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Food Insecurity and Homelessness  
in the Journeys Home Survey

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# **Food Insecurity and Homelessness in the Journeys Home Survey\***

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## **Abstract**

Homelessness not only deprives people of comfort, safety, and dignity but may also cause other problems, including food insecurity. In this study, we use data from the Journeys Home survey, a large national longitudinal survey of disadvantaged Australians who were homeless or at risk of homelessness, to estimate multivariate ordered categorical variable models of the association between homelessness and food insecurity. The Journeys Home survey includes an extensive set of measures of people's circumstances that we include in our models. We also estimate dummy endogenous variable specifications. All our specifications indicate that homelessness is associated with higher (worse) food insecurity for men. We also find unconditional associations in the same direction for women, but these become statistically insignificant when we include extensive sets of observed controls in our models or estimate dummy endogenous variable specifications. We also investigate how homelessness is related to food consumption, meal consumption, and food expenditures. Food expenditures are negatively associated with homelessness for men in all our specifications; however, the other food outcomes for men and women do not show consistent, statistically significant associations.

**JEL classification:** I32

**Keywords:** Food insecurity, food consumption, food expenditures, homelessness, Journeys Home survey

Homelessness involves many hardships. People who lack accommodations altogether (the primary homeless) endure the physical discomfort and risks of sleeping rough. They—along with those who double up with friends or relatives and those who shelter in emergency or culturally inadequate arrangements (the secondary and tertiary homeless)—also often lack access to the full facilities of a home, confront uncertainty regarding their housing situation, and lose privacy and dignity. As uncomfortable and stressful as these circumstances may be, homelessness may also beget other deprivations, including food hardships.

Homelessness could cause food problems in a number of ways. Homelessness may preclude access to kitchen and food storage facilities and interfere with other market and nonmarket activities that are essential to food acquisition and meal preparation. The stress associated with homelessness may detract from the attention that is needed to achieve food security. Worse, food insecurity may be particularly detrimental for the homeless, with studies documenting that food hardships and nutritional deficits for the homeless are associated with higher rates of health problems, chronic conditions, hospitalization, and emergency room treatment (Baggett et al. 2011; Hamelin and Hamel 2009).

These logical and descriptive linkages notwithstanding, the empirical basis for an impact of homelessness on food hardships is surprisingly tenuous. Few of the descriptive studies directly compare outcomes for homeless and housed people, with most relying on implicit comparisons. Only a handful of multivariate studies have been conducted (Furness et al. 2004; Gundersen et al. 2003; Lee and Greif 2008; Wehler et al. 2003), but these have been hampered by limitations on their samples (e.g., samples of single cities or just of homeless populations) and measures.

We address these limitations, using data from the Journeys Home (JH) survey, a large, national survey, which longitudinally followed disadvantaged Australians who were either homeless or at high risk of homelessness or housing insecurity from 2011 until 2014. Unlike

the data examined in previous analyses, the JH survey spans many geographic contexts and includes a heterogeneous at-risk population. JH was designed to examine the circumstances and consequences of homelessness, and it asked extensive questions about people's economic, demographic, health, and well-being outcomes as well as their housing situations. Among the well-being measures were reports of food hardships, food and meal consumption, and food expenditures, allowing us to analyse how homelessness is associated with each of these food outcomes.

The principal contributions of this study are that it analyses a more general sample of the disadvantaged population at risk of homelessness, includes a more extensive set of control measures, and considers a broader set of food outcomes than any previous multivariate study. Additionally, we extend knowledge regarding homelessness and food insecurity in several other directions. First, we conduct statistical analyses that address the potential endogeneity of homelessness by estimating dummy endogenous variable models that account for spurious associations from unobserved variables.

Second, we have sufficient data from the JH survey to estimate separate models for men and women. Previous multivariate studies either estimated outcomes for women only (Gundersen et al. 2003; Wehler et al. 2003) or pooled data for men and women while only including simple controls for gender (Furness et al. 2004; Lee and Greif 2008). Estimates from our models reveal that there are substantial gender differences, with homelessness being strongly associated with food hardships for men but not for women.

Third, we investigate these relationships with data from Australia, a developed, high-income country with extensive social supports that also has modestly high levels of homelessness and food hardships. The Australian Bureau of Statistics (ABS) estimated that 105,000 Australians, or 0.5 percent of the population, were homeless on the night of the nation's last census in 2011 (ABS 2012), and Chamberlain and Johnson (2015) have

estimated that 2.4 million Australians, or about an eighth of the population, have experienced homelessness during their lifetime. In addition, Foley et al. (2010) estimated that seven percent of South Australians experienced food hardships. An interesting aspect of the Australian policy context is the availability of cash transfer payments for homeless people. This contrasts sharply with the U.S. where homeless people not only face social exclusion and deprivation but also often fall outside the cash social safety net.

The remainder of this paper is organized as follows. The next section describes a theoretical rational-choice model of food insecurity and uses that model to develop explanations for the empirical relationship between homelessness and food insecurity. The following section reviews the empirical research literature on these relationships. In the next section, we describe the JH survey, the construction of our empirical measures, and the selection of our analysis sample. We next report results from our multivariate empirical models. The final section of the paper offers conclusions.

### **Conceptual framework**

We analyse how homelessness might cause food hardships, using Barrett's (2002) rational-choice model of food insecurity. Barrett's model considers a person who has life-cycle preferences regarding her physical well-being and her own consumption of other goods in the present and future periods. The model further assumes that the level of physical well-being in each period depends on the level of well-being from the previous period; is augmented through inputs of nutrition, the person's time, and purchasable goods and services; and is subject to potential shocks. Nutrition, in turn, depends on purchases of food and inputs of time. The person's total available time is constrained, with the time that she can devote to investing in her nutrition and physical well-being being reduced by time that she spends in the labour market. The person faces a life-cycle budget constraint in which

expenditures on goods and services in a given period are constrained by her per-period earnings, the returns on her net savings (or interest payments on her debt), other unearned income, and borrowing or savings. In each period, the person chooses allocations of time and expenditures on goods and services to maximize her life-time utility subject to the production, time, and budget constraints.

Based on these choices, the person attains given levels of nutrition and physical well-being. If the nutritional inputs are above a particular biological threshold, the person will be food secure, meaning that she has sufficient food to meet her physical well-being needs, but if the nutritional inputs are below the threshold, she will be food insecure. Because the consequences of food insecurity can be acute and severe, people may also engage in various coping strategies to avoid these conditions, especially when their resources are low. These coping strategies take the form of demeaning and socially undesirable ways of obtaining food or the resources for food that may include seeking emergency services, borrowing, begging, foraging, and stealing.

The model points to many general conditions that raise people's risks of food insecurity. First, food insecurity is more likely among people whose market and non-market productivities are low and who have trouble either obtaining the economic resources to buy food or converting food into nutritious meals. Second, the risks of food insecurity rise when wages fall or prices increase, as both of these conditions reduce what people can purchase. Third, food insecurity is more likely if people lack access to labour markets where they can "sell" their effort or product markets where they can buy food. Fourth, food risks increase when people lack wealth and assets that might be spent down to obtain food. Fifth, food risks also increase when people are blocked from borrowing or shifting financial resources from one period to another. Sixth, food insecurity is more likely in the absence of reliable social, private, or public insurance arrangements and safety nets. Seventh, food risks increase when

people's circumstances put them close to nutritional margins; in these circumstances, any negative shocks are more likely to move people below those margins. Eighth, risks also increase when people's work, health, or living conditions make them susceptible to shocks. Ninth, food risks are higher when people's coping strategies are limited.

From these risk factors, we can see many ways that homelessness might cause food problems. For example, homelessness might harm people's physical health (Dennis et al. 1991), mental health (Hodgson et al. 2013), and safety (Diette and Ribar 2015; Milburn and D'Ercole 1991), which might, in turn, reduce their market and non-market productivity. Homelessness may reduce people's work opportunities (Shier et al. 2012), access to food markets (Crawford et al. 2014), public assistance (Koegel et al. 1990), and social supports (Meadows-Oliver 2005). In general, homelessness will increase the chances of food insecurity if it raises any of the risk factors from Barrett's model.

There are also some special circumstances of homelessness that might lead to food insecurity. For one thing, primary homelessness (e.g., sleeping rough) not only implies the loss of an accommodation but all the things associated with that accommodation, including kitchen and food storage facilities (Crawford et al. 2014; Dachner and Tarasuk 2002; Miewald and Ostry 2014; Wicks et al. 2006). Poor dentition among the homeless may interfere with eating and hence the conversion of food inputs into nutrition (Wicks et al. 2006). Homeless people may also face negative, rather than positive, effects of social networks if those networks include other needy members who put reciprocal obligations on them (Dachner and Tarasuk 2002; Koegel et al. 1990; Tsai and Rosenheck 2013).

Aspects of homeless people's coping behaviours may also affect food security. Some behaviours may lead to worse outcomes. For example, alcohol consumption, which tends to be high among homeless, is a source of calories that might substitute for the intake of healthier nutrients (Darmon et al. 2001; Darnton-Hill and Ash 1988; Malmauret et al. 2002).



However, other coping behaviours may be more beneficial. Homeless people may lose their inhibitions about utilizing soup kitchens, begging, and foraging (Booth 2006; Hamelin and Hamel 2009; Koegel et al. 1990; Lee and Greif 2008; Quine et al. 2004; Tarasuk et al. 2009; Tsai and Rosenheck 2013; Wicks et al. 2006). Part of this response may be an adaptation by homeless people to their circumstances (Koegel et al. 1990; Lee and Greif 2008), perhaps through increased identification with homelessness (Snow and Anderson 1987).

Although there are many reasons why homelessness might cause food problems, the observed relationship may reflect other things and not be causal. Homelessness, like food security, is an endogenous (behavioural) outcome. The empirical association between these outcomes might stem from other characteristics that mutually cause each of them. In a comprehensive review of empirical studies of the causes of homelessness, Lee et al. (2010) identified many characteristics, such as reduced economic resources, high costs, poor health, inadequate social buffers, and vulnerability to negative shocks, that overlap with the risk factors from Barrett's model. Similarly, Joyce et al. (2012) documented that food insecurity rarely happens in isolation but rather often co-occurs with economic, health, and energy insecurity in addition to housing insecurity. Although empirical studies, including ours, can control for many of these characteristics, they cannot account for all of them, leaving the possibility of omitted variables bias.

Another methodological concern is that food hardships, if they are prolonged and severe enough, could contribute to housing and economic problems and hence to reverse causation. The most likely mechanism for reverse causation would be through food insecurity damaging health (see, e.g., Cook et al. 2013) which would reduce the person's productivity or otherwise affect homelessness. However, food insecurity could also motivate people to obtain social or public assistance that could reduce homelessness.

As this discussion indicates, theory provides ample explanations for why

homelessness might affect food security. Many of the explanations centre on indirect effects of homelessness through general risk factors that contribute to food hardships. The discussion also points to non-causal explanations for the observed relationships, which need to be kept in mind as we interpret results and prompt us to estimate endogenous variable models.

