

Family Food Insufficiency, but Not Low Family Income, Is Positively Associated with Dysthymia and Suicide Symptoms in Adolescents¹

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ABSTRACT Food insufficiency has been shown to be associated with poor health, academic and psychosocial outcomes in American children, but the relationship between food insufficiency and depressive disorders in U.S. adolescents has not been studied. Further, there are no national estimates of the prevalence of depressive disorders for U.S. adolescents, nor investigation of associations with sociodemographic characteristics using national data. Therefore, we analyzed data for 15- and 16-y-old adolescents from the Third National Health and Nutrition Examination Survey (NHANES III). Depressive disorders and suicidal symptoms were assessed using the Diagnostic Interview Schedule. Adolescents were classified as "food insufficient" if a family respondent reported that the family sometimes or often did not have enough to eat. The prevalence of depression outcomes is reported by sociodemographic characteristics. Odds ratios for associations with food insufficiency are reported, adjusted for sociodemographic factors. Overall, lifetime prevalence of major depressive disorder was 6.3% and of dysthymia, 5.4%. Almost 5% of 15- to 16-y-old adolescents reported that they had ever attempted suicide and 38.8% reported at least one suicidal symptom. Female adolescents were significantly more likely than males to have had dysthymia, any depressive disorder and all symptoms of suicide. Low income adolescents were less likely to report suicide ideation than high income adolescents, but there were no other differences by family income. Food-insufficient adolescents were significantly more likely to have had dysthymia, thoughts of death, a desire to die and have attempted suicide. There is a strong association between food insufficiency and depressive disorder and suicidal symptoms in U.S. adolescents. *J. Nutr.* 132: 719–725, 2002.

KEY WORDS: • *depression* • *suicide* • *adolescents* • *hunger* • *food insufficiency*

The dramatic increase in economic inequality in the United States over the past three decades has translated into the highest level of child poverty of any developed nation (1,2). Currently, one in five American children lives in a poor family (3). Poverty is associated with many material hardships such as substandard or absent housing and lack of access to health care. One relatively common hardship that low income families experience is food insecurity (4,5). The USDA estimates that > 14 million children live in food-insecure households, i.e., households in which there is "limited or uncertain availability of nutritionally adequate or safe foods" (5).

Although there has been extensive documentation of the damaging effects of growing up poor in America, there has been relatively little research on the psychological consequences of resource-constrained food deprivation (6). Two studies from the Community Childhood Hunger Identification Project found that children identified as hungry and/or at risk of hunger were more likely to have behavioral problems and impaired psychosocial function, including symptoms of depression (7,8). In addition, research using the Third National

Health and Nutrition Examination Survey (NHANES III)⁴ showed that food-insufficient children and teen-agers were more likely to have seen a psychologist and had more problems getting along with other children (9). A fourth study demonstrated that compared with food-sufficient children, food-insufficient children had poorer health status and had more frequent stomach aches, headaches and colds (10).

The objectives of this paper are as follows: 1) to report the national lifetime prevalences of Diagnostic and Statistical Manual of Mental Disorders (DSM-III) major depression, DSM-III dysthymia and symptoms of suicide in 15- to 16-y-old American adolescents by sociodemographic characteristics, including family food insufficiency, and 2) to report associations among depression, dysthymia and symptoms of suicide and sociodemographic characteristics, including family food insufficiency. We postulated that family characteristics are associated with depressive syndromes and suicidal symptoms in this national sample of adolescents. Furthermore, we postulated that family food insufficiency is independently associated with these disorders and symptoms after adjusting for other sociodemographic characteristics.

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⁴ Abbreviations used: CI, confidence interval; DIS, Diagnostic Interview Schedule; DSM, Diagnostic and Statistical Manual of Mental Disorders; MDD, Major Depressive Disorder; NHANES III, Third National Health and Nutrition Examination Survey; OR, odds ratio; PIR, poverty index ratio.

