BMJ Open

A population-based study of premature mortality in relation to neighbourhood density of alcohol sales and cheque cashing outlets in Toronto, Canada

Flora I Matheson,[1,2] Maria Isabella Creatore,[2] Piotr Gozdyra,[2] Alison L Park,[2] Joel G Ray[3]

To cite: Matheson FI, Creatore MI, Gozdyra P, *et al*. A population-based study of premature mortality in relation to neighbourhood density of alcohol sales and cheque cashing outlets in Toronto, Canada. *BMJ Open* 2014;**4**:e006032. doi:10.1136/bmjopen-2014-006032

▶ Prepublication history and additional material is available. To view please visit the journal (http://dx.doi.org/10.1136/bmjopen-2014-006032).

Received 2 July 2014
Revised 4 November 2014
Accepted 21 November 2014

[1]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario
[2]Centre for Research on Inner City Health, St. Michael's Hospital, Toronto, Ontario, Canada
[3]Departments of Medicine and Obstetrics and Gynaecology, St. Michael's Hospital, University of Toronto, Toronto, Ontario

Correspondence to
Dr Flora I Matheson; mathesonf@smh.ca

ABSTRACT

Objective: Alcohol overuse and poverty, each associated with premature death, often exist within disadvantaged neighbourhoods. Cheque cashing places (CCPs) may be opportunistically placed in disadvantaged neighbourhoods, where customers abound. We explored whether neighbourhood density of CCPs and alcohol outlets are each related to premature mortality among adults.

Design: Retrospective population-based study.

Setting: 140 neighbourhoods in Toronto, Ontario, 2005–2009.

Participants: Adults aged 20–59 years.

Measures: Our primary outcome was premature all-cause mortality among adults aged 20–59 years. Across neighbourhoods we explored neighbourhood density, in km^2, of CCPs and alcohol outlets, and the relation of each to premature mortality. Poisson regression provided adjusted relative risks (aRRs) and 95% CIs, adjusting for material deprivation quintile (Q), crime Q and number of banks.

Results: Intentional self-harm, accidental poisoning and liver disease were among the top five causes of premature death among males aged 20–59 years. The overall premature mortality rate was 96.3/10 000 males and 55.9/10 000 females. Comparing the highest versus lowest CCP density Q, the aRR for death was 1.25 (95% CI 1.15 to 1.36) among males and 1.11 (95% CI 0.99 to 1.24) among females. The corresponding aRR comparing the highest Q versus lowest Q alcohol outlet density in relation to premature mortality was 1.36 (95% CI 1.25 to 1.48) for males and 1.11 (95% CI 1.00 to 1.24) for females. The pattern of the relation between either CCPs or alcohol outlet density and premature mortality was typically J shaped.

Conclusions: There is a J-shaped relation between CCP or alcohol outlet density and premature mortality, even on controlling for conventional measures of poverty. Formal banking and alcohol reduction strategies might be added to health promotion policies aimed at reducing premature mortality in highly affected neighbourhoods.

Strengths and limitations of this study

- Premature death among young and middle-aged adults has received little attention, despite the fact that many deaths are accidental and potentially highly preventable.
- This study was conducted within a universal health insurance setting in which all residents have full access to primary and hospital care services, and where both retail in-store and on-premise alcohol sales are completely regulated by provincial licensing.
- We evaluated alcohol outlet density, as well as a novel marker of neighbourhood disadvantage—cheque cashing outlet density—and the impact of each on premature mortality.
- We did not capture alcohol consumption at the individual level, nor did we consider race/ethnicity, a potentially important confounder between low-income status and premature mortality.

BACKGROUND

Preventing untimely or premature death is a major goal of healthcare and public health programmes. Current definitions of 'premature mortality' differ, but most studies use an age range of birth to 75 years.[1–4] While this broad age range can identify potential years of life lost,[4] it may obscure our understanding of those factors that are specifically preventable in adulthood. The reason is that most deaths among children are from events arising around or in the perinatal period, while most seniors succumb to cancer or cardiovascular disease. Indeed, the top causes of death in young and middle-aged adults are very different from those that claim the lives of older adults. For example, in Canada, accidents and self-harm are leading causes of death among

those aged 25–44 years. After age 64 years, accidents are no longer in the top three, being displaced by cancer and heart disease.[5]

Most premature deaths among young and middle-aged adults are potentially highly preventable. In many nations, alcohol use is an important risk factor for mortality.[6 7] About 6% of all deaths among Canadians are alcohol related—twice that for men than for women—resulting in 144 142 potential years of life lost.[7] In other areas of the world, including Russia, where alcohol consumption has emerged as a major public health concern, it is estimated that 43% of reported deaths among males aged 25–54 years are attributed to hazardous drinking.[8] In early and middle adulthood, alcohol leads to accidental death through impaired functioning and a higher propensity for risky behaviour among males.[9 10] We recently showed a higher risk for injury due to serious assault in association with alcohol sales, especially among young urban men.[11] Stockwell found that rates of alcohol-related death in British Columbia, Canada increased by 3.25% for each 20% increase in the density of private alcohol outlets.[12] Greater alcohol outlet density is associated with increased alcohol consumption and ensuing medical disease, injury, crime and violence.[13]

