

Social Epidemiology

Time in the United States, social support and health behaviors during pregnancy among women of Mexican descent

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Abstract

Among women of Mexican descent, increased acculturation in the US has been associated with poorer health behaviors during pregnancy. This study examined a population of low-income women of Mexican descent in an agricultural community to determine: whether social support patterns were associated with age at arrival in the US; whether social support was associated with pregnancy behaviors; and whether increased social support could prevent some of the negative pregnancy behaviors that accompany acculturation. Participants were 568 pregnant women enrolled in prenatal care in the Salinas Valley, California. Participants were predominantly Spanish speaking, born in Mexico, and from farmworker families. Information on social networks, social support, age at arrival in the US, and pregnancy health behaviors was gathered during interviews conducted during pregnancy and immediately after delivery. Poorer health behaviors were observed among women who had come to the US at a younger age. Social support during pregnancy was lowest among women who had come to the US at an older age. High parity, low education, and low income were also associated with low social support. Higher social support was associated with better quality of diet, increased likelihood of using prenatal vitamins, and decreased likelihood of smoking during pregnancy. High social support also appeared to prevent the negative impact of life in the US on diet quality. Women with intermediate or low levels of social support who had spent their childhoods in the US had significantly poorer diet quality than women who had spent their childhoods in Mexico. However, among women with high social support, there was no difference in diet quality according to country of childhood. Thus, in the case of diet quality, increased social support appears to prevent some of the negative pregnancy behaviors that accompany time in the US among women of Mexican descent.

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Introduction

The social stressors for immigrant women are considerable. Many face language barriers, discrimination, and separation from family, friends, and social resources. For Mexican immigrant women in

California's agricultural communities, these problems are often compounded by poverty, sub-standard housing conditions, and a migrant lifestyle (Bradman et al., 2005). Because of their mobility and, often, undocumented immigration status, pregnant women of Mexican descent in farmworker communities are a difficult-to-study population, with little known about their pregnancy health, health behaviors, and resources for social support.

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Studies have shown low levels of social support among recent immigrants (Vega & Kolody, 1985). With increasing time in the US, many Mexican immigrant women become more socially integrated and begin to develop social networks to replace those left behind in Mexico. Traditional Mexican culture places strong value on the extended family as a source of emotional support and assistance (Clark, 2001; Dunkel-Schetter, Sagrestano, Feldman, & Killingsworth, 1996). Relative to US-born women of Mexican descent, Mexican immigrants to the US are more likely to be married and to receive support from their partner but are less likely to have access to an established network of family and friends (Dunkel-Schetter et al., 1996).

With increasing time in the US, immigrant women tend to become more acculturated into US society and to adopt poorer, “Americanized” health behaviors during pregnancy. Studies of the effect of acculturation on pregnancy health have found that Mexican–American women born in the US are more likely to use cigarettes, alcohol, or illicit drugs during pregnancy (Vega, Kolody, Hwang, Noble, & Porter, 1997; Wolff & Portis, 1996) and to have poorer nutrition (Harley, Eskenazi, & Block, 2005) than immigrant women born in Mexico.

US-born Mexican–American women are at higher risk of delivering a low birth weight (Collins & Shay, 1994; Fuentes-Afflick & Lurie, 1997; Guendelman, Gould, Hudes, & Eskenazi, 1990; Singh & Yu, 1996; Ventura & Taffel, 1985; Zambrana, Scrimshaw, Collins, & Dunkel-Schetter, 1997) or preterm infant (Crump, Lipsky, & Mueller, 1999; Singh & Yu, 1996; Ventura & Taffel, 1985; Zambrana et al., 1997) than their Mexico-born counterparts. Poorer health behaviors and increased risk of preterm delivery have also been observed over a much shorter time frame: one study found increases in preterm delivery among Mexican women who had lived in the US for 5 years or more, compared to more recent immigrants (Guendelman & English, 1995).

Conceptual framework

Acculturation and the agricultural context

Acculturation has been described as “a multi-dimensional process in which individuals whose primary learning has been in one culture (e.g., the Mexican or Mexican–American culture) take over characteristic ways of living from another culture

(e.g., the mainstream, non-Hispanic white culture)” (Hazuda, Haffner, Stern, & Eifler, 1988). Acculturation encompasses changes in all cultural realms. Elements of acculturation that may affect pregnancy health include changes in diet, smoking and drinking patterns, family structures and social support, and access to health care.

Several multi-item acculturation scales (Cuellar, Harris, & Jasso, 1980; Deyo, Diehl, Hazuda, & Stern, 1985; Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987) have been developed to quantify acculturation among people of Mexican descent. Most of the variability in these scales is dominated by language variables, leading some investigators to develop shortened versions of their scales which use language variables only (Deyo et al., 1985; Marin et al., 1987), or a combination of language, ethnic identity, and nativity (Heilemann, Lee, Stinson, Koshar, & Goss, 2000; Scribner & Dwyer, 1989). Many studies of the effect of acculturation on health simply use country of birth as a proxy for acculturation into US society (Collins & Shay, 1994; Crump et al., 1999; Guendelman et al., 1990; Singh & Yu, 1996; Ventura & Taffel, 1985; Zambrana et al., 1997).

Acculturation levels may be particularly low in farmworker communities (Mehta et al., 2000). Many migrant and seasonal farmworkers maintain strong ties with Mexico and families often return to their homes in Mexico during the winter when there is little work to be had in agriculture. Spanish is the main language of many of California’s agricultural communities, with even US-born people reporting that Spanish is their primary language (Harley, Eskenazi, & Block, 2005).

Social support

Social support is defined as the resources provided by others (Cohen & Syme, 1985), particularly family and friends. Social support is often divided into sub-types such as emotional, informational, and instrumental support (Dunkel-Schetter et al., 1996). Emotional support encompasses love and affection, often from a spouse, family member, or close confidante. Informational support is related to the provision of advice, information, or guidance (Berkman, Glass, Brissette, & Seeman, 2000). Instrumental support is tangible assistance with concrete needs, such as lending money, helping with childcare, or providing help when someone is sick (Wills, 1985).

In epidemiologic studies, social support measures have often focused either on: (1) structural measures of social relationships or social network size, or (2) functional measures of an individual's own perception of support available or support received. Early studies assessed social support by quantifying and summarizing social relationships, such as marital status, church attendance, and number of close friends or relatives (Berkman & Syme, 1979; House, Robbins, & Metzner, 1982). However, not all relationships are supportive, and many researchers now recognize that structural aspects of social networks, such as the absolute number or density of social contacts, do not necessarily translate to more received support (Berkman & Glass, 2000). In contrast, functional measures of social support assess an individual's perception of the social support she actually receives or may receive in a time of need.

House and Kahn (1985) recommend that researchers assess all levels of social support, including social relationships, social networks, and social support received (sub-divided into types of support such as emotional, informational, and instrumental). Berkman et al. (2000) argue for an even larger conceptual model of the role of social support on health. They suggest that the effect of social support must be seen as a multi-level process beginning with the larger cultural context that shapes social networks which, in turn, influence health through social support, social influence, and access to material resources. Social support may influence health through behavioral, psychological, and physiological pathways.

