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Material deprivation in Canada

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Abstract

Material deprivation data are collected annually by the national statistics offices of many advanced economies and the resulting statistics are used by academics, policy makers and interest groups as a complement to low-income statistics. This paper presents the first nationally and provincially representative statistics on material deprivation in Canada. Using the one-time Canadian Survey of Economic Well-being (2013) we construct a material deprivation index, study the incidence and correlates of material deprivation across socio-demographic groups, and explore the overlap in incidence between material deprivation, low income and economic hardship.

Our tests indicate that all available deprivation items meet the scientific criteria (suitability, validity, reliability and additivity) for inclusion in a material deprivation index. We further develop an empirical strategy that uses supplementary information in the CSEW to help set the material deprivation threshold: we assess whether a materially deprived person has a relatively high or low likelihood of being poor, thereafter analyzing how the composition of these groups changes as the threshold changes. The resulting material deprivation index includes 17 items and reflects the percentage of Canadians living in households that are deprived of two or more items. Setting the threshold is the most influential methodological decision: a threshold of two items yields a material deprivation rate of 18 percent, while thresholds of one item and three items yield rates of 29 and 13 percent respectively. We proceed the analysis with a threshold of two items. The appendix also offers all results for a threshold of three items. Other than finding a lower incidence of material deprivation, the general findings described below also hold for a threshold of three items.

We find that the population identified as materially deprived only partially overlaps with the population identified as low-income using the Low-Income Measure (LIM). Because some Canadians are identified as having (only) a low income (8 percent), others as being (only) materially deprived (11 percent), and another group as both (8 percent), the total population that could be experiencing poverty level living conditions is considerably larger than what is measured by Canada's low-income indicators (27 percent).

Moreover, most socio-economic groups that have a high risk of low income also have a high risk of material deprivation. For these groups, the total population that could be experiencing poverty is substantively higher than for the general population. For instance, sixty percent of lone-parent households are either deemed poor by both indicators (33 percent), (only) materially deprived (17 percent) or (only) low-income (10 percent).

However, some socio-demographic groups known to have a high risk of poverty according to one indicator do not also have a high risk according to the other indicator (or vice versa). For instance, persons aged 65 years and above have an above-average risk of having low income but an on average risk of being materially deprived. Families consisting of a couple with children have a below-average risk of having low income but an on average risk of being materially deprived.

Finally, even though by far most materially deprived persons also report experiencing economic hardship (88 percent), there is also a significant population reporting economic hardship without being materially deprived. This suggests that economic hardship affects a broader population than that experiencing poverty. Economic hardship is defined as having, in the past year: experienced difficulty meeting necessary expenses; asked for help from friends or family, taken on debt, sold assets, or turned to a charity when short of money; and/or experienced financial difficulty due to a long-term disability or health problem.

Concluding, these novel findings for Canada corroborate those of a large body of international research: identifying persons experiencing poverty level living conditions requires more than measuring low incomes alone; and, material deprivation indicators complement low-income indicators because they are better at screening the material well-being of persons with above (or below) 'typical' needs, costs of living, access to subsidized services, non-income financial resources and/or debt service.

Key words: Material well-being, material deprivation, low income, poverty, economic hardship, social indicators, Canada.

JEL Classification: D31, I32.

1. Introduction[1]

In Canada, as in many other rich countries, there is a longstanding tradition to measure material well-being of its residents with monetary indicators such as income, expenditures and wealth. Such indicators tell us something about the amount of financial resources that individuals and their families can (potentially) spend to attain a certain living standard. While financial resources are very important to achieving material well-being in a largely monetized economy such as Canada's, monetary indicators are nonetheless only imperfectly correlated with a person's actual living standard. These discrepancies arise because of differences in the operationalization of material-well-being indicators as well as differences in persons' needs, capabilities, and access to (non-) financial resources and public goods.

The discrepancy between persons' financial resources and their actual material well-being also arises when the analytical goal is to measure poverty. The term poverty is often used to describe persons who are experiencing adverse material outcomes because they do not have enough financial resources. Poverty has traditionally been operationalized either by measuring one financial resource (most frequently income, as measured by low-income indicators) or, more recently, by an index measuring adverse material outcomes (measured by a material deprivation index). A large body of academic research, covering many countries, time periods and different types of indicators, finds that there is a positive though only relatively modest correlation between monetary and non-monetary indicators of poverty (i.e. Battiston et al., 2013; Bossert et al., 2013; Fusco et al., 2011; Nolan and Whelan, 2010). Two studies using Canadian and Ontarian data present similar findings (Heisz and Langevin, 2011; Notten, 2015a).

The modest correlation arises because monetary and non-monetary poverty indicators measure related but distinct aspects of poverty and because each indicator has its own specific measurement issues. This is why some analysts prefer labelling these indicators as 'low income' and 'material deprivation' rather than 'poverty'. Leaving semantics aside, the fact remains that the population identified as 'least well off' according to a monetary indicator only partially overlaps with that identified by a non-monetary indicator. Reliance on only one type of indicator is risky because it excludes populations whom we may consider as 'poor' using the other indicator and it includes populations whom we may consider as 'non-poor' with the other indicator (Notten, 2015a; Notten, 2015b). The mismatch is typically substantive enough to affect research findings and policy decisions.

Non-monetary and monetary poverty indicators are thus considered complements and their use in academic research and policymaking has become increasingly common. Over the past decades scholars have developed and tested methods to construct non-monetary indicators (i.e. Guio et al, 2016; Bossert et al, 2013; Nolan and Whelan, 2011) and the indicators are also increasingly used to assess the role of social policy on poverty (i.e. Cancian and Meyer, 2004; Nelson, 2012; Notten, 2015b; Saunders and Wong, 2011). Many governments produce both low-income and material deprivation statistics on a regular basis. The European Union publishes low-income and material

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deprivation indicators annually and tracks both as part of its strategic policy target to reduce poverty and social exclusion by 2020 (Notten and Guio, September 2016). Ireland and New Zealand each have their national material deprivation indices alongside income poverty indicators (Central Statistics Office website; Perry, August 2016). The United Kingdom publishes statistics specifically designed to measure material deprivation among pensioners over age 65 (Kotecha, Arthur, and Coutinho, 2013). In Canada, however, only the Government of Ontario briefly used a material deprivation index to monitor progress on their first poverty reduction strategy (Government of Ontario, 2008).

This paper undertakes a nationally and provincially representative analysis of the incidence of adverse material well-being outcomes in Canada using data from the one-time Canadian Survey of Economic Well-being (CSEW) conducted in 2013. These are the first and, thus far, only Canadian data that permit such an analysis. Until the CSEW, Statistics Canada only collected material deprivation data for Ontario (on request and financed by the Government of Ontario) and as part of its own pilot survey, which covered a relatively small sample of households in only four provinces (Heisz and Langevin, 2011). This study thus contributes new empirical evidence regarding the extent and character of low material well-being in Canada.

The richness of the data allows for rigorous statistical testing to guide the construction and validation of a material deprivation index. More precisely, this paper tests whether each deprivation item that could be included in a material deprivation index satisfies four scientific measurement criteria (suitability, validity, reliability and additivity). Testing the validity and additivity criteria requires information on income and economic hardship which is available in the data. This research thus informs potential future data collection and indicator production efforts in Canada, activities that seem pertinent in light of the evidence from this and other research on non-monetary poverty indicators.

This paper also explores the relation between the material deprivation index, Canada's Low-Income Measure (LIM), and economic hardship. We focus on the discrepancy between these types of indicators in identifying the least well-off and whether there are differences in high poverty risk populations. Such analysis is important because it reveals information that is not taken into account in analyses that solely focus on monetary poverty.

This paper is structured as follows: Section 2 reviews the Canadian and international literature on monetary and non-monetary poverty measurement focusing on methodological approaches and findings; Section 3 describes the CSEW data and offers descriptive statistics of the key variables; Section 4 develops and tests the material deprivation index; Section 5 presents a profile of material deprivation in Canada and compares this to the profiles of low income and economic hardship; Section 6 concludes.

2. Measuring material well-being of the least well off [2]

This paper focuses on the material dimension of poverty and refers to poverty when persons are experiencing adverse material outcomes because they do not have enough financial resources. In operationalizing this concept into indicators, non-monetary indicators, such as a material deprivation index, focus on measuring adverse material outcomes, and monetary indicators focus on measuring financial resources, typically income (Notten, 2015a). Both types of indicators measure a relevant aspect within the material dimension of poverty and can thus be used to identify groups that are at high risk of poverty. However, neither of them is a direct measure of poverty (Berthoud and Bryan, 2011).

The definition of poverty used here is consistent with Townsend's (1979) concept of material deprivation, which is the intellectual basis for European, Anglo-Saxon, and Ontarian material deprivation indices. By focusing on adverse material outcomes, a material deprivation index provides a more direct measurement of experiences associated with poverty (Heisz and Langevin, 2011). The index is derived from a set of questions enquiring whether households lack specific items deemed to be necessities, and whether this is due to a lack of financial resources (Guio, 2009; Department for Work and Pensions, 2003; Combat Poverty Agency, 2006; Whelan, 2007). Ontario's material deprivation index, for instance, is based on questions asking whether a family can afford items such as fresh fruit and vegetables every day or a visit to a dentist if needed (Matern et al, 2009a). Data from these questions are then converted to an index, which can be analyzed on its own, or in combination with data on low income. Items in the material deprivation index are not meant to represent an exhaustive list of necessities; rather, they are meant to be indicators, signals or symptoms of a lack of resources (Heisz and Langevin, 2009; Berthoud and Bryan, 2010). The material deprivation questions can be framed either in subsistence (absolute) or inclusive (relative) terms, and they can be defined relative to expert or community based judgments (Heisz and Langevin, 2009).

In contrast, low-income indicators are indirect indicators that measure whether a family has enough income to purchase the goods and services that are required to support an acceptable state of material well-being (Heisz and Langevin, 2009). The money threshold can be derived in a relative way – such as Canada's LIM which sets the threshold at a percentage of median income, or in an absolute fashion, such as Canada's Market Basket Measure (MBM) and Sarlo's Basic Needs Poverty Measure (2013), or some combination of the two as with the Low-Income Cut-Off (LICO) (Zhang, 2008).

Both material deprivation and low-income indicators have shortcomings when it comes to correctly identifying poor persons (Notten, 2015a). When selecting material deprivation items, one presumes that persons have a common prioritization of needs (McKay, 2004; Nolan and Whelan, 2011). Differences in needs by certain population groups may thus be overlooked. Moreover, adaptive preferences can lead to underreporting as adverse circumstances can lower persons' aspirations to the degree that, instead of saying that they cannot afford an item, they respond that

[2] For this section we draw from earlier publications of the authors, notably Notten (2015a, p. 3-4) and Heisz and Langevin (2011, p. 269-270), and Heisz and Langevin (2009, p. 4-9).

they do not want it (Guio, 2009). Feelings of shame can also induce underreporting (Breunig and McKibbin, 2011).

A key shortcoming of low-income indicators is that income is not the sole source for financing material needs. Access to alternative resources may explain why someone with low income can avoid adverse material outcomes. Savings or credit help meet expenses (Brandolini et al., 2010). When access to public services is subsidized, more income is left for other expenses (Paulus et al., 2010). Social networks can also help (Kalil and Ryan, 2010). Moreover, income is a resource, not an outcome. Someone with a somewhat higher income may still face adverse material outcomes because conditions such as chronic illness or disability require more resources to satisfy needs (She and Livermore, 2007). Similarly, debt payment obligations reduce the finances available for current needs (Pressman and Scott, 2009). Finally, both administrative and survey income data suffer from reporting errors (Rendtel et al., 2004).

The relation between low income and material deprivation is thus not necessarily immediate but can also be dynamic. Past expenditures on durables, for instance, may reduce the need for current expenditures, and alternative financial and social resources can help a household smooth expenditures during a period of low(er) income (Figari, 2012). Likewise, an improvement in income may not directly translate into an improvement in material outcomes (Nolan and Whelan, 2010). Research using longitudinal data finds evidence of both an immediate and a lagged effect of income on material deprivation (Figari, 2012; Berthoud and Bryan, 2010).

Moreover, issues of data collection also explain some of the mismatch observed at a given time. An annual measure of low income might not detect one or multiple episodes of low income when they arise because a drop in income covers two tax years or because a household's income is very volatile (Notten and Mendelson, July 2016; Hills, 2015). Moreover, in most surveys the reference period for income information differs from that of the material deprivation information. In Canadian and European data, for instance, the reference period for income is usually the previous tax year while the material deprivation questions refer to the implied present (Notten, 2015a; Figari, 2012). Synchronizing reference periods either requires longitudinal data (Iacovou, 2004) or a change in data collection practices.

The above reasons explain why a large body of academic research finds that the population identified as 'least well off' according to a monetary indicator only partially overlaps with that identified by a non-monetary indicator (i.e. Battiston et al., 2013; Bossert et al., 2013; Fusco et al., 2011; Nolan and Whelan, 2010). Canadian findings are consistent with those of international research. Using Ontario data for two survey waves and three low-income measures, Notten (2015a) finds that 15 to 20 percent of Ontario's children are identified as poor by either a low-income indicator, a material deprivation index or both. Of this group of potentially poor children, the share of low income and material deprivation indicators jointly identifying children as poor is only 12 to 22 percent. Using Canadian pilot data, Heisz and Langevin (2009) show that while the incidence of material deprivation is highest among those in the lowest income decile (and falling monotonically thereafter), it is still substantive for households in the second and third income decile. Thus, quite some households experiencing material deprivation have incomes that are (somewhat) above Canada's most used low-income thresholds.

For the purposes of understanding poverty and measuring the effects of policy on poverty, low-income and material deprivation indicators are thus complementary (Notten, 2015b). The cost of the current dominance of low-income measures in Canada is that we exclude a substantively large population group from the analysis, namely those experiencing adverse material outcomes without having an income below the low-income threshold(s). While better measurement can reduce the flaws of income indicators there is thus still a considerable benefit to also measuring material deprivation (Nolan and Whelan, 2010; Berthoud and Bryan, 2011).

3. Data and descriptive statistics

The data used in this study are from the Canadian Survey of Economic Well-being (CSEW). The CSEW was conducted by Statistics Canada on a one-time basis in 2013.

The CSEW questionnaire is comprised of four sections. The first section contains questions on households' ability to satisfy basic material needs such as food, clothing, and housing as well as social needs of participation and leisure. Information was collected about 17 of these needs, which we refer to as "material deprivation items". Second, five questions on economic hardship aim to determine how households deal with day to day finances. Finally, the last two sections collected information on household income sources and total personal income.

The CSEW was conducted in the ten provinces in August and September 2013. A sub-sample[3] of households in the Labour Force Survey (LFS) sample was selected to respond to the CSEW on a voluntary basis. A household refers to a person or group of persons living in the same dwelling, and may consist of any combination of: one person living alone, one or more families, or a group of people who are not related but who live together. The CSEW was completed by a responsible and knowledgeable member of the household. The questions on material deprivation, economic hardship and household income sources were asked about the household as a whole, and proxy answers were permitted for the questions on household members' personal income.

Table 1: Number of CSEW respondents, Canada

	Households	Percent of CSEW starting sample
CSEW starting sample	36,042	100.0%
LFS responding households	33,019	91.6%
CSEW responding households	24,258	67.3%

[3] The total LFS sample is composed of six independent samples, called rotation groups, because each month one sixth of the sample (or one rotation group) is replaced. The CSEW used four rotation groups from the LFS (totalling 36,042 households).