A finding that family food insufficiency and depression and suicide are associated would be significant because the 12-mo prevalence of affective disorders is highest among 15- to 24-y olds (11) and suicide is the third leading cause of death for this same age group at 11.4 deaths per 100,000 (12). Discovering possible causes of these disorders that are amenable to policy and program interventions, such as food insufficiency, offers public policy makers and professionals an important role in the reduction of adolescent morbidity and mortality.

SUBJECTS AND METHODS

This analysis used data from NHANES III, a cross-sectional representative sample of the U.S. civilian, noninstitutionalized, nonhomeless population living in households conducted from 1988 to 1994. The Diagnostic Interview Schedule (DIS) was available for children ages 15–16 y ($n = 754$). Mexican-Americans and Black Americans were oversampled to provide more reliable estimates for these groups. Detailed descriptions of the sample design and operation of the survey have been published elsewhere (13).

NHANES III included medical examinations and interviews conducted with survey participants and proxies. All interviews were administered using standard protocols by trained interviewers (13). Ethical considerations were taken into account by the National Center for Health Statistics when the data were collected and survey participants cannot be identified in the data. For this analysis, data were used from the Household Family Questionnaires (proxy interviews) conducted in the home, and the DIS Questionnaire conducted in the Mobile Examination Centers.

Sociodemographic characteristics. For each adolescent in the survey, information about sex, age, race-ethnicity, metropolitan or nonmetropolitan region of residence, family income, and employment status and education of the family head were provided by a responsible adult living in the home. The “family head” was a person who owned or rented the home in which the adolescent lived.

Total family income for the previous 12 mo was reported for categories ranging from “less than \$1000” to “\$80,000 and over,” in \$1000 increments below \$19,999, in \$5000 increments between \$20,000 and \$49,999, and in \$10,000 increments between \$50,000 and \$79,999. A poverty index ratio (PIR) was then calculated by comparing the mid-point of the category and the adolescent’s family size to the Federal poverty line (14). These analyses used the following three poverty status categories: low income (defined as PIR $\leq 130\%$ of the poverty line, which is the federal cut-off point for eligibility for the Food Stamp Program); middle income (>130 to 300% of the poverty line); and high income ($>300\%$ of the poverty line).

Information on race and ethnicity of the adolescent was used to classify adolescents into the following race-ethnic categories: 1) non-Hispanic White adolescents, and “other” adolescents, 2) non-Hispanic Black-American adolescents, and 3) Mexican American adolescents. Twenty-seven Mexican American and five “other” adolescents were administered the DIS questionnaire in Spanish, which was too small a number to be able to statistically control for language of interview in our analyses. Analyses run with and without these adolescents did not change the results; therefore, these Spanish-speaking adolescents were kept in the analyses. In addition, 27 teenage girls reported having had at least one full-term birth. Again, analyses run with and without these girls did not change the results and they were kept in the analyses.

Food insufficiency. For the purpose of NHANES III, food insufficiency was defined as “an inadequate amount of food intake due to a lack of resources.” A child was classified as “food insufficient” if the respondent to the family questionnaire reported that the family either “sometimes” or “often” did not have enough food to eat. Cognitive testing has determined that this question is valid (15–20) and that respondents interpret the time frame associated with it from “just generally” to “within the past year” (16). The question has also been shown to be associated with food expenditure and nutrient intake (21–23).

Depression, dysthymia and symptoms of suicide. Lifetime history of major depressive disorder (MDD), dysthymia and symptoms of suicide were assessed using the DIS developed for the National Institute of Mental Health’s Epidemiologic Catchment Area program (24). The DIS includes a series of questions that asked about the adolescent’s lifetime history of depressive symptoms. MDD was diagnosed if the adolescent had a low mood or sadness for 2 wk or more with four concurrent symptom groups, this sadness was not due to medication or a medical condition, was not due to bereavement, and the episode was severe enough to cause help-seeking or subjective impairment. The symptom groups included the following: subjective weight loss or weight gain, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue, feelings of worthlessness or guilt, diminished ability to think or concentrate and suicidal symptoms (25).