Social support and pregnancy

Over the past 30 years, it has become increasingly accepted that social support can have a positive effect on a wide variety of health outcomes, including pregnancy (Berkman & Syme, 1979; Broadhead et al., 1983; House, Landis, & Umberson, 1988; Seeman, 1996). Studies during pregnancy have shown social support from spouse, family, or friends to be associated with reduced rates of pregnancy complications (Norbeck & Anderson, 1989; Nuckolls, Kaplan, & Cassel, 1972) and increased birth weight (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1993; Feldman, Dunkel-Schetter, Sandman, & Wadhwa, 2000; Mutale, Creed, Maresh, & Hunt, 1991; Turner, Grindstaff, & Phillips, 1990). Early studies of the effect of social

support on pregnancy outcome found increased rates of pregnancy complications only among women experiencing both high life stress and low social support (Nuckolls et al., 1972), leading to the theory that social support improved pregnancy health by buffering a woman's perception and reaction to stressful events. However, subsequent studies (Collins et al., 1993; Feldman et al., 2000; Mutale et al., 1991; Norbeck & Anderson, 1989; Turner, Langkamp-Henken, Littell, Lukowski, & Suarez, 2003) found higher levels of social support to be associated with better birth outcomes regardless of the mother's stress level, suggesting that social support may have a positive effect on pregnancy outcome independent of stress. Thus, three possible mechanisms for the effect of social support on pregnancy health have been suggested (Berkman et al., 2000; Cohen, Gottlieb, & Underwood, 2000); social support may: (1) act as a "stress buffer" by lessening a woman's physiologic response to stressful events; (2) directly affect the neuroendocrine system by improving the mother's psychological and emotional state; or (3) influence health-related behaviors during pregnancy.

Although it is plausible that social support may impact pregnancy outcome by influencing beneficial health behaviors, there is a paucity of data examining this. Social support has been associated in some studies with earlier initiation of prenatal care (Giblin, Poland, & Ager, 1990; Schaffer & Lia-Hoagberg, 1997; Zambrana, Dunkel-Schetter, & Scrimshaw, 1996; Zambrana et al., 1997) and lower smoking (Schaffer & Lia-Hoagberg, 1997), alcohol (Stephens, 1985), or drug use (Giblin et al., 1990) during pregnancy. However, another study found no effect of social support on these pregnancy behaviors (Aronson, 1989). No previous studies have specifically examined the effect of social support on nutrition during pregnancy.

The present study examines the inter-relationship of acculturation, social support, and health behaviors among Mexican and Mexican-American pregnant women living in an agricultural community in California. The purpose of this study was to determine: (1) how overall social support during pregnancy differed according to the amount of time lived in the US; (2) whether social support was associated with health behaviors during pregnancy; and, if so, (3) whether social support modified the association of negative pregnancy behaviors with acculturation among Mexican and Mexican-American women.

Methods

Subjects and recruitment

Subjects were participants in the Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS), a longitudinal birth cohort study of the health of pregnant women and their children living in the Salinas Valley, an agricultural region of California. Most of the study participants were of Mexican descent and came from farm-worker families. Details of the design and implementation of the CHAMACOS study have been published elsewhere (Eskenazi et al., 2004, 2003). The study was approved by the institutional review board at UC Berkeley. Briefly, pregnant women entering prenatal care between October 1999 and October 2000 at a county hospital and five regional clinics were screened for eligibility and invited to participate in the study. Eligible women were 18 years or older, spoke English or Spanish, were less than 20 weeks gestation at enrollment, qualified for Medicaid (which is not dependent on legal immigration status), and planned to deliver at the county hospital.

A total of 601 women were enrolled in the study. The present analysis was restricted to the 571 participants of Mexican descent. Three women were missing information on social support, leaving a final sample size of 568.

Measurements

Women were interviewed three times: near the end of the first trimester of pregnancy (enrollment; mean \pm SD = 13 \pm 5 weeks gestation), at the end of the second trimester of pregnancy (mean \pm SD = 25 \pm 2 weeks gestation), and following delivery. All interviews were conducted in English or Spanish by trained bilingual, bicultural interviewers, with the majority of interviews (94%) conducted in Spanish. Study instruments were translated by a professional translator and reviewed by Mexican–American and Mexican immigrant staff members who were familiar with the language of the community and of the regions of southern Mexico from where many local residents migrated.

Information on acculturation and time lived in the US was gathered at the enrollment interview. Each participant was asked about her ethnic identity, her country of birth and her parents'

countries of birth, her first language spoken, and the language she spoke at home (with the possible responses: Spanish only, more Spanish than English, both Spanish and English equally, more English than Spanish, English only, or another language). Because nearly all of the women in the study were Spanish speaking and born in Mexico, the main acculturation-related variables used were age at arrival in the US and total time residing in the US. Many families move back and forth between the US and Mexico, so each woman was asked her age when she first moved to the US, as well as the total number of years she had lived in the US. Age at arrival in the US was categorized as 0–10, 11–20, and 21 years or older to differentiate women who had spent their childhoods in the US from those arriving as adolescents or adults. The 0–10-year category included 63 women who were born in the US. Time in the US was defined as a categorical variable with the categories <5, 6–10, >11 years, and entire life. "Entire life" was defined as living at least 90% of her life in the US and included women born in the US as well as four women born in Mexico who immigrated to the US in infancy. A small number of women born in the US had spent a considerable portion of their lives in Mexico and were thus categorized as <5 or 6–10 years. The 5-year interval between categories was selected because previous studies have found changes in health behaviors and birth outcomes after just 5 years of residence in the US (Guendelman & English, 1995).

Information was also gathered at the enrollment interview about demographic covariates such as age, marital status, parity, education level, and family income. Poverty level was calculated by dividing household income by the number of people supported by that income and comparing it to federal poverty thresholds (US Census Bureau, 2000). Because maternal attitude toward the pregnancy might influence health behaviors, women were asked how they felt about being pregnant, with the options: "Happy about having the baby now", "Happy, but I would have preferred to wait", "Okay", "Unhappy", and "Don't know". Much of the information gathered was very sensitive and particular care was taken to protect the privacy of the study participants, including receiving a certificate of confidentiality for the study from the US Health and Human Services Administration. Participants were not asked about their legal immigration status.

Information about social networks and social support was gathered primarily at the enrollment interview. Social networks were assessed by asking the woman how many close relatives or friends she had that she could confide in or count on, who she lived with during her pregnancy, her marital status, and how often she attended church. Social support was measured using a modified version of the Duke-University of North Carolina Functional Social Support Questionnaire (FSSQ) (Broadhead, Gehlbach, de Gruy, & Kaplan, 1988). This eight-item questionnaire assesses perceived social support but does not differentiate between sources of support. Participants were asked how strongly they agreed with statements such as “I have people who care what happens to me” and “I have chances to talk to someone I trust about my personal and family problems”, with responses on a Likert scale ranging from 5 (as much as I would like) to 1 (much less than I would like). The FSSQ measures two dimensions of emotional social support: affective support (the perception of being loved and valued) and confidant support (the availability of someone to discuss and share important life matters). Because the FSSQ does not measure instrumental support (i.e., assistance with tasks and material needs), two additional questions were added to assess this construct. These were “I have help around the house or with child care” and “I have people who help me when I can’t make ends meet”. The reliability and validity of the FSSQ has been established in both English and Spanish in other studies (Bellon Saameno, Delgado Sanchez, Luna del Castillo, & Lardelli Claret, 1996; Broadhead et al., 1988). Good internal consistency was observed with the modified, 10-question version of the FSSQ used in this study (Cronbach’s $\alpha = 0.86$). To gather information on support from the baby’s father, one additional question was asked of the mothers after delivery: women were asked how supportive they felt the baby’s father had been during the entire pregnancy, with the response options “very supportive”, “somewhat supportive”, “not as supportive as I would have liked”, “not at all supportive”, and “father not involved”. Women giving any of the last three answers were considered to have low partner support.

