be particularly severe if the patient sustains a head concussion, spinal cord damage, chronic pain, permanent disfigurement, psychiatric sequelae, or long-term disabling conditions ². Even a minor injury, moreover, can hinder a person's functioning as a parent ³. The cause of injury usually entails individual human error that could have been prevented by a minor change in behaviour ⁴.

Behavioral decision science is the field that studies how people pay attention, formulate decisions, and make errors. One finding is that human error is often accentuated with increasing cognitive loads; that is, people who are in relatively unfavorable positions tend to make relatively more unfavorable decisions ⁵. In a study of food choices, for example, college students were twice as likely to eat indulgent chocolate cake rather than healthy fruit salad after being randomized to situations of demanding rather than easy academic challenges ⁶. One reason is that task-unrelated thoughts become intrusive under cognitive load and then lead to distraction ⁷. Such cognitive patterns may also extend to poor mothers with dependent children who sometimes face challenges on a day to day basis ⁸, yet no study has tested this hypothesis.

Financial benefit payments to poor mothers are a popular social insurance program for relieving some of the stress that prevails in disadvantaged individuals ⁹. Public health advocates traditionally argue that such payments may also mitigate illnesses linked to poverty (eg, malnutrition). Critics suggest, however, that payments sometimes go toward risky behaviours (eg, substance abuse) ^{10 11 12}. The evidence underlying these debates around financial benefit payments is often limited by small sample size, selective sampling, or hidden confounders. The purpose of our study was to avoid such limitations in prior research and explore whether errors that lead to acute injuries are mitigated or exacerbated by child benefit payments for poor mothers with dependent children.

METHODS

Setting

Ontario is Canada's largest province with a population of 13,210,667 in 2010 (study end-point), of whom 3,764,967 were women between the age 15 and 55 years ¹³. Throughout the study, access to emergency medical care was free of charge with no user fees or co-payments under national universal health insurance ¹⁴. Utilization of emergency medical services could also be tracked in a systematic manner through previously-validated, individual-level, community-based, health-services research administrative databases ^{15 16}. The National Ambulatory Care Reporting System database, in particular, has been validated in past research and is particularly reliable for identifying demographic data, visit date, and chief complaint for emergency department patients ¹⁷.

Patients

We identified all emergency department visits throughout Ontario between April 1, 2003 and March 31, 2010 to any acute care hospital in the region, representing all data available. We focused on patients who were women between age 15 years and 55 years, living in the lowest socio-economic quintile, and presenting with a chief complaint of acute injury. We included those who were mothers of dependent children, as defined by at least one record of a live birth within the 18 years preceding the emergency department visit. We excluded individuals who were missing a valid health card number; otherwise, our sample was fully comprehensive with no other exclusions. We included all days over the interval with special attention to days of a child benefit payment, days immediately before, and days immediately following.

Characteristics

We obtained data on patient age, sex, home location, neighborhood income, and potential date of death through computerized health database linkages using methods developed in earlier research ^{18 19}. Patient arrival day, hospital type, and length of stay were obtained directly from the database, as were data on departure category (eg, dead, admitted, or discharged). Health status variables included triage acuity (coded using the Canadian Triage Acuity Scale), and main diagnosis (coded using the International Classification of Disease 10th Revision). The number of young children for each mother was ascertained from the total records of live births during the 18 years preceding the emergency department visit. The available databases contained no data on employment, housing, schooling, lifestyle, genetics, personality, or marital status.

Benefit Payments

Child benefit payments were introduced in Ontario in 1945 as Canada's first universal social insurance program designed as a family allowance to help cover the cost of child maintenance. The program underwent multiple name changes and structural revisions over the years with particular emphasis towards integration with the tax system ²⁰. Child benefit payments are currently directed toward low-income families and phase-out at higher levels of income (although middle-income and high-income mothers can claim tax credits for dependent children when filing an annual personal income tax submission). Child benefit payments are distinct from other social insurance programs such as welfare, disability, and unemployment benefits that are distributed at different times for different qualifications.

Payment Details

Child benefit payments in this setting were delivered as a mass distribution typically around the 20th day of the month ²¹. The program underwent no major changes during the study although amounts fluctuated due to differing budgetary support from government agencies (Canada Child Tax Benefit, National Child Benefit Supplement, Ontario Child Benefit, and Universal Child Care Benefit) ²². In 2010, a mother with an annual income of \$23,855 or lower who had one child below age 18 years would receive \$478 each month. Child benefit payments were scaled to the total number of dependent children below age 18, so that a low-income mother with two young children would receive \$936 per month and a low-income mother with three young children would receive \$1,394 per month ²³. The payment typically occurred as an electronic funds transfer directly into the recipient's bank account ²⁴.