### **Previous studies**

The vast majority of empirical studies that have investigated homelessness and food hardships have been descriptive, aiming mainly to characterise the outcomes and circumstances of homeless people. Quantitative studies by Booth (2006), Koegel et al. (1990), Ora et al. (2008), and Tarasuk et al. (2009) and qualitative studies by Crawford et al. (2014), Dachner and Tarasuk (2002), Miewald and Ostry (2014), Quine et al. (2004) and Wicks et al. (2006) have documented high levels of hunger, food insecurity, and other food hardships among the homeless as a whole and among subpopulations, such as homeless youths and older homeless adults, across many different country and geographic contexts.

A large related descriptive literature has examined food intakes and documented nutritional deficits among the homeless (Darmon et al. 2001; Darnton-Hill and Ash 1988; Drake 1992; Gelberg et al. 1995; Langnäse and Müller 2001; Luder et al. 1990; Malmauret et al. 2002; Quine et al. 2004; Richards and Smith 2010; Smith and Richards 2008; Sprake et al. 2014; and Wolgemuth et al. 1992). The studies by Drake (1992) and Luder et al. (1990) additionally uncovered a disconnect between homeless people's perceptions of food sufficiency, which many see as adequate, and their actual nutritional intakes, which are often unhealthy. This raises the possibility that homeless people may report food access hardships differently from other food well-being measures and motivates us to also consider measures of food and meal consumption.

The descriptive studies have yielded strong evidence that homeless people face high

risks of food hardships and nutritional problems; however, most fail to indicate the strength of the relationship because they lack comparisons between homeless and housed people, and they also fail to provide causal results because they lack multivariate controls. Only a few studies have conducted multivariate analyses.

Gundersen et al. (2003) and Wehler et al. (2003) estimated models of food hardships, using a convenience sample of low-income, single-mother families in Worcester, Massachusetts. Wehler et al. found that counts of recent housing problems, receipt of housing subsidies (among the housed), and a short tenure in the area predicted children's food hardships but not mothers' hardships. The companion study by Gundersen et al. estimated instrumental-variable models of food hardships in an attempt to obtain causal effects of homelessness; the models indicated that homelessness increased food hardships, but the estimates were imprecise and most could not be distinguished from zero.

Two other studies found stronger associations between aspects of homelessness and food problems. Furness et al. (2004) analysed data from a telephone survey of low-income households in Los Angeles that included a question about homelessness within the past five years. Past homelessness was a strong and significant predictor of current food insecurity, but the study included very few control variables. Lee and Greif (2008) examined a large national survey of people who were utilizing homelessness services and who lacked permanent or suitable accommodations. Although their study was limited to people who were homeless, they were able to distinguish between different types of homelessness and different housing problems. They found that being on the street (sleeping rough) and the number of homeless spells within the past month were each associated with increased food hardships.

As these descriptions indicate, each of the existing multivariate studies suffers from limitations. Three of the studies covered individual U.S. cities that might not be representative of homelessness experiences elsewhere; the other study was restricted to

people who were homeless. One of the studies (Furness et al. 2004) only considered past homelessness, and all of the studies had relatively modest sets of control variables. The Journeys Home survey, which we describe in the next section, overcomes these limitations.

### **Analysis data from the Journeys Home Survey**

Our empirical analyses use data from the Journeys Home survey, a large, national, interviewer-administered, longitudinal survey that followed a sample of Australian public assistance clients who were at risk of homelessness and housing insecurity. Critically for the purposes of investigating effects of homelessness, the JH sample was drawn from a broad, albeit disadvantaged, at-risk population that included homeless and housed people. Interviews began in 2011 and continued in six-month intervals with each wave asking people about their housing, economic, health, and other circumstances (Wooden et al. 2012). In the initial wave of interviews, 1,682 people participated, which represented a response rate of 62 percent of the in-scope sample. Retention in the subsequent waves of JH was high, with 91, 88, 86 and 84 percent of the initial respondents being re-interviewed in waves 2-5, respectively.

Food outcomes. Our principal outcome measure is an ordered categorical index of food insecurity that comes from questions in the fifth wave of JH that were adapted from the Household Food Insecurity Access Scale (HFIAS). The HFIAS was developed to measure hardships in food access across different cultural contexts (Coates et al. 2007), including among homeless adults (Holland et al. 2011). JH asked six of the nine HFIAS questions, inquiring whether and how often during the “past four weeks” the person had to:

1. “worry that you would not have enough food,”
2. “eat a limited variety of foods because of a lack of money,”
3. “eat some foods that you really did not want to eat because of a lack of money,”
4. “eat a smaller meal than you felt you needed because there was not enough food,”

5. “skip a meal because of a lack of money,” and
6. “go a whole day and night without eating anything because there was not enough food.”

The possible responses to each item were “never,” “rarely (once or twice in the past four weeks),” “sometimes (three to ten times in the past four weeks),” and “often (more than ten times in the past four weeks).” We formed an index by first assigning values of zero to the “never” responses, one to the “rarely” and “sometimes” responses, and two to the “often” responses and then summing these values for the questions regarding worrying, eating a limited variety of foods, eating unwanted foods, and going a day and night without food. The resulting index ranges from zero to eight, with higher values indicating greater food insecurity. Formal analyses, which are described in Appendix A, supported the construction of our four-item, three-response-category index. In sensitivity analyses (which are omitted for brevity but available upon request), we examined alternative indices that incorporated all of the available items and response categories; the use of less parsimonious indices did not substantively alter our findings.

The fifth wave of the JH survey also asked about usual weekly meals, food expenditures, and food consumption. These measures provide direct, objective indications of food behaviours, but they may provide less information about people’s well-being. Descriptive evidence from studies of nutritional intakes (Drake 1992; Luder et al. 1990) and expenditures (Gundersen and Ribar 2011) suggests that objective measures should be considered alongside of self-reported hardships. From JH questions on the usual numbers of weekly breakfasts, lunches, and dinners consumed, we summed the responses to form a count (0-21) of weekly meals. JH also asked about the usual weekly expenditures that the respondent and people living with him or her made on food and drink, including meals eaten away from home. We adjusted the measure by dividing the total reported expenditures by the

modified OECD equivalence scale for the people covered by the expenditures.<sup>1</sup> Finally, for food consumption, we formed a factor score from responses to questions about the usual weekly servings of fruits and vegetables and the usual days on which the person ate seafood, meat, and legumes. External validation analyses reported in Appendix A confirmed that these measures were negatively correlated with self-reported food hardships.

Homelessness. Our primary explanatory variable is a binary indicator for whether the respondent was homeless at any point during the month preceding the fifth wave interview. Definitions of homelessness are highly contested (see Chamberlain and MacKenzie 1992; Lee et al. 2010; Toro 2007). We follow Chamberlain and MacKenzie (2008) and adopt a “cultural” definition of homelessness, which refers to living in a situation that falls below community standards. This includes people who are primary homeless (those without accommodation), secondary homeless (those in short-term, rent-free arrangements with friends or family), and tertiary homeless (those in long-term arrangements but below community standards, such as living in boarding houses or caravans). In preliminary analyses we examined separate categorizations of primary, secondary, and tertiary homelessness but found that these did not have statistically distinct associations with food insecurity.

Other explanatory variables. Gender is a key conditioning variable in our analyses. Preliminary analyses indicated that homelessness, family structure, substance abuse, and other characteristics differed substantially between the men and women in our sample. Accordingly, we disaggregate all our empirical analyses by gender.

Our analyses include other demographic measures: age; age squared; an indicator for identifying as Aboriginal or a Torres Strait Islander; an indicator for migrating from a non-English-speaking country; and two indicators for schooling (one for completing high school but not a higher qualification and another for completing a higher qualification). We also

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<sup>1</sup>The scale applies weights of 1.0 for the first adult, 0.5 for each additional adult, and 0.3 for each child under age 15.

have measures that characterise the person's childhood: an indicator for ever being placed into foster, residential or kin care; an indicator for not being with both parents at age 14; and a 0-4 index of childhood abuse and neglect that is the sum of indicators for whether the person was left without food or shelter, suffered physical force or violence from someone s/he lived with, suffered physical force or violence from someone else, and/or was sexually assaulted. Finally, we include two dummies that indicate being in two of the three JH sampling strata to account for survey design effects.

We also include many other variables that correspond to risk factors from Barrett's model. However, because each of these variables is potentially endogenous and possibly influenced by the person's food security status, we measure them using data from wave 4 of the JH survey, rather than wave 5—that is, we use lagged values of these variables. The variables include three measures of family structure and relationships: an indicator for being in a formal or de facto marriage, a count of the number of resident children, and an indicator for being in contact with other family members. We also include several measures of the person's health: an indicator for being diagnosed with a chronic health condition, an indicator for a long-term health condition or disability that limits activities, a 1-5 index of self-assessed poor health, an indicator for being diagnosed with a mental health problem, and the Kessler scale (0-24) of psychological distress. We include four measures of employment and economic resources: a measure of the proportion of time that the respondent has been employed since completing school, an indicator for being employed at the time of the interview, the logarithm of the respondent's weekly gross household income from all sources adjusted by the modified OECD equivalence scale, the amount of total outstanding debt (top coded at \$50,000), and an indicator for whether the respondent held a credit card. To capture public safety-net and social supports, we include a dummy variable for having received social services in the last six months (i.e. housing, tenancy, emergency relief, legal aid, financial

support, gambling support, family violence services), a 5-25 scale of access to social support (i.e. the respondent can get help from others, can lean on people, has people to cheer him/her up, feels better talking to people he/she knows, and seldom feels lonely); an indicator for having a “resourceful” social network (i.e. friends who are housed and who have full-time jobs); and an indicator for having a “resourceless” social network (i.e. either no friends or friends who are mostly homeless or without full-time jobs).

We also include four controls for substance abuse: a measure of the average number of alcoholic drinks consumed per day, an indicator for weekly cannabis use in the preceding six months, and an indicator for smoking daily in the preceding six months. To account for violence and perpetrating behaviour, we include an indicator for having suffered from physical or sexual violence in the last six months and an indicator for having been incarcerated. To characterize access to local food and labour markets, we include an indicator for whether the respondent lived more than 500 meters from public transport and indicators for living in an urban area outside of a major city and living in a non-urban area. As additional controls for housing costs and job market conditions, we use a lagged measure of the person’s SA4 area of residence to link each observation to the log of the area apartment/flat rental price and the area unemployment rate for the observation reference period.<sup>2</sup> That is, we use lagged information to identify areas but current information to characterise the conditions. We also include several measures that are specifically related to food access, coping strategies, and food problems: an indicator for whether the respondent used emergency meal services in the last six months, an indicator for having access to kitchen facilities, and an indicator for whether the respondent reported skipping meals during wave 4.

Instrumental variable. In our models that adjust for the possible endogeneity of homelessness, we include an indicator for being on a public housing waiting list as an

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<sup>2</sup> SA4 areas are sub-state geographies defined by the ABS to represent labour sub-markets and typically have 300,000-500,000 people in metropolitan areas and 100,000-300,000 people in other areas.



explanatory variable for homelessness but not for food insecurity. Being on a waiting list does not confer any direct economic benefits or provide any resources, so it should not directly contribute to food outcomes. Also, because waiting lists adjust relatively slowly, waiting list status should not be influenced by current food problems. One concern may be that waiting list status may be associated with the willingness to take up social services; however, our endogenous variable models control for the use of other services, including emergency meal services.

