WIC Participation, Education, Marital Status, Age, and Parity are Associated with Household Food Status among Pregnant Women

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Introduction: Food insecurity and hunger, first measured in the 1995 Current Population Survey, persists as a serious social and health concern. In 2001, 30 million people (almost 13 million of whom are children) experienced food insecurity (Nord 2002), defined as "whenever the availability of nutritionally adequate and safe food, or the ability to acquire acceptable foods in socially acceptable ways, is limited or uncertain" or hunger, defined as "the uneasy or painful sensation caused by a recurrent or involuntary lack of food and is a potential, although not necessary, consequence of food insecurity. Over time, hunger may result in malnutrition" (Anderson 1990). Food insecurity has been associated with poor nutrition (Rose 1997), poor diabetes management (Nelson 1998), poor school performance among children (Alaimo 2001a, b) and obesity (Townsend 2001, Olson 1999). The purpose of this study was to investigate the prevalence and predictors of food insecurity among pregnant women.

Methods: This sample includes 777 women who have completed participation in the Pregnancy, Infection, and Nutrition 3 (PIN3) prospective cohort study that examines the influence of infection, physical activity, nutrition, food security, and stress on preterm birth. Women were recruited at <20 weeks' gestation who were seeking services from prenatal clinics at UNC Hospitals. The food security module used is comprised of 18 questions that ask women to reflect on the household food status in the last 12 months. The questions increase in severity beginning with being worried that would food run out and continue with asking if portion sizes were cut, meals were skipped, days passed without food, and weight loss was experienced due to not enough food because of a lack of money to buy more food. Food security status was constructed based on the 18 item scale. Women who answered all questions in the negative were categorized as being from a food secure household. If only one or two questions were answered in the affirmative such as, "worried food would run out before (I/we) got more money," and "food bought didn't last and (I/we) didn't have money to get more," the household was categorized as worried about enough food. Lastly, if three or more questions were answered in the affirmative the household was categorized as food insecure. Very few households were identified as food insecure with moderate hunger (a subset of food insecure) and no households were identified as food insecure with severe hunger. Analysis included simple descriptive statistics, t-test for continuous variables and chi square test for categorical variables. Multivariate logistic regression was conducted to identify predictors of food security that included poverty (indicator of 185% poverty and below), education (indicator of less than 12 years compared to greater than 12 years), race (indicator for black and other race compared to white), age (indicator for 16-19 years and greater than 30 years compared to 20 to 29 years), parity (indicator for one and greater than two children compared to no children), and body mass index (BMI=kilograms over meters squared) categories (indicator for underweight as less than 18.5, overweight as between 25 and 29.9, and obese as greater than 30 BMI compared to normal BMI). Only those variables with a probability of 0.05 were included in the final model.

Results: The sample included women who were 69% White, 21% Black, and 7% other race. Descriptive statistics for individual characteristics are shown in Table 1 below. On average, women were 29 years old. Four percent of the women had less than a high school education,

18% had a high school education, 44% had some college, and 34% had more than a college education. The vast majority had incomes well above poverty (18% had incomes <185% poverty); 76% were married, 22% were single and 2% were widowed/ divorced/ separated; and 43% had no previous children. Pregravid BMI was distributed as follows—5% underweight (<18.5 BMI), 55% normal weight (18.6-24.9 BMI), 17% overweight (25-29.9 BMI), and 23% obese (>30 BMI). Twelve percent of the sample population had a preterm birth.

