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The Association between General Health Status and Marital Status among Mothers of Reproductive Age (20-44) with Children under 14—A Secondary Analysis of the 2009 California Health Interview Survey

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Abstract

The Association between General Health Status and Marital Status among Mothers of Reproductive Age (20-44) living with Children under 14—A Secondary Analysis of the 2009 California Health Interview Survey

By Kashika M. Sahay

Background: Motherhood is a transitional time when general health status may vary by social supports, operationalized in this study as marital status.

Hypothesis: Among mothers with young children living in California, those who are married or living with partners will have reduced odds of self-reported fair or poor health when compared to mothers who are not living with a partner.

Methods: We used the cross-sectional 2009 Adult California Health Interview Survey to obtain a sample of mothers ages 20-44 (N = 4228) who reported having children under age 14 living at home. We assessed our primary outcome using the five category general health status question at interview. We defined the primary exposure of interest of marital status at interview by a single question assessing if the individual is now married, living with a partner in a marriage-like relationship, or single. We examined the potential effect modifiers of the mother's country of birth, as well as her education, age and race. We identified potential confounders using a 10% difference rule between the crude (cOR) and adjusted odds ratios (aOR). We performed logistic regression in SUDAAN to account for jackknife replicate weights the complex survey design with married mothers as the reference group.

Results: The unadjusted odds ratio (cOR) for fair or poor health was significantly higher for single (cOR = 3.29, 95% CI: 1.99-5.45) and cohabiting (cOR 2.38, 95% CI: 1.54-3.69) mothers as compared to married mothers. Non-native born mothers comprised 46% of the sample (n=1935). Preliminary analyses found effect modification for country of origin. However, all women were included in the final model which adjusts for education and race. Compared to married mothers, adjusted odds ratio (aOR) for fair or poor health for single mothers was (aOR= 2.50, 95% CI 1.39-4.51); and for cohabiting mothers (aOR=1.45, 95% CI: 0.93-2.27).

Conclusion: Married women with young children are healthier than either single or cohabiting women. Cohabiting women are healthier than women rearing children alone. Owing to the cross-sectional nature of the survey, the data capture a moment in time rather than a longitudinal follow-up; therefore, causation cannot be established.

The Association between General Health Status and Marital Status among Mothers of Reproductive Age (20-44) with Children under 14—A Secondary Analysis of the 2009 California Health Interview Survey (CHIS)

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THESIS GLOSSARY

<u>Abbreviation</u>	<u>Description</u>
BRFSS	Behavioral and Risk Factor Surveillance System
CDC	Centers for Disease Control Prevention
CHIS	California Health Interview Survey
HRQOL	Health related quality of life
NHANES	National Health and Nutrition Evaluation Survey
NHIS	National Health Interview Survey
TANF	Temporary Assistance for Needy Families

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By Kashika M. Sahay

CHAPTER 1: BACKGROUND
The Association between General Health Status and Marital Status among Mothers of
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Introduction

Purpose:

The purpose of this literature review is to ground my Masters' thesis in the existing literature.

The literature review aims to understand 1) the basic rationale for assessing health status, 2)

changing demographic characteristics of marital status and 3) finally, critically assess research

regarding the associations between maternal health status and marital status in the United States.

How is quality of life measured?

The CDC defines health-related quality of life as 'an individual's or group's perceived

physical and mental health over time(1).' Measuring quality of life is increasingly seen as

important to fully assessing health and well-being(1-4). Measuring health perceptions is

important in assessing morbidity due to potential disease and assessing the overall health of

populations. Perceived health measures are used to measure trends in general community health

status and mortality over time(5).

Health related quality of life (HRQOL) is a broad umbrella term that encompasses several

domains including physical and mental health as well as functional disability and limitations.

These measures have been used to assess quality of life related outcomes for various clinical

populations from diabetics to cardiovascular disease (6-9). Even in maternal and child-health

related studies, considerable diversity exists amongst measures of HRQOL in different

populations (10-13). National surveillance systems such as the Behavioral Risk Factor

Surveillance System (BRFSS) and the National Health and Nutrition Examination Survey

(NHANES), Medicare Health Survey, and National Health Interview Survey (NHIS) have

selected a subset of HRQOL measures for general surveillance(1, 14).

Quality of life is traditionally divided into multiple domains relating to physical, mental and general health status. Although several quality of life indicators are used in public health, the CDC has promoted use of the Healthy Days measures. The four core healthy days measures are: 1) General Health status question 'Would you say that in general your health is excellent, very good, good, fair or poor? 2) Physically Unhealthy Days question, "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" 3) Mentally Unhealthy Days question, "Now thinking about your mental health, which includes stress, depression and problems with emotions, for how many days during the past 30 days was your mental health not good?" 4) Disability Affected Days question, "During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?" The core questions are part of a larger set of 14 questions for evaluating health-related quality of life (15).

The General Health Status of Individuals in the United States

In this analysis, the focus is on the general health status question (question 1 above). Healthy People 2020 considers perceived general health status to be a part of foundation measures for comparison across different health conditions and populations(16). The general health status question on the population level is usually reported as the percentage of a population with self-rated fair or poor health. According to the CDC in 2007, approximately 9.5% of the US population had fair or poor health(2).