Dysthymia was diagnosed if the adolescent reported a low mood for ≥ 2 y and reported at least two symptoms of the six symptom groups listed in the DSM-IV including the following: poor appetite or overeating, insomnia or hypersomnia, low energy or fatigue, low self-esteem, poor concentration or feelings of hopelessness (approximated by suicidal symptoms). There are two variations between the diagnosis used in this study and the DSM-IV criteria for dysthymia: first, the DSM-IV criteria include low mood for only 1 y or longer, but a 2-y criterion was assessed for these adolescents; second, the DSM-IV criteria require that the two other symptoms be concurrent with the low mood, but this timing was not assessed during NHANES III (25).

Four symptoms of suicide were assessed during the DIS and included a question asking whether there had been a period of 2 wk or longer when the adolescent: “thought a lot about death—either your own, someone else’s or death in general” or “felt like you wanted to die.” In addition, adolescents were asked if they “ever felt so low you thought of committing suicide” or if they had “ever attempted suicide.”

Changes in appetite and weight often accompany depression. Therefore, we also studied the three appetite questions asked as part of the DIS, i.e., whether there ever was a “period of two weeks or longer when you lost your appetite”; “have you ever lost weight without trying—as much as two pounds (0.9 kg) a week for several weeks [or as much as 10 pounds (4.5 kg) all together]” or was there a period in which “your eating increased so much that you gained as much as two pounds (0.9 kg) a week for several weeks [or 10 pounds (4.5 kg) all together].”

Statistical methods. Sample weights were created for the NHANES III data to take into account the oversampling of certain groups, such as Black and Mexican-Americans, as well as nonresponse. For these analyses, NHANES III weighted data were analyzed using the *svy* commands available in STATA Statistical Software (26). These commands use the weights and survey cluster design to calculate accurate point estimates and variances. Investigation of outliers and influential data points revealed that unusual adolescents with high sample weights had strong influence on the analyses, which reduced the accuracy of our estimates. To compensate for this problem, we transformed the sample weights using the square root of the sample weight. This kept the integrity of the relationship among adolescents to the total population while diminishing the influence of a few of the individuals.

Pearson χ^2 tests (two-tailed) were used to determine significant ($P < 0.5$) differences of depressive disorders and symptoms of suicide by age, gender and metropolitan region. Logistic regression models were created to test for significant differences among race-ethnicities, family income, family head education, employment and marital status after adjusting for age, gender and metropolitan region.

Logistic regression models were also created to test the hypothesis that food insufficiency is associated with major depression, dysthymia and symptoms of suicide, independent of potential confounders including all other sociodemographic variables described above. Interactions were not assessed because of the limited sample size and low prevalence of food insufficiency and depressive disorders. Population

attributable risks for food insufficiency were calculated using the odds ratios (OR) from the logistic regression models as estimates of relative risks (27).

For prevalence estimates and means, missing data were excluded from the analyses. For the logistic regression analyses testing differences by food sufficiency status, all missing data except for food insufficiency status and the outcomes were imputed using the *impute* command in STATA, which uses regression equations to fill in missing values based on other nonmissing data in the adolescent's record. Variables included in these regression equations were chosen separately for each imputed variable using backward step-wise regression to screen for associated variables. For dichotomous variables, *impute* was used to predict a probability, and a random value was selected based upon this probability. The number of missing values imputed ranged from 0 children missing data for whether the child had a regular source of health care to 70 (9.3%) adolescents missing data for their family's PIR. A total of 105 teenagers had at least one missing value. None of the teenagers were missing data for the food insufficiency question.

RESULTS

Table 1 shows the weighted sample characteristics for U.S. adolescents ages 15–16 y. The prevalence of family food insufficiency was 6.6%. The overall lifetime prevalence of major depression (MDD) was 6.3% and of dysthymia, 5.4% (**Table 2**). Almost 5% of 15- to 16-y-old adolescents reported that they had ever attempted suicide and 38.8% reported at least one suicidal symptom.