Of the households selected for the CSEW in August and September 2013, 91.6 per cent responded to the LFS. Of those responding to the LFS, 73.5 per cent also responded to the CSEW, leading to an overall response rate of 67.3 per cent for the CSEW. The final CSEW sample consists of 24,258 households composed of 57,911 individuals.

Donor imputation was used to fill in missing data from non-response to questions on total personal income. In the case of material well-being questions, 1,590 individuals were missing information on at least one material deprivation item, representing 2.7 per cent of individuals in the sample. These individuals were excluded from the sample in Section 3 and Section 5 (sample exclusions are indicated throughout the paper where applicable). Individuals missing information at least one material well-being or economic hardship question totaled 2,274 or 3.9 per cent of the sample (Table 2).

The unit of analysis for this paper is the individual. As the population of interest for this study is individuals living in Canada, the entire CSEW sample is in scope and sample exclusions are made based on households missing information on variables of interest. These exclusions are indicated where applicable throughout the paper.

Table 2: CSEW records with missing information, Canada

	Households	**Individuals**
CSEW respondents	24,258	57,911
Respondents missing information on at least one material deprivation item [percent of respondents]	771 [3.2%]	1,590 [2.7%]
Respondents missing information on at least one economic hardship or material deprivation item [percent of respondents]	1,069 [4.4%]	2,274 [3.9%]

Material deprivation questions in CSEW

The CSEW collected information about households' ability to satisfy 17 different basic material or social needs, which we refer to as "material deprivation items". Questions on material deprivation items were developed based on questions from Statistics Canada's Ontario Deprivation Survey (OMDS, 2009), as well as the European Union Statistics on Income and Living Conditions (EU-SILC) and the analysis conducted by the EuroStat Task Force on Material Deprivation (Statistics Canada, 2013).

For each material deprivation item, the respondent was asked if the household has the item (i.e., if the need in question is satisfied). Respondents who reported that their household does not have the item were then asked if this was because they could not afford it or for some other reason. Those responding that they did not have the item because they could not afford it are considered deprived of that item.

Table 3 lists the 17 material deprivation items in CSEW, the survey questions used, and the incidence of deprivation for each item. A small percentage of the population (well under 5 per cent) lives in a household who cannot afford to: get around in their community by car of public transportation (0.6 per cent), live in a home free of unwanted pests (0.9 per cent), access Internet in or outside the home (1.1 per cent), keep their home at a comfortable temperature (1.5 per cent), eat meat or an equivalent every day (1.5 per cent), provide two pairs of suitable footwear per household member (2.0 per cent), buy small gifts for family or friends once a year (2.1 per cent), have job interview clothing for each adult member (2.1 per cent), eat fresh fruits and vegetables every day (2.4 per cent), or have friends and family over for a meal once a month (3.2 per cent). The items with medium incidence rates show that it is more common for individuals to live in a household that is not able to afford to: pay for all household members to have a hobby (4.7 per cent), pay bills on time (4.9 per cent), and replace a broken or damaged appliance (7.1 per cent). Of the 17 items, it is most common for individuals to live in households who cannot afford: a small amount of weekly spending money for each adult household member (9.7 per cent), regular dental care for all household members (10.3 per cent), an unexpected expense of $500 (16.5 per cent), and to replace worn-out furniture (16.6 per cent).

There is a broad range in incidence rates among the items, which is a trait consistent with other data sets. Notten (2015) shows that deprivation rates vary considerably between items in Ontario using 2009 Survey of Labour and Income Dynamics (SLID) and Ontario Material Deprivation Survey (OMDS) data (Notten, 2015). In addition data for EU countries with a comparable living standard to Canada show deprivation rates well below 10 per cent for items such as for eating meat every second day and keeping the home warm (Guio, 2009), while other items have deprivation rates of up to 30 per cent, such as the ability to afford an unexpected expense of about US$1,100 (Notten, 2015).

Table 3: Material deprivation items in CSEW and incidence rates

Item	Question(s)	Percent deprived
Appliances	Are you and your household able to replace or have repaired broken or damaged appliances such as a vacuum or a toaster?	7.1 (0.28)
Furniture	Are you and your household able to replace worn-out furniture in your house or apartment?	16.6 (0.40)
Unexpected expense	Could you and your household cover an unexpected expense today of $500 from your own resources?	16.5 (0.39)
Pay bills	Are you and your household currently able to pay your bills on time?	4.9 (0.25)
Internet*	(1) Do you and your household have access to the Internet at home? (2) Do you and each member of your household have regular access to the Internet during your leisure time outside your home?	1.1 (0.07)
Temperature	Are you and your household able to keep your house or apartment at a comfortable temperature?	1.5 (0.13)
Getting around	Are you and your household always able to get around your community, either by having a car or by taking the bus or equivalent mode of transportation?	0.6 (0.06)
Friends	Are you and your household able to have friends or family over for a meal at least once a month?	3.2 (0.20)
Dental	Are you and each member of your household able to get regular dental care if needed?	10.3 (0.34)
Gifts	Are you and your household able to buy some small gifts for family or friends at least once a year?	2.1 (0.14)
Pests	Is your house or apartment free of unwanted pests, such as cockroaches, mice or bedbugs?	0.9 (0.12)
Vegetables	Do you and each member of your household eat fresh fruits and vegetables at least once a day?	2.4 (0.16)
Meat	Do you and each member of your household eat meat, chicken, fish or a vegetarian equivalent at least once a day?	1.5 (0.13)
Footwear	Do you and each member of your household have at least two pairs of properly fitting footwear including a pair of suitable winter footwear?	2.0 (0.13)
Clothes	Do you and each adult in your household have appropriate clothes for job interviews?	2.1 (0.15)
Hobby	Do you and each member of your household have a hobby or leisure activity?	4.7 (0.25)
Spending money	Are all the adults in your household able to spend a small amount of money each week on themselves?	9.7 (0.33)
Number of records		56,321

Notes: Proportions calculated from weighted counts of individuals. Standard errors are in parentheses and are calculated using 1,000 replicate bootstrap weights. For each item, respondents who answered "no" were then asked "is this because you cannot afford it, or for some other reason?" Respondents answering "no" to the first question and stating affordability as the reason in the second question are deprived of the item.
* For Internet: households stating that they do not have Internet access at home are asked whether they have regular access to Internet during their leisure time outside of the home, and those responding no to this second question are asked whether this is because they cannot afford it or for some other reason. Households who lacked Internet access at home and regular access outside the home because they could not afford it are deprived.

Table 4 shows the incidence of the total number of deprivation items ranging from zero to 17 among individuals in the sample with no information missing for any material deprivation items. Seventy-one percent of individuals were not deprived of any items, 10 per cent were deprived of one item, and 6 per cent of two items. The percentage continues to decline with the number of deprivation items, and no individuals in the sample were deprived of more than 15 items.

Table 4: Incidence of the total number of material deprivation items

Number of deprivation items	Percent of individuals with number of deprivation items
0	71.2 (0.51)
1	10.2 (0.34)
2	5.7 (0.25)
3	3.8 (0.22)
4	2.9 (0.21)
5	2.0 (0.16)
6	1.5 (0.12)
7	0.8 (0.09)
8	0.7 (0.08)
9	0.6 (0.08)
10	0.3 E (0.06)
11	0.2 E (0.05)
12 to 15	0.2 E (0.05)
16 to 17	0.0 (0.00)
Number of records	56,321

Notes: Standard errors are in parentheses. Standard errors calculated using 1,000 replicate bootstrap weights. Proportions calculated from weighted counts of individuals. Individuals missing information on one or more material deprivation item were excluded from the sample. Individuals with 12 to 15 deprivation items were grouped for data quality and/or confidentiality reasons. Cells marked with an E indicate estimates of marginal quality (coefficient of variation between 16.6% and 33.3%).

Table 5 presents population shares of various household-level demographic characteristics using the sample of individuals for whom no information is missing about material deprivation items. According to CSEW, 23 per cent of individuals lived in a rented dwelling, and 19 per cent in a rural area. Sixteen per cent of individuals had an adjusted before-tax household income below the Low-Income Measure (LIM) line[4], and 10 per cent individuals lived in a household where income came mainly from government sources. Eleven percent of individuals lived alone, while 4 per cent lived in a lone-parent household. Twenty percent of individuals in the population were children aged under 18 years, and 15 percent were seniors aged 65 years or older.

One member of each household was defined as the reference person for the purpose of this study. The LFS asks respondents to designate an adult, normally with responsibility for the care or support of the family, as a reference person for each economic family in the household. For households made up of one economic family, the family reference person designated by the respondent in the LFS was used as the household reference person. For households with two or more families, one of the family reference persons was chosen to be the household reference person based on the following criteria, in order: (1) highest personal income, (2) oldest or (3) highest educational attainment.[5]

Four per cent of Canadians lived in a household with an unemployed reference person, and 2 per cent with a reference person permanently unable to work. Another 25 per cent of individuals lived in a household headed by a person who was out of the labour force and able to work, the labour force status group under which most seniors are found.[6] One quarter of the population lived in a household with an immigrant as the reference person, and 6 per cent with a reference person who had immigrated less than 10 years ago. Three per cent lived with a reference person of Aboriginal identity, and 29 per cent lived in a household headed by a reference person with a high school diploma or less. Fifteen per cent of individuals lived in a household headed by an adult aged 65 or more and less than one per cent in a household headed by someone aged less than 18 years.

[4] The LIM line is below which individuals are considered income-poor is $23,875. It was calculated as 50% of the median adjusted income of all individuals in the CSEW sample. Income was adjusted by dividing before-tax total household income by the square root of the household size and assigning this value to all individuals in the household. The low-income rate calculated is based on self-reported before-tax income as after-tax income were not available.

[5] For the very few cases in which a unique individual could not be chosen based on those three criteria, the individual who had responded to the CSEW content was used.

[6] Based on the CSEW, 83.8 per cent of the population aged 65 or older was not in the labour force and able to work.

Table 5: Population shares of usual correlates

Variable	Percent of population	Number of records
Renter	22.7	56,317
Rural	18.5	56,321
Low income (below LIM)	15.9	56,321
Main income source:		
Employment earnings	79.4	54,546
Investment or retirement	8.3	54,546
Government	10.3	54,546
Other	1.9	54,546
Household type:		
One-person	11.1	56,321
Couple with children	36.9	56,321
Couple without children	37.5	56,321
Single parent household	4.1	56,321
Other household	10.5	56,321
Individual's age:		
Under 18 years old	19.8	56,321
18 to 64 years	65.4	56,321
65 years or older	14.7	56,321
Household reference person:		
Aboriginal	2.7	56,321
Employed	69.8	56,148
Unemployed	4.2	56,148
Not in labour force, able to work	24.5	56,148
Not in labour force, permanently unable to work	1.5	56,148
Immigrant	25.0	56,321
Landed immigrant (10 or more years)	17.7	56,321
Landed immigrant (less than 10 years)	5.5	56,321
Not a landed immigrant	1.7	56,321
Some high school	11.2	56,321
High school graduate	17.4	56,321
Some post-secondary	5.4	56,321
Post-secondary below bachelor's	36.0	56,321
Bachelor's	19.9	56,321
Above bachelor's	10.1	56,321
18 to 64 years old	84.7	56,321
65 years old or more	15.2	56,321

Notes: Percentages based on weighted counts of individuals. Percentages may not add up to 100 due to rounding. Records with missing information for one or more material deprivation items were excluded from the sample. For each proportion, records with missing information for the variable of interest were excluded from the calculation. The Low Income Measure (LIM) line was calculated at $23,875 (before-tax income) over the entire sample of CSEW respondents. Cells marked with an F were suppressed for data quality reasons (CV above 33.3%).

Table 6 shows the average number of deprivation items per individual and the incidence of the total number of deprivation items by adjusted household income[7] quintile.

Over the whole population, the average number of deprivation items is 0.9 items. Individuals in the lowest quintile are deprived of 2.3 items on average; as expected, this number increases with each quintile and is lowest at 0.1 per cent in the highest quintile. Within each quintile the proportion of individuals deprived declines as the number of items increases. For each total number of items, the percentage of individuals deprived is highest for the lowest quintile and declines with each quintile, with the exception of a higher share of individuals being deprived of one item in the second quintile compared to the first.

A considerable share of individuals are deprived of one or more items in the fourth (15.7 per cent) and fifth (5.8 per cent) quintiles, mainly due to the "furniture", "unexpected expense", "dental care", and "spending money" items (these items also have the highest incidence rates overall, as seen in Table 3).

[7] Before-tax total household income, adjusted by dividing by the square root of the household size.

Table 6: Incidence of the total number of deprivation items by adjusted household income quintile

Number of deprivation items	Quintile					
	All quintiles	Lowest quintile	Second quintile	Third quintile	Fourth quintile	Highest quintile
average number of items						
	0.87 (0.021)	2.33 (0.064)	1.10 (0.047)	0.57 (0.033)	0.30 (0.030)	0.11 (0.013)
percent of individuals						
0	71.2 (0.51)	40.1 (1.08)	60.3 (1.18)	75.6 (1.08)	84.3 (0.99)	94.2 (0.60)
1	10.2 (0.34)	12.3 (0.76)	15.4 (0.92)	10.9 (0.84)	9.0 (0.79)	3.6 (0.51)
2	5.7 (0.25)	11.2 (0.74)	7.8 (0.67)	5.3 (0.55)	3.2 (0.50)	1.2 E (0.26)
3	3.8 (0.22)	9.0 (0.70)	5.3 (0.53)	3.3 (0.44)	1.4 E (0.31)	F
4	2.9 (0.21)	7.0 (0.54)	4.1 (0.60)	2.6 E (0.46)	1.1 E (0.33)	F
5	2.0 (0.16)	6.3 (0.62)	2.0 (0.32)	1.1 E (0.27)	F	F
1 or more	28.8 (0.51)	59.9 (1.08)	39.7 (1.18)	24.4 (1.08)	15.7 (0.99)	5.8 (0.60)
2 or more	18.6 (0.42)	47.6 (1.09)	24.3 (1.05)	13.4 (0.86)	6.6 (0.71)	2.2 (0.32)
3 or more	12.9 (0.39)	36.4 (1.07)	16.5 (0.91)	8.2 (0.71)	3.4 (0.53)	1.1 E (0.22)
4 or more	9.1 (0.33)	27.4 (0.99)	11.3 (0.84)	4.9 (0.55)	2.0 E (0.44)	0.8 E (0.19)
5 or more	6.2 (0.26)	20.4 (0.92)	7.1 (0.66)	2.3 (0.35)	1.0 E (0.29)	0.6 E (0.17)
Number of records	56,321	12,363	11,664	11,450	11,045	9,799

Notes: Standard errors are in parentheses. Standard errors calculated using 1,000 replicate bootstrap weights. Proportions calculated from weighted counts of individuals. Individuals missing information on one or more material deprivation item were excluded from the sample. Percentages may not add up to 100 due to rounding. Adjusted household income was calculated by dividing total household income by the square root of the household size and then assigning this value to each member of the household. Cells marked with an E indicate estimates of marginal quality (CV between 16.6% and 33.3%). Cells marked with an F were suppressed for data quality reasons (CV above 33.3%).