There is a substantial body of research on neighbourhoods and health: neighbourhood disadvantage is associated with poor psychological and physical health.[14–16] Neighbourhood disadvantage may reflect a structural lack of access to opportunities, available alternatives or choices.[17 18] Recent research on neighbourhood disadvantage—material deprivation, social disorder and instability—points to its negative impact on health, including higher rates of all-cause mortality.[14–16 19]

Evidence suggests that poverty is also a driver of premature mortality.[20 21] For example, there is a doubling in death due to homicide among residents living in low-income versus high-income neighbourhoods.[22] However, beyond the direct economic measures of neighbourhood disadvantage, there may be further benefit to using other area indicators, such as the presence of cheque cashing places (CCPs).[23] Previous research suggests that CCPs are opportunistically placed in low-income neighbourhoods to meet the needs of more vulnerable populations.[24] We and others have shown that there is a linear relation between the density of CCP and violent crime, independent of classic indicators of poverty.[23 25]

What is not well understood is the nature of the individual relation between the density of CCPs and premature mortality, as well as the density of alcohol sales outlets (as a neighbourhood indicator of alcohol availability) and premature mortality. We explored this question in a setting where both retail in-store and on-premise alcohol sales are completely regulated by provincial licensing, and in which there is detailed information on CCP density and premature mortality.

METHODS

This population-based study was conducted in the City of Toronto, Canada using its 140 predefined neighbourhoods as the geographic units for analysis. These neighbourhoods, created by the Social Policy Analysis and Research unit in the City's Social Development & Administration Division, with assistance from Toronto Public Health, contain an average of 7000–10 000 residents (http://www.toronto.ca/demographics/neighbourhoods.htm) with an average area of 4.5 km^2 (range 0.4–37.5). Toronto is the largest city in the province of Ontario, where universal healthcare is available to virtually all residents.

The study outcome was premature mortality, defined as the number of deaths per 10 000 adults aged 20–59 years. Mortality data were extracted from the Ontario Mortality Data from 2005 to 2009 (Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO). Data were also available by sex. We pooled the data across all 5 years due to the low annual number of premature deaths in each neighbourhood.

We explored two exposure variables separately. The first was the neighbourhood density of *CCPs* per km^2. The second was the neighbourhood density of *alcohol outlets* per km^2. Toronto CCPs were identified through online Google and Yellow Pages directory internet searches, using the terms 'cheque cashing', 'payday loans' and 'cash', as described elsewhere.[11] *All alcohol outlets* comprised all retail liquor[11] and beer stores, as well as all on-premise licensed facilities, including restaurants, bars, pubs, social clubs and hotels. We used lists of licensed on-premise and retail outlets provided by the Ontario Ministry of the Attorney General and the Liquor Control Board of Ontario as well as the Ontario Beer Stores. Thus, since all retail and on-premise alcohol sales in Ontario are governmentally licensed and regulated, this approach captures nearly all places where alcohol can be purchased by the public.

Using the address postal code, a CCP or alcohol outlet was assigned to a given Toronto neighbourhood. The density of CCPs and alcohol outlets were each expressed as a number per neighbourhood area, in km^2, and then further assigned to a quintile (Q) based on ranking neighbourhoods from lowest density (Q1) to highest (Q5). Q were calculated using the RANK procedure in SAS.

On the basis of previous work,[25] as covariates, we assigned to each neighbourhood all-cause police-reported crime per 10 000 residents from the 2006 Uniform Crime Reporting Survey (http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3302) and the number of full-access main bank branches per km^2 (http://en.wikipedia.org/wiki/Big_Five_(banks), each expressed as a Q. We also included a more standard measure of neighbourhood disadvantage as another covariate which was expressed as a material deprivation index Q, based on the 2006 Ontario Marginalization Index;[26] http://www.torontohealthprofiles.ca/onmarg.php. Material deprivation includes six census measures expressed as percentages: aged ≥20 years without high

school graduation, lone parent families, population receiving government transfer payments, aged ≥15 and unemployed, living below the low income cut-off, and homes needing major repairs.

Data analysis

The association between premature mortality and the Q-defined density of CCPs was examined using Poisson regression, with the natural log of the number of residents aged 20–59 years in each neighbourhood as the offset variable, based on the 2006 Canada Census (http://en.wikipedia.org/wiki/Canada_2006_Census). An unadjusted relative risk (RR) and 95% CI expressed the relation between premature mortality and increasing CCP density, with the lowest CCP Q as the referent. Adjusted RRs (aRR) were calculated by adding Q of crime, banks and material deprivation to the model, for males and females combined, as well as individually by sex.

The same unadjusted and adjusted models were used to explore the relation between alcohol outlet Q and premature mortality. We performed a separate analysis restricting the alcohol outlets to those not typically associated with food service or accommodation (called '*alcohol-focused outlets*' here), namely, on-premise establishments designated for adult entertainment, bars, taverns, nightclubs, billiard/pool halls, gaming facilities, lounges and stadiums, in addition to retail liquor and beer stores (see online supplementary table S2). Hence, the density of *alcohol-focused outlets* was used as a more specific measure of alcohol-seeking behaviour at the neighbourhood level.

