Treat or Eat: Food Insecurity, Cost-related Medication Underuse and Unmet Needs

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Abstract

Background: Adults with chronic disease are often unable to meet medication and/or food needs, but no study has examined the relationship between cost-related medication underuse and food insecurity in a nationally representative sample. We examined which groups most commonly face unmet food and medication needs.

Methods: Cross-sectional analysis of data from chronically ill participants (self report of arthritis, diabetes mellitus, cancer, asthma, chronic obstructive pulmonary disease, stroke, hypertension, coronary heart disease, or presence of a "psychiatric problem"), age ≥20 years, of the 2011 National Health Interview Survey. We fit logistic regression models to identify factors associated with food insecurity, cost-related medication underuse, or both.

Results: 9,696 adult NHIS participants reported chronic illness; 23.4% reported cost-related medication underuse; 18.8% reported food insecurity; and 11% reported both. Adults who reported food insecurity were significantly more likely to report cost-related medication underuse (adjusted odds ratio [aOR] 4.03). Participants with both cost-related medication underuse and food insecurity were more likely to be Hispanic (aOR 1.58) non-Hispanic Black (aOR 1.58), and have more chronic conditions (aOR per additional chronic condition 1.56) than patients reporting neither. They were also less likely to have Public, non-Medicare insurance (aOR 0.70) and report to WIC participation (aOR 0.39).

Conclusions: Approximately 1 in 3 chronically-ill NHIS participants are unable to afford food, medications, or both. WIC and public health insurance participation are associated with less food insecurity and cost-related medication underuse.

Introduction

The current economic climate has led to substantial hardship for many Americans. In 2012, one in six Americans report that they lack health insurance(1) and nearly one in five report trouble meeting basic needs(2). As a result, approximately 15% of chronically ill Americans report cost-related medication underuse, which refers to taking less medication than prescribed, or not taking it at all, due to cost(3, 4). An equal proportion of American households(5) experience food insecurity, which is defined as "limited or uncertain availability of nutritionally adequate and safe foods, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways(6)".

While prescription drug benefit programs and food security assistance programs, such as the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program) do exist, it is not clear if they are sufficient to mitigate the effects of food insecurity on medication underuse or the effects of out-of-pocket medication payments on food insecurity.

Both cost-related medication underuse and food insecurity are associated with adverse health consequences,(7-10) but no prior study has examined the relationship between them in a nationally representative sample. We used the 2011 National Health Interview Survey to understand how common these two aspects of economic insecurity are among individuals with chronic disease and, to inform policy-making, whether specific groups of patients, when both needs cannot be met, are more likely to report food insecurity, or vice versa.

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Methods

Data Source and Study Sample

We analyzed data from the 2011 National Health Interview Survey (NHIS)(11). The NHIS is conducted annually by trained in-person interviewers in English, Spanish, or with an interpreter. Full details of NHIS methodology have been previously described(12). To focus on participants with chronic illness, who may be forced to choose month after month between medications and food and for whom such tradeoffs may have important clinical consequences, we included adult participants (age ≥20 years) in the 2011 NHIS who report at least one of 8 common chronic conditions surveilled by the NHIS: arthritis, diabetes mellitus, cancer, asthma, chronic obstructive pulmonary disease (COPD), stroke, hypertension, coronary heart disease, or presence of a "psychiatric problem". For subgroup analyses, we created the following groups: cardiovascular disease or hypertension, defined as participants reporting hypertension, coronary heart disease (including myocardial infarction), or stroke; diabetes mellitus; non-cardiovascular disease (asthma, COPD, arthritis, or cancer); and presence of a "psychiatric problem". We also conducted sensitivity analyses using all adult participants, regardless of whether they reported a chronic illness.

The Partners HealthCare Human Research Committee exempted this study from review.

Food Insecurity Assessment

Food insecurity was assessed using the 10 adult-referenced items of the United States Department of Agriculture (USDA)'s household-level 30-day food security scale. These items are used to ascertain national rates of food insecurity(6). We dichotomized responses into Food Secure (affirmative response to 0-2 items) and Food Insecure (affirmative response to 3-10 items) according to standard protocol(6).