Economic hardship questions in CSEW

The CSEW asks five questions on the household's recent experience dealing with day-to-day finances. The five economic hardship indicators are whether, in the past 12 months, the household:

1. Asked for financial help from friends or family for day-to-day expenses because they were short of money "sometimes" or "often";
2. Took on debt or sold assets for day-to-day expenses because they were short of money "sometimes" or "often";
3. Turned to a charity organization because they were short of money "sometimes" or "often";
4. Experienced significant financial difficulty because of a long term disability or health problem of a member of the household "sometimes" or "often";
5. Found it "very difficult" or "difficult" to meet their needs in terms of transportation, housing, food, clothing and other necessary expenses.

Incidence rates for each economic hardship question are shown in Table 7. The sample excludes individuals missing information on any of the material deprivation items or economic hardship variables. Twenty per cent of Canadians lived in a household who experienced difficulty meeting necessary expenses, 16 per cent asked for help with basic expenses from friends or family, 15 per cent used credit or sold assets when short of money, 10 per cent had financial difficulty because of long term illness or disability, and 5 per cent turned to a charity organization.

Table 7: Economic hardship questions in CSEW and incidence rates

Question	Responses indicating hardship	Percent of population with hardship
Did you and your household ever ask for financial help from friends or relatives for day-to-day expenses because you were short of money?	"Sometimes" or "often"	15.6% (0.39)
Did you and your household ever take on debt or sell an asset for day-to-day expenses because you were short of money?	"Sometimes" or "often"	15.2% (0.42)
Did you and your household ever have to turn to a charity organization (such as a food bank or a thrift store) because you were short of money?	"Sometimes" or "often"	5.2% (0.25)
How difficult or easy was it for you and your household to meet your needs in terms of transportation, housing, food, clothing and other necessary expenses? Was it...?	"Very difficult" or "difficult"	19.9% (0.46)
Have you and your household experienced significant financial difficulty because of a long term disability or health problem of a member of your household?	"Sometimes" or "often"	10.3% (0.34)
Number of records		55,637

Notes: Standard errors are in parentheses. Proportions calculated from weighted counts of individuals. Each question was preceded by "In the past 12 months (…)". Sample excludes individuals with missing information for any material deprivation items or economic hardship questions.

Table 8 shows that the number of economic hardship indicators is positively correlated with the number of material deprivation items. This is expected since material deprivation and economic hardship both aim to measure adverse outcomes due to a lack of financial resources. The majority (90.1 per cent) of individuals not experiencing economic hardship are not deprived of any item. As the number of economic hardship items increases, the likelihood of being deprived of a higher number of material deprivation items increases.

Table 8: Incidence of the total number of deprivation items by incidence of the total number of economic hardship indicators (percent of individuals)

Number of material deprivation items	Number of economic hardship indicators					
	0	**1**	**2**	**3**	**4 or 5**	**Total**
0	90.1 (0.38)	54.0 (1.32)	29.7 (1.86)	11.6 (1.37)	4.0 E (0.92)	71.4 (0.51)
1	6.3 (0.32)	19.4 (1.13)	19.5 (1.57)	16.2 (2.08)	6.9 E (1.59)	10.2 (0.35)
2	1.9 (0.18)	11.5 (0.91)	15.9 (1.41)	13.5 (1.51)	9.2 E (1.64)	5.6 (0.25)
3	1.0 (0.12)	5.6 (0.56)	11.4 (1.27)	14.3 (1.80)	10.4 (1.65)	3.7 (0.22)
4	0.3 E (0.10)	3.6 (0.42)	11.8 (1.48)	12.7 (1.64)	11.5 (1.80)	2.9 (0.21)
5	0.2 E (0.06)	2.7 E (0.50)	5.5 (0.81)	8.9 (1.24)	11.3 (1.72)	2.0 (0.16)
6 to 15	0.1 E (0.03)	3.2 (0.46)	6.2 (0.75)	22.8 (1.68)	46.7 (2.90)	4.2 (0.21)
16 to 17	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)
Total	100	100	100	100	100	100
Number of records	36,886	9,012	4,593	2,955	2,191	55,637

Notes: Standard errors are in parentheses. Standard errors calculated using 1,000 replicate bootstrap weights. Proportions calculated from weighted counts of individuals. Individuals missing information on one or more material deprivation items or economic hardship items were excluded from the sample. Percentages may not add up to 100 due to rounding. Cells marked with an E indicate estimates of marginal quality (CV between 16.6% and 33.3%). Individuals with 4 or 5 economic hardship indicators, as well as individuals with 6 to 15 material deprivation items, were grouped for data quality and/or confidentiality reasons. It should be noted that for each number of economic hardship items, the proportions generally continue to decline with the number of material deprivation items from 6 to 15 items.

4. Constructing a material deprivation index

This section develops a material deprivation index that can serve as an indicator to identify groups at high risk of poverty in Canada. Rather than being a direct measure of poverty, the material deprivation index is a proxy that "should reflect basic living standards, and be appropriately sensitive to income variations at the lower end of the scale" (Berthoud and Bryan, 2011, p.137). We first critically examine whether the deprivation items in the CSEW meet the scientific criteria for inclusion in an index, and then we construct an index highlighting the justification for, and consequences of, methodological choices and their alternatives.

4.1 Testing deprivation items

Following Guio et al (2016), we test each of the 17 deprivation items in terms of four scientific criteria, namely suitability, validity, reliability and additivity. The suitability criterion entails that the item should be considered to be a necessity by a large part of the (Canadian) population. The validity criterion asserts that the item should be sufficiently strongly related to other known aspects associated with poverty such as economic hardship and low income. The reliability criterion tests whether each deprivation item and the material deprivation scale as a whole is related to a single, underlying (latent) concept. The additivity criterion asserts that persons experiencing more item deprivations should, on average, be worse off than persons experiencing fewer deprivations. The results of all the tests are summarized in Table 10 at the end of Section 4.1.

Given data and resource limitations, this paper does not investigate whether there are suitable deprivation items that are currently not available in the CSEW data. Such an exercise is a well-accepted practice deemed necessary for the periodical updating of the index; it should also be considered in case a decision is made to collect new material deprivation data in Canada.

4.1.1 Suitability

The suitability criterion is important because it ensures that the items feeding into an index reflect a sufficiently broad and popular consensus regarding their relevance as a necessary component contributing to a minimum acceptable living standard in a given society at a given point in time. To assess the suitability of the CSEW deprivation items we perform two tests.

The first test relies on the information in the CSEW data and uses the responses to the survey questions to deduct the relevance of each item (Guio et al, 2016). For each deprivation item there are two questions, which together establish whether a households' lack of an item is enforced, and is a consequence of not having enough financial resources. The first question asks whether a household is able to, for instance, replace worn out furniture. In case the answer is 'no', a follow up question asks whether this is because the household cannot afford it or does not have the item for some other reason. Households that answer no for the first question and indicate affordability as the reason, are considered item deprived. In the first suitability test we use this information to calculate the percentage of households that reveal they 'want' an item by either answering that they have it or that they cannot afford it. Table 9 shows that the levels of 'wanting' the item are all

above or well above 90% for all items. This is very high compared to the levels found Europe, where in some EU member states items have rates between 70 and 90 percent (Guio et al, 2016).

Table 9: The percentage of households 'wanting' an item

Item	Percent of households who have or cannot afford the item	Number of records
Appliances	97.4	24,141
Furniture	97.6	24,099
Unexpected expense	98.6	24,093
Pay bills	99.2	24,199
Internet	91.2	24,196
Temperature	98.7	24,198
Getting around	99.2	24,224
Friends	95.1	24,186
Dental care	98.5	24,124
Gifts	99.4	24,204
Pests	97.2	24,198
Vegetables	93.1	24,203
Meat	96.3	24,210
Footwear	98.3	24,211
Clothes	96.8	24,086
Hobby	91.6	24,178
Spending money	98.5	24,176

Notes: The questions for the Internet item are different than for other items: Households are asked whether they have access to Internet at home. Those responding "no" are then asked whether they have regular access to Internet during their leisure time outside of the home, and those responding no to this second question are asked whether this is because they cannot afford it or for some other reason. Households with no Internet access inside the home but with regular access outside the home were included in the numerator, in addition to those reporting that they did not have access to Internet outside the home because they could not afford it. For each item, households missing information on that item are excluded from the calculation.

The second test assesses whether there is broad popular consensus that a specific item is a necessity. A common benchmark for establishing suitability is that the percentage level agreement should at least be a simple majority i.e. 50% (Saunders, 2007; Guio et al, 2016). This test is better than the first because, as also indicated in Section 2, the affordability question in the first test does not perfectly distinguish between choice and constraint because of preference adaption and preference drift effects (Saunders et al, 2007, p.30). It does, however, rely on external data, which is currently not available for Canada as a whole. Fortunately, we can draw from the thorough groundwork that went into the construction of the Ontario Material Deprivation Index in 2009 (Matern et al, 2009). Ontario is the largest province in terms of population and one that often represents 'the middle of pack' in terms of socio-economic data. For the few items for which there is no Ontarian information available, we rely on similar statistics available for Australia and West-European EU member states.

The Ontario Material Deprivation Index was created in 2009 through a collaboration between the Daily Bread Food Bank and the Caledon Institute of Social Policy, with funding from the Metcalfe Foundation (Matern et al, 2009). The Ontario Government subsequently adopted the index as part of its indicator portfolio to monitor progress on its poverty reduction strategy. Suitable deprivation items were identified through a three step process. The first involved a survey asking food bank users whether they considered each item on a 29 item list necessary. The results were subsequently discussed in various focus groups (with a total of 49 participants with lived experience of poverty) and resulted in a revised list of deprivation items (also including new items). The third step was another survey, conducted by Ipsos-Reid and consisting of a random sample of 2,047 Ontarians, which asked the necessity question for the revised list of 25 items. In comparison to the EU Eurobarometer survey, which only polls the necessity question among a random sample of the member states' populations, the active inclusion of a segment of the population that is (much more) likely to (have) experience(d) poverty and thus has experienced making such tough decisions, is an important assurance that the selected items are indeed a good indicator of poverty level living conditions.

Necessity ratings for Ontario are available for 15 of the 17 CSEW indicators (see Matern et al 2009 for more detailed information). Response rates are well above 50 percent for 14 items. Some items, such as dental care, pests, footwear and temperature, have rates above 90 percent. Other items, such as getting around, vegetables, meat, clothing, spending money, appliances, have rates between 70 and 90 percent. For items such as furniture, gifts, friends and hobby rates varied between 55 and 70 percent. Necessity ratings also differ sometimes between food bank users and the broader population but, only in the case of Internet, the difference was such that the majority of the general population identified the item as a necessity (55 percent) while only a minority of food bank users thought the same (46 percent). There are no Ontarian necessity ratings for the items unexpected expense and unpaid bills. The ratings for unexpected expense are above 70 percent in Australia, Ireland, United Kingdom and France. The ratings for unpaid bills are above 90 percent (same countries except Australia, for which there are no data).

Concluding, Internet is the only item for which there is some ambiguity in the suitability test results. However, given the sustained increase in importance of Internet as a medium of communication and a source of information, it is likely that this item will see higher necessity ratings if polled now and in the years to come.

4.1.2 Validity

The validity tests assesses whether each deprivation item exhibits a statistically significant relationship with independent variables known to be associated with poverty (Guio et al, 2016). We test this by running a series of binary logistic regressions, using the deprivation item as a dependent variable and (sequentially) one of three independent variables known to be correlated with material deprivation. We use the following validity indicators:

- Low-income status as measured by the Low-Income Measure (LIM). For reasons described in Section 2, low income is regularly (though not necessarily) a cause of experiencing material deprivation. Of the three commonly used low-income indicators in Canada, the

LIM sets the least 'stingy' threshold. This seems the most appropriate choice given the plethora of reasons that may explain why a family's income, that is modest but above (some of) the low-income thresholds, does not suffice to avoid material deprivation.

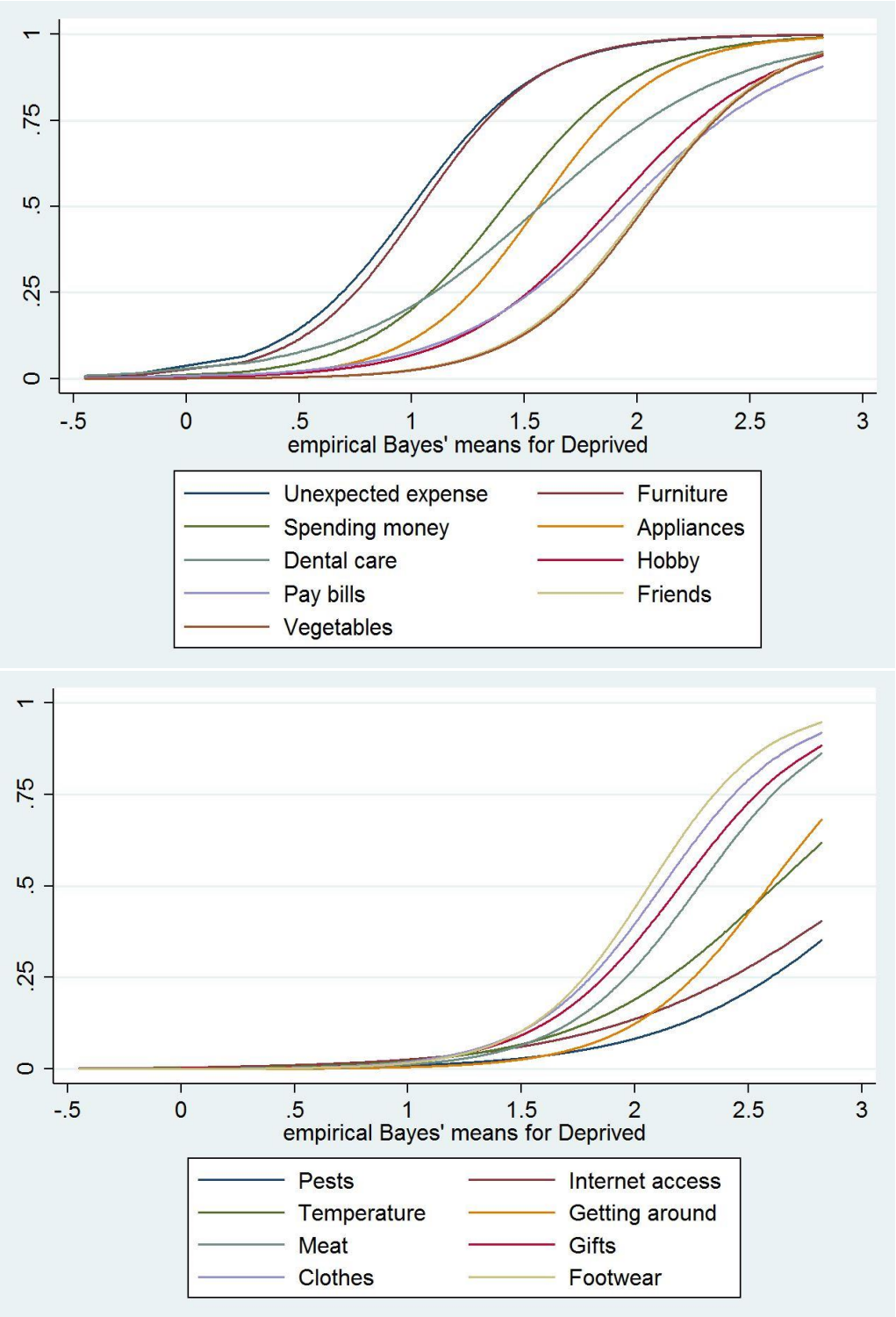
- Economic hardship as measured with an answer of "difficult" or "very difficult" to the question "In the past 12 months, how difficult or easy was it for [you/you and your household] to meet your needs in terms of transportation, housing, food, clothing and other necessary expenses?" This question focuses more generally on the capacity to meet expenses on necessities and thereby implicitly takes account of different needs, the availability of a broader range of financial resources and access to subsidized goods and services.
- Economic hardship as measured with one or more positive answers to five questions asking the household whether they experienced financial difficulty in the past 12 months. In addition to the question described above, three questions ask whether the household 1) asked help from friends/family, 2) took on debt/sold an asset, and 3) turned to charity because they were out of money. The fifth question asks whether the household is in financial difficulty due to a long term disability or health problem. Together these questions form a broad range of conditions associated with insufficient financial resources that, in turn, could give rise to material deprivation.