Sample selection. The initial in-scope group for our analysis sample consists of wave 5 JH respondents who answered the food security questions (N = 1,406). Because our analyses incorporate lagged explanatory variables, we drop observations for people who did not participate in the wave 4 interview. To maximize the remaining sample size, we set values of variables with missing values to zero and include dummy controls for missing responses when the number of missing responses exceeds 20 (these include the measures for childhood abuse, work experience, debt, distance to public transportation, and history of skipping meals). For measures with lower levels of item non-response, we drop observations with missing values. We are left with 1,152 observations: 611 men and 541 women.

Descriptive analysis. Table 1 reports means of the food outcome and explanatory variables separately for the homeless and housed men and women in our analysis sample. As the numbers of observations in each column indicate, the rate of homelessness was nearly twice as high among the men (23 percent) than the women (13 percent).

[Table 1 about here]

From the first row of the table, homeless men and women reported similar average levels of food insecurity that were each higher (worse) than the levels reported by their housed counterparts. Housed women, however, reported higher food insecurity than housed men. These differences notwithstanding, the incidence of food hardships was modest. Figure

1 displays the distributions of housed and homeless men and women reporting each food insecurity response. Overall, nearly 60 percent of our sample reported not experiencing any food hardships during the preceding month. Among our homeless respondents, half the homeless women and 43 percent of the homeless men reported no hardships.

[Figure 1 about here]

Consistent with their reports of higher food insecurity, homeless people in our sample reported eating about one fewer meal per week, on average, than housed people and spending \$12.50-\$15.50 less per week on food on an equivalised basis. However, only the meal and expenditure differences for men can be statistically distinguished from zero. There were no discernible differences between homeless and housed people's food consumption scores.

Comparisons of the means of the other explanatory variables indicate that the homeless people in the JH survey differed in many ways from the housed people, with several of the differences varying by gender. Homeless men and women, on average, were older, had fewer children, had less family contact, worked less, enjoyed fewer social supports, drank and smoked more, used emergency meal services more often, had less access to kitchen facilities, and were more likely to have previously reported going without meals than their housed counterparts. Homeless men were less likely to be married, were less likely to hold credit cards, were more likely to have unemployed or homeless friends, experienced more violence, and lived in areas with lower unemployment and higher rents than housed men. Homeless women were more likely to identify as Indigenous, had less education, had lower incomes, and smoked cannabis more than housed women. The differences in observed characteristics by housing status motivate us to estimate multivariate models, while the differences by gender motivate us to conduct those analyses separately for men and women.

## Multivariate empirical analyses

Food insecurity. The main outcome measure for our multivariate analyses is our ordered categorical (0-8) food insecurity index. Let  $f_i^*$  be a continuous latent index of person  $i$ 's food insecurity, and let  $f_i$  be the actual categorical report. In addition, let  $h_i$  be an indicator of whether the person was homeless,  $X_i$  be a vector of the person's other observed characteristics, and  $\varepsilon_i$  be a standard normal random variable that represents the person's unobserved characteristics. We begin our multivariate analysis by estimating ordered-probit models of the form

$$f_i^* = \alpha h_i + \beta X_i + \varepsilon_i$$
$$f_i = \begin{cases} 0 & \text{if } f_i^* < 0 \\ 1 & \text{if } 0 \leq f_i^* < \delta_1 \\ \vdots & \vdots \\ 8 & \text{if } \delta_7 \leq f_i^* \end{cases}$$

where  $\alpha$  is a scalar coefficient,  $\beta$  is a vector of coefficients, and  $\delta_1 - \delta_7$  are threshold parameters to be estimated. The ordered-probit model accounts for  $f_i$  being an ordered but non-cardinal measure of food insecurity.<sup>3</sup>

Table 2 lists estimated coefficients and standard errors from ordered-probit models that were run separately for men and women in the JH sample. The first columns for each gender group list estimates from specifications that include homelessness as the only explanatory variable. The next columns add controls for the exogenous background variables, and the final columns add controls for the lagged, potentially endogenous explanatory variables. For all the specifications, we report robust, Huber-White standard errors.

[Table 2 about here]

As with the simple differences in means from Table 1, the unconditional associations between homelessness and the latent food insecurity indices in the ordered-probit models are significantly positive for men and women in the first columns of Table 2. Thus, the use of

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<sup>3</sup> We also estimated OLS models that treat  $f_i$  as a cardinal measure and obtained similar findings.

non-linear ordered-probit models does not fundamentally alter the patterns of association.

When we add controls for the exogenous background variables, the estimated conditional associations between homelessness and food insecurity remain positive and nearly identical in magnitude to the unconditional estimates. Among the background variables, the quadratic controls for age and the index for childhood abuse are significant for both genders. Additionally, childhood experiences in state care are significant for women.

In the third set of specifications that add lagged measures of potentially endogenous variables, homelessness continues to be significantly positively associated with food insecurity for men with little change in the magnitude of the coefficient. Homelessness is also estimated to have a positive association with women's food insecurity, but the coefficient is smaller than in the previous specifications and not statistically distinguishable from zero.

Several other characteristics appear to be associated with disadvantaged men's and women's food insecurity. High levels of psychological stress, the receipt of social services (such as tenancy, emergency relief, legal aid, gambling support, or family violence services), and previous reports of going without meals because of a shortage of money are each positively associated with food insecurity for men and women. Other characteristics seem to have distinct, gender-specific associations. For disadvantaged men, migrating from a non-English-speaking country, being married, having a chronic health condition, reporting poor health, working, having less income, holding credit cards, experiencing violence, and using emergency meal services are each associated with more food hardships. For women, childhood abuse, increased family contact, lower levels of social support, and higher local rents are associated with greater food insecurity.

Dummy endogenous variable specifications. The multivariate ordered-probit models control for the confounding influences of a host of observed characteristics. However, there may be unobserved characteristics that are also correlated with homelessness and food

insecurity and that lead to spurious estimated associations. To address these potential sources of bias, we estimate dummy endogenous variable (DEV) versions of our food insecurity model. Specifically, we model homelessness as a function of the observed characteristics from our food insecurity model,  $X_i$ ; some unique observed characteristics (an instrument),  $Z_i$ ; and unobserved characteristics,  $\eta_i$ , such that

$$h_i = I(\gamma X_i + \theta Z_i + \eta_i > 0).$$

We assume that  $\varepsilon_i$  and  $\eta_i$  follow a bivariate standard normal distribution with correlation  $\rho_{\varepsilon\eta}$  and estimate the homelessness probit model jointly with the food insecurity ordered-probit model using Roodman's (2011) CMP maximum-likelihood Stata procedure. Results from the DEV specifications for men and women are reported in Table 3.

[Table 3 about here]

The estimates provide evidence of correlations among the unobserved determinants of homelessness and food insecurity. For men, the estimated correlation is moderately negative (-0.44), while for women the estimated correlation is strongly positive (0.63). However, both estimates are quite imprecise. The 95-percent confidence interval (CI) around the estimate for men is consistent with both near-perfect negative correlation and modest positive correlation, and the 95-percent CI for women extends from a slightly positive correlation to near-perfect positive correlation.<sup>4</sup> Coefficients on the public housing waiting list instrumental variables in the homelessness models are both positive and highly significant.

Adjusting for the unobserved correlations leads to large changes in the estimated coefficients for homelessness in the food insecurity models, with the homelessness coefficient for men becoming much more strongly positive and the coefficient for women switching signs and becoming strongly negative. Both of the homelessness coefficients,

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<sup>4</sup> Likelihood functions for DEV models sometimes have local maxima; we used grid searches over the correlation coefficients for all of our models to confirm that we found global maxima.

however, also have very large standard errors. While both coefficients are statistically different from zero, the 95-percent CIs are consistent with both weak and very strong associations. Because of the large standard errors, we do not focus on the point estimates of the homelessness coefficients from Table 3 but rather interpret the results as a sensitivity test that supports our earlier findings that homelessness is associated with greater food insecurity for men but not women, even after making statistical adjustments for other characteristics.

Other food outcomes. The JH survey also asked about food consumption, meal consumption, and food expenditures. Table 4 reports coefficients on the homelessness indicator from alternative specifications of our OLS and DEV models. The models are specified to include exactly the same explanatory variables as the food insecurity models from Tables 2 and 3.<sup>5</sup>

[Table 4 about here]

As with the descriptive results from Table 1, the estimates from Table 4 indicate that men's homelessness is associated with lower food expenditures even after controls for observed and unobserved characteristics are included in the models. The other significant difference from Table 1—homeless men's lower number of weekly meals—is not robust to the inclusion of other controls. The coefficient becomes weaker and loses its statistical significance when the exogenous background controls are included, becomes weaker still when the full set of observed controls is included, and switches sign in the DEV specification. There are no consistent patterns of significant association for food consumption for men or for the three food outcomes for women.

Sensitivity tests. We subjected the multivariate results to a number of sensitivity tests and robustness checks.<sup>6</sup> First, we re-estimated the ordered-probit models using an alternate

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<sup>5</sup> We use the log of food expenditures in the food expenditure model. More detailed estimation results for the models are reported in Appendix Tables B.1 (men) and B.2 (women).

<sup>6</sup> For brevity, we discuss the general findings without reporting detailed results; those results are available upon request.

scale of food insecurity that incorporated all six of the available hardship items (i.e., included the two items that our other analyses had found to be redundant) and that used all four of the response categories. The use of those outcome variables led to substantively similar findings.

Second, we re-estimated our models using an indicator for experiencing homelessness at any point during the six months prior to the JH survey as an alternative measure of homelessness. Most spells of homelessness are brief (Cobb-Clark et al. 2016), and entry and exit are common. The one-month window of our principal homelessness measure may miss some recently completed spells that might have left people vulnerable to food hardships. Coefficient estimates on homelessness are weaker when the six-month measure is used, but the signs and most significance levels are similar to those based on the one-month measure.

Third, we examined the robustness of our DEV specifications to weaker identification assumptions. The DEV models in Tables 3 and 4 are identified in two ways: through a variable exclusion restriction on the public housing waiting list measure and through functional form restrictions associated with the non-linear model specification and the bivariate normal assumption on the model errors. Researchers typically employ variable exclusion restrictions, as we do, to bolster identification, but the DEV models can be estimated without these. DEV estimates from models that only use functional form identification (i.e., that drop the waiting list measure from the homelessness equation) are very similar to those that we have reported, with one exception—the coefficient on homelessness in the model for women’s food insecurity is insignificant and much closer to zero. As an alternative test of our identification assumptions, we re-estimated the models by including the public housing waiting list measure in both the homelessness and food outcome equations. The public housing waiting list variable was not significant in our food insecurity specifications nor in any of our other food outcome equations for men. The waiting list variable was significantly negative in the food consumption equation ( $p$ -value 0.058) and

positive in food expenditure equation ( $p$ -value 0.097) for women.

Differences between men and women. Estimates from our multivariate models consistently indicate that homelessness is associated with worse food security for men but not for women. What can explain this pattern of results? The descriptive statistics from Table 1 show that there are many differences between the disadvantaged men and women in our sample. Women in the JH survey are much more likely than men to have co-resident children and thus higher food needs. Women are also less likely to be employed, have less work experience, drink and smoke less, have more unemployed and homeless friends, are more likely to come from a non-intact family, and are less likely to use emergency meal services. While differences in these characteristics have the potential to explain differences in reported food hardships, they are generally not significant in the multivariate models for women.