Information on the amount of smoking, drinking, and drug use in the previous trimester was gathered at each of the three interviews. Women were classified as smokers if they reported smoking during any trimester of pregnancy. Similarly,

women were classified as using drugs if they reported drug use during any trimester. Because many women reported drinking one or two drinks during pregnancy, women were only classified as drinking alcohol if they drank at least one drink per week in any trimester of pregnancy. The week of pregnancy the woman entered prenatal care was gathered from medical records following delivery. Early entry to prenatal care was defined as beginning prenatal care before the 13th week of pregnancy. Because of missing data on health behaviors, the total sample size for analyses is less than 568 for some outcomes.

Information about dietary habits and vitamin supplement use was obtained at the second interview. Diet during pregnancy was assessed using a 72-item, interviewer-administered food frequency questionnaire, based on the Spanish-language Block 98 Questionnaire (Block, Thompson, Hartman, Larkin, & Guire, 1992; Block, Woods, Potosky, & Clifford, 1990), but tested and modified for this population (Harley & Eskenazi, 2004). Because morning sickness may change a woman’s dietary habits in early pregnancy, women were asked about usual food intake during the second trimester only. Frequency and portion size were gathered for each food item, with photographs used to help participants estimate portion size. Food and vitamin supplement consumption was converted to average daily energy and nutrient intake based on the USDA Nutrient Database for Standard Reference (US Department of Agriculture Agricultural Research Service, 1999).

Overall quality of diet was quantified using the Diet Quality Index for Pregnancy (DQI-P) (Bodnar & Siega-Riz, 2002), which was calculated from food frequency questionnaire data. The DQI-P is an 80-point scale made up of eight dietary characteristics which each contribute a maximum of 10 points. The first three components are based on the adequacy of daily servings of grains (6–10 servings depending on caloric intake), fruits (3–5 servings depending on caloric intake), and vegetables (2–4 servings depending on caloric intake) as recommended by the Dietary Guidelines for Americans (US Department of Agriculture & Department of Health and Human Services, 2000). The fourth component reflects intake of fat as compared to the recommended level (<30% of energy intake). The next three components reflect the adequacy of folate, iron and calcium intake, nutrients particularly important during pregnancy, based on the woman’s intake as

a percentage of the level recommended by the Dietary Reference Intakes (Institute of Medicine, 2001). The final component of the DQI-P, number of meals and snacks per day, was not available in our study and was not included in the index. Thus, a modified version of the DQI-P with a maximum score of 70 was used for these analyses. In other respects, the nutritional assessment techniques used in this study were very similar to those used in the development of the DQI-P. Higher DQI-P scores indicate better diet quality. DQI-P scores were divided into tertiles and women were categorized as high (DQI-P range: 49–67), medium (DQI-P range: 40–49), and low (DQI-P range: 16–40) diet quality.

Data analysis

Social support scores ranged from 1 to 5, with higher scores indicating better social support. *T*-tests and ANOVAs were used to compare mean functional social support scores according to age at arrival in the US, time in the US, and preferred language, and according to socio-demographic characteristics and structural measures of social networks. Bonferroni adjustments were used to account for multiple comparisons.

Logistic regression was used to assess the association of age at arrival in the US or time in the US (as categorical variables) with behaviors during pregnancy (i.e., smoking, alcohol use, drug use, early entry to prenatal care, prenatal vitamin use, and high diet quality). Logistic regression was also used to examine the association of social support scores (as a continuous variable), marital status, and support from the father (both categorical variables) with pregnancy behaviors. All models also included maternal age, parity, maternal education level, family income (above or below poverty level), and mother's feelings about the pregnancy, to control for confounding by these variables.

Interaction between age at arrival in the US and social support was tested by including interaction terms in the multiple logistic regression models. Interaction terms (came to US in childhood \times social support, came in adolescence \times social support, came in adulthood \times social support) were created and likelihood ratio tests were used to compare the models with and without the interaction terms. The interaction terms were tested as a group and one by one, with statistical interaction considered present

for *p*-values <0.2 . Similar interaction terms were created using number of years the US. All analyses were conducted using Stata 8.0.

Results

Table 1 shows the demographics, social network characteristics, and social support levels of the population. The median age of participants was 25 years (range: 18–43) and approximately two-thirds of participants were multiparous. Almost half of the women had a sixth grade education or less and 63% were living below the federal poverty level (with almost all within 200% of this level). More than 80% of women were married and 60% lived with other adult extended family members, such as their parents, in-laws, siblings, aunts, uncles, or cousins. Almost half of the participants reported that they had one or fewer close friends or relatives that they could confide in or call upon for help. Approximately 30% of women attended church on a weekly basis and 40% attended church occasionally. Most women were happy to be pregnant, although 30% said they would have preferred to wait.

The mean social support score in this population was 3.7 ± 0.9 (range: 1.2–5). Mean scores for confidant, affective, and instrumental support were 3.6 ± 1.0 , 4.1 ± 0.9 , and 3.5 ± 1.3 , respectively. Social support scores associated with various demographic characteristics are shown in Table 1. Women with one or more older children had lower overall social support ($p = 0.009$), affective support ($p < 0.001$), and instrumental support ($p = 0.003$) scores than first-time mothers. Women with some high school education or who had completed high school had higher scores for all aspects of social support than women with a sixth grade education or less ($p < 0.001$ for total social support). Women living above the poverty level had higher overall social support ($p = 0.02$), confidant support ($p = 0.05$), and affective support ($p = 0.01$) scores than women living below the poverty level. Maternal age was not associated with social support.

Table 1 also shows the association of marital status, living arrangement, and other social network parameters with perceived social support scores. Predictably, having more close relatives or friends was associated with a higher mean overall social support score ($p < 0.001$ for 2+ vs. 1, 2+ vs. 0, and 1 vs. 0), as well as higher confidant, affective, and instrumental support scores. Women who lived in the same household as their mothers had increased

Table 1

Socio-demographic characteristics and mean social support scores during pregnancy among low-income women of Mexican descent

