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Role of food insecurity in prescription delay among adults with asthma: Results from the California Health Interview Survey

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Abstract

Background: Food insecurity remains a major public health concern in the United States. Studies have noted that food insecurity can lead to lower healthcare utilization and poorer health status. Despite the continuous burden of asthma, little research has shown whether food insecurity serves as a social determinant to poor asthma care. In this study, we specifically focused on whether food insecurity can lead to delay in prescription medication for adults with asthma in California.

Methods: We utilized the California Health Interview Survey. Survey weighted descriptive, univariate, and multivariable logistic regression analyses were conducted. A total of 11,645 observations, representing an average annual population size of 1,085,481 was included in this study.

Results: Nearly 15% and 8% of participants were food insecure and had current asthma, respectively. Based on adjusted odds ratio, food insecure adults were 148% more likely to report delay in asthma prescription, as compared to those who were food secure (adjusted odds ratio =2.48; 95% CI: 1.58, 3.89).

Conclusion: Given the delay in prescription, and thus appropriate health care, demonstrated in our study, targeted measures at point of care should be implemented to identify such at-risk patients early and provide resources for food aid to ensure optimal health outcomes.

Key words: Food insecurity, healthcare delay, asthma, prescription

Background

Asthma is a chronic respiratory illness characterized by tightness in chest, coughing, wheezing, and shortness of breath (1). The Centers for Disease Control and Prevention (CDC) note that nearly 8% of adults in the U.S. have asthma with one of the highest rates (11.1%) reported among those living below 100% of the federal poverty level (2). While a major mode of asthma management is prescription medication (3), various patient-level characteristics can delay prescription or medication adherence, thus further leading to delay in care. For example, Pacheco et al. (4) in an evaluation of low-income families with asthmatic children found that ethnic minority households were more likely to have low housing quality and were also more likely to be of lower income; cumulatively creating an at-risk environment for poor asthma management. Similarly, Keet et al. (5) demonstrated that inner-city living was significantly related to asthma-related outcomes, such as emergency department visits and hospitalizations.

While similar socioeconomic-based studies on asthma outcomes among adults are limited and with inconsistent results among children (6,7), a national study among adults noted that food insecurity was associated with medication underuse (8). Why such a relationship exists, however, is not known. We hypothesize that food insecure adults may attempt to save money by lowering their healthcare utilization, specifically by delaying prescriptions, in order to afford food for their household.

Given that food insecurity remains a major public health issue as currently over 49 million Americans are reported to be food insecure (9), there is a critical need to address if such a social determinant may be an underlying factor in poor asthma management, primarily due to delay in prescription. The literature has further shown that food insecurity can have a negative impact on outcomes (10), including prescription delay (11,12), especially among those with type 2 diabetes (13), though a similar assessment among adults with asthma remains limited. As such, the aim of this study is to assess whether food insecurity is associated with prescription delay among adults with asthma.

Methods

Data source

The California Health Interview Survey (CHIS) is an annual survey administered by the UCLA Center for Health Policy Research that consists of various self-reported health-related questions that are administered to adults and children living in California. The survey is weighted to provide estimates that can be applied to the entire California population. The public use file of CHIS contains poststratification jackknife replicate weights that allow for variance estimation. Additional details regarding CHIS methodology can be found elsewhere (14).

CHIS adult public access data from 2009 to 2014 was utilized, as these years contained the variables needed for the study. The population for this study included those who reported having current asthma within the last 12 months, for a total sample size of 11,645, representing an average annual population size of 1,085,481 across these 6 years.

Measures

The primary outcome variable was the CHIS-created variable of reporting a delay in asthma prescription, which was assessed as those who answered yes to all the following: “During the past 12 months, did you delay or not get a medicine that a doctor prescribed for you?”, “Was cost or lack of insurance a reason why you delayed or did not get the prescription?”, and “Was this prescription for your asthma?”

Food security status was regarded as the main exposure variable, defined using CHIS-provided variable of being food secure or food insecure. The variable was created by CHIS using the United States Department of Agriculture (USDA)-6-item questionnaire on food security status. In addition, control variables based on literature were included: age (18-34 years, 35-49 years, 50 or more years; as based on natural breakpoints), sex (male, female), marital status (currently married, currently not married), race/ethnicity (African American, Asian American, Hispanic/Latino, non-Hispanic White, other), education (high school or less, some college, bachelors’ or higher), general health status (excellent to good, or poor/very poor), psychological distress based on the Kessler-6 (K-6) scale (none, mild-to-moderate, serious), insurance status (insured all past 12 months, not insured all past 12 months), geographic location (rural, urban), and survey year (each year of data).

Data analysis

Survey-weighted descriptive statistics were conducted to obtain frequencies and weighted percentages for each variable of interest. The average annual population size estimate was calculated from the survey-weighted frequency divided by the total number of years analyzed. This represents the average frequency of adults with asthma in California across study years 2009-2014. Next, to evaluate the association between the delay in asthma prescription to exposure and control variables, Rao-Scott Chi-Square analyses were conducted (15). To assess the adjusted relationship between food security status and delay in asthma prescription, survey-weighted multivariable binary logistic regression analyses were utilized. The level of significance was set at .05 for all analyses using SAS version 9.4 (SAS Institute Inc. Cary, NC).