We think that a more plausible explanation is that the homelessness experiences of women in the JH sample are different and in some respects less severe than the experiences of men. Estimates from Table 1 show that homelessness is less common among JH women than among men. Chamberlain and Johnson (2015) and Cobb-Clark et al. (2016) have investigated the durations of homelessness spells and found that women's spells are shorter than men's. Chamberlain and Johnson also found that women experience fewer repeat spells of homelessness. Diette and Ribar (2015) compared other characteristics and found that JH women who experienced homelessness in a given six-month period spent more time in their own homes and more time in either a house or apartment in that same period than men who experienced homelessness. One possible explanation for these differences by gender is that there are more housing services available to homeless women than to men. Less severe episodes of homelessness could account for smaller differences in the reports of food problems.



## **Conclusions**

In this study, we use the rich and unique data from the Journeys Home survey to investigate how homelessness is associated with disadvantaged Australians' food insecurity and other food outcomes. The JH survey interviewed a more heterogeneous at-risk population than the subjects examined in most previous multivariate studies, and it includes many more covariates. There are also sufficient observations to let us investigate relationships separately for men and women.

Our descriptive analyses confirm previous findings that homelessness is associated with worse food security, with the relationships being stronger for men than women. When we extend the analysis to consider other food outcomes, we find also that homeless men spend less on food and eat fewer meals than their housed counterparts but no evidence that they have worse food consumption. We find similar patterns for women, but none of the differences is statistically precise. We also find that homeless and housed Australians differ in many other dimensions, including in their family situations, employment status, social networks, drinking and smoking behaviour, use of emergency meal services, access to kitchen facilities, and history of food hardships. These differences motivate us to undertake multivariate analyses that can account for confounding influences from observed and unobserved characteristics.

Estimates from the multivariate models confirm the associations of men's homelessness with greater food insecurity and lower food expenditures. The results are robust to the inclusion of alternative sets of controls and to the use of dummy endogenous variable methods that account for spurious associations from unobserved characteristics. In contrast to these findings, the unconditional associations between men's homelessness and meal consumption and between women's homelessness and food insecurity become weaker and insignificant in models that include observed controls and switch signs in DEV models. We

conjecture that the gender differences in the associations between homelessness and food problems may arise because of the more severe conditions involved in men's homelessness.

The chief qualification regarding our results is that the JH survey was drawn from an especially disadvantaged set of public assistance clients who were at special risk of homelessness. This is a relevant population to focus on, but it is more disadvantaged than public assistance clients generally and obviously not representative of the overall Australian population. Differences in the populations can be seen in the low levels of employment, the high prevalence of childhood disadvantages, and in the high rates of health, psychological, and substance abuse problems. While we find associations between homelessness and food insecurity among the vulnerable men in the JH sample, these associations may differ for Australians with more resources.

A second limitation of the JH sample is the low number of homeless women. This leads to some imprecise estimates and a corresponding inability to distinguish some large associations from null associations. Other aspects of our descriptive and multivariate analyses show that it is important and appropriate to examine disadvantaged women's and men's food insecurity separately. We are able to provide several definitive results for disadvantaged men, but our results for women are less conclusive.

The results from our study need to be considered against a backdrop of low absolute levels of food hardships in Australia, even among the most disadvantaged groups. Of the homeless men in our sample, the median response was experiencing one food hardship rarely or sometimes during the month, and 43 percent reported experiencing no food hardships at all. Nevertheless, our findings of differences in the food security of housed and homeless men indicate that there is some scope for targeted food and meal services to reduce these hardships further.

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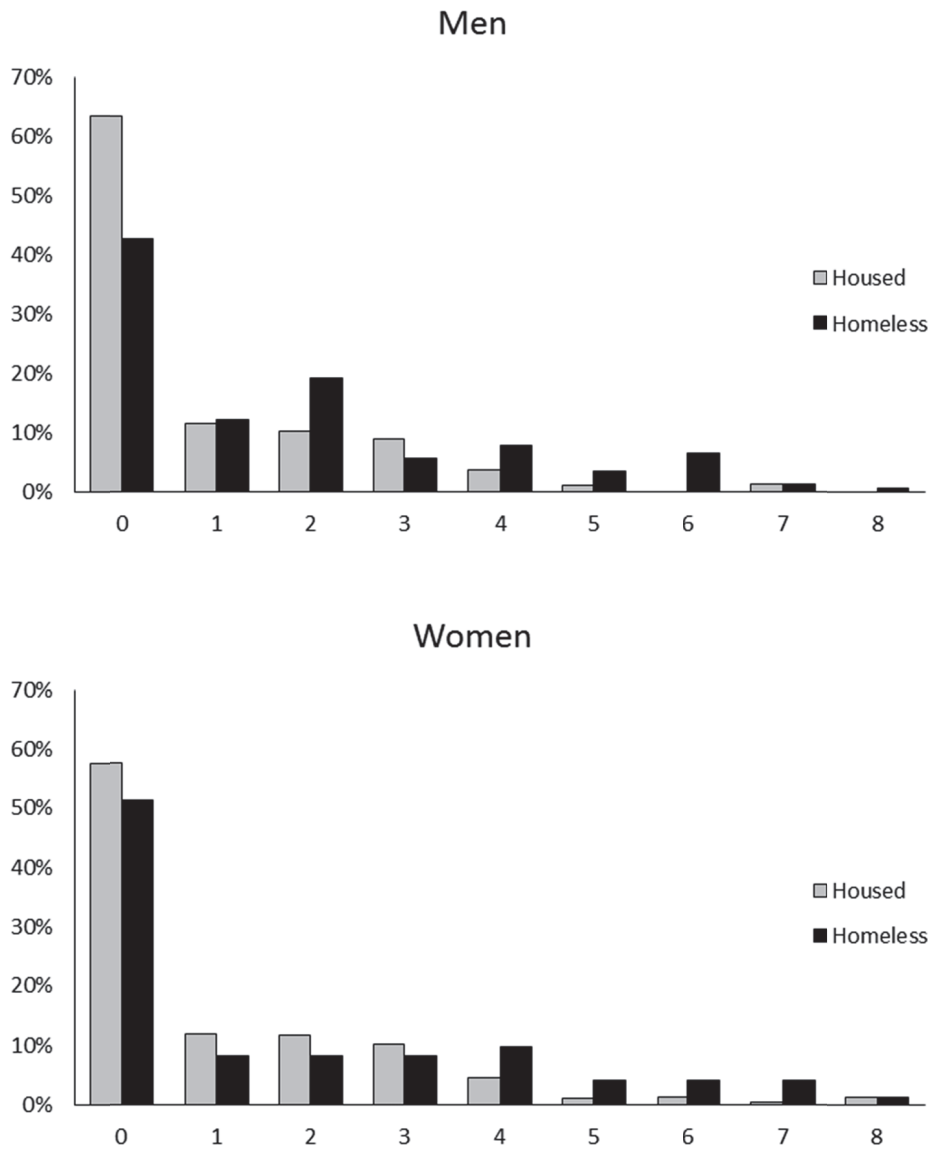
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**Figure 1. Distribution of Food Insecurity Responses by Gender and Homelessness**



Note: Authors' calculations of percentages of respondents with each food insecurity score value from Journeys Home analysis sample.

**Table 1. Means of Analysis Measures Conditional on Gender and Homelessness**

|                                 | Men    |        |           | Women  |        |           |
|---------------------------------|--------|--------|-----------|--------|--------|-----------|
|                                 | All    | Housed | Homeless  | All    | Housed | Homeless  |
| <u>Food outcome variables</u>   |        |        |           |        |        |           |
| Food security index             | 1.07   | 0.87   | 1.71 ***  | 1.19   | 1.10   | 1.75 ***  |
| Consumption factor score        | 0.01   | -0.01  | 0.08      | -0.03  | -0.02  | -0.06     |
| Weekly meal cons.               | 15.24  | 15.42  | 14.64 *   | 15.25  | 15.38  | 14.37     |
| Weekly equiv. food exp.         | 103.16 | 106.44 | 91.89 **  | 105.60 | 107.29 | 94.78     |
| <u>Demo./background vars.</u>   |        |        |           |        |        |           |
| Age                             | 35.63  | 34.39  | 39.81 *** | 31.96  | 31.43  | 35.43 **  |
| Indigenous                      | 0.15   | 0.15   | 0.16      | 0.18   | 0.17   | 0.29 **   |
| Mig. non-English country        | 0.06   | 0.06   | 0.06      | 0.07   | 0.08   | 0.03      |
| Tertiary education              | 0.34   | 0.35   | 0.29      | 0.35   | 0.37   | 0.25 **   |
| Completed high-school           | 0.12   | 0.12   | 0.11      | 0.09   | 0.10   | 0.04      |
| Ever in state care              | 0.25   | 0.23   | 0.29      | 0.27   | 0.28   | 0.25      |
| Childhood abuse index           | 1.18   | 1.16   | 1.23      | 1.31   | 1.32   | 1.22      |
| Missing abuse index             | 0.08   | 0.08   | 0.07      | 0.12   | 0.12   | 0.14      |
| Non-intact family age 14        | 0.49   | 0.50   | 0.46      | 0.59   | 0.61   | 0.51      |
| Population strata 2             | 0.34   | 0.34   | 0.36      | 0.36   | 0.34   | 0.47 **   |
| Population strata 3             | 0.35   | 0.34   | 0.41 *    | 0.39   | 0.40   | 0.38      |
| <u>Lagged explanatory vars.</u> |        |        |           |        |        |           |
| Married or de facto             | 0.21   | 0.24   | 0.11 ***  | 0.27   | 0.27   | 0.26      |
| No. of resident children        | 0.21   | 0.24   | 0.08 ***  | 0.79   | 0.83   | 0.53 **   |
| Family contact                  | 0.82   | 0.85   | 0.73 ***  | 0.88   | 0.89   | 0.82 *    |
| Chronic health condition        | 0.67   | 0.66   | 0.69      | 0.63   | 0.63   | 0.63      |
| Long-term health/disab.         | 0.45   | 0.44   | 0.49      | 0.43   | 0.42   | 0.46      |
| Self-reported poor health       | 2.97   | 2.97   | 2.97      | 3.07   | 3.06   | 3.11      |
| Mental health                   | 0.16   | 0.15   | 0.19      | 0.22   | 0.22   | 0.21      |
| Kessler psych. distress         | 6.53   | 6.34   | 7.17      | 7.59   | 7.48   | 8.32      |
| Time in paid work               | 0.43   | 0.43   | 0.41      | 0.30   | 0.30   | 0.27      |
| Missing work var.               | 0.03   | 0.03   | 0.03      | 0.03   | 0.03   | 0.04      |
| Employed                        | 0.28   | 0.32   | 0.15 ***  | 0.21   | 0.23   | 0.10 **   |
| Log equiv. HH income            | 5.63   | 5.64   | 5.57      | 5.75   | 5.80   | 5.45 **   |
| Outstanding debt (\$000)        | 4.73   | 4.68   | 4.89      | 3.86   | 4.12   | 2.18      |
| Missing debt variable           | 0.05   | 0.05   | 0.06      | 0.05   | 0.05   | 0.06      |
| Hold credit card                | 0.10   | 0.12   | 0.06 **   | 0.09   | 0.09   | 0.06      |
| Receipt of services             | 0.41   | 0.39   | 0.46      | 0.42   | 0.41   | 0.50      |
| Social support                  | 16.97  | 17.21  | 16.15 **  | 17.87  | 18.12  | 16.26 *** |
| Employed/housed friends         | 0.28   | 0.30   | 0.23      | 0.26   | 0.27   | 0.19      |
| Unemp./homeless friends         | 0.39   | 0.34   | 0.54 ***  | 0.47   | 0.46   | 0.51      |
| Alcoholic drinks per day        | 2.02   | 1.85   | 2.59 **   | 0.99   | 0.87   | 1.78 ***  |
| Cann. weekly last 6 mo.         | 0.26   | 0.25   | 0.29      | 0.12   | 0.10   | 0.28 ***  |