	<i>N (%)</i>	Total social support Mean (SD)	Confidant support Mean (SD)	Affective support Mean (SD)	Instrumental support Mean (SD)
<i>Age (years)</i>					
18–24	274 (48.2)	3.8 (0.9)	3.7 (1.1)	4.1 (0.9)	3.6 (1.3)
25–29	168 (29.6)	3.7 (1.0)	3.6 (1.1)	4.0 (1.0)	3.4 (1.4)
30–34	86 (15.1)	3.7 (0.9)	3.6 (1.0)	4.0 (0.9)	3.5 (1.3)
35+	40 (7.0)	3.7 (0.7)	3.7 (0.8)	4.0 (0.9)	3.4 (1.3)
<i>Parity</i>					
0	203 (35.7)	3.9 (0.9) ^a	3.7 (1.1)	4.3 (0.9) ^b	3.8 (1.3) ^c
1+	365 (64.3)	3.7 (0.9) ^a	3.6 (1.0)	4.0 (0.9) ^b	3.4 (1.3) ^c
<i>Education</i>					
6th grade or less	255 (44.9)	3.5 (0.9) ^{d,e}	3.4 (1.1) ^{f,g}	3.9 (1.0) ^{h,i}	3.2 (1.4) ^{j,k}
7th to 12th grade	214 (37.7)	3.9 (0.9) ^d	3.8 (1.0) ^f	4.2 (0.9) ^h	3.7 (1.2) ^j
Completed high school	99 (17.4)	4.1 (0.7) ^e	3.9 (0.8) ^g	4.4 (0.8) ⁱ	4.0 (1.1) ^k
<i>Family income</i>					
At or below poverty level	356 (62.7)	3.7 (0.9) ^l	3.6 (1.0) ^m	4.0 (1.0) ⁿ	3.5 (1.3)
Above poverty level	212 (37.3)	3.9 (0.9) ^l	3.7 (1.0) ^m	4.2 (0.9) ⁿ	3.6 (1.4)
<i>Marital status</i>					
Married/living as married	461 (81.3)	3.8 (0.9)	3.6 (1.0)	4.1 (0.9) ^o	3.6 (1.3)
Single	106 (18.7)	3.7 (1.0)	3.6 (1.1)	3.9 (1.0) ^o	3.5 (1.4)
<i>Lived with her mother</i>					
Yes	88 (15.5)	4.1 (0.9) ^p	3.9 (1.0) ^q	4.3 (0.8) ^r	4.1 (1.2) ^s
No	480 (84.5)	3.7 (0.9) ^p	3.6 (1.0) ^q	4.1 (0.9) ^r	3.4 (1.3) ^s
<i>Lived with extended family*</i>					
Yes	351 (61.8)	3.8 (0.9)	3.6 (1.0)	4.1 (0.9)	3.7 (1.3) ^t
No	217 (38.2)	3.7 (0.9)	3.7 (1.0)	4.0 (0.9)	3.3 (1.4) ^t
<i>Number of close friends/relatives</i>					
0	47 (8.3)	2.9 (0.9) ^u	2.5 (1.0) ^v	3.6 (1.1) ^w	2.8 (1.4) ^{x,y}
1	212 (37.4)	3.6 (0.9) ^u	3.5 (1.0) ^v	4.0 (1.0) ^w	3.5 (1.3) ^x
2 or more	308 (54.3)	4.0 (0.8) ^u	3.9 (0.9) ^v	4.2 (0.8) ^w	3.7 (1.3) ^y
<i>Attends church</i>					
Never	152 (31.3)	3.7 (0.9)	3.5 (1.1)	4.1 (1.0)	3.6 (1.3)
Occasionally	189 (38.9)	3.7 (0.9)	3.6 (1.0)	4.0 (0.9)	3.4 (1.3)
Weekly	145 (29.8)	3.7 (0.9)	3.6 (1.0)	4.1 (0.9)	3.5 (1.3)
<i>Feelings about the pregnancy</i>					
Happy, wanted baby now	360 (63.6)	3.9 (0.9) ^{z, aa}	3.7 (1.0) ^{bb}	4.2 (1.0) ^{cc}	3.7 (1.3) ^{dd, ee}
Happy, would have preferred to wait	170 (30.0)	3.6 (0.9) ^z	3.5 (1.0)	4.0 (0.9) ^{cc}	3.4 (1.3) ^{dd}
Okay, unhappy, don't know	36 (6.4)	3.3 (1.0) ^{aa}	3.2 (1.1) ^{bb}	3.5 (0.9) ^{cc}	2.9 (1.4) ^{ee}

CHAMACOS Study, Salinas Valley, California, 2000–2001.

*Extended family includes parents, parents-in-law, aunt, uncle, cousin, siblings, brother-in-law, and sister-in-law.

^{a,b}Values with the same superscript are significantly different ($p < 0.05$).

overall social support scores ($p < 0.001$) and increased confidant ($p = 0.002$), affective ($p = 0.004$) and instrumental ($p < 0.001$) support scores compared to women who did not live with their mothers. Living with extended family was associated only with increased tangible support

($p < 0.01$) and being married was associated only with increased affective support ($p = 0.03$). Church attendance was not associated with any aspect of perceived social support.

Acculturation-related variables are shown in Table 2. The median age when moving to the US

Table 2

Mean overall social support score during pregnancy and mean score of confidant, affective, and tangible support during pregnancy according to time in the US CHAMACOS Study, Salinas Valley, California, 2000–2001

	<i>N</i> (%)	Total social support Mean (SD)	Confidant support Mean (SD)	Affective support Mean (SD)	Instrumental support Mean (SD)
<i>Came to the US</i>					
Childhood (age 0–10)*	91 (16.0)	4.1 (0.8) ^{a,b}	4.0 (0.9) ^{c,d}	4.4 (0.8) ^{e,f}	4.0 (1.1) ^{g,h}
Adolescence (age 11–20)	254 (44.7)	3.7 (0.9) ^a	3.6 (1.1) ^c	4.0 (1.0) ^e	3.6 (1.3) ^g
Adulthood (age 21+)	223 (39.3)	3.6 (0.9) ^b	3.5 (1.0) ^d	4.0 (0.9) ^f	3.3 (1.4) ^h
<i>Time residing in the US</i>					
5 years or less	311 (54.8)	3.6 (0.9) ⁱ	3.5 (1.1) ^k	4.0 (1.0) ^l	3.4 (1.3) ^m
6–10 years	121 (21.3)	3.8 (0.9) ^j	3.6 (1.1)	4.1 (0.9)	3.6 (1.3)
11 years or more	80 (14.1)	3.8 (0.9)	3.7 (0.9)	4.2 (0.9)	3.5 (1.4) ⁿ
Entire life**	56 (9.9)	4.2 (0.8) ^{i,j}	4.1 (0.9) ^k	4.4 (0.8) ^l	4.1 (1.1) ^{m,n}
<i>Language spoken</i>					
Mostly Spanish	516 (91.7)	3.7 (0.9)	3.6 (1.0)	4.1 (0.9)	3.5 (1.3) ^o
Both Spanish and English	25 (4.4)	4.1 (0.8)	3.9 (1.0)	4.3 (0.7)	4.3 (1.1) ^o
Mostly English	22 (3.9)	4.1 (0.8)	4.0 (0.9)	4.4 (0.9)	4.0 (1.2)

*Includes women born in the US.

**Lived in the US for 90% of life or more.

^{a,b}Values with the same superscript are significantly different ($p < 0.05$).

was 19 years (range: 0–37 years) and the median time residing in the US was 5 years (range: 0–34 years). Only 11% of women were born in the US (not shown) and 10% had lived their entire lives in the US. Almost all the women were Spanish speaking, with 43% of women who had lived their entire lives in the US speaking mostly Spanish at home.

The association of time in the US variables and mother's perceived social support during pregnancy is shown in Table 2. Women who had spent their childhoods in the US had significantly higher scores for all aspects of social support than women who immigrated to the US later in life. Similarly, women who had lived in the US for 5 years or less had significantly lower scores for every aspect of social support than women who had lived their entire lives in the US and there was a statistically significant trend of increasing social support scores for all aspects of social support with increased time in the US. Women who were bilingual had higher levels of instrumental support than women who spoke mostly Spanish ($p = 0.01$). No other associations were seen with language preference, but this may have been due to small sample sizes.