Cost-Related Medication Underuse

Cost-related medication underuse was determined by response to four validated items adapted from the Medication Expenditure Panel Survey(13). Similar to prior studies(14), a respondent was considered to have cost-related medication underuse if he or she responded 'Yes' to any of 4 items which asked if, in the last 12 months, 1) there was a prescription a participant did not fill due to cost, 2) the participant skipped medication doses to save money, 3) the participant took less medication than prescribed to save money, or 4) the participant delayed filling a prescription to save money.

Demographic and Socioeconomic variables

We adjusted for several demographic and socioeconomic variables that may be associated with food insecurity and/or cost-related medication underuse(4, 9). Demographic factors included age (in years), gender, self-report race/ethnicity (non-Hispanic white, non-Hispanic Black, Hispanic, or other/mixed race/ethnicity), and nativity status (born in the United States or not). We categorized health

insurance status with regard to both source and presence of a prescription drug benefit. Because almost 90% of Medicare beneficiaries have creditable prescription drug coverage(15), and prescription drug benefits are offered by Medicaid in all 50 states(16), we categorized patients into 5 mutually-exclusive insurance groups: none, private with drug benefit, private without drug benefit, Medicare, and other non-Medicare public insurance (including Medicaid, Medicare/Medicaid dual eligible respondents, and Veterans Administration coverage). For socioeconomic factors, we categorized educational attainment as less than high school diploma, high school diploma, or some college or higher. We classified income as a percentage of the federal poverty level (FPL), which accounts for household size, in categories of ≤100%, 101-200% FPL, and ≥200% FPL. We also ascertained self-reported household participation in the two main federal nutrition assistance programs, the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program) and the Special Supplemental Nutrition Assistance Program for Woman, Infants, and Children (WIC).

Clinical and other Variables

Because the number of chronic medical conditions that a patient has is associated with a higher likelihood of cost-related medication underuse(4), we constructed an index of the number of chronic medical conditions, similar to the method of Madden et al(4). As above, these conditions included arthritis, diabetes mellitus, cancer, asthma, COPD, stroke, hypertension, coronary heart disease, or presence of a "psychiatric problem". We also adjusted for tobacco use because the

cost associated with this may lead to food insecurity and/or cost-related medication underuse, categorized as current, former, and never users based on self-report.

Statistical Analysis

Unadjusted comparisons were made using chi-squared tests for categorical variables and t-tests for continuous measures. We then used multivariable logistic regression to test our hypothesis that food insecurity was independently associated with cost-related medication underuse, adjusting for the demographic, social, and clinical variables described above. In order to see if these results, obtained in a chronically ill population, were generalizable to the overall American population, we then fit a model with the same variables but in all adult NHIS participants who were asked food security and cost-related medication underuse questions.

We also hypothesized that participation in insurance programs with lower prescription medication co-pays, such as Medicaid, or programs that reduced out-of-pocket spending for food, such as WIC, might be associated with lower food insecurity and lower cost-related medication underuse. In order to test these hypotheses, we fit three multivariable logistic regression models comparing those with food insecurity but not cost-related medication underuse, those reporting cost-related medication underuse but no food insecurity, and those reporting both with those who report neither food insecurity nor cost-related medication underuse.

Finally, in order to understand what factors were associated with unmet food and medication needs in situations where both cannot be fulfilled, we fit multivariable logistic regression models comparing those who were food insecure

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but did not report cost-related medication underuse to those who reported cost-related medication underuse but were not food insecure. This represents a group that may be subject to a "treat or eat" trade-off between prescription medication and household food. We also conducted this analysis among participants with incomes <200% of the FPL in order to capture a more homogenous population with few resources--those for whom a "treat or eat" trade-off would be most likely.

Analyses were conducted using SAS version 9.3 (Cary, NC) survey procedures with domain analyses to account for the complex multistage sampling design and provide appropriate weights, as recommended in the 2011 NHIS data release documentation(17).