Results

A total of $n=130,789$ California adults were included among whom 14.55% and 7.79% reported being food insecure and having current asthma, respectively. Furthermore, among all those who reported being food insecure, the prevalence of current asthma was significantly higher as compared to those who reported being food secure (9.83% vs. 7.45%, chi-square $p < .0001$, data not shown in table).

As shown in Table 1, among the 11,645 CHIS participants with current asthma, representing a population estimate of over 6.5 million California adult residents across years 2009-2014, 18.35% and 4.84% reported food insecurity and delayed prescription for asthma, respectively. As noted in Table 2 survey-weighted chi-square results, among all those with current asthma, delaying prescription was significantly higher when food insecure as compared to being food secure (10.22% vs. 3.63%, chi-square $p < .0001$). Model fit statistics for survey-weighted logistic results indicate appropriate fit of model (Likelihood Ratio Test $p < .0001$). Results of survey-weighted logistic regression analyses (Table 3), further confirm that after adjusting for control variables, food insecure adults were 148% more likely to report delay in asthma prescription, as compared to their food secure counterparts (adjusted odds ratio =2.48; 95%CI: 1.58, 3.89; $p < .0001$).

Discussion

Asthma remains a national public health issue and addressing food insecurity has become increasingly a priority in the field. Despite evidence on the negative health outcomes associated with food insecurity, such as obesity, mental health, etc. evidence is lacking on the impact of food insecurity on prescription delay among asthma patients, especially given that medication adherence is key to asthma management. Key findings from our study note that: (1) prevalence of current asthma was significantly higher among adults who reported food insecurity and (2) such population was also nearly 1.5 times more likely to delay prescription, as compared to their food secure counterparts.

A similar trend has been noted when addressing other health outcomes. For example, Pellowski et al. highlighted that rate of missed medication was significantly higher among patients with HIV and severe food insecurity, compared to those who were not (16). Similarly, among a nationally representative sample, a dose-response association was found among nonelderly adults with food insecurity and medication underuse due to cost (17). A major potential underlying reason is often the cost associated with medication. Exemplifying this is a study among emergency department users where food insecure patients, as compared to food secure patients, were more likely to report a delay in paying for or reducing frequency of medications to buy food, and often had to make a choice between food versus medication, cumulatively resulting in worse health outcomes (18). Likewise, results from the National Health Interview Survey demonstrate that adults with food insecurity were more likely to report cost-related underuse of needed medications, and were also more likely to be the most at-risk populations, such as ethnic minorities and those that reported

chronic conditions, among others (8). While such literature does not specifically evaluate adults with asthma, the current empirical evidence, along with our study results, do demonstrate the negative burden of food insecurity among adults and provide several scopes of public health initiatives.

For example, the 2-item screening tool to identify families at risk of food insecurity was initially developed for families with young children (19). Validation and use of such an instrument (or one similar) for patients with asthma is critical and can be incorporated to identify such at-risk populations early in the disease management process. Similarly, incorporation of nutrition educators as part of community food security measures (20) during home visitations for asthma patients may posit a putative means to identify the most vulnerable populations.

The results of our study are not without limitations. Other factors related to medication underuse that are not feasible to assess using the database should be further explored, including, cost-sharing and coverage of generic brands by insurance status that can limit patients' affordability to obtain medications. Similarly, the self-reported data for CHIS are vulnerable to recall and social desirability biases and participants may not be willing to share their food security status. Nevertheless, the results of the study provide one of the first assessments of the negative impact of food insecurity on asthma management and thus call for health care and public health collaborations to identify at-risk populations early to improve long-term outcomes.

Declaration of Interest

There is none to declare for all authors.

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Table 1. Characteristics of study population, adults with current asthma, CHIS 2009-2014 (n = 11,645; Average Annual N = 1,085,481)

Variable	N	n (%)
Food security status		
Food secure	5,317,603	9688 (81.65)
Food insecure	1,195,282	1957 (18.35)
Delayed prescription for asthma		
No	6,197,853	11146 (95.16)
Yes	315,032	499 (4.84)
Age		
18-34 years	2,081,056	1448 (31.95)
35-49 years	1,650,061	2092 (25.34)
50 years or more	2,781,768	8105 (42.71)
Sex		
Male	2,418,824	3413 (37.14)
Female	4,094,061	8232 (62.86)
Marital status		
Currently married	2,968,220	5241 (45.57)
Not currently married	3,544,665	6404 (54.43)
Race/ethnicity		
African American	600,707	741 (9.22)
Asian American	645,157	724 (9.91)
Hispanic/Latino	1,045,442	1135 (16.05)
Non-Hispanic White	3,551,088	7940 (54.52)
Other	670,492	1105 (10.29)
Education level		
Bachelors or higher	2,194,080	4254 (33.69)
Some college, vocational, Associates degree	1,912,318	3648 (29.36)
High school or less	2,406,487	3743 (36.95)
General health status		
Excellent, very good, good	4,536,329	7509 (69.65)
Fair or poor	1,976,556	4136 (30.35)
Psychological distress		
None	5,176,225	9411 (79.48)
Mild to moderate	870,482	1393 (13.37)
Serious	466,178	841 (7.16)
Insurance status		
Insured all past 12 months	5,374,676	10401 (82.52)
Not insured all past 12 months	1,138,209	1244 (17.48)
Geographic location		
Urban	5,753,300	9233 (88.34)
Rural	759,585	2412 (11.66)
Year		
2009-2010	2,127,756	4120 (32.67)
2011-2012	2,144,224	3784 (32.92)
2013	1,089,303	1893 (16.73)
2014	1,151,602	1848 (17.68)