The tests indicate that none of the deprivation items is a concern in terms of validity: all coefficients in the 51 regressions are statistically significant at a 1 percent level. The associations for the two economic hardship variables are larger than those for the LIM (higher odds ratios). A likely explanation is that the economic hardship variables are also outcome variables and are more flexible in taking account of the plethora of conditions that could give rise to material deprivation.

4.1.3 Reliability

We test the reliability of the material deprivation scale as a whole using Cronbach's alpha to measure the internal consistency of the scale (Nunally, 1978). This test assesses whether the group of deprivation items measure one latent construct (material deprivation). An alpha of 0.70 or higher is considered satisfactory. Cronbach's alpha is well above this threshold level for the entire sample (0.83), and for each province (varying from 0.79 in Manitoba to 0.87 in Newfoundland and Labrador; results not shown here).

Figure 1: Item Characteristics Curves



Source: Author calculations, CSEW (2013).

We further use Item Response Theory (IRT) to test the reliability of each deprivation item on the deprivation scale. "IRT is a set of statistical models which describes the relationship between a person's response to the questionnaire items and an unobserved latent trait" (Guio et al, 2016, p. 224). The IRT model assumes that deprivation can be measured indirectly using survey responses to a person's ability to afford specific necessities (p. 226). We apply a unidimensional two-parameter IRT test (in Stata), which jointly estimates the severity (also called difficulty) and discrimination for each deprivation item.[8]

Severity refers to the likelihood that a person will lack the item. As material deprivation levels can be higher or lower for different households, it is desirable to include items with different levels of severity on one scale. We follow Guio et al (2016) in setting a severity threshold of three standard deviations because items with a larger standard deviation capture deprivation levels that are only endured by a very small population, thereby reducing the statistical reliability of the item.[9] The results of the IRT models indicate that that the 17 items indeed differ in terms of severity scores (evaluated at a probability of item deprivation of 0.5) and that the scores for most items lie within three standard deviations (results not shown here). Only for the Internet (3.04) and pests (3.1) items the severity scores were slightly above three standard deviations.

The discrimination parameter measures how well a specific item is able to differentiate between a deprived and a non-deprived person. The discrimination parameter can be transformed into a correlation between the item and the latent variable (deprivation) (Cox, 2008). Following Guio et al (2016) we use a correlation of 0.4[10] to distinguish between items that discriminate sufficiently or not. The correlations for all items are well above this threshold (all above 0.9).

The Item Characteristic Curves (ICC) in Figure 1 offer a visualization of the performance of each item on the severity and discrimination parameters. Desirable characteristics of a scale are that the item curves are spread out horizontally (indicating different severity scores) while being steep vertically around the inflection point (indicating high discrimination scores). A reliable material deprivation index is thus characterized by a series of S-shaped curves with a broad horizontal spread. Most curves fit this pattern, with the exception of the two right most curves (pest and Internet items) whose inflection point occurs beyond the desired level of material deprivation of three standard deviations.

4.1.4 Additivity

The additivity criterion asserts that persons experiencing more item deprivations should, on average, be worse off than persons experiencing fewer deprivations (Guio et al, 2016). We test

[8] We test the appropriateness of the unidimensionality assumption using factor analysis. The analysis identifies multiple latent variables but the LR test testing a maximum likelihood factor model with one factor (the first) versus a saturated model indicates that none of the other factors add value to the model. All factor loadings are positive, with 13 loadings being above 0.4 (but below 0.7) and 4 loadings between 0.2 and 0.4 (pests, Internet, getting around, temperature).

[9] This threshold follows the 'three-sigma rule' which, in the case of a normal distribution, implies that 99.7 percent of a population's scores are expected to lie within three standard deviations.

[10] Evans (1996) suggests a correlation of 0.4 as a cut-off for a modest correlation whereas Cohen (1988) suggests a cut-off of 0.3.

this by comparing, for each possible pair of deprivation items, the average income of respondents with zero deprivations to that of respondents with one deprivation (excluding those with both deprivations), and, the average income of respondents with one deprivation to that of respondents with both deprivations (excluding those with zero deprivations). For each specification, individuals missing information on one or both of the deprivation items were excluded from the sample. Bootstrap weights were used. The t-test tests whether the mean incomes for these groups differ significantly in a statistical sense at a five percent level. Thus, these tests show whether we can expect that, on average, families with more deprivations have lower income levels than families with fewer or no deprivations.

Of the in total 272 specifications, the t-test was statistically significant in all of the tests comparing the mean incomes of single deprived respondents with zero deprived respondents (136 tests). For the comparison respondents with one and two deprivations the test was insignificant in 43 of 136 tests. Table 10 shows that the most frequently affected items are pests (11), temperature (11), friends (9) and vegetables (8). These are fairly minor interaction problems, especially because they involve the comparison of two groups that are more likely to be similar in terms of a rough proxy for financial resources (income).

4.1.5. In sum

There is no gold standard as to the optimal number of items to be included in a material deprivation index. Having fewer items means an increased risk that some important necessities in a, typically, heterogeneous population are not taken into account. Having many items increases the chance that two items are strongly correlated, thus questioning the cost-effectiveness of including both. With 17 indicators, the CSEW is the richest Canadian dataset currently available. This number fits well within the normal range of many routine annual material deprivation indices. For instance, New Zealand's index also holds 17 items (Perry, August 2016); the EU's current material deprivation index holds 9 indicators and its new index will likely hold 13 indicators (Guio et al, 2016); Ontario's index held 10 indicators and the index used by Heisz and Langevin (2009; 2011) also held 10 indicators (with some different indicators than Ontario's).

Table 10: Deprivation item tests – summary

Item	Suitability	Validity	Reliability	Additivity
Appliances	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 3/16 failed
Furniture	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 1/16 failed
Unexpected expense	Test 1: √ Test 2: no data	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 1/16 failed
Pay bills	Test 1: √ Test 2: no data	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 1/16 failed
Internet	Test 1: √ Test 2: √, except food bank users	All 3 tests: √	Test 1: √ Test 2: √, failed severity test	Test 1: √ Test 2: √, 6/16 failed
Temperature	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 11/16 failed
Getting around	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 2/16 failed
Friends	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 9/16 failed
Dental care	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 4/16 failed
Gifts	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 4/16 failed
Pests	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √, failed severity test	Test 1: √ Test 2: √, 11/16 failed
Vegetables	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 8/16 failed
Meat	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 7/16 failed
Footwear	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 2/16 failed
Clothes	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 7/16 failed
Hobby	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 7/16 failed
Spending money	Test 1: √ Test 2: √	All 3 tests: √	Test 1: √ Test 2: √	Test 1: √ Test 2: √, 2/16 failed

Suitability: Test 1: Percentage of CSEW respondents 'wanting' the item (≥70%); Test 2: Percentage of Ontarians and Ontarian food bank users responding the item necessary (≥50%) and deemed a necessity in focus groups.
Validity tests 1-3: A statistically significant (1%) coefficient in a binary logistic regression (dependent variable: deprivation item, independent variable: low-income status [LIM]; economic hardship 1: 'very difficult' or 'difficult' to meet necessary expenses; economic hardship 2: ≥1 affirmative answers [out of 5 questions]).
Reliability: Test 1: Alpha above 0.7 in country and provincial Cronbach's Alpha tests; Test 2: Two parameter IRT test (country level) assessing item performance in terms of severity (including items ≤ 3 standard deviations) and discrimination (including items with correlation ≥ 0.4).
Additivity: A statistically significant (5%) difference between mean equivalized household incomes of two groups from (a total of 272) t-tests. For each possible pair of deprivation items, test 1 compares mean incomes of respondents with 0 versus 1 deprivation, and test 2 compares mean incomes of respondents with 1 versus 2 deprivations. Per test, each item was interacted and tested 16 times. The t-test was insignificant in 43 of 136 tests in test 2.

The above sections have shown that, despite using conservative criteria, there are only minor issues with only some of the 17 deprivation items available in the CSEW (see Table 10 for a summary). None of the items unambiguously fails the four test criteria (suitability, validity, reliability and additivity) and thus we conclude that all items can be included in a material deprivation index for Canada. A limitation of the testing methodology used here is that it only focuses on the items collected in the CSEW data and, for the second suitability test, is based on 2008/9 data covering only Ontario. Additional efforts are needed to identify items for which there are currently no, or no recent, Canadian data.

A material deprivation index needs an updating mechanism to stay relevant, just like any other well-being indicator. As living standards and/or public service provision improve, some deprivation items may lose their salience while others may take their place. For instance, whereas few persons would have deemed access to Internet a necessity a few decades ago, Internet is becoming an increasingly important medium for accessing information and communication, including accessing basic government services and programs such as tax filing and applications for Employment Insurance. The percentage of the population that deems access to Internet a necessity will likely be increasing further in the coming years.

It is thus important to periodically review items that are currently included and to identify new items. Such an exercise typically takes place every 5 years or 10 years and, ideally, involves a combination of focus groups (covering population groups that are in or at high risk of poverty) and surveys (covering the general population while ensuring adequate coverage of high poverty risk populations). A complementary and low cost option would be to include an open-ended question at the end of the annual material deprivation questionnaire, asking respondents for items that were not mentioned but that would be a necessity in their opinion.

It would also make sense to collect information on more deprivation items than strictly needed for a federal material deprivation index. First, collecting information on, say 25 instead of 17 deprivation items, carries relatively low additional costs and is still within a safe margin considering respondent's fatigue. Second, it allows for a smoother updating of the index. Any change in the composition of the index leads to a break in the series, making it difficult to disentangle changes over time into 'real' changes in in living standards and changes due to a different index composition. If information on (soon to be) expired/introduced items is collected annually and for a period of five years or so, it would be possible to smoothen the transition by calculating both the old and the new indices for that period. Third, it allows for the inclusion of items that are considerably more relevant for some Canadians than for others. Certain items may be more salient in some provinces, or for Canadians living in rural areas, or for specific age groups such as seniors or persons with a disability, and so on. While it is important to have a common index to track well-being over time and between sub-groups of the Canadian population, collecting data on more items than strictly needed for a national index makes sense for a diverse and decentralized population such as Canada's. This would also, for instance, enable provinces to construct an index that they deem more appropriate for their population while, at the same time, allowing them to track their progress in comparison to other provinces using the common index.

4.2 Index construction

Following our earlier findings we proceed by constructing a material deprivation index consisting of 17 deprivation items.[11] This section discusses the key steps, options and choices regarding the construction of a material deprivation index. Section 4.3 shows the impact of different choices on material deprivation rates.

A key step in the construction of a material deprivation index involves making choices regarding a cumulative deprivation threshold. Other steps involve making choices regarding the weights of items in the index and the measure of material deprivation. For each of these decisions, there are multiple options to choose from, with each affecting the level of measured deprivation. Depending on the purpose of the index, each option has specific advantages and disadvantages.

The primary purpose of the index would be to monitor the material dimension of poverty, referring to poverty when a person is experiencing adverse material outcomes that are associated with a poverty level living standard in Canada. Key factors influencing the material well-being of Canadians are the economy, labour market and government policy. For reasons of justice and efficiency, it makes sense to (also) monitor the effects of such factors on those who are materially least well off. Canada's low-income indicators serve the same purpose. The index could also serve a policy purpose. For instance, together with low-income and other socio-economic indicators, a material deprivation index could help identify a person or family's characteristics associated with an increased poverty risk; it could help with policy development so as to ensure that government policy (also) reaches high risk poverty groups, or, has no adverse effects on such groups; and, it could also play a role in assessing the effects of ongoing policies on poverty risk (see Notten 2015a for a more detailed discussion).

Given these purposes, the material deprivation index should not only be responsive to changes in material well-being of the least well-off but it should also be relatively easy to interpret by a broad range of potential users such as policy-makers, politicians, civil society groups, academics of all disciplines, and the general public. We address these considerations as we motivate our choices.

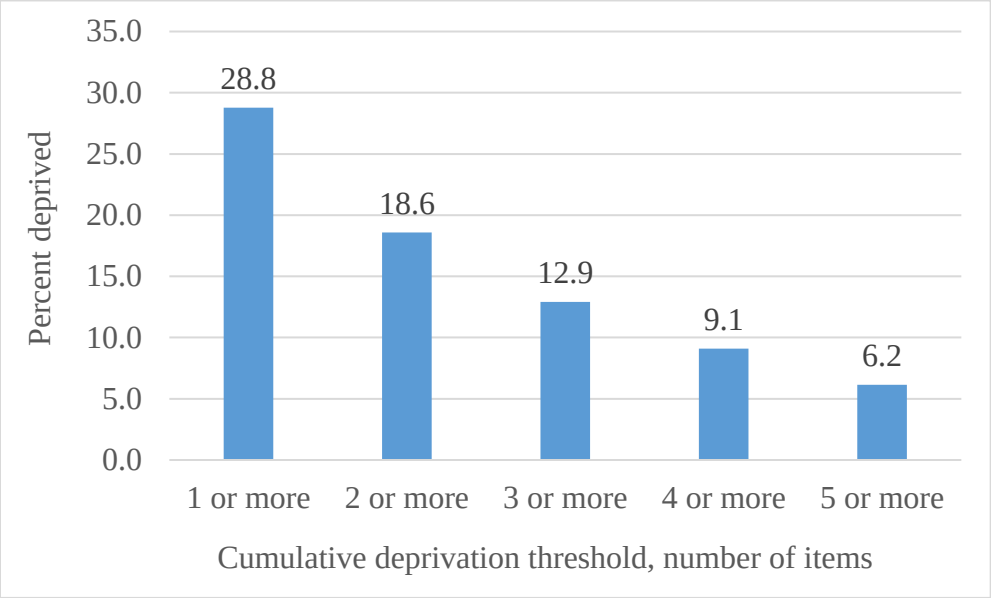
Cumulative deprivation threshold

The material deprivation index serves as a proxy for material deprivation, which in turn, measures a dimension falling under the broader concept of poverty. Low-income indicators are also proxies of financial resources, which in turn, are a dimension under the broader concept of poverty. Having established that each of the 17 deprivation items are positively and sufficiently strongly associated with the underlying (unobserved) concept of material deprivation, it is the role of a cumulative deprivation threshold to separate the population in a group that is, in all likelihood, materially deprived and a group that is not. Thus, material deprivation measures simplify a more complex reality (one in which material well-being is a continuum) into a bi-fold division. This facilitates poverty analyses and the communication of its results to a broader group of users. Setting a cumulative threshold has a very large impact (Figure 2). For a threshold of one item deprivation,

[11] Namely, appliances, furniture, unexpected expense, pay bills, Internet, temperature, getting around, friends, dental care, gifts, pests, vegetables, meat, footwear, clothes, hobby, and spending money. See Table 3 in Section 3 for more details.