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|                              |      |      |          |      |      |          |
|------------------------------|------|------|----------|------|------|----------|
| Smoked daily last 6 mo.      | 0.68 | 0.67 | 0.74 *   | 0.58 | 0.56 | 0.69 **  |
| Violence last 6 months       | 0.15 | 0.13 | 0.21 *** | 0.16 | 0.16 | 0.21     |
| Incarcerated last 6 months   | 0.03 | 0.02 | 0.05     | 0.01 | 0.01 | 0.03     |
| Distance to public trans.    | 0.18 | 0.19 | 0.17     | 0.20 | 0.21 | 0.15     |
| Missing distance trans.      | 0.02 | 0.01 | 0.05 *** | 0.02 | 0.01 | 0.06 **  |
| Other urban area             | 0.16 | 0.17 | 0.12     | 0.15 | 0.14 | 0.17     |
| Non-urban area               | 0.06 | 0.06 | 0.06     | 0.05 | 0.05 | 0.08     |
| Unemployment rate            | 6.24 | 6.43 | 5.58 *** | 6.23 | 6.28 | 5.91     |
| Median weekly rent           | 335  | 327  | 362 ***  | 329  | 329  | 330      |
| Emer. meal services          | 0.15 | 0.10 | 0.29 *** | 0.07 | 0.05 | 0.18 *** |
| Access to kitchen            | 0.90 | 0.92 | 0.84 *** | 0.92 | 0.94 | 0.79 *** |
| Skipped meal last 6 mo.      | 0.60 | 0.57 | 0.70 *** | 0.58 | 0.56 | 0.72 *** |
| Missing meal variable        | 0.03 | 0.03 | 0.01     | 0.03 | 0.03 | 0.03     |
| <u>Instrumental variable</u> |      |      |          |      |      |          |
| Public housing wait list     | 0.25 | 0.21 | 0.39 *** | 0.27 | 0.24 | 0.46 *** |
| Observations                 | 611  | 471  | 140      | 541  | 469  | 72       |

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Note: Authors' calculations using data from the *Journeys Home* analysis sample. Asterisks indicate statistically significant differences in means between homeless and housed people.  
 \* Significant at 0.1 level.      \*\* Significant at 0.05 level.      \*\*\* Significant at 0.01 level.

**Table 2. Selected Results from Ordered-Probit Models of Food Insecurity**

|  | Men                 |                     |                      | Women              |                      |                     |
|--|---------------------|---------------------|----------------------|--------------------|----------------------|---------------------|
|  | (1)                 | (2)                 | (3)                  | (1)                | (2)                  | (3)                 |
| Homeless                                       | 0.547***<br>(0.108) | 0.538***<br>(0.110) | 0.519***<br>(0.125)  | 0.320**<br>(0.153) | 0.324**<br>(0.158)   | 0.176<br>(0.166)    |
| Age  |                     | 0.053**<br>(0.023)  | 0.015<br>(0.026)     |                    | 0.088***<br>(0.024)  | 0.069**<br>(0.030)  |
| Age squared (/100)                             |                     | -0.065**<br>(0.029) | -0.014<br>(0.034)    |                    | -0.103***<br>(0.033) | -0.085**<br>(0.039) |
| Indigenous                                     |                     | 0.124<br>(0.133)    | 0.050<br>(0.150)     |                    | -0.045<br>(0.144)    | -0.136<br>(0.154)   |
| Migrant from non-Eng.<br>speaking country      |                     | 0.170<br>(0.191)    | 0.353*<br>(0.203)    |                    | 0.053<br>(0.188)     | -0.084<br>(0.215)   |
| Tertiary education                             |                     | 0.022<br>(0.104)    | 0.039<br>(0.116)     |                    | -0.134<br>(0.115)    | -0.099<br>(0.129)   |
| Completed high school                          |                     | -0.115<br>(0.146)   | -0.214<br>(0.168)    |                    | 0.069<br>(0.177)     | 0.069<br>(0.195)    |
| Ever in state care                             |                     | -0.186<br>(0.121)   | -0.149<br>(0.132)    |                    | 0.212*<br>(0.119)    | 0.173<br>(0.128)    |
| Childhood abuse index                          |                     | 0.128***<br>(0.042) | -0.014<br>(0.048)    |                    | 0.182***<br>(0.042)  | 0.095**<br>(0.047)  |
| Non-intact family at<br>age 14                 |                     | 0.024<br>(0.105)    | 0.061<br>(0.108)     |                    | 0.004<br>(0.110)     | -0.004<br>(0.116)   |
| Married or de facto                            |                     |                     | 0.244*<br>(0.138)    |                    |                      | 0.022<br>(0.129)    |
| No. of resident children                       |                     |                     | -0.041<br>(0.090)    |                    |                      | -0.011<br>(0.053)   |
| Family contact                                 |                     |                     | 0.238<br>(0.168)     |                    |                      | 0.411**<br>(0.208)  |
| Chronic health condition                       |                     |                     | 0.283**<br>(0.127)   |                    |                      | -0.125<br>(0.134)   |
| Long-term health/<br>disability condition      |                     |                     | -0.068<br>(0.124)    |                    |                      | 0.031<br>(0.128)    |
| Self-reported poor health<br>status            |                     |                     | 0.128**<br>(0.057)   |                    |                      | -0.009<br>(0.059)   |
| Mental health                                  |                     |                     | -0.009<br>(0.139)    |                    |                      | -0.047<br>(0.130)   |
| Kessler psychological<br>distress index        |                     |                     | 0.026**<br>(0.011)   |                    |                      | 0.033**<br>(0.014)  |
| Time in paid work since<br>finishing education |                     |                     | -0.151<br>(0.225)    |                    |                      | 0.159<br>(0.242)    |
| Employed                                       |                     |                     | 0.286*<br>(0.146)    |                    |                      | 0.069<br>(0.166)    |
| Log of equivalised<br>household income         |                     |                     | -0.234***<br>(0.083) |                    |                      | -0.143<br>(0.096)   |

|                           |          |          |
|---------------------------|----------|----------|
| Outstanding debt (\$000)  | 0.000    | -0.003   |
|                           | (0.002)  | (0.005)  |
| Hold credit card          | 0.329**  | 0.026    |
|                           | (0.164)  | (0.210)  |
| Receipt of services       | 0.310*** | 0.415*** |
|                           | (0.113)  | (0.116)  |
| Social support            | -0.022   | -0.046** |
|                           | (0.016)  | (0.022)  |
| Employed & housed         | -0.013   | 0.059    |
| friends                   | (0.139)  | (0.158)  |
| Unemployed & homeless     | 0.058    | 0.214    |
| friends                   | (0.135)  | (0.137)  |
| Alcoholic drinks per day  | -0.002   | 0.030    |
|                           | (0.014)  | (0.020)  |
| Cannabis weekly in last   | 0.185    | 0.017    |
| 6 months                  | (0.119)  | (0.169)  |
| Smoking daily in last     | 0.045    | -0.046   |
| 6 months                  | (0.120)  | (0.116)  |
| Violence in last 6 months | 0.225*   | 0.046    |
|                           | (0.134)  | (0.154)  |
| Incarcerated in last      | -0.119   | 0.210    |
| 6 months                  | (0.279)  | (0.407)  |
| Distance to public        | 0.129    | -0.049   |
| transportation            | (0.145)  | (0.151)  |
| Other urban area          | 0.047    | 0.189    |
|                           | (0.169)  | (0.168)  |
| Non-urban area            | -0.013   | -0.738** |
|                           | (0.237)  | (0.337)  |
| Local unemployment rate   | -0.029   | -0.001   |
|                           | (0.022)  | (0.025)  |
| Log of local median rent  | -0.339   | 0.658**  |
|                           | (0.255)  | (0.292)  |
| Emergency meal services   | 0.249*   | -0.270   |
|                           | (0.140)  | (0.205)  |
| Access to kitchen         | -0.234   | 0.363    |
|                           | (0.252)  | (0.303)  |
| Skipped meal in last      | 0.733*** | 0.806*** |
| 6 months                  | (0.136)  | (0.131)  |
| Log-likelihood            | -819.82  | -810.69  |
|                           | -740.19  | -770.63  |
|                           | -745.43  | -675.71  |

Note: Authors' calculations of ordered-probit model coefficients (and robust standard errors in parentheses) using data for 611 men and 541 women from the JH survey. In addition to the listed coefficients, the models include intercepts and threshold parameters; models (2) and (3) include controls for sample strata and missing responses for the childhood abuse measure, and model (3) includes controls for missing responses to the work experience, debt, distance to public transportation, and going without meals measures.

\* Significant at 0.1 level.

\*\* Significant at 0.05 level.

\*\*\* Significant at 0.01 level.