All statistical analyses were performed using SAS V.9.3 (SAS Institute Inc., Cary, North Carolina, USA). We calculated Moran's I to assess spatial autocorrelation.[27] All I values ranged from 0.07 to 0.10, suggesting very low levels of spatial autocorrelation.

RESULTS

In 2006, Toronto's 140 neighbourhoods together had a population of 2 493 125 residents, of whom 1 478 610 were aged 20–59 years, and 48% were male (table 1). Overall, the density of *all alcohol outlets* was 12.9/km^2, *alcohol-focused outlets* 1.2/km^2, and CCPs 0.8/km^2. The average crime rate was 425.9/10 000 residents.

Among adult males aged 20–59 years, intentional self-harm, accidental poisoning and liver disease were among the top five causes of death (see online supplementary table S1). For females, cancer was the dominant cause of death, and intentional self-harm was among the top five causes. The premature mortality rate among all persons aged 20–59 years was 74.1/10 000 residents, and was much higher for males (96.3/10 000) than females (55.9/10 000; table 1).

There was a J-shaped relation between CCP density and premature mortality (table 2 and figure 1). This was seen especially for males, and less so for females, after adjusting for certain covariates. For example, the aRR between CCP Q5 versus Q1 was 1.25 (95% CI 1.15 to 1.36) for males and 1.11 (95% CI 0.99 to 1.24) for females.

The corresponding aRR for premature mortality comparing all alcohol outlet density Q5 versus Q1 was 1.36 (95% CI 1.25 to 1.48) for males and 1.11 (95% CI 1.00 to 1.24) for females (table 2 and figure 1). For alcohol-focused establishments, the relation was not significant, but like all alcohol outlet density, the pattern of the relation was typically J shaped (figure 1).

DISCUSSION

Intentional self-harm, accidental poisoning and liver disease rank within the top five causes of premature death among males aged 20–59 years, who are nearly twice as likely as females to die prematurely. Moderate-to-high neighbourhood density of CCPs was significantly associated with a higher risk of premature mortality for men and women, even after adjusting for material deprivation, crime, and number of banks. Like CCPs, alcohol outlet density had a J-shaped relation to premature mortality.

Stockwell showed that the density of private liquor stores is independently associated with local rates of alcohol-related death.[12] Alcohol impairs cognitive functioning, and, when combined with a higher propensity for risk-taking behaviours among males, increases their likelihood of intentional and unintentional injury and death.[9 10] In a study of hospitalisations for serious assault, we previously found that victimisation increased with alcohol sales, especially among young urban men.[11] In the current study, neighbourhoods with a high density (Q4 and Q5) of *all alcohol outlets* exhibited a higher risk of premature mortality among males (figure 1, middle panel), an association not evident for *alcohol-focused outlets* (figure 1, lower panel). Why this is so, is unclear, since, unlike *alcohol-focused outlets*, other licensed facilities, including restaurants and social clubs, function as gathering places less centred on alcohol consumption (see online supplementary table S2), where intoxication is usually not tolerated and the hours of operation are limited.[28 29]

Density of CCPs is certainly a proxy for poverty, itself an established risk factor for premature mortality.[1 2 29–33] However, in our analyses, we accounted for a complex measure of poverty, namely material deprivation. Previous research on CCPs suggests that they are opportunistically placed in low-income neighbourhoods to meet the needs of more vulnerable populations.[24] We established a rationale early in the paper to suggest that CCPs are another measure of disadvantaged neighbourhoods with an independent effect on premature mortality.

Previous research has observed an association between location of CCPs and violent crime,[23 25] as well as alcohol sales and serious assault.[11 34 35] There is growing evidence about the negative effects of CCPs and pay day loan services on the health and welfare of communities.[23 36 37] Moreover, the link between alcohol sales and

Table 1 Description of study variables for all 140 neighbourhoods in Toronto, Canada