29 percent of Canadians would be materially deprived. As this threshold increases to five items, this number declines to six percent.

Figure 2: Material deprivation at different cumulative deprivation thresholds



As an objective analytical exercise, we use information correlated with poverty to divide the ***materially deprived population*** into groups that have a relatively high and a relatively low likelihood of being poor and we subsequently assess how the relative size of these groups changes as the threshold increases. Table 11 lists all combinations of the values that we can observe for persons related to their material deprivation status (deprived/not deprived), income (low/low-middle/high[er]) and economic hardship (yes/no). For income we combine the information from the low-income threshold ($23,875) with distributional information to create three groups of materially deprived persons: persons who are both materially deprived and have low income (below the LIM threshold), persons who are materially deprived and have an income above the low-income threshold but below the third income quintile (40 percent of the population has an adjusted annual income below $40,330), and persons who are materially deprived and whose income falls in the third income quintile or above. Using the bottom or the bottom two quintiles is a common empirical approach to identifying and monitoring the least well-off (Coady, Grosh and Hoddinot, 2004).[12] Moreover there are quite a few circumstances that could explain why persons with an income that is only modestly above the low-income threshold could experience a poverty level living standard (debt, needs, no access to subsidized goods, high price levels; see Section 2 for references). Economic hardship is defined as a person living in a household that has one or more affirmative answers to the five economic hardship questions (see Section 4.1.2 for more details).

[12] Given the imperfections of income as a measure of adequate financial resources we decided to focus on the forty percent lowest incomes (below $40,330). We acknowledge that further robustness checks could be done using, for instance, the bottom twenty (below $26,458) or thirty (below $33,988) percent.

Table 11: Cross-validation and likelihood of being poor

Variable	**Status**					
Material deprivation	Deprived					
Income	Low income		Low-middle income		High(er) income	
Economic hardship	Yes	No	Yes	No	Yes	No
Likelihood of being poor	Highest	High	High	Low	Low	Lowest
Group	A	B	C	D	E	F

In attributing a value to the likelihood of being poor for each combination we use our definition of poverty as a guide (see Section 2): a person is poor when (s)he suffers adverse material outcomes because (s)he has insufficient financial resources. Following this definition, persons in group A have the highest likelihood of being poor because the three pieces of information all point towards conditions that are strongly associated with poverty. Reversely, persons in group F have the lowest likelihood of being poor because two of the three pieces of information contradict the material deprivation information. While it is possible that persons in group F experience a poverty level living standard (i.e. because of very high debt repayments, very high inequality in sharing financial resources within the household, or very costly needs), it is more likely that the material deprivation information is 1) measured with error or 2) the consequence of non-representative consumption choices. We classify groups B and C as having a high likelihood of being poor and groups D and E as having a low likelihood. Groups B and C either have low income or report economic hardship while groups D and E either have high income or do not report economic hardship.

Table 12 shows the size of each of these groups for different cumulative deprivation thresholds. For instance, at a threshold of one item, eight percent of Canadians are materially deprived, have a low income and report economic hardship (Group A). At this threshold, the highest/high likelihood groups together represent 17 percent of Canadians (Groups A, B and C) and 60 percent of the materially deprived. At the same threshold the lowest/low likelihood groups (Groups D, E and F) represent 11 percent of Canadians and 40 percent of the materially deprived. As the threshold increases two things happen. First, the percentage of materially deprived persons decreases. Second, the share of persons with the high/highest likelihood of poverty increases.

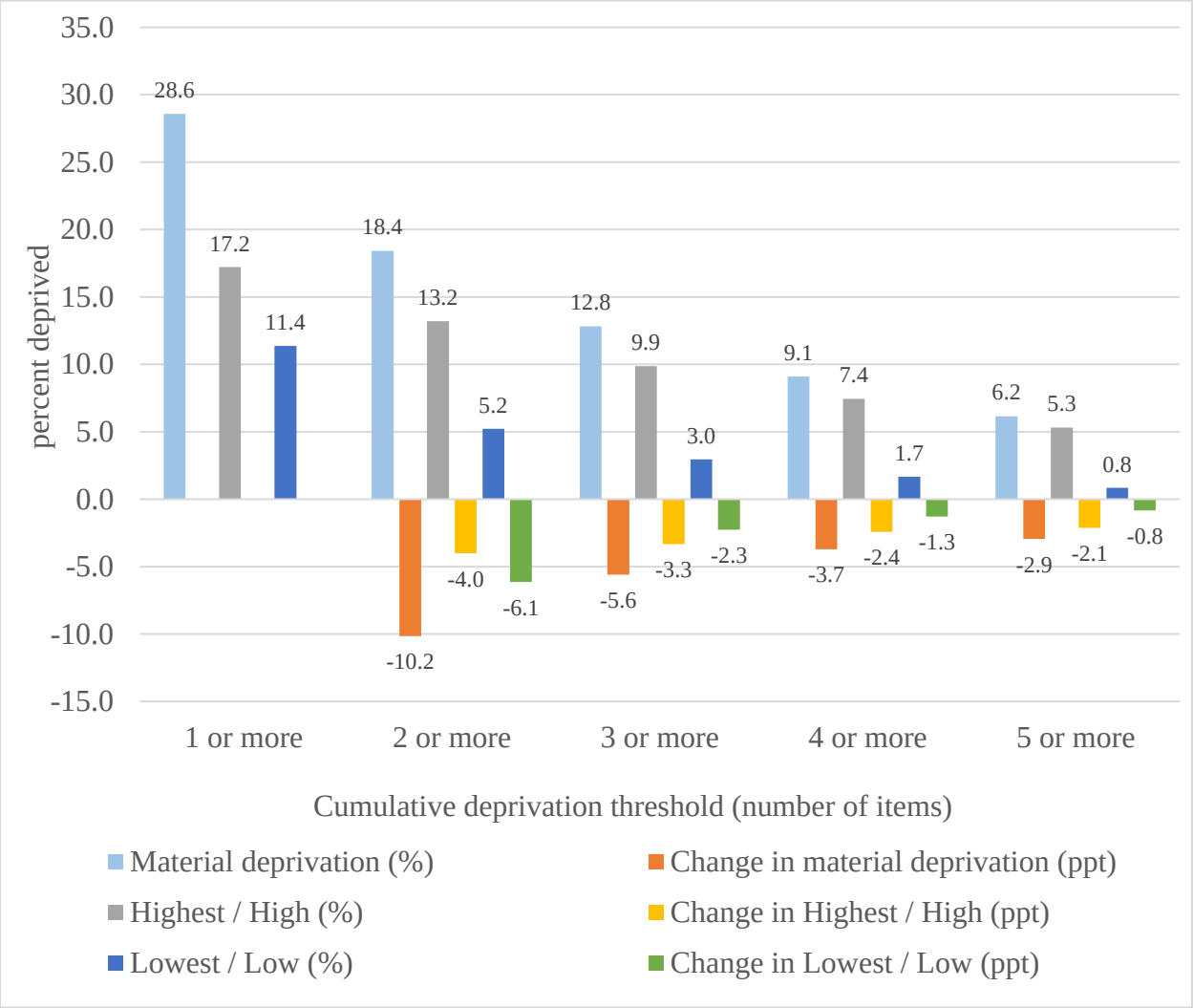
Table 12: Likelihood of being poor for different cumulative deprivation thresholds (percent of Canadian population; in square brackets: percent of materially deprived population)

Status – materially deprived and:	Group	Cumulative deprivation threshold				
		1	**2**	**3**	**4**	**5**
- Low income, economic hardship	A	8.3	7.1	5.7	4.6	3.5
- Low income, no economic hardship	B	1.6	0.8	0.4	0.2	0.1
- Low-middle income, economic hardship	C	7.4	5.3	3.8	2.7	1.7
Highest / High likelihood of being poor (False negatives)	**A+B+C**	**17.2 [60.2]**	**13.2 [71.6]**	**9.9 [77.0]**	**7.4 [81.7]**	**5.3 [86.4]**
- Low-middle income, no economic hardship	D	2.2	0.8	0.4	0.1	0.1 F
- High(er) income, economic hardship	E	6.5	3.7	2.3	1.4	0.7
- High(er) income, no economic hardship	F	2.7	0.7	0.3 E	0.1 F	0.1 F
Lowest / Low likelihood of being poor (False positives)	**D+E+F**	**11.4 [39.8]**	**5.2 [28.4]**	**3.0 [23.0]**	**1.7 [18.3]**	**0.8 [13.6]**
Materially deprived	**A+B+C +D+E+F**	**28.6**	**18.4**	**12.8**	**9.1**	**6.2**

Note: The sample excludes individuals missing information for any of the 17 material deprivation items or any of the five economic hardship questions. Differences in the material deprivation rate in this table with those mentioned in Figure 2 are due to missing observations for the economic hardship variables. Cells marked with an E indicate estimates of marginal quality (CV between 16.6 and 33.3%), while cells marked with an F indicate estimates of poor quality (CV above 33.3%).

While we do not know for sure how many poor persons are lost when increasing the cumulative deprivation threshold, Figure 3 shows that for a threshold of two the trade-off between loosing false positives (desirable) and adding a group of false negative (undesirable) is optimal. Let us explain this further. When switching from a threshold of one to two, 10 percent of the population is not counted as deprived anymore. But within that 10 percent lost, six percentage points of Canadians were potentially false positives under the threshold of one (i.e. being categorized as lowest/low likelihood), compared to four percentage points of Canadians who are likely poor (highest/high likelihood). Thus, the threshold of two seems more appropriate than one because it loses more false positives than it adds in false negatives. But when moving from threshold two to three, another 5.6 percent of the population is lost in the deprivation count. This time, of those individuals missed, the number of persons with a low(est) likelihood (1.8 percentage points) is smaller than the number of high(est) likelihood (3.3 percentage points). Thus, as of threshold three more potential false negatives would be added relative to losing false positives (similarly for thresholds four and five). To conclude, a threshold of two deprivations thus seems most appropriate.

Figure 3: Material deprivation and (changes in) the likelihood of being poor (by cumulative deprivation threshold, Canadian population)



Poverty measure

This paper calculates a so-called headcount index.[13] This index reflects the percentage of materially deprived persons in Canada and is constructed by adding the number of deprivations per person and using the cumulative deprivation threshold to identify that person as deprived or not (i.e. it counts the 'heads' but does not take into account whether a person has three, four or more item deprivations).[14] Ease of interpretation is the key strength of a headcount index, which

[13] Note also that the index that is used in this paper differs from area-based indices because it uses information from the same individual rather than aggregate statistics (Pampalon et al. 2009, Canadian Index of Well Being 2012).

[14] This headcount index is the least sophisticated measure of a group of multidimensional poverty measures identified by scholars taking an axiomatic approach (Alkire, Foster 2011). In an axiomatic approach a measure is judged by the degree to which it satisfies a range of criteria (i.e. axioms). Alternative statistical approaches such as factor and principal component analysis use correlations between items to convert the raw information into a single value with a continuous distribution (Pampalon et al. 2009). Such approaches are often used when material well-being is an explanatory variable and/or when the research focuses on inequality rather than poverty.

explains its popularity as a tool for policy making. (Many of the low-income indicators produced by Statistics Canada are headcount indices.) An adjusted headcount index could be considered as a secondary material deprivation index.[15] Such an index additionally accounts for the number of deprivations a deprived person experiences but it does not have an intuitive interpretation. Its added value lies in that persons lacking many items are likely worse off than those lacking a few and may thus have a higher policy priority; improving their situation may also be more challenging, and may require a different policy response (Notten and Roelen, 2012). A well-known example of an adjusted headcount index is the Multidimensional Poverty Index (MPI) which monitors poverty in developing countries (UNDP).

Weights

In constructing the index this paper gives equal weight to the indicators meaning that each type of deprivation is valued equally. In doing so, the advantage is that the number retains an intuitive interpretation. This is the most common choice for such indices. Two alternative weighting methods are the frequency-based and stated-preferences methods (see Guio et al 2009 and Notten 2013 for sensitivity tests using European data). Underlying the frequency-based method is the argument that it is worse to be deprived when most people are not. This argument is implemented by assigning a weight to each indicator that depends on the deprivation rate; indicators with lower deprivation rates thus get a higher weight. The stated-preferences method, on the other hand, is based on prevailing norms in society. Items or aspects of higher value to the average population should get a higher weight than those that are less valued. This method can be implemented by using opinion surveys such as the Eurobarometer to determine the weight of each indicator.

4.3 Sensitivity tests - items

This paper calculates a material deprivation index that includes all 17 deprivation items. Section 4.1 showed that all indicators pass most, if not all, of the qualification tests. Nonetheless, the number of items is in no small part a consequence of the information available in the survey. All other things equal, the more indicators one includes, the potentially higher the material deprivation index. Additionally, the higher the incidence of item deprivation, the larger the effect of adding an indicator on the index value. Table 13 illustrates this by sequentially excluding one of the 17 indicators from the index calculations for different item thresholds. At an item threshold of two, excluding one of the two items with the highest incidence (unexpected expense and furniture) would reduce the deprivation index by three percentage points from 18.6 to 15.6 percent. At the same threshold, excluding the dental care or spending money item would reduce the index by respectively 1.6 or 1.1 percentage points. The effect for the other items is considerably lower.[16]

[15] This paper does not calculate an adjusted headcount index.

[16] Note that the suitability tests (Section 4.1.1) do not suggest that any of the items that have a large effect on the index should be excluded as they are all deemed to be necessities by a considerable or a large majority of the population. The furniture item could be considered for exclusion as it has one of the lowest necessity majorities (55 percent) and it has the highest correlation with another item (its correlation with appliances is 0.54).

Table 13: Effect of excluding a deprivation item on incidence of material deprivation

Cumulative deprivation threshold	**1**	**2**	**3**	**4**	**5**
Percent deprived (17 items)	28.8	18.6	12.9	9.1	6.2
Excluded item	Percentage Point Difference (comparing incidence with 17 versus 16 items)				
Unexpected expense	-3.1	-3.0	-2.5	-2.2	-1.6
Furniture	-2.9	-3.0	-2.6	-2.3	-1.8
Dental care	-1.7	-1.6	-1.5	-1.4	-1.1
Spending money	-0.8	-1.1	-1.3	-1.6	-1.3
Pay bills	-0.4	-0.5	-0.5	-0.8	-0.5
Hobby	-0.2	-0.3	-0.7	-0.7	-0.6
Appliances	-0.1	-0.7	-1.0	-1.0	-1.1
Internet	-0.1	-0.2	-0.1	-0.2	-0.1
Temperature	-0.1	-0.1	-0.1	-0.2	-0.1
Vegetables	-0.1	-0.1	-0.1	-0.2	-0.2
Friends	-0.1	-0.1	-0.2	-0.4	-0.4
Pests	0.0	-0.1	-0.1	-0.1	-0.1
Meat	0.0	0.0	-0.1	-0.1	-0.2
Getting around	0.0	0.0	0.0	0.0	0.0
Gifts	0.0	-0.1	-0.2	-0.1	-0.2
Footwear	0.0	-0.1	-0.1	-0.1	-0.2
Clothes	0.0	-0.1	-0.1	-0.2	-0.3
Notes: Rounded to one digit.					