Methodologic Design

We used multiple strategies to avoid limitations in past research about poverty and health. Ethics approval was obtained from the Sunnybrook Research Ethics Board including a waiver on the need for individual consent. Information on emergency department utilization was based on existing databases with no reliance on self-report surveys. Outcomes were ascertained blind to exposure status; in addition, exposure status was determined blind to outcomes. The perspective throughout the analysis was the patient rather than the population (to avoid ecological fallacy ²⁵) using hierarchical techniques to account for potential clustering. All calculations were conducted at the Institute for Clinical Evaluative Sciences including security safeguards for patient privacy. We made no attempt to examine children's health due to the fallible nature of computer linkages as well as negative results reported by others ²⁶.

Statistics

Our primary analysis evaluated the number of emergency visits and compared the day of a child benefit payment to all other days that had no child benefit payment. The primary statistic was based on an unpaired t-test taking into account the normal distribution of total patients per day. A secondary non-parametric analysis used the Mann-Whitney test to compare the median number of patients per day. An additional autoregressive integrated moving average time series analyses were used to adjust results for year, month, weekday, and first-order serial correlation²⁷. Tracer analyses repeated comparisons based on days immediately before and after the child benefit payment. Secondary endpoint analyses explored medical diagnoses, admission rates, inpatient care, short-term mortality as well as emergencies unrelated to acute injury.

RESULTS

A total of 153,377 visits occurred over the 7 years across 192 separate hospitals. This was equal to an average of 60.0 visits per day (range 25 to 105). Visit rates declined over time, so that the total daily number of patients averaged about 19% higher during the first half of the study than the second half of the study (64.8 vs 54.4, $p < 0.001$). The median patient was 32 years old, lived in an urban location, sought care at a large community hospital, and had two dependent children (Table 1). A triage severity score was available for 99% of patients and spanned the full range from Resuscitation ($n = 625$), Emergent ($n = 11,721$), Urgent ($n = 43,579$), Less-urgent ($n = 81,955$), and Non-urgent ($n = 15,385$).

*** TABLE 1 ABOUT HERE ***

A total of 84 child benefit payments occurred over the interval, equivalent to exactly one per month with no missing dates or extra distributions. We observed 4,735 total emergency department visits during these 84 payment days and 148,642 total emergency department visits during the remaining 2,473 control days. This yielded an average equal to 56.4 visits per day on payment days compared to 60.1 visits per day on control days (Figure 1). The observed mean difference was equal to a 6.2% relative reduction in emergencies (95% confidence interval 2.2 to 10.2, $p = 0.008$). Time series models that adjusted for year, month, and weekday yielded a 5.8% reduction in emergencies (95% confidence interval 2.6 to 9.0, $p < 0.001$).

*** FIGURE 1 ABOUT HERE ***

Secondary analyses yielded similar findings. Analyses based on median visits per day yielded about a 5% reduction associated with child benefit payments (56 vs 59, $p = 0.023$). The reduction in emergencies on payment days was similar during the first half and second half of the study (Table 2). The reduction was somewhat larger for younger mothers than older mothers, and about the same for those with one or with several dependent children. A reduction was observed for both those above and below the median triage severity. In contrast, we observed no significant difference in emergencies for analyses that examined visit rates during the surrounding days before and after a child benefit payment (Figure 1).

*** TABLE 2 ABOUT HERE ***

Ten diagnosis patterns explained the majority (72%) of emergencies, with remaining patients having complex multiple-injury patterns (Table 3). Injuries to the wrists, hands, or fingers were the most common specific pattern and showed a 9.1% reduction associated with child benefit payments (95% confidence interval 2.6 to 15.6, $p = 0.014$). Injuries to the ankle, foot, or toes were the second most common pattern and showed a 10.2% reduction with child benefit payments (95% confidence interval 1.5 to 19.0, $p = 0.038$). Overall, 9 of the 10 diagnosis patterns showed a reduction with child benefit payments (neck injuries the exception, $p = 0.167$). Patients with multiple-injury patterns showed a 5.1% reduction with child benefit payments (95% confidence interval -0.6 to 10.7, $p = 0.098$).

*** TABLE 3 ABOUT HERE ***

We found no evidence that the severity of injury was different for patients on child benefit payment days compared to control days. A total of 5056 patients were admitted to hospital, with a rate similar for individuals on payment days compared to control days (3.1% vs 3.3%, $p = 0.140$). A total of 1445 patients required surgery, with a rate similar for the two groups (0.8% vs 0.9%, $p = 0.221$). A total of 1001 patients stayed in hospital more than a week, with a rate similar for the two groups (0.5 % vs 0.7 %, $p = 0.133$). A total of 85 patients died in the emergency department, during hospitalization, or within 30 days of the visit, with a rate similar for the two groups (0.06% vs 0.06%, $p = 0.899$).