TABLE 1

*Sample characteristics for 15- to 16-y-old adolescents:
NHANES III, 1988–1994*

	n	U.S. prevalence	
		%	SEM
All	754	100.0	
Age, y			
15	352	46.8	(2.4)
16	402	53.2	(2.4)
Gender			
Male	365	50.7	(3.1)
Female	389	49.3	(3.1)
Region			
Metropolitan	350	43.6	(5.4)
Nonmetropolitan	404	56.4	(5.4)
Race-ethnicity			
Non-Hispanic White	201	66.7	(3.1)
Non-Hispanic Black	276	15.4	(1.6)
Mexican-American	239	7.8	(1.2)
Family income			
Low	319	27.0	(2.1)
Middle	241	40.0	(1.6)
High	127	33.0	(4.1)
Family head education			
< High school	310	25.3	(3.0)
High school	252	36.4	(2.7)
> High school	189	38.3	(2.9)
Family head employment status			
Unemployed	174	16.9	(1.9)
Employed	539	83.1	(1.9)
Family head marital status			
Single	252	28.6	(2.3)
Married	500	71.4	(2.3)
Food sufficiency status			
Food insufficient	86	6.6	(1.6)
Food sufficient	668	93.4	(1.6)

Table 2 shows the overall prevalences of depressive disorders and symptoms of suicide by age, gender, race-ethnicity, family income, family head education, employment and marital status and food insufficiency. There were no significant differences in the prevalence of disorder or suicidal symptoms by age or metropolitan region. Female adolescents were significantly more likely than male adolescents to have had dysthymia, any depressive disorder and all symptoms of suicide, including suicide attempt.

There were few significant differences among the race-ethnic groups after adjusting for age, gender and metropolitan region. Non-Hispanic Black adolescents were significantly less likely than non-Hispanic White adolescents to have had major depression and to report suicidal ideation. Mexican-American adolescents were significantly more likely to have attempted suicide than non-Hispanic White and non-Hispanic Black adolescents.

Trends in the prevalence of depressive disorders and suicidal symptoms varied by family income; the only significant difference was that low income adolescents were less likely to report suicide ideation than high income adolescents. In addition, adolescents who lived in families whose head had not completed high school or who only had a high school degree were significantly more likely to have had a desire to die than those who lived in a family whose head had more education than a high school degree.

Family head employment status was strongly associated with dysthymia, any depressive disorder and suicide attempt. Adolescents living in families in which the family head was unemployed were about twice as likely to have had dysthymia, any depressive disorder and to have attempted suicide. The only significant difference between adolescents who lived in families with single vs. married parents was for dysthymia; adolescents who lived in single-parent families were more than twice as likely to report dysthymia.

Except for gender, the results for food insufficiency were the most striking of all the characteristics studied. From the regression analyses testing for statistical significance, food-insufficient adolescents were significantly more likely to have had dysthymia and to report three of the four symptoms of suicide (**Table 3**). Remarkably, food-insufficient adolescents were 4.0 [95% confidence interval (CI), 1.6–10.0] times more likely to have had dysthymia, 2.0 (95% CI, 1.2–3.3) times more likely to have had thoughts of death, 3.4 (95% CI, 1.5–7.5) times more likely to have had a desire to die and 5.0 (95% CI, 1.7–14.6) times more likely to have attempted suicide.

The relationship between food insufficiency and three DIS appetite questions was examined (data not shown). As expected, food-insufficient adolescents were more likely ($P < 0.08$) to have reported losing weight without trying (OR: 1.8) and less likely ($P < 0.09$) to report gaining weight without trying (OR: 0.6). This apparently was not due to changes in their appetite because there was no difference between food-insufficient and food-sufficient adolescents reporting that there has been at least a 2-wk period in which they had lost their appetite (OR:1.3; $P = 0.4$).