Table 3 shows the distributions of health-related behaviors during pregnancy. Smoking, drug, and alcohol use were uncommon in this population. Four percent of women reported smoking during

Table 3

Health behaviors during pregnancy among time in the US CHAMACOS Study, Salinas Valley, California, 2000–2001

	<i>N</i> (%)
<i>Smoked during pregnancy</i>	
Yes	24 (4.2)
No	544 (95.8)
<i>Used drugs during pregnancy</i>	
Yes	8 (1.6)
No	481 (98.4)
<i>Alcohol use during pregnancy</i>	
None	370 (74.0)
Less than 1 drink/week	122 (24.4)
1 or more drinks/week	8 (1.6)
<i>Began prenatal care in first trimester</i>	
Yes	371 (67.7)
No	177 (32.3)
<i>Used prenatal vitamins</i>	
Yes	424 (92.0)
No	37 (8.0)
<i>Diet quality index</i>	
Low	156 (33.1)
Medium	157 (33.3)
High	159 (33.7)

pregnancy and less than 2% of women reported using drugs or consuming alcohol during pregnancy. Two-thirds of women began prenatal care

during the first trimester of pregnancy and 92% reported using prenatal vitamins during the second trimester.

The crude associations of age at arrival in the US and pregnancy behaviors are shown in Table 4. Compared to women who moved to the US as adults, women who had spent their childhoods in the US were five times as likely to smoke during pregnancy ($p = 0.002$) and 50% less likely to have a high quality diet ($p = 0.04$). Women who had spent their childhoods in the US were also considerably more likely to use drugs during pregnancy ($p = 0.02$), although the sample size was very small for this analysis. No differences in pregnancy behaviors were found comparing women who had come to the US as adolescence to those who had come as adults. Similar results were found with time in the US, with women who had lived their entire lives in the US being more likely to smoke and use drugs and less likely to have high diet quality than women who had lived in the US for 5 years or less.

Table 5 shows the adjusted associations of social support and pregnancy behaviors. For diet quality, significant interaction was found between social support and coming to the US in childhood; thus, the effect of social support on diet quality is stratified by country of childhood. Similar interaction was found with drug use, although the sample size was too small to be conclusive, and drug use is not included in Table 5.

After controlling for age at arrival in the US, maternal age, parity, education level, income, and feelings about the pregnancy, increasing social support was associated with decreased likelihood of smoking during pregnancy, although only the association of affective support with smoking avoidance was statistically significant ($p = 0.01$). Being married was significantly associated with reduced likelihood of both smoking ($p = 0.02$) and drinking alcohol ($p = 0.04$) (data not shown). Total social support was also suggestive of an increased likelihood of using prenatal vitamins, with increasing confidant support associated with increased vitamin use ($p = 0.03$). No association was seen between perceived social support and entry to prenatal care in the first trimester. All associations between social support score and pregnancy behaviors persisted when marital status was included as a covariate in the models.

Increasing perceived social support during pregnancy was also associated with better quality of diet. These findings were statistically significant among

Table 4

Unadjusted odds ratios (OR) and 95% confidence intervals (CI) for health-related behaviors during pregnancy associated with age at arrival in the US and years lived in the US CHAMACOS Study, Salinas Valley, California, 2000–2001

	Smoked		Used alcohol ^a		Used drugs		Received early prenatal care		Used prenatal vitamins		High diet quality index	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
<i>Age at arrival in the US</i>												
Childhood (age 0–10)	5.0 (1.8, 13.9)	<0.01**	0.7 (0.1, 6.3)	0.75	13.6 (1.6, 118.6)	0.02*	1.1 (0.6, 1.9)	0.75	1.3 (0.4, 3.7)	0.61	0.5 (0.3, 1.0)	0.04*
Adolescence (age 11–20)	1.0 (0.3, 3.1)	0.97	0.7 (0.2, 3.1)	0.63	1.9 (0.2, 21.0)	0.60	1.3 (0.9, 2.0)	0.16	1.4 (0.7, 3.0)	0.33	1.0 (0.7, 1.6)	0.84
Adulthood (age 21+)	Reference		Reference		Reference		Reference		Reference		Reference	
<i>Time in the US</i>												
5 years or less	Reference		Reference		Reference		Reference		Reference		Reference	
6–10 years	0.7 (0.2, 2.5)	0.58	2.5 (0.5, 12.6)	0.27	4.9 (0.4, 54.5)	0.2	2.0 (1.2, 3.3)	<0.01**	1.1 (0.5, 2.6)	0.79	1.2 (0.7, 1.9)	0.57
11 years or more	—		1.4 (0.1, 13.7)	0.77	—		1.4 (0.8, 2.4)	0.22	1.9 (0.6, 6.6)	0.31	0.7 (0.3, 1.3)	0.22
Entire life	5.9 (2.4, 14.7)	<0.01**	2.1 (0.2, 20.4)	0.53	29.3 (3.3, 257.0)	<0.01**	1.0 (0.5, 1.8)	0.99	0.9 (0.3, 2.8)	0.90	0.4 (0.2, 0.9)	0.06*

—No smokers or drug users in the 11 years or more category.

*p-value < 0.05.

**p-value < 0.01.

^a1 drink/week or more during any trimester of pregnancy.

Table 5

Adjusted^a odds ratios (OR) and 95% confidence intervals (CI) for health-related behaviors during pregnancy associated with different measures of social support. CHAMACOS Study, Salinas Valley, California, 2000–2001

	Smoked		Received early prenatal care		Used prenatal vitamins		High diet quality index		US childhood	
	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value
Total social support (range: 1–5)	0.6 (0.4, 1.0)	0.07	1.1 (0.9, 1.3)	0.45	1.4 (1.0, 2.1)	0.07	1.4 (1.1, 1.8)	<0.01**	2.3 (0.9, 6.3)	0.10
Confidant support (range: 1–5)	0.8 (0.5, 1.2)	0.31	1.1 (0.9, 1.3)	0.49	1.4 (1.0, 2.0)	0.03*	1.2 (1.0, 1.4)	0.14	2.2 (0.9, 5.2)	0.09
Affective support (range: 1–5)	0.6 (0.4, 0.9)	<0.01**	1.1 (0.9, 1.3)	0.49	1.3 (0.9, 1.8)	0.15	1.4 (1.1, 1.8)	<0.01**	2.2 (0.8, 6.3)	0.14
Instrumental support (range: 1–5)	0.8 (0.6, 1.1)	0.17	1.0 (0.9, 1.2)	0.63	1.1 (0.8, 1.4)	0.64	1.4 (1.1, 1.6)	<0.01**	1.4 (0.7, 2.6)	0.33
<i>Marital status</i>										
Not married	Reference		Reference		Reference		Reference		Reference	
Married/living as married	0.3 (0.1, 0.8)	0.02*	1.2 (0.8, 2.0)	0.41	0.9 (0.3, 2.2)	0.76	1.1 (0.6, 2.0)	0.70	0.9 (0.2, 3.4)	0.84
<i>Social support from father</i>										
Low support	Reference		Reference		Reference		Reference		Reference	
High support	1.2 (0.3, 4.3)	0.80	1.0 (0.6, 1.6)	0.91	1.3 (0.6, 3.2)	0.50	2.0 (1.1, 3.8)	0.02*	1.2 (0.1, 9.9)	0.85

*p-value < 0.05.