Variable	Value for that variable
Population of Toronto (2006)	
Total size of population studied for all ages, across all neighbourhoods	2 493 125
Total number of residents aged 20–59 years, across all neighbourhoods	1 478 610
Percentage of male residents aged 20–59 years, across all neighbourhoods	48.4
Mean (SD) number of residents per neighbourhood aged 20–59 years	10 562 (5115)
Mean (SD) number of residents per neighbourhood aged 20–49 years	8307 (4149)
Mean (SD) number of males aged 20–59 years/10 000 residents	5113 (2520)
Mean (SD) number of females aged 20–59 years/10 000 residents	5448 (2623)
Mean (SD) number of males aged 20–49 years/10 000 residents	4042 (2061)
Mean (SD) number of females aged 20–49 years/10 000 residents	4264 (2110)
Neighbourhood area, km^2	
Mean (SD); Min; Max	4.5 (4.6); 0.4; 37.5
All alcohol outlets*	
Total number for all neighbourhoods	4626
Mean (SD) number per km^2	12.9 (22.2)
Number (%) of neighbourhoods with no outlets	1 (0.7)
Number (%) of neighbourhoods with ≥1 outlet	139 (99.3)
Alcohol-focused outlets†	
Total number for all neighbourhoods	428
Mean (SD) number per km^2	1.2 (1.9)
Number (%) of neighbourhoods with no outlets	34 (24.3)
Number (%) of neighbourhoods with ≥1 outlet	106 (75.7)
Median (IQR) material deprivation index	4 (3)
Banks	
Total number for all neighbourhoods	472
Mean (SD) number per km^2	1.1 (1.3)
Number (%) of neighbourhoods with no banks	14 (10.0)
Number (%) of neighbourhoods with ≥1 bank	126 (90.0)
All crime (2006)	
Mean (SD) number of all crimes per 10 000 residents	425.9 (255.6)
Mean (SD) number of violent crimes per 10 000 residents	103.5 (54.3)
Cheque cashing places	
Total number for all neighbourhoods	310
Mean (SD) number of cheque cashing places per km^2	0.8 (1.2)
Number (%) of neighbourhoods with no cheque cashing places	42 (30.0)
Number (%) of neighbourhoods with ≥1 cheque cashing place	98 (70.0)

*Includes all on-premise alcohol licensed facilities, as well as liquor and beer stores.
†Restricted to specific on-premise alcohol licensed facilities (see online supplementary table 2), as well as liquor and beer stores.
Min, minimum; Max, maximum.

premature mortality is well established,[2 8 32 38] as is that between poverty and increased morbidity and mortality.[39–42] However, little attention has focused on premature death among young and middle-aged adults, despite the fact that many deaths are from intentional and unintentional self-harm, and thus are potentially preventable. Most studies considered premature mortality from birth to age 75 years,[1–4] but the differing age-related causes of death across this broad group obscures our deeper understanding of why young and middle-aged adults die. Furthermore, these latter populations constitute the majority of the workforce, who are sensitive to the economic conditions that may contribute to CCP density. Hence, it was logical and novel for us to assess whether CCP density and alcohol outlet density each impact on premature mortality at the neighbourhood level. This study was conducted within a universal health insurance setting in which all Ontario residents have full access to primary and hospital care services.

Study limitations

To reduce data suppression due to small cell sizes, we aggregated our data at the neighbourhood level. Accordingly, the presence of an on-premise or retail alcohol sales outlet did not necessarily reflect alcohol consumption by those who reside in a given neighbourhood. We used administrative boundaries for each neighbourhood. While such boundaries may underestimate the influence of CCPs or alcohol outlets on adjacent neighbourhoods, Stafford *et al*[43] found that administrative boundaries are a suitable substitute for neighbourhoods otherwise defined by socioeconomic homogeneity or physical boundaries. However, we could not determine the degree of clustering (ie, proximity to

Table 2 Risk of premature mortality among adults aged 20–59 years in relation to density of CCP or alcohol outlet Q.

	Crude relative risk (95% CI)			Adjusted relative risk (95% CI)*		
Exposure variable	**All**	**Males**	**Females**	**All**	**Males**	**Females**
CCP density Q						
Q1	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Q2	0.96 (0.89 to 1.03)	0.91 (0.83 to 1.00)	0.94 (0.84 to 1.05)	0.91 (0.84 to 0.98)	0.88 (0.80 to 0.98)	0.92 (0.81 to 1.03)
Q3	1.21 (1.14 to 1.28)	1.19 (1.10 to 1.28)	1.14 (1.04 to 1.24)	1.04 (0.98 to 1.11)	1.03 (0.94 to 1.12)	1.05 (0.95 to 1.17)
Q4	1.24 (1.17 to 1.32)	1.25 (1.17 to 1.35)	1.16 (1.06 to 1.27)	1.07 (1.00 to 1.14)	1.07 (0.98 to 1.16)	1.08 (0.97 to 1.20)
Q5	1.46 (1.38 to 1.54)	1.52 (1.42 to 1.63)	1.24 (1.13 to 1.36)	1.20 (1.12 to 1.29)	1.25 (1.15 to 1.36)	1.11 (0.99 to 1.24)
All alcohol outlet density Q†						
Q1	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Q2	1.13 (1.06 to 1.20)	1.16 (1.07 to 1.25)	1.08 (0.99 to 1.19)	1.03 (0.96 to 1.09)	1.04 (0.96 to 1.13)	1.03 (0.93 to 1.13)
Q3	1.01 (0.95 to 1.08)	1.06 (0.98 to 1.15)	0.96 (0.87 to 1.06)	0.99 (0.93 to 1.06)	1.04 (0.96 to 1.13)	0.95 (0.86 to 1.05)
Q4	1.18 (1.11 to 1.26)	1.21 (1.11 to 1.31)	1.11 (1.00 to 1.22)	1.18 (1.10 to 1.26)	1.21 (1.11 to 1.32)	1.11 (0.99 to 1.23)
Q5	1.28 (1.20 to 1.35)	1.35 (1.26 to 1.46)	1.10 (1.00 to 1.21)	1.26 (1.18 to 1.35)	1.36 (1.25 to 1.48)	1.11 (1.00 to 1.24)
Alcohol-focused outlet density Q‡						
Q1	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Q2	0.99 (0.93 to 1.05)	0.93 (0.86 to 1.01)	0.99 (0.89 to 1.09)	0.85 (0.79 to 0.92)	0.82 (0.74 to 0.90)	0.91 (0.80 to 1.02)
Q3	1.08 (1.01 to 1.15)	1.03 (0.95 to 1.11)	1.06 (0.96 to 1.17)	0.95 (0.88 to 1.03)	0.93 (0.85 to 1.02)	0.98 (0.88 to 1.10)
Q4	1.12 (1.05 to 1.20)	1.08 (1.00 to 1.17)	1.08 (0.98 to 1.20)	1.04 (0.96 to 1.12)	1.03 (0.94 to 1.13)	1.05 (0.93 to 1.18)
Q5	1.20 (1.12 to 1.27)	1.17 (1.08 to 1.26)	1.08 (0.98 to 1.20)	1.06 (0.98 to 1.14)	1.06 (0.96 to 1.17)	1.02 (0.90 to 1.15)