CHIS = California Health Interview Survey, N = population weighted estimate, n = sample size

Table 2. Association between food insecurity and delay in asthma prescription, CHIS 2009-2014, Survey-weighted chi-square results

Variable	% (95% CI)	P value
Food security status		<.0001
Food secure	3.63 (2.88, 4.38)	
Food insecure	10.22 (7.18, 13.26)	
Age		0.2728
18-34 years	5.48 (3.65, 7.32)	
35-49 years	5.39 (3.74, 7.05)	
50 years or more	4.02 (3.04, 5.01)	
Sex		0.1141
Male	3.89 (2.44, 5.35)	
Female	5.39 (4.51, 6.28)	
Marital status		0.0449
Currently married	3.97 (3.05, 4.88)	
Not currently married	5.57 (4.31, 6.83)	
Race/ethnicity		0.0071
Non-Hispanic White	4.40 (3.47, 5.33)	
African American	5.31 (1.81, 8.81)	
Asian American	1.57 (0.21, 2.92)	
Hispanic/Latino	5.73 (3.56, 7.89)	
Other	8.49 (4.76, 12.22)	
Education level		0.6638
Bachelors or higher	4.69 (3.31, 6.08)	
Some college/vocational/Associates degree	5.42 (3.80, 7.05)	
High school or less	4.50 (3.21, 5.79)	
General health status		0.0705
Excellent, very good, good	4.39 (3.46, 5.33)	
Fair or poor	5.85 (4.49, 7.22)	
Psychological distress		0.0047
None	4.27 (3.40, 5.13)	
Mild to moderate	5.98 (3.52, 8.43)	
Serious	9.02 (5.53, 12.51)	
Insurance status		<.0001
Insured all past 12 months	3.76 (3.00, 4.52)	
Not insured all past 12 months	9.93 (6.94, 12.91)	
Geographic location		0.5857
Urban	4.90 (4.05, 5.76)	
Rural	4.33 (2.57, 6.10)	
Year		0.6283
2009-2010	4.11 (3.03, 5.18)	
2011-2012	5.28 (3.80, 6.75)	
2013	5.32 (3.46, 7.17)	
2014	4.91 (2.72, 7.10)	

CHIS = California Health Interview Survey, CI = Confidence Interval

Table 3. Association between food insecurity and delay in asthma prescription, CHIS 2009-2014, survey-weighted multivariable logistic regression results

	Adjusted OR (95% CI)	P value
Food security status		
Food secure	Reference	
Food insecure	2.48 (1.58, 3.89)	<.0001
Age		
18-34 years	Reference	
35-49 years	0.99 (0.60, 1.62)	0.9641
50 years or more	0.86 (0.51, 1.47)	0.5897
Sex		
Male	Reference	
Female	1.40 (0.90, 2.17)	0.1329
Marital status		
Currently married	Reference	
Not currently married	1.01 (0.71, 1.45)	0.9563
Race/ethnicity		
Non-Hispanic White	Reference	
African American	0.98 (0.42, 2.27)	0.9648
Asian American	0.34 (0.14, 0.79)	0.0126
Hispanic/Latino	1.05 (0.62, 1.78)	0.8515
Other	1.69 (1.03, 2.77)	0.0394
Education level		
Bachelors or higher	Reference	
Some college/vocational/Associates degree	0.70 (0.42, 1.15)	0.1594
High school or less	0.56 (0.36, 0.89)	0.0137
General health status		
Excellent, very good, good	Reference	
Fair or poor	1.00 (0.69, 1.47)	0.9856
Psychological distress		
None	Reference	
Mild to moderate	1.02 (0.63, 1.67)	0.9274
Serious	1.43 (0.79, 2.61)	0.2386
Insurance status		
Insured all past 12 months	Reference	
Not insured all past 12 months	2.35 (1.50, 3.69)	0.0002
Geographic location		
Urban	Reference	
Rural	0.84 (0.52, 1.36)	0.4834
Year		
2009-2010	Reference	
2011-2012	1.31 (0.84, 2.05)	0.2365
2013	1.28 (0.80, 2.06)	0.3039
2014	1.19 (0.65, 2.17)	0.5714

CHIS = California Health Interview Survey, OR = Odds Ratio, CI = Confidence Interval