**Table 3. Selected Results from DEV Ordered-Probit Models of Food Insecurity**

|  | Men                  |                     | Women              |                   |
|--|----------------------|---------------------|--------------------|-------------------|
|  | Food ins.            | Homeless            | Food ins.          | Homeless          |
| Homeless                                       | 1.246***<br>(0.456)  |                     | -0.914*<br>(0.528) |                   |
| Age  | 0.007<br>(0.027)     | 0.031<br>(0.033)    | 0.056*<br>(0.030)  | -0.008<br>(0.038) |
| Age squared (/100)                             | -0.009<br>(0.034)    | -0.013<br>(0.041)   | -0.065*<br>(0.039) | 0.023<br>(0.048)  |
| Indigenous                                     | 0.050<br>(0.143)     | -0.094<br>(0.193)   | -0.069<br>(0.154)  | -0.025<br>(0.236) |
| Migrant from non-Eng.<br>speaking country      | 0.328<br>(0.222)     | 0.095<br>(0.278)    | -0.149<br>(0.217)  | -0.448<br>(0.395) |
| Tertiary education                             | 0.044<br>(0.116)     | -0.065<br>(0.150)   | -0.160<br>(0.127)  | -0.262<br>(0.190) |
| Completed high school                          | -0.225<br>(0.169)    | 0.020<br>(0.225)    | -0.009<br>(0.195)  | -0.470<br>(0.357) |
| Ever in state care                             | -0.190<br>(0.131)    | 0.217<br>(0.163)    | 0.111<br>(0.132)   | -0.238<br>(0.203) |
| Childhood abuse index                          | -0.010<br>(0.049)    | -0.050<br>(0.064)   | 0.066<br>(0.050)   | -0.072<br>(0.071) |
| Non-intact family at<br>age 14                 | 0.055<br>(0.107)     | 0.050<br>(0.140)    | -0.068<br>(0.127)  | -0.261<br>(0.186) |
| Married or de facto                            | 0.309**<br>(0.147)   | -0.368*<br>(0.191)  | 0.026<br>(0.129)   | 0.106<br>(0.202)  |
| No. of resident children                       | -0.037<br>(0.090)    | -0.106<br>(0.148)   | -0.030<br>(0.054)  | -0.091<br>(0.089) |
| Family contact                                 | 0.324*<br>(0.171)    | -0.474**<br>(0.191) | 0.396**<br>(0.191) | 0.080<br>(0.275)  |
| Chronic health condition                       | 0.291**<br>(0.126)   | -0.104<br>(0.159)   | -0.159<br>(0.129)  | -0.228<br>(0.211) |
| Long-term health/<br>disability condition      | -0.022<br>(0.131)    | -0.300*<br>(0.169)  | 0.018<br>(0.129)   | 0.030<br>(0.203)  |
| Self-reported poor health<br>status            | 0.153**<br>(0.061)   | -0.153**<br>(0.075) | -0.017<br>(0.061)  | -0.040<br>(0.098) |
| Mental health                                  | 0.000<br>(0.136)     | -0.020<br>(0.177)   | -0.031<br>(0.132)  | 0.068<br>(0.208)  |
| Kessler psychological<br>distress index        | 0.021*<br>(0.012)    | 0.022<br>(0.015)    | 0.026*<br>(0.014)  | -0.011<br>(0.021) |
| Time in paid work since<br>finishing education | -0.094<br>(0.224)    | -0.248<br>(0.278)   | 0.149<br>(0.229)   | 0.130<br>(0.362)  |
| Employed                                       | 0.330**<br>(0.150)   | -0.278<br>(0.195)   | 0.005<br>(0.164)   | -0.122<br>(0.252) |
| Log of equivalised<br>household income         | -0.237***<br>(0.080) | 0.013<br>(0.102)    | -0.115<br>(0.090)  | 0.015<br>(0.126)  |
| Outstanding debt (\$000)                       | 0.000<br>(0.003)     | 0.005<br>(0.004)    | -0.004<br>(0.006)  | -0.022<br>(0.017) |
| Hold credit card                               | 0.361**<br>(0.168)   | -0.369<br>(0.250)   | 0.053<br>(0.213)   | 0.077<br>(0.351)  |

|                                      |                     |                     |                      |                     |
|--------------------------------------|---------------------|---------------------|----------------------|---------------------|
| Receipt of services                  | 0.339***<br>(0.118) | -0.197<br>(0.155)   | 0.358***<br>(0.127)  | -0.203<br>(0.190)   |
| Social support                       | -0.025<br>(0.017)   | 0.021<br>(0.022)    | -0.049***<br>(0.019) | -0.015<br>(0.029)   |
| Employed & housed<br>friends         | -0.068<br>(0.148)   | 0.363*<br>(0.187)   | 0.065<br>(0.158)     | -0.068<br>(0.239)   |
| Unemployed & homeless<br>friends     | -0.033<br>(0.141)   | 0.437**<br>(0.172)  | 0.231*<br>(0.135)    | 0.104<br>(0.205)    |
| Alcoholic drinks per day             | -0.004<br>(0.014)   | 0.005<br>(0.017)    | 0.033<br>(0.021)     | 0.010<br>(0.032)    |
| Cannabis weekly in last<br>6 months  | 0.194*<br>(0.118)   | -0.035<br>(0.155)   | 0.204<br>(0.189)     | 0.637***<br>(0.233) |
| Smoking daily in last<br>6 months    | 0.009<br>(0.127)    | 0.183<br>(0.163)    | 0.029<br>(0.126)     | 0.335*<br>(0.185)   |
| Violence in last 6 months            | 0.150<br>(0.149)    | 0.360**<br>(0.179)  | 0.030<br>(0.147)     | -0.075<br>(0.228)   |
| Incarcerated in last<br>6 months     | -0.209<br>(0.305)   | 0.379<br>(0.344)    | 0.242<br>(0.435)     | 0.035<br>(0.719)    |
| Distance to public<br>transportation | 0.117<br>(0.140)    | -0.068<br>(0.194)   | -0.066<br>(0.140)    | -0.368<br>(0.254)   |
| Other urban area                     | 0.032<br>(0.161)    | 0.090<br>(0.214)    | 0.174<br>(0.176)     | 0.129<br>(0.280)    |
| Non-urban area                       | -0.059<br>(0.222)   | 0.273<br>(0.298)    | -0.580*<br>(0.322)   | 0.476<br>(0.373)    |
| Local unemployment rate              | -0.017<br>(0.024)   | -0.075**<br>(0.031) | -0.020<br>(0.027)    | -0.064<br>(0.040)   |
| Log of local median rent             | -0.377<br>(0.252)   | 0.232<br>(0.313)    | 0.576*<br>(0.314)    | 0.049<br>(0.466)    |
| Emergency meal services              | 0.100<br>(0.174)    | 0.608***<br>(0.183) | -0.119<br>(0.229)    | 0.483<br>(0.302)    |
| Access to kitchen                    | -0.203<br>(0.253)   | 0.029<br>(0.308)    | 0.102<br>(0.305)     | -0.793**<br>(0.310) |
| Skipped meal in last<br>6 months     | 0.677***<br>(0.140) | 0.213<br>(0.161)    | 0.863***<br>(0.131)  | 0.542***<br>(0.200) |
| Public housing waiting list          |                     | 0.396***<br>(0.139) |                      | 0.480***<br>(0.158) |
| Rho                                  |                     | -0.437<br>(0.269)   |                      | 0.632**<br>(0.297)  |

Note: Authors' calculations of coefficients (and robust standard errors in parentheses) from jointly estimated ordered-probit food insecurity and probit homelessness models using data for 611 men and 541 women from the JH survey. In addition to the listed coefficients, the models include intercepts, thresholds (ordered-probits), and controls for sample strata and missing responses for the childhood abuse, work experience, debt, distance to public transportation, and going without meals measures.

\* Significant at 0.1 level.

\*\* Significant at 0.05 level.

\*\*\* Significant at 0.01 level.

**Table 4. Homelessness Coefficients from OLS and DEV Models of Food Consumption, Meal Consumption, and Food Expenditures**

| Specification                   | Men               |                    |                              | Women               |                   |                              |
|---------------------------------|-------------------|--------------------|------------------------------|---------------------|-------------------|------------------------------|
|                                 | Food consumption  | Weekly meals       | Log weekly food expenditures | Food consumption    | Weekly meals      | Log weekly food expenditures |
| No controls                     | 0.094<br>(0.070)  | -0.776*<br>(0.458) | -0.158**<br>(0.066)          | -0.032<br>(0.080)   | -1.015<br>(0.703) | -0.042<br>(0.060)            |
| Exogenous background controls   | 0.082<br>(0.071)  | -0.639<br>(0.458)  | -0.144**<br>(0.065)          | -0.047<br>(0.079)   | -1.109<br>(0.679) | -0.025<br>(0.065)            |
| All controls                    | 0.134*<br>(0.078) | -0.296<br>(0.480)  | -0.135*<br>(0.071)           | -0.004<br>(0.082)   | -0.228<br>(0.725) | 0.003<br>(0.071)             |
| All controls, DEV specification | 0.089<br>(0.179)  | 0.634<br>(2.063)   | -0.834***<br>(0.276)         | 0.906***<br>(0.261) | 0.019<br>(2.866)  | -0.791***<br>(0.263)         |
| Sample size                     | 601               | 610                | 585                          | 533                 | 540               | 524                          |

Note: Authors' calculations of coefficients (and robust standard errors in parentheses) from standard OLS and DEV regression models using data from the JH survey. The models include the same controls as the corresponding models in Tables 2 and 3.

\* Significant at 0.1 level.

\*\* Significant at 0.05 level.

\*\*\* Significant at 0.01 level.

## Appendix A. Developing and Validating a Food Insecurity Scale for Journeys Home

Wave five of the Journeys Home survey asked six questions that were adapted from the nine-item Household Food Insecurity Access Scale (Coates et al. 2007). These questions asked whether and how often during the “past four weeks” the person had to:

1. “worry that you would not have enough food,”
2. “eat a limited variety of foods because of a lack of money,”
3. “eat some foods that you really did not want to eat because of a lack of money,”
4. “eat a smaller meal than you felt you needed because there was not enough food,”
5. “skip a meal because of a lack of money,” and
6. “go a whole day and night without eating anything because there was not enough food.”

The possible responses to each item were “never,” “rarely (once or twice in the past four weeks),” “sometimes (three to ten times in the past four weeks),” and “often (more than ten times in the past four weeks).”<sup>7</sup> Following Deitchler et al. (2010), we constructed and validated a summary scale based on the responses to these measures.

We began by fitting the ordered responses to the six JH items to a polytomous Rasch item-response-theory model (Rasch 1960; Andersen 1977), using Christensen’s (2013) conditional maximum likelihood routine and an unweighted sample of 1,406 wave five JH respondents who answered all the food hardship questions. Rasch models are used to relate responses to multiple items to a single, underlying, latent scale—in this case, the respondent’s level of food insecurity. In the ordered-response case, the model assumes that the latent scale is increasing in the frequency of affirmed conditions (in the ordinal responses). It also assumes that the responses to the items are independent of each other, conditional on the value of the latent scale. Finally, it assumes that response behavior is the same across different subpopulations. If these conditions are met, the sum of the ordinal responses is a sufficient statistic for the underlying latent scale.

Estimated parameters from the polytomous Rasch model can be used to estimate  $k-1$  “item step” values for each of the  $k$  possible responses to a given item; higher estimated item step values can be interpreted as indicating that reported condition is more severe. For the responses to be meaningful, we would like the estimated item steps to increase with the ordinal response values. When we fit the six JH items with all four possible response values, monotonically increasing item steps were found for items 1, 2, and 3 but not for items 4, 5, and 6. For the items with non-monotonic steps, the item step values for “rarely” and “sometimes” were reversed. As with Deitchler et al. (2010), we collapsed the “rarely” and “sometimes” responses into a single category and re-estimated the Rasch model as a six-item, three-response specification. For this specification, monotonically increasing step values were estimated for all of the items.<sup>8</sup>

A related testable property of a Rasch scale is that the expected ordinal responses of each

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<sup>7</sup> The JH items differ from the HFIAS in asking about the respondent rather than the household. The fifth JH item differs from the corresponding HFIAS item in asking about the respondent “skip(ping) a meal” rather than “eat(ing) fewer meals in a day,” and the JH survey omits HFIAS items about “not (being) able to eat the kinds of foods you preferred,” “there ever (being) no food of any kind in your household,” and “go(ing) to sleep at night hungry.”

<sup>8</sup> There are two other ways to collapse the responses for a three-response model. The approach that we adopted led to the greatest distance between the item step values.

item should increase as the latent index increases. To test this property, we examined average ordinal responses for each item conditional on the total summary scale value. With the six-item, three-response (0-12) scale, the average values of the ordinal responses were monotonically non-decreasing for several but not all of the items. Items 4 (smaller meal) and 5 (skip meal) had average severities that were almost identical to item 3 (eat unwanted foods) but had smaller gaps between the item steps. Items 4 and 5 were removed, and a four-item, three-response (0-8) scale was re-estimated. Estimated standardized item-step values from the least to most severe items are shown in Table A.1. This revised scale had monotonically non-decreasing average ordinal responses for all of its items.