**p-value < 0.01.

^aControlling for age coming to the US, maternal age, parity, maternal education, family income, and mother's feelings about the pregnancy.

women who immigrated in adolescence or adulthood but not among women who had come to the US in childhood, even though the magnitude of the effect is larger among the US-childhood women. (The lack of statistical significance is likely due to the smaller sample size of US-childhood women.) Among women who had spent their childhoods in Mexico, a one-unit increase in overall social support was associated with a 40% greater likelihood of having a high quality diet ($p = 0.006$). Higher levels of affective and instrumental support were also associated with better diet quality ($p = 0.006$). Women who reported high social support from the infant's father were twice as likely to have high diet quality ($p = 0.02$), but marital status was not associated with diet quality.

The statistically significant interaction between social support and age coming to the US on diet quality is illustrated in Fig. 1. Among women with low or intermediate levels of overall social support, US-childhood women had significantly poorer diet quality than Mexican-childhood women ($p < 0.001$). However, among women with high social support, there was no significant difference in diet quality comparing women who spent their childhood in the US and those who came to the US as adults. Thus, the most marked impact of social support on diet quality is among women who spent their childhoods in the US. Social support may help prevent some of the deterioration in diet associated with childhood in the US.

A similar pattern was seen with drug use (i.e., that social support may help prevent the higher rates of drug use in women who spent their childhoods in the US); however, because of the small number of drug users in this population, this analysis must be considered exploratory.

Discussion

Consistent with other studies (Vega et al., 1997; Wolff & Portis, 1996; Zambrana et al., 1997), this study found that earlier age at arrival in the US was associated with poorer health behaviors during pregnancy. Specifically, childhood in the US was associated with increased smoking and drug use and decreased diet quality among the pregnant women in this study. However, there was some indication that high social support could counter the negative association of acculturation and diet quality; i.e., among women with high social support, the diets of women who spent their childhoods in the US did

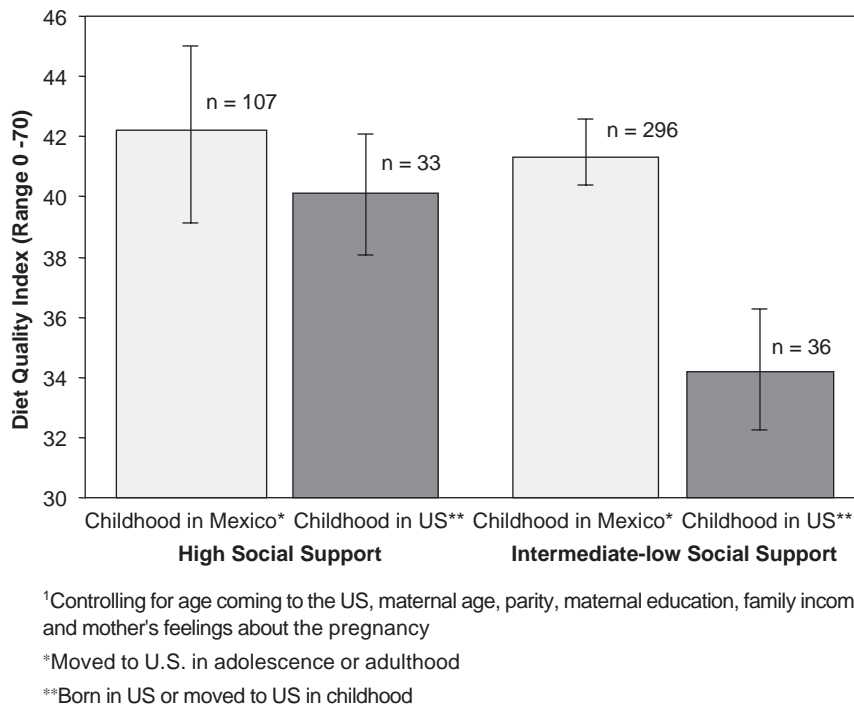


Fig. 1. Comparison of diet quality during pregnancy among women who spent their childhood in Mexico vs. the US, according to level of social support (adjusted¹ means and standard errors). CHAMACOS Study, Salinas Valley, California, 2000–2001.

not differ in quality from those of women who spent their childhoods in Mexico. Although there was some suggestion that social support might prevent some of the increases in drug use among US-childhood women, the number of substance users in this study was small; the interaction of social support with time in the US on drug use, smoking, and alcohol use should be examined in other populations, such as urban populations, with higher rates of substance use.

Few studies have examined predictors of social support during pregnancy and none have specifically looked at rural women of Mexican origin. This study found that social support during pregnancy was lowest among recent Mexican immigrants and highest among women who had lived their entire lives in the US or who had come to the US at a young age. Other predictors of low social support were high parity, low education level, and poverty.

High social support in this population was associated with increased prenatal vitamin use, decreased smoking and better quality of diet. In contrast to other studies, we did not find an association between social support and early initiation of prenatal care; however, our power to

examine this association may have been limited by the fact that all women in the study were receiving prenatal care by 26 weeks gestation.

Being married was associated with lower likelihood of tobacco and alcohol use during pregnancy in this population, but social support from the baby's father was not. Previous studies have used marital status or cohabitation as a proxy for social support from the father (Zambrana et al., 1996). However, the findings of this study suggest that marital status is associated with substance use during pregnancy through a mechanism other than social support. One possibility is that marriage reinforces traditional Mexican values about motherhood and women's roles. Smoking and drinking are relatively common behaviors among men in Mexico, but very uncommon among women (Alaniz, Treno, & Saltz, 1999). A husband's cultural beliefs may have a stronger effect on his wife's pregnancy behaviors than his social support. Of all the health behaviors examined, diet quality was most strongly associated with perceived social support and was the only behavior associated with social support from the father, suggesting that, in this case, it was the father's support, and not just his presence, that affected behavior.

Mexican-origin women who have lived in the US since childhood but who have low social support may represent a particularly high-risk group. Although they did not differ from other women with regard to income, women in this group had the lowest diet quality, the highest rates of drug use, and were the most likely to be single mothers (55% were unmarried). This group is comprised of women who, despite being more acculturated, have not gained the higher social support that usually comes with increased time in the US. One possibility is that this group represents women in the marginalized or transitional phase of acculturation: they have weakened ties with Mexico and poorly established ties in the US. Women in the marginalized phase of acculturation tend to have poorer health outcomes because they have lost the positive social and cultural influences of their native country and have not yet gained the benefits of US culture, such as educational, income, and health care opportunities (Keefe & Padilla, 1987; Sundquist & Winkleby, 1999).

This study examined an understudied, but increasingly important, population: pregnant women of Mexican origin in a farmworker community. According to the National Agricultural Workers Survey (NAWS), 75% of farmworkers in the US are born in Mexico, 84% speak Spanish, and 12% are unable to speak English (Mehta et al., 2000). Estimates place the number of migrant and seasonal farmworkers to be 1.3 million people in California alone (Larson, 2000). To our knowledge, this study is the first to gather detailed information about social support, age at arrival in the US, and the effects of these variables on diet and other prenatal health behaviors in this population.

This study has some limitations. Our findings from an agricultural community may not be generalizable to all women of Mexican descent in California. The women in this farmworker community had high levels of poverty, low educational attainment, low acculturation, and a relative isolation from Anglo-American society. Additional studies of urban populations are needed to further understand the relationships of social support, acculturation, and health behaviors in women of Mexican descent. Additionally, because women receiving late or no prenatal care were not eligible for the study, the women at highest risk of poor pregnancy behaviors may have been excluded. However, despite low rates of deleterious health behaviors in this population, we still found an association between pregnancy health behaviors and level of social support.