We checked our data by conducting a sensitivity analysis of spillover to alternative emergencies and surrounding days. To do so, we identified all poor mothers with dependent children who visited an emergency department during the study and this time included only those with a chief complaint unrelated to injury. In total, we found 30,720 total visits during the 84 payment days and 933,432 total visits during the 2,473 control days. This yielded an average equal to 365.7 visits per day on payment days compared to 377.4 visits per day on control days. The observed mean difference was equivalent to a 3.1% relative reduction in visit rates (95% confidence interval 0.9 to 5.2, $p = 0.009$). Analyses of surrounding days also showed no significant countervailing increases (Figure 2).

*** FIGURE 2 ABOUT HERE ***

DISCUSSION

We examined the largest Canadian province for seven years to study acute injury emergencies among poor women with dependent children. We found that child benefit payments did not produce an increase of acute injury emergencies and, in contrast, led to an immediate reduction. The absolute difference amounted to about 300 fewer total emergencies over the study interval, was mostly evident on the day of payment, and was not easily attributed to chance. The relative reduction extended across a range of diagnoses, included the full spectrum of severity, followed patterns of unintentional injury rather than violent assault, and was not accompanied by a countervailing increase in other emergencies²⁸. This relative risk reduction is similar in magnitude to the effect of doubling alcohol sales taxes on reducing total alcohol-related adverse health outcomes within developed countries²⁹.

Our study corroborates past experiments in behavioural decision science conducted under controlled laboratory conditions on healthy volunteers engaged in artificial tasks that involved no real medical outcomes^{30 31}. For example, participants tend to give-up more quickly on solving difficult anagrams when subjected to distracting cognitive demands for personal self-control³². Similarly, participants become significantly less likely to detect the letter "K" on a display when concurrently subjected to increasing mental demands³³. The general pattern is that cognitive stress depletes a pool of finite renewable mental resources and can result in distraction, faulty judgments, and other errors in a range of experimental settings^{34 35 36}. Our study is the first

attempt to test this pattern in a medical setting involving poverty, risky behaviours, and the challenges of everyday life.

Several reasons may explain why the results of this study differ from past research correlating welfare payments with immediate increases in visits for emergency medical care. One nuance is that a mother with dependent children may have a different lifestyle than a single man with no family ³⁷. A second factor might be that child benefit payments prime in the mother a sense of responsibility and positive self-identity compared to the potentially stigmatizing identity of being a welfare, disability, or unemployment recipient ³⁸. An additional difference is that the Canadian setting provides much larger child benefit payments to poor mothers than most other developed countries (Australia and Germany the largest exceptions) ³⁹. Together, such ideas suggest the need for more insights from behavioural decision science to inform large-scale social programs and public health policies.

This study finds no immediate increase in acute injury emergencies with social benefit payments and also provides a concrete reminder that risk differences are often modest due to multi-factorial reasons. For example, some injuries reflect errors by others in the surroundings so that the patient could not have avoided the event. Human behaviour is also diverse so that aggregate statistics can underestimate associations. In addition, adults living in poverty often have large debts so that a single payment can temporarily raise mental wellbeing but not change overall financial position. Without adjusting for these limitations, a number-needed-to-treat calculation would estimate about 1 acute injury emergency is prevented for every 500 women who receive child benefit payments monthly for 18 years. Public health interventions often have modest effects on individuals yet large benefits when applied over a full population ⁴⁰.

Our findings disagree with political commentary that emphasizes the high frequency of adverse health behaviours among the poor ⁴¹. The observed prevalence of smoking and obesity in disadvantaged populations ⁴², for example, is often attributed to individual human error due to insufficient education or maladaptive traits. By this logic, social benefit payments might increase risky behaviours. Our study made allowance for the opposite interpretation; namely, that it is the poverty that contributes to the human error. By this logic, social benefit payments might decrease risky behaviours. Both mechanisms could be mutually compounding and ultimately help explain the intricate links between sustained poverty and increased mortality ⁴³.

An awareness of both mechanisms might help clinicians understand cases where patient behaviour and choices fall short of the ideals suggested by medical advice.

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COMPETING INTERESTS

All authors have no financial or personal relationships or affiliations that could influence the decisions and work on this manuscript. The views expressed in this paper are those of the authors and do not necessarily reflect the Ontario Ministry of Health.

ETHICS STATEMENT

This study was approved by the Research Ethics Board of the Sunnybrook Health Science Centre.

AUTHOR STATEMENT

All authors have contributed to the design, analysis, and interpretation of the study. The lead author (DAR) had full access to all data and takes responsibility for the accuracy of the analysis. We wish to thank the following for helpful comments: Philip Berger, Allan Detsky, Stephen Hwang, Donna Stewart, and Christopher Yarnell.

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