Results

Our sample comprised 9,696 adults who reported chronic illness. Overall, 23.4% of respondents, representing approximately 7.2 million Americans, reported cost-related medication underuse in the prior 12 months. In addition, 18.8% of respondents, representing 5.8 million American households, reported food insecurity. More than 11% of respondents reported both food insecurity and cost-related medication underuse. The baseline characteristics of our sample, stratified by the presence of cost-related medication underuse, food insecurity, both or neither, are presented in Table 1. Those with no cost-related medication underuse or food insecurity were older, more likely to be white, and had higher incomes than those in the other groups. Poverty was more common among those participants

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reporting food insecurity. Lack of insurance was more prevalent in groups with cost-related medication underuse.

Relationship between cost-related underuse and food insecurity

Cost related medication underuse was more common in respondents with food insecurity compared to those without (55.5% vs. 16.0%, p<.001). After adjustment for demographic factors, insurance, and clinical comorbidities, food insecurity remained strongly associated with cost-related medication underuse (OR 4.03 95%CI 3.44, 4.73) (Table 2). The odds ratio was similar in a model including all adult NHIS participants, not only those with chronic disease (eAppendix Table A). The observed association was also similar when looking at the individual subtypes of cost-related medication underuse (adjusted for the same covariates as above): unable to afford a prescription (OR 4.15 95% CI 3.52, 4.89), delaying a prescription due to cost (OR 4.01 95% CI 3.38, 4.76), skipping doses due to cost (OR 3.43 95% CI 2.90, 4.06), and taking less medication than prescribed due to cost (OR 3.64 95% CI 3.06, 4.33). Finally, the results were similar when looking at four subgroups of chronically ill patients: those with cardiovascular disease or hypertension, those with diabetes, those with non-cardiovascular disease (asthma, COPD, arthritis, or cancer) and those who reported history of a "psychiatric problem" (eAppendix Table B).

Risk factors for cost-related medication underuse, food insecurity, or both

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Compared to participants with neither cost-related medication underuse nor food insecurity, participants reporting both were more likely to be Hispanic, non-Hispanic Black, have no usual place of care, have no insurance, and have more chronic conditions (Table 3). These participants were also less likely to have public, non-Medicare insurance and to be WIC beneficiaries.

Individuals reporting only food insecurity were more likely to be Hispanic, non-Hispanic Black, and have more chronic conditions, but were less likely to be WIC beneficiaries, than adults reporting neither food insecurity nor cost-related medication underuse. Adults reporting only cost-related medication underuse were more likely to have no insurance and more chronic conditions.

Finally, we conducted an analysis among those reporting only cost-related medication underuse but not food insecurity and those reporting only food insecurity but not cost-related medication underuse(Table 4). Participants who were Hispanic and non-Hispanic Black were less likely to report cost-related medication underuse, but more likely to report food insecurity, while adults who met food but not medication needs were more likely to have dependent children in the household, no insurance or private insurance without drug coverage, and more chronic conditions. Sensitivity analyses restricted to adults with incomes < 200% FPL revealed similar results in a smaller sample (eAppendix Table C).

Discussion

In this nationally representative sample of adults with chronic disease, food insecurity and cost-related medication underuse were common, with 22% reporting

food insecurity *or* cost-related medication underuse. Another 11% reported both food insecurity *and* cost-related medication underuse. The high overall prevalence of food insecurity and cost-related medication underuse highlights how difficult successful chronic disease management in the current social environment is. These findings suggest residual unmet needs for food insecure participants and thus have clear implications for health policy. Additionally, our finding that respondents with incomes from 100%-200% FPL, an income range associated with the phase out of many means-tested benefits, report high rates of food insecurity and cost-related medication underuse may be an important consideration when setting program eligibility rules.

We report an association between public insurance programs, such as Medicaid, and lower cost-related medication underuse compared to private insurance prescription benefits. This likely reflects the lower levels of cost-sharing, such as lower co-payments, in Medicaid plans. Low or no-cost sharing prescription drug benefits have been associated with improved health outcomes in a general population(18), as well as the reduction of socioeconomic disparities in health outcomes(19). Similarly, we found that patients enrolled in WIC had a lower prevalence of food insecurity and cost-related medication underuse. While the WIC program serves a population different from many chronically ill Americans, it may be useful to investigate whether aspects of the program itself are particularly effective in reducing economic insecurity. The observation that Medicaid and WIC participation is associated with lower odds of *both* food insecurity and cost-related medication underuse suggest that there may be important 'spill-over' effects from

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programs that target food insecurity or cost-related medication underuse, by freeing up available resources. Interestingly, SNAP participation was associated with higher rates of food insecurity. Prior analyses have also noted greater food insecurity in SNAP participants compared to income-matched non-participants, which is often attributed to self-selection into the program(20).