Interestingly, as the threshold changes from one to five item deprivations, the percentage point change resulting from removing a given item either gets larger (spending money), smaller (i.e. unexpected expense and furniture) or stays roughly the same (i.e. pay bills and appliances). This suggests that the likelihood of being deprived of a specific item also depends on the total number, or breadth, of deprivations. This may arise because views on what items are a necessity differ between persons with low or higher financial resources. For instance, food bank users in Ontario are considerably more likely to judge the spending money item as a necessity than the Ontario population as a whole (see Section 4.1.1).

5. Results

5.1 Incidence of material deprivation

In 2013, nearly one fifth of Canadians (18.6 percent) lived in a household that was unable to afford two or more items that many in Canada consider to be necessities for achieving a minimum living standard in Canada (Table 14). Following the methodology set out in Section 4, we identify these individuals as materially deprived.

At 19 percent, the incidence of material deprivation is higher than the low-income rates measured by the three commonly used low-income indicators in Canada in 2013: 13.4 percent (Low-Income Measure); 12.2 percent (Market Basket Measure); and 9.8 percent (low-income cut-off).[17] However, as will be shown in Section 5.3 in more detail, a considerably large group of the materially deprived population does not have a low income (LIM) while, likewise, a considerably large group of the low-income population is not materially deprived.

Material deprivation rates differ across the Canadian population. The eastern provinces Nova Scotia (25.3) and New Brunswick (22.3) have rates above the national average while the rate for Saskatchewan (14.0) is below average. The rates for the other provinces are, statistically speaking, overlapping with the confidence interval of the national average. Likewise for the rural-urban disaggregation.

Children aged under 18 years are at a higher risk of material deprivation with an incidence rate of 23.3 percent. The above-average risk for children is driven by households with three or more children.[18] Individuals living in a rented dwelling (36.7) have much higher deprivation rates, as do individuals living in a household where the reference person is unemployed (42.2), not in the labour force and unable to work (55.0), has some high school (31.0) or only finished high school (22.9), is an immigrant (22.7), or aboriginal (33.0). Also at high risk are individuals living in households whose main income source are government transfers (44.6) or other income (32.5) and individuals who live as one-person households (24.1) or in lone-parent (50.4) or other households (24.5).

Individuals at low risk of material deprivation are those living in owned housing (13.3) and seniors aged 65 years or older (13.6)[19]. The same holds for individuals living in a household where the

[17] Statistics Canada, CANSIM Table 206-0041, electronically available at http://www5.statcan.gc.ca/cansim/a26?lang=eng&id=2060041 (accessed on 24 April 2017). These low-income rates are based data from the Canadian Income Survey (CIS). There a two main reasons for the difference between the LIM rate in this paper and that available in the published CANSIM Table. First, the CIS income data come from tax files while income in the CSEW data is self-reported. Second, while the CANSIM tables list the after-tax LIM rate, we calculate the before-tax LIM rate because the CSEW data set does not have after-tax information. Unpublished calculations with the CIS data lead to a before-tax LIM rate of 17.6 percent compared to 15.9 percent in our paper.

[18] For a two-item threshold, twenty-eight percent of individuals (of any age) living in a household with three or more children are materially deprived. This rate is statistically different than for individuals living in a household with two children (19.9 percent) or with only one child (20.5 percent). This overall finding holds when a three-item threshold is used. Children are defined as any household member aged under 18 years.

[19] While seniors in general are at a lower risk of material deprivation, seniors living alone are at a slightly higher risk with a deprivation rate of 21.2 percent (although this rate is not statistically different from the rate for the population as a whole). This conclusion holds when a three-item deprivation threshold is used.

reference person is employed (15.7) or has a Bachelor's degree (11.7) or above (10.4). Also at low risk are those living in household whose main income source is employment income (16.2) or investment or retirement income (6.2). Couples without children (11.6) are further at low risk of material deprivation.

Results based on a cumulative deprivation threshold of three items are shown in Table A1 in the appendix. Using the threshold of three or more items, 12.9 per cent of Canadians would be identified as materially deprived. The characteristics associated with a higher risk of materially deprivation compared to the national average are similar to those identified with the two-item threshold.

Table 14: Incidence of material deprivation, by select demographic characteristics

	Percent deprived	Lower bound	Upper bound
Canada:	18.6	17.7	19.4
Newfoundland and Labrador	18.8	15.6	22.1
Prince Edward Island	20.0	15.8	24.3
Nova Scotia	25.3	22.0	28.5
New Brunswick	22.3	19.5	25.0
Quebec	18.3	16.6	20.1
Ontario	19.4	17.7	21.0
Manitoba	17.9	15.5	20.3
Saskatchewan	14.0	11.9	16.1
Alberta	16.3	14.2	18.4
British Columbia	17.8	15.7	19.9
Place of residence:			
Urban	18.2	17.3	19.1
Rural	20.2	18.4	22.0
Dwelling:			
Owned	13.3	12.4	14.1
Rented	36.7	34.7	38.7
Individual's age:			
Under 18 years	23.4	21.7	25.0
18 to 64 years	18.3	17.4	19.1
65 years or older	13.5	12.4	14.7
Household reference person:			
Employed	15.7	14.7	16.6
Unemployed	42.2	36.8	47.5
Not in labour force – able to work	20.6	19.1	22.1
Not in labour force – unable to work	55.0	47.9	62.0
Some high school	31.0	28.4	33.6
High school graduate	22.9	20.6	25.1
Some post-secondary	20.9	17.4	24.4
Post-secondary below bachelor's	18.3	17.0	19.6
Bachelor's degree	11.7	9.9	13.6
Above bachelor's degree	10.4	8.1	12.7
Not immigrant	17.2	16.4	18.0

Immigrant	22.7	20.4	25.0
Not aboriginal	18.2	17.3	19.0
Aboriginal	33.0	27.8	38.2
Main income source:			
Employment income	16.2	15.2	17.1
Investment and retirement income	6.2	4.6	7.8
Government transfers	44.6	42.0	47.1
Other income	32.5	25.6	39.4
Household type:			
One-person household	24.1	22.6	25.6
Couple with children	18.8	17.2	20.5
Couple without children	11.6	10.4	12.7
Lone-parent household	50.4	46.0	54.9
Other household	24.5	21.8	27.2

Notes: The upper and lower bounds are calculated for a 95 percent confidence interval. Sample excludes individuals missing information on any of the 17 material deprivation items.

5.2 Multivariate regression

We reassess whether characteristics associated with a high or low risk of material deprivation in Section 5.1 remain once we take all characteristics into account at the same time. Table 15 presents the odds estimated with a logistic regression using an individual's material deprivation status as the dependent variable. The odds ratio for persons living in a rented dwelling (1.9) means that such individuals are nearly twice as likely of being materially deprived in comparison to persons living in an owned dwelling (the reference group) when all other characteristics are held constant.

Characteristics associated with an elevated risk of material deprivation are a rural place of residence (1.3), rented dwelling (1.9), immigrant (1.3), Aboriginal (1.4), unemployed (2.0), not in the labour force and unable to work (2.1), some high school (1.8) or high school (1.6), government transfers (2.2), lone parent (2.6) and other household (1.4). Couples with children (1.3) are now also at an elevated risk in comparison to couples without children. Persons living in a household where the reference person has a post-secondary degree below bachelor's (1.4) are now also at an elevated risk (in comparison to those with a bachelor's degree). These high risk characteristics are very similar to those found for low-income indicators but the magnitude of the risk is not necessarily the same (see Notten 2015 for a review of the literature and a comparison of multivariate results).

Characteristics associated with a low risk of material deprivation are residents of Saskatchewan (0.6) and persons living in a household with investment and retirement income as the main income source (0.5). In comparison to Ontario, residents of most other provinces now also have a lower risk while Alberta and British Colombia residents have equal risk. Individuals aged 65 or older (0.4) are at a lower risk of material deprivation compared to those aged 18 to 64. Relative to the first quintile, persons living in households with incomes in the second quintile and up are at low risk of material deprivation (with the odds decreasing gradually from 0.5 for the second quintile to 0.04 in the fifth).

Table 15: Multivariate regression

Dependent variable: materially deprived (two or more deprivations)				
Parameter	Odds	Lower Bound	Upper Bound	P value
Intercept	0.378	0.274	0.523	0.000
Newfoundland and Labrador	0.688	0.520	0.910	0.009
Prince Edward Island	0.731	0.532	1.005	0.054
Nova Scotia	1.206	0.957	1.519	0.112
New Brunswick	0.762	0.610	0.953	0.017
Quebec	0.677	0.568	0.806	0.000
Manitoba	0.694	0.543	0.888	0.004
Saskatchewan	0.600	0.466	0.774	0.000
Alberta	0.987	0.785	1.240	0.908
British Columbia	0.882	0.725	1.073	0.208
Rural	1.257	1.064	1.485	0.007
Dwelling rented	1.887	1.617	2.201	0.000
Individual aged under 18	0.962	0.894	1.035	0.294
Individual aged 65 or older	0.372	0.306	0.453	0.000
Reference person:				
Unemployed	1.998	1.510	2.644	0.000
Not in labour force – able to work	0.866	0.697	1.075	0.192
Not in labour force – unable to work	2.064	1.305	3.264	0.002
Some high school	1.840	1.379	2.454	0.000
High school graduate	1.591	1.230	2.057	0.000
Some post-secondary education	1.313	0.952	1.812	0.097
Post-secondary below bachelor's	1.411	1.122	1.775	0.003
Above bachelor's degree	1.044	0.756	1.442	0.794
Immigrant	1.253	1.036	1.516	0.020
Aboriginal	1.423	1.037	1.952	0.029
Investment and retirement income	0.516	0.375	0.710	0.000
Government transfers	2.158	1.694	2.749	0.000
Other income	1.104	0.743	1.640	0.625
One-person household	1.108	0.947	1.296	0.201
Couple with children	1.260	1.027	1.544	0.026
Lone-parent household	2.591	2.003	3.351	0.000
Other household	1.373	1.090	1.730	0.007
Second income quintile	0.465	0.389	0.556	0.000
Third income quintile	0.243	0.199	0.297	0.000
Fourth income quintile	0.117	0.087	0.157	0.000
Fifth income quintile	0.037	0.026	0.054	0.000

Notes: The upper and lower bounds are calculated for a 95 percent confidence interval. Reference groups are: Ontario for the provinces; age 18 to 64 for individual's age; employed for reference person's labour force status; bachelor's degree for reference person's education level; employment income for main source of household income; couple without children for the household type; and the first income quintile. Sample excludes individuals missing information on one or more material deprivation items, on reference person's labour force status, or on main source of household income (N=54,373).

Table A2 in the appendix shows that using a cumulative deprivation threshold of three items yields similar odds ratios for the various characteristics as with the two-item threshold. Living in a rented dwelling (1.7) or in a single-parent parent household (2.3) is still associated with a higher risk of material deprivation, although the odds ratios are slightly lower compared to those estimated using the two-item threshold. As well, living with a reference person who is an immigrant or an Aboriginal or living in a couple household with children no longer has a statistically significant effect on the risk of material deprivation when the three-item threshold is used.

5.3 Overlap with low-income measure

With the two item threshold the incidence of material deprivation is somewhat higher than that of low income as measured by the Low-Income Measure (LIM). In this section we show that differences in the incidence of both indicators hide two important insights: first, there is a high commonality in the characteristics that are associated with a high risk of poverty; second, a considerable share of the individuals identified as being at high risk of a poverty level standard of living by one indicator is not identified as being at high risk by the other indicator.

The disaggregated MDI and LIM rates[20] show that individuals are at a higher risk of poverty according to both indicators if they are children or if they are living: in a rented dwelling; in Nova Scotia or New Brunswick; in a household where the reference person is unemployed or out of the labour force and unable to work, has only high school education or lower, immigrant, or Aboriginal (columns two and three of Table 16; comparing the rate of each subpopulation to that of the national average). The same observation holds for most low risk characteristics such living in a household where the reference person is employed or has a Bachelor's degree or higher and so on. This commonality in high and low risk of poverty characteristics is reassuring for the many policies that use these characteristics as eligibility criteria.

In some cases one indicator suggests an elevated or a low risk while the other indicator suggests that the risk is close to the national average. For instance, residents of Newfoundland and Labrador have a LIM rate above the national average but an on-average MDI rate; couples with children have a below-average LIM rate but an on-average MDI rate; seniors aged 65 or older have an above-average LIM rate but a below-average MDI rate. Such differences can be explained by the strengths and weaknesses in the measurement methodology (such as (not) accounting for regional price levels or exclusion of deprivation items mainly relevant for specific population groups such as (possibly) long term care for the elderly). Other explanatory factors are substantive differences in needs, in the type of financial resources used to finance needs, and in access to subsidized goods and services (such as high costs of child care for working parents).

More importantly, when comparing the results of each indicator on an individual level it becomes clear that the population deemed at high risk of poverty by the MDI only very partially overlaps with that at high risk as identified by the LIM. At the national level, only eight percent of Canadians have a low income and are materially deprived; eleven percent are materially deprived but do not have a low income; and eight percent have a low income but are not materially deprived (Table 16

[20] Table A3 in the appendix also contains the upper and lower bounds of the confidence interval around the LIM rates.

columns four, five and six). This means that of all Canadians, a bit more than a quarter (27 percent) is either identified as low-income, materially deprived or both (Table 16, column seven). Nonetheless, only one third of that group is deemed 'poor' by both indicators at the same time (Table 16, column four, number between brackets).

Such a large discrepancy between the low-income and materially deprived populations is not specific to Canada; it is a well-established finding in the international literature on poverty measurement (see Notten 2015 for an overview). The limited overlap between both indicators is also present at a disaggregated level. The nuance though is that the total percentage of individuals identified as 'poor' by one or both indicators is much higher than that of the national average for groups with a high risk characteristics whereas that number is well below the average for those with a low risk characteristic. For instance, of the individuals living in a rented dwelling in Canada, 50 percent are identified as 'poor' by one or both LIM and MDI. Of the individuals living as a couple without children, only 18 percent is identified as 'poor' by one or both indicators.

When a cumulative threshold of three deprivation items is used to identify individuals as materially deprived, the incidence of material deprivation is slightly below that of the LIM (Table A4 in appendix). As with the MDI based on the two-item threshold, when a three-item cumulative deprivation threshold is used there are some population sub-groups for which we observe a higher poverty risk (compared to the national average) according to one indicator but not the other; these discrepancies are the same as with the two-item threshold, except that residents of New Brunswick have an average risk of material deprivation when the higher threshold is used compared to an above-average risk of low income. Again, the population at high risk of material deprivation measured with a three-item threshold only partially overlaps with the low-income population; at the national level, of those identified as 'poor' by one or both measures, only 27 percent are both materially deprived and have a low income (Table A4 in appendix, column four).