*All models were adjusted for the material deprivation Q and crime Q, while the analysis of CCPs was also adjusted for the number of banks.
†Includes all on-premise alcohol licensed facilities, as well as liquor and beer stores.
‡ Restricted to specific on-premise alcohol licensed facilities (see online supplementary table 2), as well as liquor and beer stores.
CCP, cheque cashing place; Q, quintile.

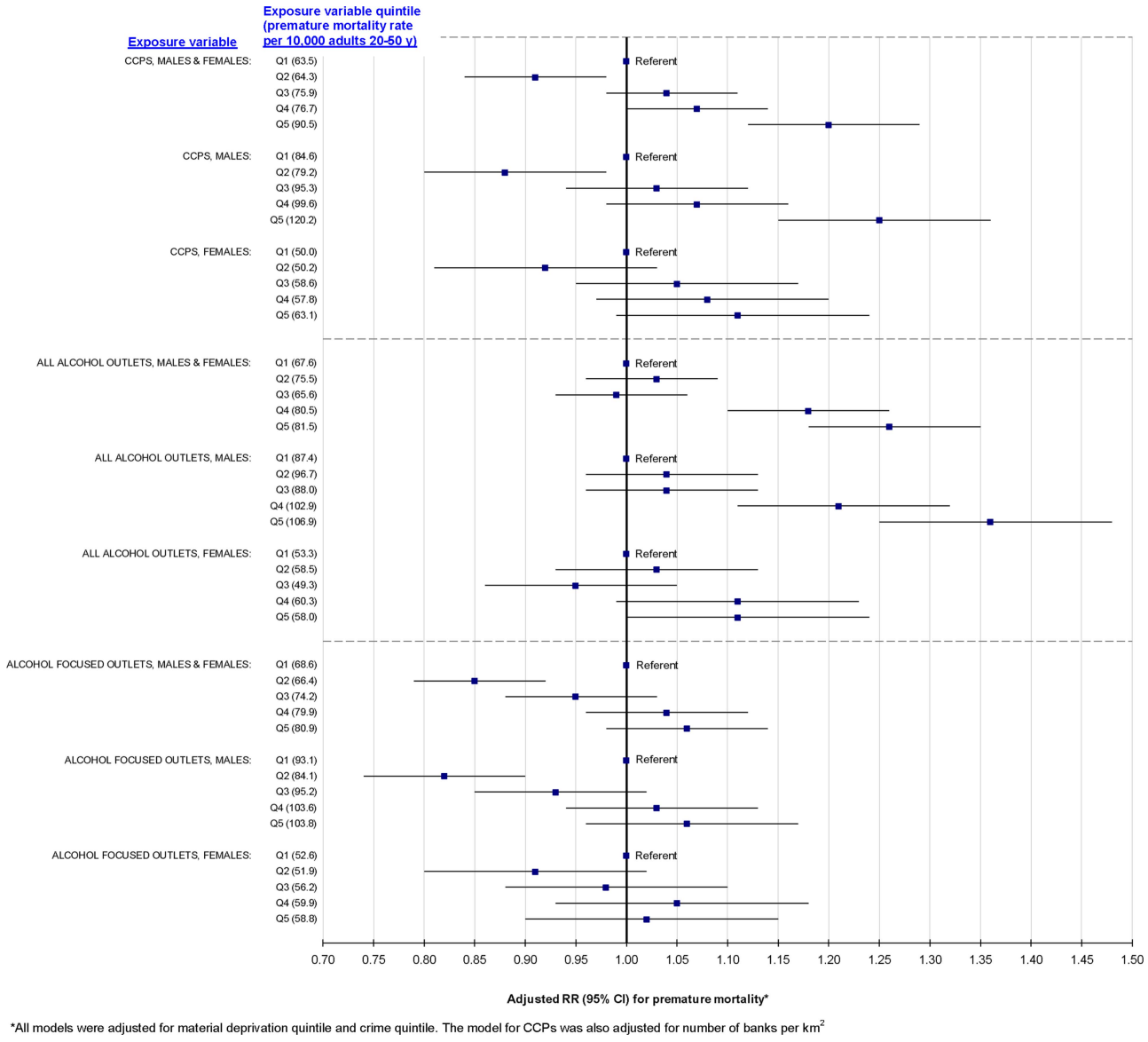

Figure 1 Risk of premature mortality in relation to CCP and alcohol outlet density quintiles (Q), presented for males and females together and separately. Next to each exposure Q label is the corresponding rate of premature mortality per 10 000 adults aged 20–59 years. Alcohol-focused outlets were limited to specific on-premise alcohol licensed facilities (see online supplementary table S2), as well as all liquor and beer stores (CCP, cheque cashing places; RR, relative risk; Q, quintiles).