Our analysis identified particular population subgroups that, when faced with insufficient resources to meet both food and medication needs, were more likely to report food insecurity rather than cost-related medication underuse and vice versa. These patient groups may particularly benefit from targeted interventions. Specifically, Hispanic and non-Hispanic black participants with insufficient resources were more likely to report food insecurity while following their prescribed treatment plan, which may represent an unforeseen harm of medical interventions. Alternatively, those with more chronic conditions and dependent children are more likely to forgo needed medications—with potentially important consequences both for their own health and for their children if their health worsens. This is consistent with observations that caregivers are less likely to adhere to their medications(21).

Because of these findings, clinicians should be attuned to the difficult trade-offs between food and medication related expenses that patients face. It is also worthwhile to keep in mind the larger social context of the patient's world—children, relatives, and others to whom the patient devotes scarce resources. Assessing for both household food insecurity and cost-related medication underuse, especially in patients from groups at high risk, may be warranted. If identified,

engagement of the patient in state, local, or private (such as pharmaceutical company based) benefit programs may help reduce the burden of competing choices. However, the ability of individual clinicians to rectify unequally distributed social determinants of health is limited. We need organized, broad-based support for multidisciplinary programs to improve social determinants in vulnerable populations.

Our analysis is consistent with and expands upon prior work. In an analysis from a representative population-based sample of Californians with diabetes, Billimek and Sorkin(22) found that food insecurity was associated with one component of cost-related medication underuse, delays in filling prescriptions. However, whether this was generalizable to other patient populations or other domains of cost-related medication underuse was previously unknown. Work by Kushel et al.(23) demonstrated that food insecurity was associated with increased acute care utilization such as emergency department visits, using data on low-income families drawn from a nationally-representative population-based sample, which suggests one possible consequence of cost-related medication underuse. An analysis of Medicare participants(4), before and after Medicare Part D implementation, found that prescription drug coverage increased disposable income available for 'basics' such as food. Also consistent with prior work(24), we observed that educational attainment is not associated with cost-related medication underuse alone, but is associated with food insecurity (and food insecurity plus cost-related medication underuse). The reasons for this apparent discrepancy are not entirely clear. It may be that those with chronic illness and lower educational attainment

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receive assistance in enrolling for prescription drug benefits when they contact the healthcare system, while there is less assistance in accessing the safety-net for food insecurity. Alternatively, the positive association between lower education and food insecurity may represent residual confounding.

NHIS data are cross-sectional and observational, which prevent us from evaluating time ordering or establishing cause. For example, the association between SNAP participation, food insecurity and cost-related medication underuse most likely represents confounding by indication—those participating in SNAP are the more severely under-resourced—rather than a causal association between SNAP and cost-related medication underuse. Despite this inability to generate causal inference, our results do demonstrate that food insecure adults are a group with high rates of cost-related medication underuse, and may particularly benefit from targeted interventions for both food insecurity and cost-related medication underuse. Next, because participants were not directly asked whether they sacrificed food for medications, or medications for food, we cannot be sure of the reason a food or medication need went unmet. Nevertheless, identifying groups that are more likely to have food insecurity when their medication needs are met, or vice versa, may be important for targeting policies to these vulnerable groups. Another limitation is that clinical outcomes, such as laboratory measurements or healthcare records, are not available in the NHIS dataset. Finally, reporting cost-related medication underuse may be subject to social desirability bias. However, there is no reason to suspect a differential effect on reporting.