Table 16: Overlap between material deprivation and low income measure (percent)

	Deprived	Low income	Both	Only deprived	Only low income	Total
Canada:	18.6	15.9	8.0	10.6	7.9	26.5
			(30)	(40)	(30)	(100)
Newfoundland and Labrador	18.8	22.2	12.0	6.8	10.1	28.9
			(42)	(24)	(35)	(100)
Prince Edward Island	20.0	18.4	8.1 E	11.9	10.2	30.2
			(27)	(39)	(34)	(100)
Nova Scotia	25.3	19.5	9.9	15.4	9.6	34.9
			(28)	(44)	(28)	(100)
New Brunswick	22.3	22.5	11.2	11.0	11.3	33.5
			(33)	(33)	(34)	(100)
Quebec	18.3	18.0	8.5	9.8	9.4	27.7
			(31)	(35)	(34)	(100)
Ontario	19.4	15.4	8.0	11.4	7.3	26.7
			(30)	(43)	(27)	(100)
Manitoba	17.9	17.2	7.4	10.5	9.7	27.6
			(27)	(38)	(35)	(100)
Saskatchewan	14.0	15.0	6.2	7.8	8.8	22.8
			(27)	(34)	(39)	(100)
Alberta	16.3	9.9	5.8	10.5	4.1	20.4
			(28)	(51)	(20)	(100)
British Columbia	17.8	16.1	7.8	10.0	8.3	26.1
			(30)	(38)	(32)	(100)
Place of residence:						
Urban	18.2	15.6	8.0	10.2	7.6	25.8
			(31)	(40)	(29)	(100)
Rural	20.2	16.9	7.8	12.4	9.2	29.4
			(27)	(42)	(31)	(100)
Dwelling:						
Owned	13.3	10.2	4.0	9.3	6.2	19.5
			(21)	(48)	(32)	(100)
Rented	36.7	35.2	21.5	15.2	13.7	50.4
			(43)	(30)	(27)	(100)
Individual's age:						
Under 18 years	23.4	18.8	10.8	12.5	8.0	31.4
			(35)	(40)	(25)	(100)
18 to 64 years	18.3	12.6	7.0	11.3	5.6	23.8
			(29)	(47)	(23)	(100)
65 years or older	13.6	26.5	8.4	5.2	18.1	31.7
			(27)	(16)	(57)	(100)
Household reference person:						
Employed	15.7	9.2	4.6	11.1	4.6	20.3
			(23)	(55)	(23)	(100)
Unemployed	42.2	33.9	24.7	17.4	9.1	51.2
			(48)	(34)	(18)	(100)

Not in LF – able to work	20.6	29.7	13.0 (35)	7.6 (20)	16.8 (45)	37.4 (100)
Not in LF – unable to work	55.0	50.1	35.7 (51)	19.3 E (28)	14.4 (21)	69.4 (100)
Some high school	31.0	36.5	19.6 (41)	11.4 (24)	16.9 (35)	47.9 (100)
High school graduate	22.9	17.2	8.5 (27)	14.4 (46)	8.7 (28)	31.6 (100)
Some post-secondary	20.9	18.8	9.3 (31)	11.6 (38)	9.5 (31)	30.4 (100)
Post-secondary below bachelor's	18.3	14.2	6.9 (27)	11.4 (45)	7.3 (29)	25.6 (100)
Bachelor's degree	11.7	9.3	4.5 (27)	7.3 (44)	4.9 (29)	16.7 (100)
Above bachelor's degree	10.4	7.8	4.0 E (28)	6.4 (45)	3.8 E (27)	14.2 (100)
Not immigrant	17.2	14.2	7.1 (29)	10.1 (42)	7.1 (29)	24.3 (100)
Immigrant	22.7	20.9	10.4 (31)	12.3 (37)	10.4 (31)	33.1 (100)
Not aboriginal	18.2	15.5	7.7 (30)	10.5 (40)	7.8 (30)	26.0 (100)
Aboriginal	33.0	28.9	17.6 (40)	15.4 (35)	11.3 (26)	44.3 (100)
Main source of income:						
Employment income	16.2	9.8	4.8 (23)	11.4 (54)	5.0 (24)	21.2 (100)
Investment and retirement income	6.2	11.3	2.6 E (17)	3.6 E (24)	8.7 (58)	14.9 (100)
Government transfers	44.6	58.7	34.8 (51)	9.8 (14)	23.9 (35)	68.5 (100)
Other income	32.5	42.2	22.6 (43)	9.9 E (19)	19.6 (38)	52.1 (100)
Household type:						
One-person household	24.1	31.1	14.9 (37)	9.2 (23)	16.2 (40)	40.3 (100)
Couple with children	18.8	13.4	6.9 (27)	11.9 (47)	6.5 (26)	25.3 (100)
Couple without children	11.6	9.9	3.4 (19)	8.2 (45)	6.5 (36)	18.1 (100)
Lone-parent household	50.4	43.3	33.4 (55)	17.0 (28)	9.9 (16)	60.3 (100)
Other household	24.5	19.2	10.8 (33)	13.7 (42)	8.4 (26)	32.9 (100)

Note: Sample excludes individuals missing information on any of the material deprivation items. Cells marked with an E indicate estimates of marginal quality (CV between 16.6% and 33.3%).

5.4 Overlap with economic hardship

Table 17 compares the incidence of material deprivation, as measured by the MDI with a two item threshold, with the incidence of economic hardship. Economic hardship is defined as one or more affirmative answers to the five questions on financial difficulty (see Section 4.1.2). That is, an individual experienced economic hardship if in the past 12 months, his or her household turned to friends, family or a charity, took on debt or sold assets when short of money; had difficulty paying for necessities; or experienced financial difficulty due to health problems or a disability. Separate incidence rates for each of the five economic hardship question are shown in Table 7 (Section 3).

The results indicate that 35 per cent of Canadians experienced economic hardship, while 18 percent were materially deprived. Most of the deprived population also reported economic hardship; 16 percent of Canadians were both materially deprived and suffered economic hardship, and 2 percent were only materially deprived. Eighteen percent of Canadians experienced economic hardship but were not deprived.

Similar to the comparison between the MDI and LIM in Section 5.3, the characteristics associated with a higher risk of poverty are common between economic hardship and the MDI. A statistically higher risk of experiencing economic hardship[21] is observed among: Nova Scotia residents; renters; children; those whose household reference person was not in the labour force and unable to work, had some post-secondary education or less, was of aboriginal status or was an immigrant; those living in lone-parent households; or members of a household whose main source of income was government transfers or other income. In contrast, a lower risk of economic hardship was associated with: living in Quebec or Saskatchewan; living in an owned dwelling; being a senior; living in a household whose reference person who is employed, is out of the labour force and able to work, or has bachelor's degree or above; living in a couple household with children; or reporting investment earnings as the main source of household income.

Like at the national level, for all of the population groups studied, the incidence of economic hardship was larger than that of material deprivation (generally by a factor of one and a half to two). Also for all disaggregations, most of the individuals who were identified as materially deprived had also experienced economic hardship. Of those living with a reference person who was out of the labour force and unable to work, 55 per cent were materially deprived and 53 per cent were both materially deprived and experienced economic hardship. Those living in a household with an aboriginal reference person had a 33 per cent chance of being materially deprived and a 30 per cent chance of both material deprivation and economic hardship, and members of lone-parent households had a 51 per cent chance of being materially deprived and a 47 per cent chance of both material deprivation and economic hardship.

A significant number of individuals are identified as having experienced economic hardship but not identified as poor by the MDI. This and the higher incidence of economic hardship compared to material deprivation can be explained by a few reasons. First, the economic hardship questions refer to experiences in the past 12 months, while the material deprivation questions refer to the

[21] Higher compared to the total population. Statistical significance of differences based on 95 per cent confidence intervals.

household's situation at the time of the interview – the economic hardship indicator may therefore count individuals who experienced episodes of poverty in the last year but not at the time of the survey. Second, the economic hardship questions measure the household's experience dealing with finances and how difficult it was it was for the household to meet its needs, while the material deprivation questions measure whether these needs were actually met (the MDI does not measure what means the household used to satisfy these needs or how difficult it was). Moreover, because income can be volatile economic hardship can also be experienced by households that have a living standard well above a poverty level living standard (i.e. one of earners in a dual earner family suffers a job loss. Thus, while economic hardship is a risk factor for adverse material outcomes, the MDI is a more direct measure of the experiences associated with these outcomes. Other measurement issues associated with using material deprivation to measure the least well-off (discussed and referenced in Section 2) can help explain this gap, namely: the MDI assumes a prioritization of needs common to all households and population groups, and adaptive preferences and shame can induced under-reporting of item-deprivation. Lastly, we (without much discussion) defined individuals experiencing experienced hardship as those with at least one of the five economic hardship items. If we had set this threshold at two or more of these items, the incidence of economic hardship would have been 17.9 per cent at the national level.

Table A5 in the appendix presents a summary of the risk characteristics associated with material deprivation (for both a two-item threshold and a three-item threshold), low income and economic hardship.

Table 17: Overlap between material deprivation and economic hardship (percent)

	Deprived	Economic hardship	Both	Only deprived	Only economic hardship	Total
Canada:	18.4	34.5	16.1	2.3	18.4	36.8
			(44)	(6)	(50)	(100)
Newfoundland and Labrador	18.6	29.3	14.7	3.9 E	14.6	33.2
			(44)	(12)	(44)	(100)
Prince Edward Island	20.1	35.9	17.3	2.8 E	18.6	38.7
			(45)	(7)	(48)	(100)
Nova Scotia	25.1	40.5	21.8	3.3 E	18.7	43.9
			(50)	(8)	(43)	(100)
New Brunswick	21.9	37.4	18.3	3.5 E	19.1	41.0
			(45)	(9)	(47)	(100)
Quebec	18.2	29.6	15.1	3.1	14.5	32.8
			(46)	(10)	(44)	(100)
Ontario	19.2	36.3	17.1	2.1	19.2	38.4
			(45)	(5)	(50)	(100)
Manitoba	17.9	36.9	15.8	2.2	21.1	39.0
			(40)	(6)	(54)	(100)
Saskatchewan	13.6	29.7	11.2	2.4 E	18.4	32.1
			(35)	(7)	(57)	(100)
Alberta	16.0	34.4	14.1	1.9 E	20.2	36.2
			(39)	(5)	(56)	(100)
British Columbia	17.8	37.0	16.3	1.5 E	20.7	38.5
			(42)	(4)	(54)	(100)
Place of residence:						
Urban	18.1	34.4	15.7	2.3	18.6	36.7
			(43)	(6)	(51)	(100)
Rural	19.9	34.9	17.6	2.4	17.3	37.3
			(47)	(6)	(47)	(100)
Dwelling:						
Owned	13.1	28.7	11.3	1.9	17.4	30.5
			(37)	(6)	(57)	(100)
Rented	36.7	54.4	32.7	4.0	21.7	58.4
			(56)	(7)	(37)	(100)
Individual's age:						
Under 18 years	23.2	41.0	21.0	2.2	20.0	43.2
			(49)	(5)	(46)	(100)
18 to 64 years	18.1	35.5	16.0	2.1	19.5	37.6
			(42)	(6)	(52)	(100)
65 years or older	13.3	21.1	10.0	3.3	11.2	24.5
			(41)	(14)	(46)	(100)
Household reference person:						
Employed	15.5	33.5	13.5	2.0	20.0	35.6
			(38)	(6)	(56)	(100)
Unemployed	42.0	51.8	36.4	5.6 E	15.4	57.5
			(63)	(10)	(27)	(100)

Not in LF – able to work	20.4	31.7	17.6 (51)	2.8 (8)	14.0 (41)	34.4 (100)
Not in LF – unable to work	54.6	74.2	53.4 (71)	F	20.8 (28)	75.4 (100)
Some high school	31.0	41.3	25.9 (56)	5.1 (11)	15.4 (33)	46.5 (100)
High school graduate	22.9	40.1	20.1 (47)	2.7 (6)	19.9 (47)	42.8 (100)
Some post-secondary	20.7	43.7	19.4 (43)	1.2 E (3)	24.2 (54)	44.9 (100)
Post-secondary below bachelor's	18.2	35.4	16.0 (43)	2.2 (6)	19.4 (52)	37.6 (100)
Bachelor's degree	11.5	28.2	9.8 (33)	1.7 E (6)	18.3 (61)	29.9 (100)
Above bachelor's degree	10.3	21.4	9.2 (41)	1.1 E (5)	12.2 (54)	22.4 (100)
Not immigrant	17.0	32.8	14.9 (43)	2.1 (6)	17.9 (51)	34.9 (100)
Immigrant	22.6	39.5	19.6 (46)	3.0 (7)	19.9 (47)	42.5 (100)
Not aboriginal	18.0	34.0	15.7 (43)	2.3 (6)	18.3 (50)	36.3 (100)
Aboriginal	32.6	51.5	30.4 (57)	2.1 E (4)	21.1 (39)	53.7 (100)
Main source of income:						
Employment income	16.1	33.9	14.0 (39)	2.1 (6)	19.9 (55)	36.0 (100)
Investment and retirement income	6.0	14.4	4.7 (30)	1.3 E (8)	9.7 (62)	15.7 (100)
Government transfers	44.6	52.9	39.8 (69)	4.8 (8)	13.1 (23)	57.7 (100)
Other income	31.9	52.6	27.5 (48)	F	25.2 (44)	57.1 (100)
Household type:						
One-person household	23.7	36.4	19.7 (49)	3.9 (10)	16.7 (41)	40.4 (100)
Couple with children	18.6	37.3	16.6 (42)	2.0 (5)	20.7 (53)	39.3 (100)
Couple without children	11.5	24.8	9.6 (36)	1.9 (7)	15.2 (57)	26.7 (100)
Lone-parent household	50.5	65.0	47.3 (69)	3.2 E (5)	17.7 (26)	68.2 (100)
Other household	24.4	45.2	21.4 (44)	3.0 E (6)	23.8 (49)	48.1 (100)

Note: Sample excludes individuals missing information on any material deprivation items or economic hardship items. As such, some of the incidence rates for material deprivation differ slightly from those shown in Table 16 which did not exclude individuals missing information on economic hardship questions. Cells marked with an E indicate estimates of marginal quality (CV between 16.6% and 33.3%). Cells marked with an F were suppressed for data quality reasons (CV above 33.3%).

6. Conclusion

This study used data from Statistics Canada's one-time Canadian Survey of Economic Well-being (CSEW, 2013), the first survey to allow for a complete and nationally representative analysis of the incidence of adverse material well-being outcomes in Canada.

Following Guio et al (2016), we tested each of the 17 deprivation items in the CSEW according to four scientific criteria: suitability, validity, reliability and additivity. We determined that all of these items could be used in an overall index measuring adverse material well-being. More specifically: all items were considered a necessity by a sufficiently large part of the population; all items were highly correlated with measures of low income and economic hardship; the items were all related to a single underlying latent concept; and individuals deprived of more items were on average worse off than individuals deprived of fewer items.

Using these 17 items we constructed a material deprivation index (MDI). It is a headcount index indicating the percentage of materially deprived persons in Canada. To determine whether an individual is materially deprived or not, the number of deprivations is summed for each person and a cumulative deprivation threshold (minimum number of deprivations) is used to identify that person as deprived or not. We showed that setting this threshold has a large impact on the index as the percentage of deprived individuals declines as the threshold is raised. Based on an empirical validation exercise, we judged that a threshold of two deprivations was most appropriate for identifying an individual as deprived. As a robustness check we also calculated all results using a threshold of three items. Other than (the expected) lower material deprivation rates, this higher threshold does not change the overall findings and conclusions of this paper.