each other) of CCPs or alcohol outlets within a specific zone of a given neighbourhood.

Here, we did not consider race/ethnicity, a potentially important confounder between low-income status and premature mortality. In the USA, victims of violent crime are more likely to be of African-American or Hispanic ancestry[44] and assault-related premature mortality is fourfold higher in the USA than in Canada (http://www.conferenceboard.ca/hcp/details/health/premature-mortality-rate.aspx). While CCPs are more concentrated in US ethnic minority enclaves,[45] Toronto's neighbourhoods tend to be more ethnically diverse, and homicide is not a leading cause of death (see online supplementary table S1). Given the cross-sectional nature of our data, we could not assess when CCPs or alcohol outlets were first introduced to each neighbourhood or the lag in premature mortality following their introduction. We also could not assign a neighbourhood postal code to persons of no fixed address. Hence, future studies might examine changes in morbidity (eg, severe intoxication, injury or acute mental illness) and mortality patterns with the opening and closing of CCPs or alcohol outlets, as well as creating a category for persons without a residential address.

It is challenging to conduct large population-based studies on alcohol-related harm using individual-level data on alcohol consumption.[46–48] Certainly, persons most apt to overuse alcohol may be least likely to respond to household surveys,[49 50] for example. Rather, a 'bird's-eye' view like ours is often necessary, where

individual alcohol consumption cannot be measured. In Ontario, alcohol is completely regulated,[11] enabling us to account for all places where alcohol is sold, unlike in other Canadian provinces or US states, where private retail outlets exist.[12 51 52] Hence, in our study, where both retail in-store and on-premise alcohol sales were documented, it was possible to evaluate the general availability of alcohol within the population.

CONCLUSION AND IMPLICATIONS

Our findings suggest that there may be a J-shaped relation between both alcohol outlet and CCP density and premature mortality, especially among males. Thus, strategic placement of CCPs or alcohol-focused outlets in certain areas may provide local residents with ready access to quick cash and/or the purchase of alcohol. We can generally identify economic disadvantage at the individual level, and even at the area level, if it affects enough local residents. A high density of CCPs may be an economic signpost that health interventions are needed within a neighbourhood, including strategies that address the causes of premature death, such as intentional self-harm, poisoning and alcohol-related liver disease (see online supplementary table S1). Future research might explore the experiences of people faced with financial bankruptcy and its impact on their overall mental and physical health.

Solving the problem of alcohol-related harm at the neighbourhood level is not easy.[53] As alcohol and CCP industries are each often government regulated, should there be a restriction on the number of CCPs and/or the type of alcohol outlets in neighbourhoods with high rates of premature death? While there is some compelling evidence for limiting alcohol sales[54]—both by the number of outlets and hours of operation[12 51 55]—less is known about that for CCPs. One approach to the latter would be to offer money management services for people at risk of alcohol overuse, in whom addiction overwhelms all aspects of their lives, including financial instability.[56] In terms of CCPs themselves, we and others have argued that they are strategically placed where customers abound,[23 25 57] and where mental illness and self-neglect are more prevalent. This has implications for how we shape health improvement strategies among people living in such neighbourhoods. For example, offering support to these individuals, in terms of formal banking, budget management and addiction counselling, all seem sensible as part of a strategy to reduce premature mortality. Moreover, physicians, nurses, addiction counsellors and social workers who help persons with alcohol problems might use an individual's neighbourhood as an indicator of their risk for health decline, and even recommend relocation to an area with few CCPs and alcohol outlets. For example, residential relocation has been associated with a greater cessation of injection drug use, especially moving from a highly deprived to a less deprived neighbourhood.[58] For alcohol addiction, recovery is less likely among those who dwell in disadvantaged neighbourhoods.[56] Certainly, the place where one lives partly determines health behaviours and opportunities for health improvement.

In conclusion, in neighbourhoods with higher than expected rates of premature mortality, lessening social disadvantage might be achieved through encouraging the use of formal banking methods and better money handling, alongside alcohol reduction strategies. One can then assess whether there follows a decline in the rate of non-fatal and fatal intentional self-harm, poisoning and acute liver disease.

Contributors JGR, FIM and MIC conceived and designed the study. FIM, JGR, MIC and PG were involved in data collection. ALP, PG and FIM contributed to data preparation and analysis. JGR and FIM wrote the manuscript. MIC and ALP helped revise the manuscript. All authors read and approved the final manuscript.

Funding This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None.