**Table A.1. Estimated standardized item-step values for four-item, three-response (0-8) scale from conditional maximum likelihood polytomous Rasch model**

| Item                                  | Step 1 | Step 2 |
|---------------------------------------|--------|--------|
| Eat a limited variety of foods        | -2.66  | 0.67   |
| Worry about not enough food           | -1.62  | 1.18   |
| Eat some foods did not want           | -1.44  | 1.56   |
| Go whole day and night without eating | -0.18  | 2.48   |

To test whether response behaviors were the same across different subgroups, we re-estimated Rasch models for the four-item, three-response scale separately for men and women, people who had experienced homelessness or been consistently housed, and people with below and above average weekly incomes. With one exception, the item-step parameter values were similar in value and followed the same ordering as Table A.1 for all subgroups (The ordering of the step-2 parameters for items 1 [worry] and 3 [eat unwanted foods] was reversed for women, but the values were very close to each other).

To examine the external validity of our scale, we estimated simple (Pearson) correlations between the four-item, three-response (0-8) scale and

- the sum of the person's reported usual breakfasts, lunches, and dinners in a week (correlation  $-0.31$ ),
- the person's usual weekly food expenditures scaled by the square root of the number of people covered by that expenditure (correlation  $-0.09$ ),
- a factor score of the usual weekly servings of fruits and vegetables and the usual days on which the person eats seafood, meat, and legumes (correlation  $-0.16$ ), and
- an indicator from a separate financial stress scale of whether the person ever skipped meals (correlation  $+ 0.66$ ), and
- the person's weekly income (correlation  $-0.10$ ).

The correlations were all statistically different from zero and in the anticipated directions.



Appendix Table B.1. Detailed Regression Results for Other Food Outcomes for Men

|  | Food consumption    |                     | Weekly meals        |                    | Log weekly food expenditures |                      |
|--|---------------------|---------------------|---------------------|--------------------|------------------------------|----------------------|
|  | OLS                 | DEV                 | OLS                 | DEV                | OLS                          | DEV                  |
| Homeless                               | 0.082<br>(0.071)    | 0.134*<br>(0.078)   | 0.089<br>(0.179)    | 0.634<br>(2.063)   | -0.144**<br>(0.065)          | -0.834***<br>(0.276) |
| Age                                    | -0.018<br>(0.012)   | -0.020<br>(0.014)   | -0.020<br>(0.013)   | -0.131<br>(0.087)  | -0.006<br>(0.013)            | 0.001<br>(0.016)     |
| Age squared (/100)                     | 0.030**<br>(0.015)  | 0.032*<br>(0.017)   | 0.032*<br>(0.017)   | 0.167<br>(0.109)   | 0.004<br>(0.016)             | 0.001<br>(0.020)     |
| Indigenous                             | 0.286***<br>(0.079) | 0.296***<br>(0.084) | 0.295***<br>(0.081) | 1.162**<br>(0.538) | 0.117*<br>(0.071)            | 0.147**<br>(0.074)   |
| Migrant from non-Eng. speaking country | 0.089<br>(0.137)    | 0.142<br>(0.142)    | 0.143<br>(0.137)    | -0.407<br>(0.748)  | 0.063<br>(0.095)             | 0.100<br>(0.120)     |
| Tertiary education                     | 0.190***<br>(0.062) | 0.132**<br>(0.065)  | 0.131**<br>(0.063)  | 0.584<br>(0.415)   | 0.047<br>(0.059)             | 0.021<br>(0.064)     |
| Completed high school                  | 0.040<br>(0.069)    | 0.005<br>(0.075)    | 0.005<br>(0.072)    | -0.059<br>(0.632)  | 0.002<br>(0.093)             | -0.036<br>(0.094)    |
| Ever in state care                     | -0.097<br>(0.064)   | -0.091<br>(0.066)   | -0.088<br>(0.065)   | -0.143<br>(0.467)  | -0.015<br>(0.067)            | 0.033<br>(0.077)     |
| Childhood abuse index                  | -0.023<br>(0.026)   | -0.013<br>(0.029)   | -0.013<br>(0.027)   | -0.187<br>(0.191)  | 0.031<br>(0.026)             | 0.019<br>(0.031)     |
| Non-intact family at age 14            | -0.030<br>(0.059)   | -0.011<br>(0.060)   | -0.011<br>(0.058)   | -0.184<br>(0.407)  | -0.073<br>(0.061)            | -0.049<br>(0.066)    |
| Married or de facto                    |                     | -0.010<br>(0.076)   | -0.015<br>(0.074)   | 0.061<br>(0.483)   | -0.023<br>(0.082)            | -0.097<br>(0.095)    |
| No. of resident children               |                     | 0.072<br>(0.046)    | 0.072<br>(0.044)    | 0.168<br>(0.310)   | 0.064<br>(0.043)             | 0.062<br>(0.044)     |
| Family contact                         |                     | -0.017<br>(0.094)   | -0.023<br>(0.093)   | -0.133<br>(0.551)  | -0.010<br>(0.085)            | -0.088<br>(0.097)    |
| Chronic health condition               |                     | 0.045<br>(0.063)    | 0.044<br>(0.061)    | -0.298<br>(0.412)  | 0.001<br>(0.064)             | -0.017<br>(0.068)    |

|  |                     |                     |                      |                      |                     |                      |
|--|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|
| Long-term health/<br>disability condition      | 0.133*<br>(0.074)   | 0.130*<br>(0.072)   | -0.262<br>(0.454)    | -0.202<br>(0.442)    | -0.070<br>(0.071)   | -0.129*<br>(0.078)   |
| Self-reported poor health<br>status            | -0.017<br>(0.031)   | -0.019<br>(0.031)   | -0.278<br>(0.206)    | -0.239<br>(0.222)    | -0.044<br>(0.033)   | -0.077**<br>(0.038)  |
| Mental health                                  | -0.035<br>(0.074)   | -0.036<br>(0.071)   | 0.275<br>(0.549)     | 0.283<br>(0.530)     | 0.062<br>(0.079)    | 0.070<br>(0.083)     |
| Kessler psychological<br>distress index        | -0.002<br>(0.007)   | -0.002<br>(0.006)   | -0.010<br>(0.043)    | -0.015<br>(0.042)    | 0.003<br>(0.007)    | 0.007<br>(0.008)     |
| Time in paid work since<br>finishing education | 0.147<br>(0.123)    | 0.143<br>(0.118)    | -1.000<br>(0.821)    | -0.929<br>(0.801)    | 0.174<br>(0.125)    | 0.103<br>(0.127)     |
| Employed                                       | 0.061<br>(0.078)    | 0.058<br>(0.076)    | 0.680<br>(0.517)     | 0.755<br>(0.534)     | 0.060<br>(0.078)    | 0.003<br>(0.082)     |
| Log of equivalised<br>household income         | -0.032<br>(0.043)   | -0.031<br>(0.042)   | 0.315<br>(0.271)     | 0.303<br>(0.268)     | 0.049<br>(0.042)    | 0.059<br>(0.044)     |
| Outstanding debt (\$000)                       | -0.003**<br>(0.001) | -0.003**<br>(0.001) | -0.023**<br>(0.010)  | -0.024**<br>(0.010)  | 0.002<br>(0.002)    | 0.003<br>(0.002)     |
| Hold credit card                               | 0.120<br>(0.101)    | 0.118<br>(0.097)    | 0.453<br>(0.583)     | 0.510<br>(0.574)     | -0.026<br>(0.096)   | -0.060<br>(0.100)    |
| Receipt of services                            | 0.018<br>(0.062)    | 0.015<br>(0.060)    | 0.208<br>(0.434)     | 0.257<br>(0.434)     | -0.166**<br>(0.072) | -0.211***<br>(0.074) |
| Social support                                 | 0.019*<br>(0.010)   | 0.019*<br>(0.010)   | 0.074<br>(0.057)     | 0.069<br>(0.057)     | 0.000<br>(0.010)    | 0.003<br>(0.010)     |
| Employed & housed<br>friends                   | 0.029<br>(0.076)    | 0.033<br>(0.074)    | 1.003**<br>(0.487)   | 0.928*<br>(0.508)    | 0.011<br>(0.079)    | 0.069<br>(0.085)     |
| Unemployed & homeless<br>friends               | -0.049<br>(0.071)   | -0.044<br>(0.073)   | 0.111<br>(0.462)     | 0.001<br>(0.513)     | -0.027<br>(0.068)   | 0.054<br>(0.075)     |
| Alcoholic drinks per day                       | -0.002<br>(0.007)   | -0.002<br>(0.007)   | -0.042<br>(0.054)    | -0.044<br>(0.053)    | -0.010<br>(0.007)   | -0.010<br>(0.007)    |
| Cannabis weekly in last<br>6 months            | -0.065<br>(0.062)   | -0.066<br>(0.060)   | -0.463<br>(0.444)    | -0.445<br>(0.431)    | -0.022<br>(0.065)   | -0.032<br>(0.069)    |
| Smoking daily in last<br>6 months              | -0.078<br>(0.068)   | -0.076<br>(0.067)   | -1.540***<br>(0.427) | -1.589***<br>(0.426) | 0.019<br>(0.065)    | 0.069<br>(0.070)     |

|                                   |                   |                   |                     |                     |                    |                     |
|-----------------------------------|-------------------|-------------------|---------------------|---------------------|--------------------|---------------------|
| Violence in last 6 months         | 0.122<br>(0.082)  | 0.126<br>(0.080)  | -0.292<br>(0.568)   | -0.379<br>(0.581)   | 0.081<br>(0.074)   | 0.144*<br>(0.086)   |
| Incarcerated in last 6 months     | 0.129<br>(0.145)  | 0.134<br>(0.140)  | -0.342<br>(1.115)   | -0.450<br>(1.089)   | -0.248<br>(0.212)  | -0.194<br>(0.237)   |
| Distance to public transportation | -0.112<br>(0.071) | -0.112<br>(0.068) | -1.065**<br>(0.476) | -1.064**<br>(0.459) | 0.024<br>(0.080)   | 0.018<br>(0.078)    |
| Other urban area                  | 0.088<br>(0.091)  | 0.088<br>(0.088)  | 1.002*<br>(0.579)   | 0.986*<br>(0.570)   | 0.182**<br>(0.082) | 0.195**<br>(0.082)  |
| Non-urban area                    | 0.165<br>(0.116)  | 0.169<br>(0.111)  | 1.782**<br>(0.740)  | 1.724**<br>(0.713)  | 0.043<br>(0.114)   | 0.102<br>(0.125)    |
| Local unemployment rate           | -0.009<br>(0.012) | -0.010<br>(0.012) | -0.026<br>(0.085)   | -0.012<br>(0.086)   | -0.020*<br>(0.011) | -0.029**<br>(0.012) |
| Log of local median rent          | 0.047<br>(0.137)  | 0.051<br>(0.132)  | 1.638*<br>(0.943)   | 1.583*<br>(0.925)   | -0.031<br>(0.136)  | 0.039<br>(0.148)    |
| Emergency meal services           | -0.065<br>(0.082) | -0.057<br>(0.087) | 0.213<br>(0.527)    | 0.034<br>(0.652)    | 0.077<br>(0.082)   | 0.206**<br>(0.101)  |
| Access to kitchen                 | -0.156<br>(0.176) | -0.155<br>(0.171) | -0.457<br>(0.822)   | -0.442<br>(0.825)   | -0.215<br>(0.156)  | -0.212<br>(0.172)   |
| Skipped meal in last 6 months     | 0.018<br>(0.068)  | 0.021<br>(0.065)  | -0.593<br>(0.452)   | -0.640<br>(0.448)   | 0.089<br>(0.068)   | 0.134*<br>(0.073)   |
| Sample size                       | 601               | 601               | 610                 | 610                 | 585                |                     |

Note: Authors' calculations of coefficients (and robust standard errors in parentheses) from standard OLS and DEV regression models using data from the JH survey. In addition to the listed coefficients, the models include intercepts and controls for sample strata and missing responses for the childhood abuse, work experience, debt, distance to public transportation, and going without meals measures.