These limitations however, are balanced by several strengths. Our analysis used data collected from a nationally representative, population-based sample with well-validated items. The large effect size after adjustment makes residual confounding a less likely explanation for the observed associations. Finally, food insecurity represents an easily identifiable risk factor for cost-related medication underuse. Because several programs are known to improve both cost-related medication underuse and health outcomes(18, 19), it may be worth evaluating whether utilizing food insecurity as an eligibility criterion for similar programs could help improve health in chronically ill patients with food insecurity.

In conclusion, food insecurity is strongly associated with cost-related medication underuse, and approximately 1 in 3 chronically-ill NHIS participants are unable to afford food, medications, or both, despite participation in assistance programs. Interventions targeted to under-resourced groups who may face 'treat or eat' choices could produce substantial health gains for these vulnerable patients.

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Clinical Significance:

- Cost-related medication underuse and food insecurity are common among chronically ill adults, with 1/3 of patients reporting one or both

- Food insecurity is strongly associated with cost-related medication underuse

- Racial/ethnic minorities and adults with more co-morbidities are more likely to report food insecurity and cost-related medication underuse. Participation in programs like Medicaid and WIC is associated with less cost-related medication underuse and food insecurity

Table 1: Demographics

	Overall n=9696	Neither Food Insecure nor CRMU n=6441	Food Secure but CRMU n=1258	Food Insecure but no CRMU n=908	Both Food Insecure and CRMU n=1082	p-value
	% or mean (se)	% or mean (se)	% or mean (se)	% or mean (se)	% or mean (se)	
Age (y)	60.9 (0.2)	64.8 (0.2)	53.7 (0.4)	54.2 (0.6)	49.7 (0.4)	<.0001
Male	38.8	40.0	36.3	38.1	34.6	.003
Race/Ethnicity						<.0001
Hispanic	8.0	6.2	9.8	14.6	11.9	
Non-Hispanic White	76.4	80.9	73.7	59.5	64.0	
Non-Hispanic Black	12.5	9.8	13.9	22.2	20.8	
Asian	2.0	2.3	1.5	1.8	1.4	
Other	1.0	0.8	1.1	1.9	1.8	
No usual place of care	5.8	3.3	9.9	7.7	15.8	<.0001
Insurance						<.0001
None	10.3	4.3	23.4	10.8	32.9	
Private, w/ Rx coverage	27.2	28.5	33.1	16.6	19.5	
Private, no Rx coverage	1.3	1.3	2.3	0.6	0.5	
Medicare	38.9	46.1	26.1	21.9	21.1	
Public, non-Medicare	22.3	19.7	15.0	50.1	26.0	
Income						<.0001
<100% FPL	19.5	13.3	17.3	46.2	40.1	
100-200% FPL	22.7	18.9	26.1	30.8	36.1	
>200% FPL	57.7	67.8	56.6	23.0	23.8	
Education						<.0001
<HS Diploma	20.4	18.2	17.9	34.8	26.4	
HS Diploma	29.8	30.1	28.5	27.4	31.8	
>HS Diploma	49.8	51.7	53.6	37.8	41.9	
Born outside US	9.6	9.1	8.9	13.3	10.9	.0004
SNAP beneficiary	17.7	10.1	19.4	46.3	41.8	<.0001
WIC beneficiary	2.6	1.5	4.5	5.1	5.7	<.0001
Smoking Status						<.0001
Current	21.5	15.0	29.6	34.5	43.7	
Former	32.65	36.4	28.5	24.1	20.3	
Never	45.9	48.7	41.9	41.4	36.0	
Number of Chronic Conditions	2.2 (0.01)	2.1 (0.02)	2.2 (0.04)	2.3 (0.05)	2.4 (0.05)	<.0001

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CRMU = cost-related medication underuse SNAP = Supplemental Nutrition Assistance Program WIC = Special Supplemental Nutrition Program for Women, Infants, and Children FPL= Federal Poverty Level