Ethics approval St. Michael's Hospital Ethics Review Board.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement No additional data are available.

REFERENCES

1. Cullen MR, Cummins C, Fuchs VR. Geographic and racial variation in premature mortality in the U.S.: analyzing the disparities. *PLoS One* 2012;7:1–13.
2. Ouellet BL, Romeder JM, Lance JM. Premature mortality attributable to smoking and hazardous drinking in Canada. *Am J Epidemiol* 1979;109:451–63.
3. Struijk EA, May AM, Beulens JW, *et al*. Development of methodology for disability-adjusted life years (DALYs) calculation based on real-life data. *PLoS One* 2013;8:1–7.
4. Maniecka-Bryla I, Pikala M, Bryla M. Life years lost due to cardiovascular diseases. *Kardiol Pol* 2013;71:1065–72.
5. Leading Causes of Death in Canada. Ottawa, 2012.
6. Leon DA, Shkolnikov VM, McKee M. Alcohol and Russian mortality: a continuing crisis. *Addiction* 2009;104:1630–6.
7. Rehm J, Patra J, Popova S. Alcohol-attributable mortality and potential years of life lost in Canada 2001: implications for prevention and policy. *Addiction* 2006;101:373–84.
8. Leon DA, Saburova L, Tomkins S, *et al*. Hazardous alcohol drinking and premature mortality in Russia: a population based case-control study. *Lancet* 2007;369:2001–9.
9. Courtenay WH, Keeling RP. Men, gender, and health: toward an interdisciplinary approach. *J Am Coll Health* 2000;48:243–6.
10. Courtenay WH. College men's health: an overview and a call to action. *J Am Coll Health* 1998;46:279–90.
11. Ray JG, Moineddin R, Bell CM, *et al*. Alcohol sales and risk of serious assault. *PLoS Med* 2008;5:0725–31.
12. Stockwell T, Zhao J, Macdonald S, *et al*. Impact on alcohol-related mortality of a rapid rise in the density of private liquor outlets in British Columbia: a local area multi-level analysis. *Addiction* 2011;106:768–76.
13. Campbell CA, Hahn RA, Elder R, *et al*. The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. *Am J Prev Med* 2009;37:556–69.
14. Pickett KE, Pearl M. Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health* 2001;55:111–22.