This study did not measure acculturation using a multi-item scale, but instead used childhood spent in the US and years in the US as proxies for acculturation. Because more than 90% of the population was Spanish speaking, it is unlikely that we would find sufficient variability in acculturation level in this population using a traditional acculturation scale. Because of the low levels of acculturation in this population, age at arrival in the US or time in the US may well provide a more subtle and sensitive measure of exposure to US life than an acculturation scale.

The suggestion that high social support may prevent deterioration of diet among women of Mexican origin raised in the US is provocative and warrants further investigation. The population included in this study was rural and consisted mainly of recent immigrants who primarily spoke Spanish. Additional research in urban areas—where there are greater numbers of US-born women, a wider range of acculturation, and higher rates of substance use (Vega, Alderete, Kolody, & Aguilar-Gaxiola, 1998)—is necessary to confirm whether social support may help prevent the deterioration of diet quality and rise in substance abuse that often accompany acculturation in pregnant women of Mexican descent. Our finding that high levels of social support may prevent some of the deterioration in diet that occurs with increased time in the US also has relevance for prenatal care providers. Prenatal outreach activities that rely on community-based *promotoras*, midwives, or doulas may be a means of increasing social support among Mexican immigrants while also reinforcing traditional Mexican cultural beliefs and practices (McGlade, Saha, & Dahlstrom, 2004). Interventions to increase social support to Mexican immigrant women may help prevent some of the negative behaviors that are associated with becoming more acculturated in the US.

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References

- Aaronson, L. S. (1989). Perceived and received support: Effects on health behavior during pregnancy. *Nursing Research*, 38(1), 4–9.
- Alaniz, M. L., Treno, A. J., & Saltz, R. F. (1999). Gender, acculturation, and alcohol consumption among Mexican Americans. *Substance Use & Misuse*, 34(10), 1407–1426.
- Bellon Saameno, J. A., Delgado Sanchez, A., Luna del Castillo, J. D., & Lardelli Claret, P. (1996). [Validity and reliability of the Duke-UNC-11 questionnaire of functional social support]. *Aten Primaria*, 18(4), 153–156, 158–163.
- Berkman, L. F., & Glass, T. (2000). Social integration, social networks, social support, and health. In L. F. Berkman, & I. Kawachi (Eds.), *Social epidemiology*. New York: Oxford University Press.
- Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine*, 51(6), 843–857.
- Berkman, L. F., & Syme, S. L. (1979). Social networks, host resistance, and mortality: A nine-year follow-up study of Alameda County residents. *American Journal of Epidemiology*, 109(2), 186–204.
- Block, G., Thompson, F. E., Hartman, A. M., Larkin, F. A., & Guire, K. E. (1992). Comparison of two dietary questionnaires validated against multiple dietary records collected during a 1-year period. *Journal of the American Dietetic Association*, 92(6), 686–693.
- Block, G., Woods, M., Potosky, A., & Clifford, C. (1990). Validation of a self-administered diet history questionnaire using multiple diet records. *Journal of Clinical Epidemiology*, 43(12), 1327–1335.
- Bodnar, L. M., & Siega-Riz, A. M. (2002). A Diet Quality Index for Pregnancy detects variation in diet and differences by sociodemographic factors. *Public Health Nutrition*, 5(6), 801–809.
- Bradman, A., Chevrier, J., Tager, I., Lipsett, M., Sedgwick, J., Macher, J., et al. (2005). Association of housing disrepair indicators with cockroach and rodent infestations in a cohort of pregnant Latina women and their children. *Environmental Health Perspectives* [online 27 July 2005].
- Broadhead, W. E., Gehlbach, S. H., de Gruy, F. V., & Kaplan, B. H. (1988). The duke-UNC Functional Social Support Questionnaire. Measurement of social support in family medicine patients. *Medical Care*, 26(7), 709–723.
- Broadhead, W. E., Kaplan, B. H., James, S. A., Wagner, E. H., Schoenbach, V. J., Grimson, R., et al. (1983). The epidemiologic evidence for a relationship between social support and health. *American Journal of Epidemiology*, 117(5), 521–537.
- Clark, L. (2001). La familia: Methodological issues in the assessment of perinatal social support for Mexicanas living in the United States. *Social Science & Medicine*, 53, 1303–1320.
- Cohen, S., Gottlieb, B., & Underwood, L. (2000). Social relationships and health. In C. S. G. BH, & U. LG (Eds.), *Social support measurement and intervention* (pp. 3–25). New York: Oxford University Press.
- Cohen, S., & Syme, S. L. (1985). Issues in the study and application of social support. In S. Cohen, & S. L. Syme (Eds.), *Social support and health*. Orlando, FL: Academic Press.
- Collins, J. W., Jr., & Shay, D. K. (1994). Prevalence of low birth weight among Hispanic infants with United States-born and foreign-born mothers: The effect of urban poverty [see comments]. *American Journal of Epidemiology*, 139(2), 184–192.
- Collins, N. L., Dunkel-Schetter, C., Lobel, M., & Scrimshaw, S. C. (1993). Social support in pregnancy: Psychosocial correlates of birth outcomes and postpartum depression. *Journal of Personality and Social Psychology*, 65(6), 1243–1258.
- Crump, C., Lipsky, S., & Mueller, B. A. (1999). Adverse birth outcomes among Mexican-Americans: Are US-born women at greater risk than Mexico-born women? *Ethnicity and Health*, 4(1–2), 29–34.
- Cuellar, I., Harris, L., & Jasso, R. (1980). An acculturation scale for Mexican American normal and clinical populations. *Hispanic Journal of Behavioral Sciences*, 2(3), 199–217.
- Deyo, R. A., Diehl, A. K., Hazuda, H., & Stern, M. P. (1985). A simple language-based acculturation scale for Mexican Americans: Validation and application to health care research. *American Journal of Public Health*, 75(1), 51–55.
- Dunkel-Schetter, C., Sagrestano, L., Feldman, P., & Killingsworth, C. (1996). Social support and pregnancy—A comprehensive review focusing on ethnicity and culture. In G. Pierce, B. Sarason, & I. Sarason (Eds.), *Handbook of social support and the family*. New York: Plenum Press.
- Eskenazi, B., Harley, K., Bradman, A., Weltzien, E., Jewell, N. P., Barr, D. B., et al. (2004). Association of in utero organophosphate pesticide exposure and fetal growth and length of gestation in an agricultural population. *Environmental Health Perspectives*, 112(10), 1116–1124.
- Eskenazi, E., Bradman, A., Gladstone, E., Jaramillo, S., Birch, K., & Holland, N. (2003). CHAMACOS, a longitudinal birth cohort study: Lessons from the fields. *Journal of Children's Health*, 1, 3–27.
- Feldman, P. J., Dunkel-Schetter, C., Sandman, C. A., & Wadhwa, P. D. (2000). Maternal social support predicts birth weight and fetal growth in human pregnancy. *Psychosomatic Medicine*, 62(5), 715–725.
- Fuentes-Afflick, E., & Lurie, P. (1997). Low birth weight and Latino ethnicity. Examining the epidemiologic paradox. *Archives of Pediatrics and Adolescent Medicine*, 151(7), 665–674.
- Giblin, P. T., Poland, M. L., & Ager, J. W. (1990). Effects of social supports on attitudes, health behaviors and obtaining prenatal care. *Journal of Community Health*, 15(6), 357–368.
- Guendelman, S., & English, P. B. (1995). Effect of United States residence on birth outcomes among Mexican immigrants: An exploratory study. *American Journal of Epidemiology*, 142(9 Suppl.), S30–S38.
- Guendelman, S., Gould, J. B., Hudes, M., & Eskenazi, B. (1990). Generational differences in perinatal health among the Mexican American population: Findings from HHANES 1982–84. *American Journal of Public Health*, 80(Suppl. (5)), 61–65.
- Harley, K., Eskenazi, B., & Block, G. (2005). The association of time in the US and diet during pregnancy in low-income