Table 2: Factors associated with Cost-Related Medication Underuse in all chronically-ill participants (n=9696)

	aOR (95% CI)
Food Insecure	**4.03 (3.44, 4.73)**
Age (y)	**0.96 (0.95, 0.97)**
Male	**0.76 (0.67, 0.86)**
Race/Ethnicity	
Hispanic	1.22 (0.96, 1.54)
Non-Hispanic White (ref)	1.0 (--)
Non-Hispanic Black	1.15 (0.98, 1.35)
Asian	0.90 (0.58, 1.39)
Other	0.92 (0.51, 1.67)
No usual place of care	1.20 (0.90, 1.61)
Insurance	
None	**3.38 (2.66, 4.29)**
Private, w/ Rx coverage (ref)	1.0 (--)
Private, no Rx coverage	1.49 (0.86, 2.59)
Medicare	0.97 (0.80, 1.19)
Public, non-Medicare	**0.47 (0.37, 0.59)**
Income	
<100% FPL	1.08 (0.87, 1.35)
100-200% FPL	1.67 (1.40, 1.99)
>200% FPL (ref)	1.0 (--)
Education	
<HS Diploma	0.86 (0.72, 1.03)
HS Diploma	0.94 (0.81, 1.09)
>HS Diploma (ref)	1.0 (--)
Born outside US	0.89 (0.70, 1.14)
SNAP beneficiary	1.12 (0.90, 1.39)
WIC beneficiary	0.91 (0.65, 1.29)
Smoking Status	
Current	**1.45 (1.25, 1.70)**
Former	1.05 (0.91, 1.22)
Never (ref)	1.0 (--)
Number of Chronic Conditions	**1.41 (1.33, 1.49)**

*adjusted OR represents multivariable logistic regression results with adjustment for all variables in table **Bold** = $p < .05$

SNAP = Supplemental Nutrition Assistance Program WIC = Special Supplemental Nutrition Program for Women, Infants, and Children

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Table 3: Multivariable logistic regression results comparing those reporting food security and no cost-related medication underuse(CRMU) to:

	Both Food Insecure and CRMU**	Food Insecure but no CRMU†	Food Secure but CRMU‡
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Age (y)	**0.94 (0.93, 0.94)**	**0.96 (0.95, 0.97)**	**0.95 (0.95, 0.96)**
Male	**0.70 (0.58, 0.84)**	0.98 (0.81, 1.17)	**0.74 (0.63, 0.87)**
Race/Ethnicity			
Hispanic	**1.58 (1.12, 2.22)**	**1.80 (1.35, 2.39)**	**1.39 (1.05, 1.85)**
Non-Hispanic White (ref)	1.0 (--)	1.0 (--)	1.0 (--)
Non-Hispanic Black	**1.58 (1.24, 2.00)**	**1.64 (1.30, 2.08)**	1.15 (0.94, 1.39)
Asian	1.04 (0.54, 1.97)	1.02 (0.59, 1.78)	0.85 (0.49, 1.47)
Other	1.44 (0.68, 3.08)	1.55 (0.77, 3.15)	0.90 (0.36, 2.30)
No usual place of care	**1.73 (1.17, 2.56)**	1.40 (0.92, 2.14)	1.30 (0.90, 1.87)
Insurance			
None	**3.73 (2.70, 5.17)**	1.10 (0.73, 1.65)	**3.62 (2.74, 4.78)**
Private, w/ Rx coverage	1.0 (--)	1.0 (--)	1.0 (--)
Private, no Rx coverage	0.62 (0.23, 1.71)	0.65 (0.25, 1.71)	1.68 (0.95, 2.97)
Medicare	1.23 (0.88, 1.72)	0.96 (0.68, 1.35)	0.95 (0.75, 1.20)
Public, non-Medicare	**0.70 (0.50, 0.96)**	**1.48 (1.11, 1.99)**	**0.55 (0.41, 0.72)**
Income			
<100% FPL	**3.87 (2.82, 5.33)**	**3.86 (2.92, 5.11)**	0.89 (0.67, 1.18)
100-200% FPL	**4.81 (3.72, 6.20)**	**3.77 (2.94, 4.84)**	**1.71 (1.38, 2.12)**
>200% FPL (ref)	1.0 (--)	1.0 (--)	1.0 (--)
Education			
<HS Diploma	0.97 (0.7, 1.23)	**1.39 (1.11, 1.74)**	0.96 (0.76, 1.22)
HS Diploma	1.05 (0.85, 1.31)	0.95 (0.75, 1.21)	0.90 (0.75, 1.08)
>HS Diploma (ref)	1.0 (--)	1.0 (--)	1.0 (--)
Born outside US	0.98 (0.71, 1.35)	1.08 (0.80, 1.46)	0.89 (0.63, 1.24)
On SNAP	**1.61 (1.25, 2.08)**	**1.82 (1.41, 2.35)**	**1.36 (1.02, 1.81)**
On WIC	**0.39 (0.25, 0.61)**	**0.50 (0.30, 0.84)**	0.89 (0.58, 1.36)
Smoking Status			
Current	**2.01 (1.61, 2.50)**	**1.43 (1.15, 1.79)**	**1.51 (1.25, 1.83)**
Former	0.98 (0.79, 1.21)	0.92 (0.72, 1.16)	1.09 (0.91, 1.31)
Never (ref)	1.0 (--)	1.0 (--)	1.0 (--)
Number of Chronic Conditions, per condition	**1.56 (1.44, 1.70)**	**1.17 (1.08, 1.27)**	**1.45 (1.36, 1.55)**