Food insufficiency was frequent among adolescents with depressive disorders or who had attempted suicide. Notably, 13% (SE: 6.1) of adolescents who ever had MDD, 24% (SE: 7.4) of those with dysthymia, and 26% (SEM 8.0) of those who had attempted suicide lived in food-insufficient families, compared with 6.6% (SE: 1.6) overall (data not shown).

Attributable risk calculations ranged from 5 to 21% for the outcomes, with 17% (95% CI, 2.1–46.7%) of dysthymia and

TABLE 2

Prevalence of depressive disorders and suicide symptoms by sociodemographic factors and food sufficiency status for adolescents ages 15 to 16 y: NHANES III, 1988–1994

	n	Major depression		Dysthymia		Any depress. disorder		Thoughts of death		Desire to die		Suicide ideation		Suicide attempt		Any suicide symptom	
		%	SEM	%	SEM	%	SEM	%	SEM	%	SEM	%	SEM	%	SEM	%	SEM
All	754	6.3	(1.4)	5.4	(1.2)	9.3	(1.6)	30.1	(2.8)	11.8	(1.9)	19.8	(2.6)	4.6	(1.4)	38.8	(3.2)
Age, 1 y																	
15	352	5.5	(1.6)	5.4	(2.0)	9.3	(2.4)	27.9	(4.1)	10.2	(2.5)	18.0	(3.0)	4.6	(2.1)	37.2	(4.4)
16	402	7.1	(2.3)	5.5	(1.9)	9.4	(2.5)	32.1	(3.8)	13.3	(2.9)	21.3	(3.5)	4.5	(1.9)	40.3	(4.2)
Gender ¹																	
Male	365	3.9	(1.8)	2.5**	(1.2)	5.1**	(1.9)	25.6*	(3.4)	6.8**	(1.9)	12.0**	(2.6)	0.3**	(0.1)	31.3**	(3.4)
Female	389	8.8	(2.2)	8.4	(2.0)	13.7	(2.5)	34.8	(4.1)	17.0	(3.4)	27.8	(4.5)	9.0	(2.7)	46.6	(4.7)
Region ¹																	
Metropolitan	350	8.1	(2.5)	5.8	(1.9)	9.8	(2.4)	26.6	(3.5)	11.5	(2.9)	22.0	(3.8)	2.5	(1.4)	37.5	(3.8)
Nonmetropolitan	404	5.0	(1.4)	5.1	(1.4)	9.0	(1.8)	32.9	(4.2)	12.0	(2.7)	18.1	(3.7)	6.2	(2.1)	39.9	(4.7)
Race-ethnicity ²																	
Non-Hispanic White	201	6.9	(1.8)	4.9	(1.6)	8.9	(2.0)	32.0	(3.8)	13.2	(2.7)	22.6	(3.3)	3.9	(1.5)	41.9	(4.1)
Non-Hispanic Black	276	2.7*	(1.0)	5.2	(1.4)	6.5	(1.5)	30.4	(3.9)	11.8	(1.9)	10.1*	(2.2)	2.2	(0.9)	36.0	(3.3)
Mexican-American	239	9.2	(2.4)	7.2	(1.6)	12.4	(2.2)	31.7	(3.0)	11.8	(1.9)	19.0	(2.7)	7.2*	(1.6)	37.6	(3.4)
Family income ²																	
Low	319	8.1	(3.0)	6.4	(2.5)	9.9	(3.0)	27.6	(3.5)	14.2	(3.4)	12.7**	(2.3)	4.6	(2.2)	33.2	(3.9)
Middle	241	6.6	(1.9)	5.2	(2.5)	9.5	(2.7)	25.9	(4.1)	14.7	(3.0)	21.3	(3.7)	4.7	(2.4)	38.2	(5.1)
High	127	5.7	(2.7)	5.5	(2.5)	10.0	(3.5)	36.4	(5.7)	6.1	(3.3)	24.1	(5.5)	4.5	(2.4)	43.4	(5.8)
Family head education ²																	
< High school	310	8.3	(2.8)	5.1	(2.2)	10.0	(2.7)	29.3	(4.0)	18.0**	(4.2)	19.3	(3.9)	6.2	(2.4)	40.0	(4.9)
High school	252	5.9	(2.2)	4.3	(2.0)	7.5	(2.5)	33.7	(4.6)	13.0*	(3.5)	17.0	(3.6)	1.9	(1.5)	41.1	(5.0)
> High school	189	5.5	(2.2)	6.7	(2.5)	10.7	(3.1)	27.4	(3.6)	6.6	(2.2)	22.7	(4.7)	6.1	(2.6)	36.0	(4.7)
Family head employment status ²																	
Unemployed	174	11.2	(5.2)	9.3**	(3.6)	15.6*	(5.3)	35.7	(6.6)	12.5	(4.0)	19.2	(2.4)	8.8*	(3.8)	38.9	(6.8)
Employed	539	5.6	(1.5)	5.0	(1.3)	8.5	(1.7)	29.4	(3.0)	11.5	(2.4)	18.4	(3.3)	3.9	(1.4)	38.1	(3.5)
Family head marital status ²																	
Single	252	5.1	(2.3)	9.1*	(2.6)	11.5	(2.8)	35.7	(5.0)	12.8	(3.8)	18.6	(4.2)	9.9	(4.2)	42.7	(5.9)
Married	500	6.8	(1.6)	3.9	(1.2)	8.5	(1.7)	28.0	(3.6)	11.5	(1.7)	20.1	(2.8)	2.5	(0.9)	37.2	(3.8)
Food sufficiency status ³																	
Food insufficient	86	12.2	(7.2)	15.5	(7.1)	16.5	(7.0)	48.9	(4.9)	30.3	(8.5)	26.5	(6.2)	19.3	(6.9)	60.4	(6.6)
Food sufficient	668	5.9	(1.4)	4.7	(1.1)	8.8	(1.6)	28.8	(3.0)	10.5	(1.7)	19.3	(2.8)	3.6	(1.2)	37.3	(3.4)