15. Latkin CA, Aaron DC. Stressful neighborhoods and depression: a prospective study of the impact of neighborhood disorder. *J Health Soc Behav* 2003;44:34–44.
16. Matheson FI, Moineddin R, Dunn JR, *et al*. Urban neighborhoods, chronic stress, gender and depression. *Soc Sci Med* 2006;63:2604–16.
17. Serido J, Almeida DM, Wethington E. Chronic stressors and daily hassles: unique and interactive relationships with psychological distress. *J Health Soc Behav* 2004;45:17–33.
18. Wheaton B. The nature of stressors. In: Horwitz AV, Scheid TL, eds. *A handbook for the study of mental health: social contexts, theories, and systems*. New York: Cambridge University Press, 1999:176–97.
19. Winkleby MA, Cubbin C. Influence of individual and neighbourhood socioeconomic status on mortality among black, Mexican-American, and white women and men in the United States. *J Epidemiol Community Health* 2003;57:444–52.
20. Fiscella K, Franks P. Poverty or income inequality as predictor of mortality: longitudinal cohort study. *BMJ* 1997;314:1724–7.
21. Backlund E, Sorlie PD, Johnson NJ. The shape of the relationship between income and mortality in the United States. Evidence from the National Longitudinal Mortality Study. *Ann Epidemiol* 1996;6:12–20.
22. Cubbin C, LeClere FB, Smith GS. Socioeconomic status and injury mortality: individual and neighbourhood determinants. *J Epidemiol Community Health* 2000;54:517–24.
23. Kubrin CE, Squires GD, Graves SM, *et al*. Does fringe banking exacerbate neighborhood crime rates? *Criminol Public Policy* 2011;10:437–66.
24. Eskin SB. *Check cashing: a model statute*. Washington DC: AARP Public Policy Institute Research Group, 1995.
25. Ray JG, Boshari T, Gozdyra P, *et al*. Cheque cashing places: preying on areas with high crime. *Sociol Mind* 2013;3:278–83.
26. Matheson FI, Dunn JR, Smith KL, *et al*. Development of the Canadian Marginalization Index: a new tool for the study of inequality. *Can J Public Health* 2012;103(8 Suppl 2):S12–16.
27. Anselin L. Local Indicators of Spatial Association—LISA. *Geogr Anal* 1995;27:93–115.
28. Popova S, Giesbrecht N, Bekmuradov D, *et al*. Hours and days of sale and density of alcohol outlets: impacts on alcohol consumption and damage: a systematic review. *Alcohol Alcohol* 2009;44:500–16.
29. Rossow I, Norstrom T. The impact of small changes in bar closing hours on violence. The Norwegian experience from 18 cities. *Addiction* 2012;107:530–7.
30. Cheng ER, Kindig DA. Disparities in premature mortality between high- and low-income US counties. *Prev Chronic Dis* 2012;9:1–11.
31. Doubeni CA, Schootman M, Major JM, *et al*. Health status, neighborhood socioeconomic context, and premature mortality in the United States: The National Institutes of Health-AARP Diet and Health Study. *Am J Public Health* 2012;102:680–88.
32. Katcher BS, Reiter RB, Aragon TJ. Estimating alcohol-related premature mortality in San Francisco: use of population-attributable fractions from the global burden of disease study. *BMC Public Health* 2010;10:1–10.
33. McCartney D, Scarborough P, Webster P, *et al*. Trends in social inequalities for premature coronary heart disease mortality in Great Britain, 1994–2008: a time trend ecological study. *BMJ Open* 2012;2:1–7.
34. Stevenson RJ, Lind B, Weatherburn D. The relationship between alcohol sales and assault in New South Wales, Australia. *Addiction* 1999;94:397–410.
35. Livingston M. Alcohol outlet density and assault: a spatial analysis. *Addiction* 2008;103:619–28.
36. Fox JA, Woodall P. Cashed out: consumers pay steep premium to "bank" at check cashing outlets. Washington DC: Consumer Federation of America, 2006.
37. Logan A, Weller CE. Who borrows from payday lenders? An analysis of newly available data. Washington DC: Center for American Progress, 2009.
38. Rehm J, Sulkowska U, Manczuk M, *et al*. Alcohol accounts for a high proportion of premature mortality in central and eastern Europe. *Int J Epidemiol* 2007;36:458–67.
39. Aaron A. Social class, life expectancy and overall mortality. *Milbank Mem Fund Q* 1967;45:31–73.
40. Link BG, Phelan J. Social conditions as fundamental causes of disease. *J Health Soc Behav* 1995;35:80–94.
41. Davey Smith G, Hart C, Hole D, *et al*. Education and occupational social class: which is the more important indicator of mortality risk? *J Epidemiol Community Health* 1998;52:153–60.
42. Kuh D, Hardy R, Langenberg C, *et al*. Mortality in adults aged 26–54 years related to socioeconomic conditions in childhood and adulthood: post war birth cohort study. *BMJ* 2002;325:1076–80.
43. Stafford M, Duke-Williams O, Shelton N. Small area inequalities in health: are we underestimating them? *Social Sci Med* 2008;67:891–99.
44. Sampson RJ, Lauritsen JL. Racial and ethnic disparities in crime and criminal justice in the United States. *Crime Justice* 1997;21:311–74.
45. Smith MM, Wackes J, Smith TE. Alternative financial service providers and the spatial void hypothesis: the case of New Jersey and Delaware. Philadelphia, PA: Federal Reserve Bank of Philadelphia, 2009.
46. Hemström Ö. Per capita alcohol consumption and ischaemic heart disease mortality. *Addiction* 2001;96 (suppl 1):S93–112.
47. Ole-Jørgen S. Methodological problems in the analysis of temporal covariation between alcohol consumption and ischemic heart disease. *Br J Addict* 1983;78:157–2.
48. Ely M, Hardy R, Longford NT, *et al*. *Methods of estimating individual levels of alcohol consumption in the general population*. London, UK: Alcohol Research UK, 2001.
49. McCoy TP, Ip EH, Blocker JN, *et al*. Attrition bias in a U.S. Internet survey of alcohol use among college freshmen. *J Stud Alcohol Drugs* 2009;70:606–14.
50. Grittner U, Gmel G, Ripatti S, *et al*. Missing value imputation in longitudinal measures of alcohol consumption. *Int J Methods Psychiatr Res* 2011;20:50–61.
51. Zalcman RF, Mann RE. The effects of privatization of alcohol sales in Alberta on suicide mortality rates. *Contemp Drug Probl* 2007;34:589–609.
52. CAMH. *Retail Alcohol Monopolies and Regulation: Preserving the Public Interest Position Paper*. Toronto, ON: Centre for Addiction and Mental Health, 2004.
53. Shakeshaft A, Doran C, Petrie D, *et al*. The effectiveness of community action in reducing risky alcohol consumption and harm: a cluster randomised controlled trial. *PLoS Med* 2014;11:1–14.
54. Brand DA, Saisana M, Rynn LA, *et al*. Comparative analysis of alcohol control policies in 30 countries. *PLoS Med* 2007;4:0752–9.
55. MADD. *Provincial Liquor Boards: meeting the best interests of Canadians. MADD Canada Policy Backgrounder*. In: MADD, ed. Oakville, ON: Mothers Against Drunk Drivers, 2014:1–19.
56. Buu A, Mansour M, Wang J, *et al*. Alcoholism effects on social migration and neighborhood effects on alcoholism over the course of 12 years. *Alcohol Clin Exp Res* 2007;31:1545–51.
57. Buckland J. *Hard choices: financial exclusion, fringe banks, and poverty in urban Canada*. Toronto: University of Toronto Press, 2012.
58. Genberg BL, Gange SJ, Go VF, *et al*. The effect of neighborhood deprivation and residential relocation on long-term injection cessation among injection drug users (IDUs) in Baltimore, Maryland. *Addiction* 2011;106:1966–74.