***Bold** represents p< 0.05

**Represents results from multivariable logistic regression with 'both food insecurity and cost-related medication underuse' status as dependant variable in a sample of chronically-ill patients with neither (n=6441) or both (n=1082)

†Represents results from multivariable logistic regression with 'food insecurity but no cost-related medication underuse' status as dependant variable in a sample of chronically-ill patients with neither (n=6441) or food insecurity but no CRMU (n=908)

‡Represents results from multivariable logistic regression with 'cost-related medication underuse but no food insecurity' status as dependant variable in a sample of chronically-ill patients with neither (n=6441) or food secure patients with CRMU (n=1258)

Table 4: Associations with report of cost-related medication underuse (CRMU) but no food insecurity compared to report of food insecurity but no CRMU

	aOR (95% CI)
Age (y)	1.00 (0.99, 1.01)
Male	0.84 (0.66, 1.06)
Race/Ethnicity	
Hispanic	**0.69 (0.47, 0.99)**
Non-Hispanic White (ref)	1.0 (--)
Non-Hispanic Black	**0.63 (0.48, 0.83)**
Asian	0.78 (0.40, 1.53)
Other	0.69 (0.29, 1.66)
No usual place of care	1.09 (0.71, 1.69)
Insurance	
None	**2.79 (1.85, 4.22)**
Private, w/ Rx coverage (ref)	1.0 (--)
Private, no Rx coverage	2.79 (0.94, 8.29)
Medicare	0.98 (0.67, 1.43)
Public, non-Medicare	**0.38 (0.26, 0.55)**
Income	
<100% FPL	**0.26 (0.19, 0.37)**
100-200% FPL	**0.42 (0.31, 0.57)**
>200% FPL (ref)	1.0 (--)
Education	
<HS Diploma	**0.63 (0.47, 0.84)**
HS Diploma	0.97 (0.74, 1.28)
>HS Diploma (ref)	1.0 (--)
Born outside US	0.88 (0.59, 1.30)
SNAP beneficiary	0.75 (0.54, 1.02)
WIC beneficiary	1.49 (0.81, 2.73)
Dependent Children	**1.45 (1.08, 1.96)**
Smoking Status	
Current	0.98 (0.76, 1.27)
Former	1.16 (0.87, 1.54)
Never (ref)	1.0 (--)
Number of Chronic Conditions	**1.19 (1.09, 1.30)**

* aOR > 1 represents more likely to report CRMU but no food insecurity; aOR < 1 represents more likely to report food insecurity but no CRMU; **Bold**=p <.05
**Adjusted OR represents adjustment for all variables in table in a multivariable logistic regression analysis among participants with CRMU but no food insecurity (n=1258) and food insecurity but not CRMU (n=908). 'CRMU but no food insecurity' status was the dependant variable

SNAP = Supplemental Nutrition Assistance Program WIC = Special Supplemental Nutrition Program for Women, Infants, and Children Appendix

The NIHMS has received the file 'mmc1.pdf' as supplementary data. The file will not appear in this PDF Receipt, but it will be linked to the web version of your manuscript.