¹ Tests of statistical significance are based on two-tailed Pearson χ^2 .

² Tests of statistical significance are based on logistic regression, adjusted for age, gender and metropolitan region.

³ Tests of statistical significance for food sufficiency status are shown in Table 3.

* $P < 0.05$; ** $P < 0.01$.

21% (95% CI, 2.3–56.8%) of suicide attempts “attributable” to food insufficiency (data not shown).

DISCUSSION

Food insufficiency was strongly associated with depressive disorders and symptoms of suicide in this analysis of national data. The literature on dieting and starvation indicates that there may be a biological mechanism by which food insufficiency causes or maintains depressed mood. In 1945, during World War II, 32 American conscientious-objectors volunteered for an experiment in which they were semistarved for 6 mo in a controlled setting (28). The results of this well-conducted study clearly document the psychological consequences these men faced while they dropped to 76% of their original body weight. Complete medical and psychological

examinations were conducted throughout the study, the 3-mo prestarvation control phase and the staged rehabilitation. Using each man’s diagnosis during the prestarvation phase as a control, these motivated volunteers experienced significant increases in social introversion, irritability and depression, and became obsessed with food during the semistarvation period. The increase in depressed mood was actually one of the most prominent changes from prestarvation to starvation. Recovery during the refeeding phase was slow but steady such that all depressive symptoms were eliminated by the end of the refeeding period. The authors attributed these changes to food deprivation rather than other study conditions because depression was not seen in men who shared the same living arrangement while participating in separate concurrent nondeprivation nutritional studies (28).

TABLE 3

Associations between depressive disorders and suicide symptoms, and food insufficiency for 15- to 16-y-old adolescents:
NHANES III, 1988–1994

	Major depression		Dysthymia		Thoughts of death		Desire to die		Suicide ideation		Suicide attempt	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Food sufficiency status												
Food insufficient ¹	1.8	(0.6, 5.8)	4.0	(1.6, 10.0)	2.0	(1.2, 3.3)	3.4	(1.5, 7.5)	1.9	(0.8, 4.2)	5.0	(1.7, 14.6)
Food sufficient	1.0		1.0		1.0		1.0		1.0		1.0	

¹ Adjusted for age, gender, metropolitan region, race-ethnicity, family income, family head education, family head employment status, and family head marital status; CI, confidence interval.