\*\* Significant at 0.05 level.

\*\*\* Significant at 0.01 level.

Appendix Table B.2. Detailed Regression Results for Other Food Outcomes for Women

|  | Food consumption    |                     | Weekly meals        |                      | Log weekly food expenditures |                      |
|--|---------------------|---------------------|---------------------|----------------------|------------------------------|----------------------|
|  | OLS                 | DEV                 | OLS                 | DEV                  | OLS                          | DEV                  |
| Homeless                               | -0.047<br>(0.079)   | -0.004<br>(0.082)   | 0.906***<br>(0.261) | -0.228<br>(0.725)    | 0.019<br>(2.866)             | -0.791***<br>(0.263) |
| Age                                    | 0.004<br>(0.010)    | 0.010<br>(0.012)    | 0.014<br>(0.013)    | -0.312***<br>(0.093) | -0.310***<br>(0.089)         | -0.002<br>(0.012)    |
| Age squared (/100)                     | -0.004<br>(0.014)   | -0.010<br>(0.016)   | -0.017<br>(0.017)   | 0.393***<br>(0.119)  | 0.391***<br>(0.114)          | 0.001<br>(0.016)     |
| Indigenous                             | 0.248***<br>(0.082) | 0.213***<br>(0.081) | 0.169**<br>(0.083)  | 1.604***<br>(0.543)  | 1.593***<br>(0.539)          | 0.203***<br>(0.077)  |
| Migrant from non-Eng. speaking country | 0.240**<br>(0.096)  | 0.172<br>(0.106)    | 0.235**<br>(0.109)  | 0.962<br>(0.832)     | 0.978<br>(0.817)             | 0.014<br>(0.110)     |
| Tertiary education                     | 0.119*<br>(0.062)   | 0.061<br>(0.065)    | 0.106<br>(0.069)    | -0.178<br>(0.491)    | -0.165<br>(0.481)            | -0.003<br>(0.066)    |
| Completed high school                  | -0.070<br>(0.077)   | -0.123<br>(0.079)   | -0.066<br>(0.089)   | 0.369<br>(0.730)     | 0.384<br>(0.731)             | -0.048<br>(0.086)    |
| Ever in state care                     | -0.103*<br>(0.061)  | -0.120*<br>(0.064)  | -0.085<br>(0.067)   | -0.637<br>(0.516)    | -0.629<br>(0.495)            | -0.203***<br>(0.067) |
| Childhood abuse index                  | -0.012<br>(0.023)   | 0.009<br>(0.024)    | 0.022<br>(0.027)    | -0.055<br>(0.190)    | -0.051<br>(0.189)            | 0.015<br>(0.024)     |
| Non-intact family at age 14            | -0.074<br>(0.061)   | -0.020<br>(0.063)   | 0.027<br>(0.068)    | -1.054**<br>(0.488)  | -0.462<br>(0.479)            | 0.104*<br>(0.055)    |
| Married or de facto                    |                     | -0.120**<br>(0.059) | -0.126**<br>(0.061) | 0.059<br>(0.488)     | 0.056<br>(0.466)             | -0.053<br>(0.063)    |
| No. of resident children               |                     | 0.076**<br>(0.031)  | 0.092***<br>(0.032) | 0.293<br>(0.227)     | 0.297<br>(0.226)             | 0.048**<br>(0.024)   |
| Family contact                         |                     | 0.228**<br>(0.092)  | 0.218**<br>(0.098)  | 0.523<br>(0.744)     | 0.521<br>(0.709)             | 0.057<br>(0.101)     |
| Chronic health condition               |                     | 0.033<br>(0.060)    | 0.070<br>(0.064)    | -0.225<br>(0.486)    | -0.216<br>(0.470)            | -0.008<br>(0.065)    |

|  |                      |                      |                      |                      |                      |                      |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Long-term health/<br>disability condition      | 0.006<br>(0.062)     | 0.019<br>(0.066)     | 0.803<br>(0.514)     | 0.804<br>(0.491)     | 0.008<br>(0.062)     | -0.011<br>(0.064)    |
| Self-reported poor health<br>status            | -0.049<br>(0.031)    | -0.041<br>(0.034)    | -0.348<br>(0.236)    | -0.346<br>(0.228)    | -0.069***<br>(0.025) | -0.079***<br>(0.027) |
| Mental health                                  | -0.032<br>(0.062)    | -0.040<br>(0.066)    | -0.098<br>(0.544)    | -0.101<br>(0.518)    | 0.124**<br>(0.061)   | 0.131**<br>(0.065)   |
| Kessler psychological<br>distress index        | -0.003<br>(0.007)    | -0.001<br>(0.008)    | -0.004<br>(0.055)    | -0.003<br>(0.053)    | 0.005<br>(0.006)     | 0.004<br>(0.006)     |
| Time in paid work since<br>finishing education | -0.103<br>(0.115)    | -0.099<br>(0.118)    | 0.064<br>(0.894)     | 0.066<br>(0.856)     | -0.110<br>(0.108)    | -0.098<br>(0.112)    |
| Employed                                       | -0.044<br>(0.074)    | -0.005<br>(0.077)    | 0.165<br>(0.595)     | 0.174<br>(0.571)     | 0.171**<br>(0.073)   | 0.142*<br>(0.073)    |
| Log of equivalised<br>household income         | 0.040<br>(0.046)     | 0.032<br>(0.050)     | -0.075<br>(0.345)    | -0.078<br>(0.331)    | 0.075*<br>(0.045)    | 0.080<br>(0.050)     |
| Outstanding debt (\$000)                       | -0.002*<br>(0.001)   | -0.002<br>(0.001)    | -0.011<br>(0.016)    | -0.011<br>(0.015)    | -0.002<br>(0.001)    | -0.003*<br>(0.002)   |
| Hold credit card                               | 0.270**<br>(0.114)   | 0.248**<br>(0.117)   | -0.899<br>(0.743)    | -0.906<br>(0.715)    | -0.076<br>(0.099)    | -0.053<br>(0.097)    |
| Receipt of services                            | -0.034<br>(0.057)    | -0.019<br>(0.061)    | -0.457<br>(0.467)    | -0.452<br>(0.452)    | -0.085<br>(0.058)    | -0.106*<br>(0.063)   |
| Social support                                 | -0.003<br>(0.009)    | 0.002<br>(0.010)     | 0.205***<br>(0.078)  | 0.206***<br>(0.075)  | -0.012<br>(0.010)    | -0.016<br>(0.010)    |
| Employed & housed<br>friends                   | 0.108<br>(0.070)     | 0.101<br>(0.073)     | -0.119<br>(0.574)    | -0.118<br>(0.548)    | -0.087<br>(0.080)    | -0.080<br>(0.079)    |
| Unemployed & homeless<br>friends               | 0.020<br>(0.061)     | -0.003<br>(0.065)    | 0.118<br>(0.488)     | 0.112<br>(0.470)     | -0.054<br>(0.064)    | -0.041<br>(0.066)    |
| Alcoholic drinks per day                       | -0.005<br>(0.011)    | -0.009<br>(0.010)    | -0.058<br>(0.106)    | -0.059<br>(0.101)    | -0.030**<br>(0.013)  | -0.026*<br>(0.014)   |
| Cannabis weekly in last<br>6 months            | -0.044<br>(0.081)    | -0.192*<br>(0.103)   | -1.363*<br>(0.750)   | -1.404*<br>(0.833)   | 0.129<br>(0.083)     | 0.253**<br>(0.105)   |
| Smoking daily in last<br>6 months              | -0.215***<br>(0.056) | -0.259***<br>(0.059) | -2.090***<br>(0.429) | -2.101***<br>(0.424) | -0.020<br>(0.055)    | 0.021<br>(0.058)     |

|                                   |                      |                    |                     |                     |                     |                    |
|-----------------------------------|----------------------|--------------------|---------------------|---------------------|---------------------|--------------------|
| Violence in last 6 months         | 0.041<br>(0.082)     | 0.050<br>(0.086)   | -0.204<br>(0.618)   | -0.200<br>(0.593)   | -0.070<br>(0.074)   | -0.065<br>(0.079)  |
| Incarcerated in last 6 months     | 0.131<br>(0.163)     | 0.117<br>(0.190)   | -0.931<br>(2.236)   | -0.937<br>(2.151)   | 0.376***<br>(0.114) | 0.406**<br>(0.177) |
| Distance to public transportation | -0.029<br>(0.067)    | -0.017<br>(0.071)  | -0.578<br>(0.555)   | -0.576<br>(0.529)   | -0.118*<br>(0.068)  | -0.133*<br>(0.072) |
| Other urban area                  | 0.238***<br>(0.092)  | 0.225**<br>(0.104) | 0.543<br>(0.716)    | 0.544<br>(0.686)    | -0.051<br>(0.094)   | -0.037<br>(0.098)  |
| Non-urban area                    | -0.050<br>(0.104)    | -0.105<br>(0.105)  | 0.075<br>(0.868)    | 0.060<br>(0.841)    | 0.052<br>(0.143)    | 0.104<br>(0.137)   |
| Local unemployment rate           | -0.030***<br>(0.011) | -0.019<br>(0.012)  | -0.165*<br>(0.092)  | -0.162*<br>(0.090)  | 0.000<br>(0.012)    | -0.011<br>(0.013)  |
| Log of local median rent          | 0.247<br>(0.155)     | 0.242<br>(0.175)   | 1.170<br>(1.153)    | 1.172<br>(1.105)    | 0.069<br>(0.156)    | 0.051<br>(0.164)   |
| Emergency meal services           | -0.068<br>(0.115)    | -0.164<br>(0.130)  | 0.573<br>(0.955)    | 0.544<br>(0.957)    | 0.044<br>(0.096)    | 0.145<br>(0.115)   |
| Access to kitchen                 | -0.228*<br>(0.130)   | -0.057<br>(0.126)  | -0.233<br>(1.051)   | -0.187<br>(1.124)   | 0.095<br>(0.114)    | -0.056<br>(0.147)  |
| Skipped meal in last 6 months     | 0.000<br>(0.065)     | -0.074<br>(0.071)  | -1.066**<br>(0.473) | -1.086**<br>(0.497) | -0.008<br>(0.056)   | 0.062<br>(0.063)   |
| Sample size                       | 533                  |                    | 540                 |                     | 524                 |                    |

Note: Authors' calculations of coefficients (and robust standard errors in parentheses) from standard OLS and DEV regression models using data from the JH survey. In addition to the listed coefficients, the models include intercepts and controls for sample strata and missing responses for the childhood abuse, work experience, debt, distance to public transportation, and going without meals measures.

\* Significant at 0.1 level.

\*\* Significant at 0.05 level.

\*\*\* Significant at 0.01 level.