Table 1: Mean, proportion, standard deviation, and range of individual characteristics

Characteristic	Mean (SD)	Categorical Value	Percent (n)
Age (years)	29.0 (5.53)	Years: 16-19	5.4 (41)
		20-30	53.4 (406)
		> 31	41.2 (313)
Education (years)	15.9 (3.3)	< High School	3.8 (28)
		High School	18.1 (132)
		College	44.1 (322)
		> College	34.0 (248)
Income (% poverty)	424.9 (222)	< 185% poverty	18.0 (111)
BMI (kg/m^2)	25.6 (6.8)	Underweight (16-18.5)	5.0 (31)
		Normal (18.6-24.9)	54.7 (339)
		Overweight (25-29.9)	17.4 (108)
		Obese (>30)	22.9 (142)

We found that 86.4% of pregnant women participating in PIN3 were food secure, 8.2% were worried about enough food, and 5.4% were food insecure. Of the 5.4% food insecure households, only 0.64 were food insecure with moderate hunger and none were found to be food insecure with severe hunger. Characteristics of women by food security status are shown in Table 2.

Table 2: Mean and standard deviation of individual characteristics by food security category

Individual Characteristics	N	Food secure mean (SD)	N	Worried mean (SD)	N	Food insecure mean (SD)
Age	659	29.4 (5.4)	62	25.3 (5.5)*	39	27.5 (5.3)
Education	649	15.9 (3.2)	61	12.2 (2.5)*	36	12.9 (2.3)*
< high school %	37	5.7%	17	27.9%	7	19.4%
high school %	92	14.2%	26	42.6%	14	38.9%
college %	296	45.6%	14	23.0%	12	33.3%
> college %	224	34.5%	4	6.6%	3	8.3%
Number of children	666	0.8 (0.9)	63	1.2 (1.4)*	41	1.6 (1.2)*
% Poverty	539	456.4 (210.4)	39	161.2 (119.3)*	25	157.6 (126.3)*
% <185% poverty	539	13.0%	39	61.5%*	25	68.0*
BMI (kg/m2)	534	25.1 (6.5)	53	27.4 (7.1)*	33	30.9 (8.0) *
Underweight	25	4.7%	4	7.6%	2	6.1%
Normal weight	314	58.8%	17	32.1%	8	24.2%
Overweight	87	16.3%	16	30.2%	5	15.2%
Obese	108	20.2%	16	30.2%	18	54.6%*

* Significance at p = <0.05 using the food secure as the referent category

Based on this sample, women from households worried about enough food and food insecure had significantly less education, income, a greater average number of children, and greater pregravid BMI. There was no association between food insecurity and preterm birth.

Among women from households with incomes less than 185% of poverty, women from households that were worried or food insecure were more likely to engage in a food coping behavior (e.g., visit a food bank, borrow, send kids to others homes for meals), and were more likely to participate in WIC compared to low-income women in food secure households. Among households with incomes less than 130% of poverty, women from households worried about enough food were more likely to participate in the Food Stamp Program compared to both women from food secure and food insecure households.

A full model was fit including poverty, education, race, age, marital status, parity, WIC participation, Food Stamp participation, and BMI. Only those variables with a probability of 0.05 were included in the final model. In the final predictive model, WIC participation, education level of high school or less, not being married, age greater than 20 years, and greater than two children remained significantly associated with reporting being worried about enough food or food insecure (See Table 3).

Table 3: Factors associated with food worry/insecurity

Characteristics	Odds Ratio	95% Confidence Interval	P value
WIC participation (Yes)	3.44	1.95, 6.07	0.001
Education (<high school)	3.39	1.95, 5.91	0.001
Marital Status (unmarried)	2.87	1.62, 5.10	0.001
Age (> 20 years)	2.78	1.14, 6.78	0.025
Children (> two)	2.00	1.13, 3.36	0.016

Discussion

Better understanding the antecedents of food insecurity may have important implications for nutrition policy. We have developed a predictive model of factors associated with food worry/insecurity during pregnancy, using a previously validated instrument (Hamilton 1997). While ethnicity and income were not associated with food worry/insecurity, single parentage, increasing number of children, low education, and older age were significantly associated with food worry/insecurity in this study population. If these results were confirmed in larger and more diverse populations, such an approach could inform efforts to more effectively target food programs.

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