* $P < 0.05$; ** $P < 0.01$.

Further indication that food deprivation causes depressed mood comes from research on the psychological consequences of dieting. In her review, Polivy (29) concluded that chronic dieters or people who restrict their eating tend to have heightened emotional responsiveness and increased irritability and distraction. Overall assessments of weight loss programs or of weight fluctuations have been mixed, however, possibly due to assessment method (30,31). Many weight loss treatments have shown decreases in negative mood from pre- to poststudy as assessed by standardized questionnaires or checklists; these changes are likely due to the feeling of success that comes with losing weight (30,32). Clinical assessments of subjects during the weight loss period, on the other hand, have found transient increases in negative affect, in some cases causing clinically significant levels of depression (30,33,34).

Most of these dieting studies excluded depressed subjects, although some case studies of formerly depressed women indicate that dieting is associated with recurrence of depressive episodes in recovered patients (30,31). It is possible that food deprivation is a maintaining factor in depression and increases the duration of the disorder. This may explain why food insufficiency was significantly associated with dysthymia, which has a longer duration, and not with MDD.

Explanations other than the biological effects of food deprivation are also possible. Stressful life events and chronic stress have both been associated with adolescent depression, and absence of food could be seen as either a stressful event or a chronic stress if the food problem is prolonged (35,36). It may also be the case that the parent(s) of the adolescent are suffering from food deprivation, which could, in turn, affect their own emotional state and parenting behaviors. Families characterized by chronic stress, chaotic interactions, low levels of nurturance and inconsistent discipline are associated with depression in adolescence (25,37–40).

Depressive disorders were more common in girls. Compared with non-Hispanic White and Black adolescents, Mexican-American adolescents reported significantly higher rates of suicide attempt and had the largest prevalence of depressive disorders. Interestingly, low family income was not positively associated with depressive disorders or suicidal symptoms. High income adolescents reported more suicide ideation, but there were no other differences by family income.

Previous studies fairly consistently showed these same gender differences (39–41), although they are inconsistent on other characteristics. In a large survey of public-school adolescents in New York, Kandel and Davies (41) found no differences in prevalence of depressed mood by race-ethnicity, family income or father's education, although the prevalence

was slightly higher for the lowest income group (<\$3000/y). However, Schoenbach et al. (42) found more depressive symptoms in African-American and poor 12- to 15-y olds in North Carolina, and Kaplan et al. (43) found that lower social class adolescents were more depressed than higher social class adolescents. Roberts et al. (44) showed that African-American and Mexican-American adolescents had higher rates of depression than Caucasian adolescents. Increased depression and suicidal symptoms in Mexican-American adolescents may reflect cultural acceptance of these symptoms for expressing distress (45).

The finding that female gender was strongly associated with symptoms of suicide and history of attempted suicide may appear inconsistent with data showing that males are more likely than females to commit suicide (12). However, although males are four times more likely to die from suicide than are females, females are more likely to report attempting suicide than are males (46). This may be due to method choice and completion rates; males tend to choose methods such as firearms for which the likelihood of succeeding is much greater (46). For this retrospective study, it is likely that many of the would-be sample of male adolescents who attempted suicide sadly succeeded, and hence could not participate in the study.

Overall lifetime prevalence estimates found in this study of MDD and dysthymia are somewhat lower than other studies. Prevalence estimates of MDD in adolescents from community samples range from 0.4 to 2.9%, but lifetime prevalence of MDD has been estimated to be between 15 and 20% (11,39,40). To our knowledge, this is the first national survey in which prevalence estimates for depressive disorders have been made available specifically for adolescents. It is unclear whether the prevalence estimates found in the community samples are an overestimate or if in this survey, adolescents underreported their symptoms. Differences also may be due to a broader age range in the community studies.