Using this MDI, we compared the incidence of material deprivation with that of poverty calculated using the Low-Income Measure (LIM). In 2013, nearly one fifth of Canadians lived in a household that was unable to afford two or more items generally considered to be necessities for achieving a minimum living standard in Canada – we consider these individuals materially deprived. At the same time, 16 per cent of the Canadian population was poor according to the low-income measure used. Consistent with the findings of other studies, we found that a significant number of individuals were identified as poor by only one of the two indicators. As well, socio-economic groups that are known to have a high risk of low income often, but not always, also have a high risk of material deprivation and economic hardship.

Given the limited overlap between the MDI and the LIM, it is clear that using low-income statistics alone to measure poverty excludes an important share of the population that is experiencing adverse material outcomes but does not have a low income.

Further research should investigate whether there are suitable deprivation items that are currently not available in the CSEW data – such an exercise is a well-accepted practice deemed necessary for the periodical updating of the index.

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Appendix

Table A1: Incidence of material deprivation using a three-item cumulative deprivation threshold, by select demographic characteristics

	Percent deprived (3-item threshold)	Lower bound	Upper bound
Canada:	12.9	12.1	13.7
Newfoundland and Labrador	13.5	10.8	16.1
Prince Edward Island	13.5	9.9	17.0
Nova Scotia	17.5	14.7	20.3
New Brunswick	15.9	13.6	18.2
Quebec	12.7	11.1	14.2
Ontario	13.6	12.2	15.0
Manitoba	11.1	9.2	13.0
Saskatchewan	8.2	6.5	9.9
Alberta	12.0	9.9	14.0
British Columbia	12.1	10.3	14.0
Place of residence:			
Urban	12.6	11.7	13.4
Rural	14.4	12.9	16.0
Dwelling:			
Owned	8.9	8.1	9.7
Rented	26.6	24.7	28.4
Age of individual:			
Under 18 years	16.5	15.0	18.0
18 to 64 years	12.7	11.9	13.5
65 years or older	9.1	8.2	10.0
Household reference person:			
Employed	10.3	9.5	11.1
Unemployed	33.4	28.4	38.5
Not in labour force – able to work	14.8	13.5	16.2
Not in labour force – unable to work	46.0	38.7	53.3
Some high school	23.0	20.6	25.4
High school graduate	16.2	14.2	18.2
Some post-secondary	15.1	12.0	18.1
Post-secondary below bachelor's	12.6	11.4	13.8
Bachelor's degree	7.5	6.0	9.0
Above bachelor's degree	6.6	4.6	8.7
Not immigrant	11.9	11.2	12.6
Immigrant	15.9	13.8	17.9
Not aboriginal	12.6	11.8	13.4
Aboriginal	23.7	19.1	28.3
Main income source:			
Employment income	10.7	9.8	11.5
Investment and retirement income	3.8 E	2.5	5.1
Government transfers	35.8	33.3	38.4
Other income	21.0	15.4	26.7
Household type:			
One-person household	17.6	16.3	19.0

Couple with children	12.8	11.3	14.3
Couple without children	7.6	6.7	8.6
Lone-parent household	37.8	33.4	42.1
Other household	17.4	15.1	19.7

Notes: The upper and lower bounds are calculated for a 95 percent confidence interval. The sample excludes individuals missing information on any of the 17 material deprivation items. Cells marked with an E indicate estimates of marginal quality (CV between 16.6% and 33.3%).

Table A2: Multivariate regression using a three-item cumulative deprivation threshold

Dependent variable: materially deprived (three or more deprivations)				
Parameter	Odds	Lower Bound	Upper Bound	P value
Intercept	0.231	0.160	0.333	0.000
Newfoundland and Labrador	0.668	0.499	0.892	0.006
Prince Edward Island	0.668	0.459	0.974	0.036
Nova Scotia	1.096	0.841	1.430	0.497
New Brunswick	0.730	0.567	0.940	0.015
Quebec	0.659	0.539	0.806	0.000
Manitoba	0.578	0.434	0.769	0.000
Saskatchewan	0.497	0.367	0.673	0.000
Alberta	1.084	0.826	1.424	0.560
British Columbia	0.871	0.696	1.091	0.229
Rural	1.336	1.108	1.612	0.002
Dwelling rented	1.677	1.414	1.988	0.000
Individual aged under 18	0.964	0.888	1.046	0.375
Individual aged 65 or older	0.340	0.274	0.423	0.000
Reference person:				
Unemployed	2.036	1.511	2.744	0.000
Not in labour force – able to work	0.889	0.699	1.132	0.341
Not in labour force – unable to work	2.124	1.282	3.519	0.003
Some high school	1.850	1.340	2.553	0.000
High school graduate	1.591	1.199	2.110	0.001
Some post-secondary education	1.408	0.977	2.030	0.067
Post-secondary below bachelor's	1.435	1.093	1.885	0.009
Above bachelor's degree	1.027	0.692	1.524	0.894
Immigrant	1.226	0.983	1.528	0.070
Aboriginal	1.287	0.908	1.825	0.156
Investment and retirement income	0.497	0.327	0.755	0.001
Government transfers	2.307	1.781	2.988	0.000
Other income	0.884	0.582	1.342	0.562
One-person household	1.216	1.016	1.454	0.033
Couple with children	1.239	0.977	1.571	0.077
Lone-parent household	2.300	1.708	3.098	0.000
Other household	1.395	1.088	1.789	0.009
Second income quintile	0.467	0.386	0.567	0.000
Third income quintile	0.228	0.180	0.288	0.000
Fourth income quintile	0.099	0.068	0.146	0.000
Fifth income quintile	0.027	0.016	0.044	0.000

Notes: The upper and lower bounds are calculated for a 95 percent confidence interval. Reference groups are: Ontario for the provinces; age 18 to 64 for individual's age; employed for reference person's labour force status; bachelor's degree for reference person's education level; employment income for main source of household income; couple without children for the household type; and the first income quintile. Sample excludes individuals missing information on one or more material deprivation items, on reference person’s labour force status, or on main source of household income (N=54,373).

Table A3: Incidence of Low-Income Measure (LIM)

	Percent low-income	Lower bound	Upper bound
Canada:	15.9	15.2	16.6
Newfoundland and Labrador	22.2	19.2	25.1
Prince Edward Island	18.4	15.0	21.8
Nova Scotia	19.5	17.1	21.9
New Brunswick	22.5	19.9	25.2
Quebec	18.0	16.2	19.7
Ontario	15.4	14.1	16.6
Manitoba	17.2	15.2	19.2
Saskatchewan	15.0	12.9	17.1
Alberta	9.9	8.2	11.6
British Columbia	16.1	14.0	18.1
Place of residence:			
Urban	15.6	14.8	16.4
Rural	16.9	15.4	18.4
Dwelling:			
Owned	10.2	9.5	10.9
Rented	35.2	33.3	37.2
Individual's age:			
Under 18 years	18.8	17.3	20.3
18 to 64 years	12.6	11.9	13.2
65 years or older	26.5	25.1	27.9
Household reference person:			
Employed	9.2	8.5	9.9
Unemployed	33.9	28.6	39.2
Not in labour force – able to work	29.7	28.1	31.3
Not in labour force – unable to work	50.1	42.9	57.3
Some high school	36.5	34.0	39.0
High school graduate	17.2	15.6	18.8
Some post-secondary	18.8	15.6	22.0
Post-secondary below bachelor's	14.2	13.2	15.3
Bachelor's degree	9.3	7.7	11.0
Above bachelor's degree	7.8	5.9	9.6
Not immigrant	14.2	13.5	14.9
Immigrant	20.9	18.9	22.9
Not aboriginal	15.5	14.8	16.2
Aboriginal	28.9	23.9	33.8
Main income source:			
Employment income	9.8	9.1	10.5
Investment and retirement income	11.3	9.7	13.0
Government transfers	58.7	56.2	61.2
Other income	42.2	35.4	49.0
Household type			
One-person household	31.1	29.6	32.7
Couple with children	13.4	12.0	14.8
Couple without children	9.9	9.2	10.6

Lone-parent household	43.3	39.0	47.5
Other household	19.2	16.7	21.7

Notes: The upper and lower bounds are calculated for a 95 percent confidence interval. The sample excludes individuals missing information on any of the 17 material deprivation items.

Table A4: Overlap between material deprivation (measured using three-item cumulative deprivation threshold) and low income (percent)

	Deprived (3-item threshold)	Low income (LIM)	Both	Only deprived	Only low income	Total
Canada:	12.9	15.9	6.1	6.8	9.7	22.6
			(27)	(30)	(43)	(100)
Newfoundland and Labrador	13.5	22.2	9.3	4.2 E	12.9	26.3
			(35)	(16)	(49)	(100)
Prince Edward Island	13.5	18.4	5.8 E	7.6 E	12.5	26.0
			(22)	(29)	(48)	(100)
Nova Scotia	17.5	19.5	7.8	9.7	11.7	29.2
			(27)	(33)	(40)	(100)
New Brunswick	15.9	22.5	9.2	6.8	13.4	29.3
			(31)	(23)	(46)	(100)
Quebec	12.7	18.0	6.5	6.2	11.5	24.1
			(27)	(26)	(48)	(100)
Ontario	13.6	15.4	6.3	7.3	9.1	22.7
			(28)	(32)	(40)	(100)
Manitoba	11.1	17.2	5.4	5.6	11.7	22.8
			(24)	(25)	(51)	(100)
Saskatchewan	8.2	15.0	3.6	4.7	11.4	19.7
			(18)	(24)	(58)	(100)
Alberta	12.0	9.9	4.7	7.2	5.2	17.2
			(28)	(42)	(30)	(100)
British Columbia	12.1	16.1	5.9	6.3	10.2	22.3
			(26)	(28)	(46)	(100)
Place of residence:						
Urban	12.6	15.6	6.2	6.4	9.5	22.0
			(28)	(29)	(43)	(100)
Rural	14.4	16.9	6.0	8.5	11.0	25.4
			(23)	(33)	(43)	(100)
Dwelling:						
Owned	8.9	10.2	3.0	5.9	7.2	16.1
			(19)	(37)	(45)	(100)
Rented	26.6	35.2	16.8	9.8	18.4	45.0
			(37)	(22)	(41)	(100)
Individual's age:						
Under 18 years old	16.5	18.8	8.5	8.0	10.3	26.8
			(32)	(30)	(38)	(100)
18 to 64 years	12.7	12.6	5.5	7.2	7.1	19.8
			(28)	(36)	(36)	(100)
65 years or older	9.1	26.5	5.9	3.2	20.6	29.7
			(20)	(11)	(69)	(100)
Household reference person:						
Employed	10.3	9.2	3.5	6.8	5.7	16.0
			(22)	(42)	(36)	(100)
Unemployed	33.4	33.9	21.0	12.4	12.8	46.2

			(46)	(27)	(28)	(100)
Not in LF – able to work	14.8	29.7	9.6	5.2	20.1	35.0
			(27)	(15)	(58)	(100)
Not in LF – unable to work	46.0	50.1	29.7	16.3 E	20.3	66.3
			(45)	(25)	(31)	(100)
Some high school	23.0	36.5	15.7	7.3	20.8	43.8
			(36)	(17)	(47)	(100)
High school graduate	16.2	17.2	6.8	9.4	10.4	26.5
			(26)	(35)	(39)	(100)
Some post-secondary	15.1	18.8	7.5	7.6	11.3	26.4
			(28)	(29)	(43)	(100)
Post-secondary below bachelor's	12.6	14.2	5.1	7.5	9.1	21.7
			(24)	(34)	(42)	(100)
Bachelor's degree	7.5	9.3	3.2 E	4.3	6.2	13.6
			(23)	(31)	(45)	(100)
Above bachelor's degree	6.6	7.8	2.9 E	3.7 E	4.8	11.5
			(26)	(32)	(42)	(100)
Not immigrant	11.9	14.2	5.6	6.4	8.6	20.6
			(27)	(31)	(42)	(100)
Immigrant	15.9	20.9	7.9	8.0	13.0	28.9
			(27)	(28)	(45)	(100)
Not aboriginal	12.6	15.5	5.9	6.7	9.6	22.2
			(27)	(30)	(43)	(100)
Aboriginal	23.7	28.9	14.5	9.2 E	14.4	38.1
			(38)	(24)	(38)	(100)
Main source of income:						
Employment income	10.7	9.8	3.6	7.1	6.2	16.9
			(21)	(42)	(37)	(100)
Investment and retirement income	3.8 E	11.3	1.6 E	2.2 E	9.8	13.5
			(12)	(16)	(72)	(100)
Government transfers	35.8	58.7	28.4	7.4	30.3	66.1
			(43)	(11)	(46)	(100)
Other income	21.0	42.2	15.7	F	26.5	47.5
			(33)		(56)	(100)
Household type:						
One-person household	17.6	31.1	11.3	6.4	19.9	37.5
			(30)	(17)	(53)	(100)
Couple with children	12.8	13.4	5.2	7.6	8.1	20.9
			(25)	(36)	(39)	(100)
Couple without children	7.6	9.9	2.5	5.1	7.4	15.0
			(17)	(34)	(49)	(100)
Lone-parent household	37.8	43.3	26.7	11.1	16.6	54.4
			(49)	(20)	(30)	(100)
Other household	17.4	19.2	8.8	8.6	10.4	27.8
			(32)	(31)	(37)	(100)

Note: the sample excludes individuals missing information on any of the 17 material deprivation items. Cells marked with an E indicate estimates of marginal quality (CV between 16.6% and 33.3%). Cells marked with an F were suppressed for data quality reasons (CV above 33.3%).

Table A5: Summary of risk characteristics for material deprivation, low income, and economic hardship

	Materially deprived (2-item threshold)	Materially deprived (3-item threshold)	Low income (LIM)	Economic hardship
Canada:				
Newfoundland and Labrador			High	
Prince Edward Island				
Nova Scotia	High	High	High	High
New Brunswick	High		High	
Quebec				Low
Ontario				
Manitoba				
Saskatchewan	Low	Low		Low
Alberta			Low	
British Columbia				
Place of residence:				
Urban				
Rural				
Dwelling:				
Owned	Low	Low	Low	Low
Rented	High	High	High	High
Individual's age:				
Under 18 years	High	High	High	High
18 to 64 years old			Low	
65 years or older	Low	Low	High	Low
Household reference person:				
Employed	Low	Low	Low	
Unemployed	High	High	High	High
Not in labour force – able to work			High	
Not in labour force – unable to work	High	High	High	High
Some high school	High	High	High	High
High school graduate	High	High		High
Some post-secondary				High
Post-secondary below bachelor's				
Bachelor's degree	Low	Low	Low	Low
Above bachelor's degree	Low	Low	Low	Low
Not immigrant			Low	
Immigrant	High	High	High	High
Not aboriginal				
Aboriginal	High	High	High	High
Main income source:				
Employment income	Low	Low	Low	
Investment and retirement income	Low	Low	Low	Low

Government transfers	High	High	High	High
Other income	High	High	High	High
Household type:				
One-person household	High	High	High	
Couple with children			Low	
Couple without children	Low	Low	Low	Low
Lone-parent household	High	High	High	High
Other household	High	High	High	High

Note: Characteristics are associated with a low or high risk when the incidence rate is statistically higher or lower than the incidence rate at the national average. Blank cells indicate that the risk level for the characteristic was not statistically different than at the national level. Statistical significance is determined by comparing 95% confidence intervals. Economic hardship is defined as one or more affirmative answers to five questions about the household's ability to deal with expenses.