- women of Mexican descent. *Paediatric and Perinatal Epidemiology*, 19(2), 125–134.
- Hazuda, H. P., Haffner, S. M., Stern, M. P., & Eifler, C. W. (1988). Effects of acculturation and socioeconomic status on obesity and diabetes in Mexican Americans. The San Antonio heart study. *American Journal of Epidemiology*, 128(6), 1289–1301.
- Heilemann, M. V., Lee, K. A., Stinson, J., Koshar, J. H., & Goss, G. (2000). Acculturation and perinatal health outcomes among rural women of Mexican descent. *Research in Nursing and Health*, 23(2), 118–125.
- House, J. S., & Kahn, R. L. (1985). Measures and concepts of social support. In S. Cohen, & S. L. Syme (Eds.), *Social support and health*. Orlando: Academic Press, Inc.
- House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science*, 241(4865), 540–545.
- House, J. S., Robbins, C., & Metzner, H. L. (1982). The association of social relationships and activities with mortality: Prospective evidence from the Tecumseh Community Health Study. *American Journal of Epidemiology*, 116(1), 123–140.
- Institute of Medicine. (2001). *Dietary Reference Intakes for vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc*. Washington, DC: National Academy Press.
- Keefe, S., & Padilla, A. (1987). *Chicano ethnicity*. Albuquerque: University of New Mexico Press.
- Larson, A. (2000). *Migrant and seasonal farmworker enumeration profiles study: California*. Washington, DC: Migrant Health Program, Health Resources and Services Administration.
- Marin, G., Sabogal, F., Marin, B., Otero-Sabogal, R., & Perez-Stable, E. (1987). Development of a short acculturation scale for Hispanics. *Hispanic Journal of Behavioral Sciences*, 9(2), 183–205.
- McGlade, M. S., Saha, S., & Dahlstrom, M. E. (2004). The Latina paradox: An opportunity for restructuring prenatal care delivery. *American Journal of Public Health*, 94(12), 2062–2065.
- Mehta, K., Gabbard, S., Barrat, V., Lewis, M., Carroll, D., & Mines, R. (2000). *Findings from the National Agricultural Workers Survey (NAWS) 1997–1998: A demographic and employment profile of United States farmworkers*. Washington, DC: US Department of Labor.
- Mutale, T., Creed, F., Maresh, M., & Hunt, L. (1991). Life events and low birthweight—Analysis by infants preterm and small for gestational age. *British Journal of Obstetrics and Gynaecology*, 98(2), 166–172.
- Norbeck, J. S., & Anderson, N. J. (1989). Psychosocial predictors of pregnancy outcomes in low-income Black, Hispanic, and White women. *Nursing Research*, 38(4), 204–209.
- Nuckolls, K. B., Kaplan, B. H., & Cassel, J. (1972). Psychosocial assets, life crisis and the prognosis of pregnancy. *American Journal of Epidemiology*, 95(5), 431–441.
- Schaffer, M. A., & Lia-Hoagberg, B. (1997). Effects of social support on prenatal care and health behaviors of low-income women. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 26(4), 433–440.
- Scribner, R., & Dwyer, J. H. (1989). Acculturation and low birthweight among Latinos in the Hispanic HANES. *American Journal of Public Health*, 79(9), 1263–1267.
- Seeman, T. E. (1996). Social ties and health: The benefits of social integration. *Annals of Epidemiology*, 6(5), 442–451.
- Singh, G. K., & Yu, S. M. (1996). Adverse pregnancy outcomes: Differences between US- and foreign-born women in major US racial and ethnic groups. *American Journal of Public Health*, 86(6), 837–843.
- Stephens, C. J. (1985). Identifying social support components in prenatal populations: A multivariate analysis on alcohol consumption. *Health Care for Women International*, 6(5–6), 285–294.
- Sundquist, J., & Winkleby, M. A. (1999). Cardiovascular risk factors in Mexican American adults: A transcultural analysis of NHANES III, 1988–1994. *American Journal of Public Health*, 89(5), 723–730.
- Turner, R. E., Langkamp-Henken, B., Littell, R. C., Lukowski, M. J., & Suarez, M. F. (2003). Comparing nutrient intake from food to the estimated average requirements shows middle- to upper-income pregnant women lack iron and possibly magnesium. *Journal of the American Dietetic Association*, 103(4), 461–466.
- Turner, R. J., Grindstaff, C. F., & Phillips, N. (1990). Social support and outcome in teenage pregnancy. *Journal of Health and Social Behavior*, 31(1), 43–57.
- US Census Bureau. (2000). *Poverty thresholds 2000, current population survey*.
- US Department of Agriculture Agricultural Research Service. (1999). *USDA national nutrient database for standard reference, release 13*. Bethesda, MD: US Department of Agriculture.
- US Department of Agriculture, & Department of Health and Human Services. (2000). *Dietary Guidelines for Americans*. Retrieved from the World Wide Web: Available at: <http://www.health.gov/dietaryguidelines/#current>; Accessed on April 15, 2004.
- Vega, W. A., Alderete, E., Kolody, B., & Aguilar-Gaxiola, S. (1998). Illicit drug use among Mexicans and Mexican Americans in California: The effects of gender and acculturation. *Addiction*, 93(12), 1839–1850.
- Vega, W. A., & Kolody, B. (1985). The meaning of social support and the mediation of stress across cultures. In W. A. Vega, & M.R. Miranda. (Eds.), *Stress and Hispanic mental health* (Vol. DHHS Publication No. 85-1410). Washington, DC: National Institute of Mental Health.
- Vega, W. A., Kolody, B., Hwang, J., Noble, A., & Porter, P. A. (1997). Perinatal drug use among immigrant and native-born Latinas. *Substance Use & Misuse*, 32(1), 43–62.
- Ventura, S. J., & Taffel, S. M. (1985). Childbearing characteristics of US- and foreign-born Hispanic mothers. *Public Health Reports*, 100(6), 647–652.
- Wills, T. (1985). Supportive functions of interpersonal relationships. In S. Cohen, & S. L. Syme (Eds.), *Social support and health*. Orlando, FL: Academic Press.
- Wolff, C. B., & Portis, M. (1996). Smoking, acculturation, and pregnancy outcome among Mexican Americans. *Health Care for Women International*, 17(6), 563–573.
- Zambrana, R. E., Dunkel-Schetter, C., & Scrimshaw, S. (1996). Prenatal care and medical risk in low-income, primiparous, Mexican-origin and African-American women. *Families, Systems and Health*, 14(3), 349–359.
- Zambrana, R. E., Scrimshaw, S. C., Collins, N., & Dunkel-Schetter, C. (1997). Prenatal health behaviors and psychosocial risk factors in pregnant women of Mexican origin: The role of acculturation. *American Journal of Public Health*, 87(6), 1022–1026.