Point prevalences of dysthymia has been found to be 1.6–8.0% (40), similar to the lifetime prevalence estimate reported here; however, this estimate has the potential to be either an underreport or an overreport due to the 2-y criterion of low mood used instead of the 1-y criterion listed in the DSM-IV, and because the other criteria symptoms did not have to be concurrent. According to the literature, ~70–76% of adolescents with dysthymia will eventually develop MDD (40,47). In fact, 41% (SEM 7.8) of the dysthymic adolescents in this study already had both syndromes, or “double depression” (data not shown).

The prevalence of suicidal symptoms reported here ranged from 5 to 30% with 39% of adolescents reporting at least one

suicidal symptom. The prevalence found in this study of suicide attempt (5%) is consistent with other community samples, which have found lifetime prevalence rates between 3.0 and 7.1% (40).

An important limitation in these analyses resides in the timing between our main explanatory variable, food insufficiency, and our outcome variables. We found an association between *current* family food insufficiency and *lifetime prevalence* of depressive disorders and symptoms of suicide. This means that we have found an association between a current state with a past and potentially on-going state. Recognizing this, we believe that these analyses are worthwhile for several reasons.

First, at any point in time, most persons who are poor will experience long stays in poverty; Bane and Ellwood (48) found that 75% of poor families were poor for the 4 y before the measurement time. Although similar research on the duration of spells of food insufficiency has not yet been conducted, we suspect that findings will be similar. In addition, >91% of adolescents with MDD reported that their worst depressive spell was within the past year (data not shown). Dysthymia, however, is associated with earlier onset than MDD. Not all dysthymic adolescents and those who had attempted suicide in this study were asked about their worst period because of skip patterns in the questionnaire but, of those who were asked, 88–92% stated that their worst spell was within the past year. According to Kovacs, mean duration of dysthymia is 4 y, which means that most ever dysthymic adolescents identified in this study are likely to be currently dysthymic (47).

These pieces of information led us to believe that the experiences of food insufficiency and symptoms of depression and suicide were fairly concurrent. Thus, we propose that the results of this study indicate that food insufficiency is associated with adolescent dysthymia and symptoms of suicide.

A second limitation of the present study is the absence of many potentially confounding variables known to be associated with depressive disorders that are missing from the NHANES III data, including history of abuse or neglect, parental and peer social support, parental psychological disorder, neighborhood characteristics and other life stresses (35–37,39–41,49–51). In addition, alcohol, cigarette and illegal drug use have also been associated with depressive disorders. Although use of these substances was assessed in NHANES III, the number of adolescents who actually reported use was so low (data not shown) as to be unbelievable compared with other estimates [see for example, (52)], and we decided not to use this information. It is likely that adolescents were unwilling to reveal substance use in this government survey. Finally, this study excluded homeless adolescents. Given that homeless people are more likely to be mentally ill and to be food insufficient, excluding them likely underestimates the prevalence of both and the association between them.

Research is required to assess whether the finding that family food insufficiency is associated with dysthymia and symptoms of depression is because of biological reactions to reduced food intake, reactions to food insufficiency as a stressor, or other unmeasured confounding factors such as chaotic parenting or child abuse and neglect. Nevertheless, this research demonstrates that a large percentage of dysthymic and suicidal adolescents are living in families that do not have enough food to eat. Unlike many factors that contribute to adolescent psychopathology such as child abuse or peer social support, food insufficiency is amenable to public policy programs such as increasing the minimum wage, expanding the Earned Income Tax Credit, increasing support for the Food Stamp Program and/or expanding the School Lunch, Breakfast, and Summer Food Service Programs. If food insufficiency

is a causal factor in dysthymia and suicidal behaviors, then public policies aimed at promoting food security could potentially prevent a substantial percentage of adolescent psychological morbidity and mortality.

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