Women of reproductive age:

BRFSS estimates from 1998-2003 suggest that approximately 10% women of reproductive age, ages 18-44 have fair or poor health (17). The CDC suggests using the general health status question as an indicator of population health by comparing with national estimates (i.e. if a population has fair or poor health that is significantly greater than 9.5%, then maybe lifestyle interventions should be considered)(1).

Applications and Practical Advantages of the General Health Status Measure:

Quality of life has been correlated with several measures including history of depression, mental well-being, and the ability to function (4). Mogos et al. explain the advantages and disadvantages of a generic measure: "These scales have the ability to measure complications secondary to treatment conditions but not directly related to the disease condition. The disadvantage of generic instruments is that they could omit some domains that are important to specific group or disease conditions, which could hamper their ability to detect clinically important changes following treatment or interventions (13)." Thus, the general health status permits comparisons of differences between mothers in different marital statuses, races and ages. However, a limitation is that general measures do not provide information about which domains of health (physical, mental, emotional, disability etc.) are responsible for overall health status.

Social Support Models Supporting the Health Benefits of Marriage

Linkages between social support and health have been a topic of research in psychology and epidemiology for several decades(18-20). Lack of social support is increasingly acknowledged as a determinant of morbidity and mortality from a variety of health conditions (5, 21). Researching relationships as a component of social support is driven by a theoretical premise that relationships affect stress and coping strategies, which are themselves important to health(22, 23). Cohen proposes four main models by which social support could act on health: 1) Social support increases access to health information and advice. 2) Social cohesion adds meaning to one's life (which leads to higher self-efficacy, motivation and sense of identity). 3) Social influence persuades individuals towards healthy behaviors. 4) Tangible resources (aid and economic services as well as limited exposure to external risk factors) are greater with greater social support(18).

Strine et al. discuss the psychiatric implications of emotional and social support (21). Those with emotional and social support are more likely to recover from depression and quit smoking. They are less likely to experience psychological distress and panic disorders. Thus appropriately assessing emotional and social support could help identify individuals at-risk for mental health services (21).

Marriage is a specific-type of social support that potentially mediates health through a variety of factors. Comparisons in health status between married and non-married women have been common practice in government reports, surveillance and academic research (24, 25). Two hypotheses for the health benefits of marriage are commonly cited in the literature: the marital resource model and the stress /crisis model, (22, 26). The marital resource model posits that marriage provides institutionalized social, psychological, and economic resources that promote physical health and longevity (27). Thus, compared to married counterparts, cohabiting and single women may not have institutionalized protection from vulnerability to life events associated with economic insecurity, material hardship, and social dislocation that could have direct or indirect effects on their health status (28, 29).

The stress/crisis model suggests that marriage acts as a buffering against factors which lead to ill health (25, 30, 31) . This hypothesis suggests that the absence of marriage is what is responsible for the poorer health of the unmarried. The stress/crisis model argues that the direct effect of social support is good health. On the other hand, when the buffering effect of support is absent, stressors act on a person leading to ill health(31). Research in marital transitions has shown that those experiencing marital stress or marital dissolution have poorer health outcomes in the short term (26, 30).

Changing attitudes and social norms complicate these hypotheses(32). It's possible that social normalization of single motherhood could result in decrease in social stigma and stress(26, 33). Concurrently it is also possible that the institution of marriage becomes less stable. For example, trend data from 1973-2003 years of the National Health Interview Survey shows that

happiness associated with marriage has decreased over time (26). Increasingly, cohabiting partnerships are emerging as an intermediate group (24, 34, 35).

Population-based Health Status based on Marital Status for Women of Reproductive Age

        The 2004 CDC report on Marital Status and Health illustrates support for the hypothesis that married individuals are generally healthier than non-married individuals (36). However, the CDC report focuses on the entire population of US adults and does not control for children in the household or for maternal status. The results for women age 18-44 illustrate considerable variability in health status as a function of marital status (see Table .). In the CDC weighted population-based analysis, married women had the lowest frequency of fair or poor health (4.8%), followed by widowed (5.1 %), never married (5.7 %) women. Women living with a partner(8.1%)

Table . % of United States Women with Fair or Poor Health Reproductive Ages 18-44, National Health Interview Survey 1999-2002.

Marital Status	% fair or poor health (SE)
Married	4.8 (0.18)
Living with a partner	8.1 (0.65)
Widowed	5.1 (2.65)
Divorced/Separated	11.9 (0.56)
Never married	5.7 (0.27)

Data adapted from National Center for Health Statistics Advanced Data Report No. 351

had an intermediary health status. Divorced/separated women(11.9%) reported the highest frequencies of fair or poor health . Note these data were not adjusted for maternal status. (36)

        The CDC report looks at several health conditions including, but not limited to smoking, body weight, alcohol use, daily functioning, psychological distress, physical inactivity, headaches, back pain, and limitations of physical activity for varying marital status across both sexes. Descriptive data were presented separately for men and women of different ages, but overall analysis was on the group level. At this population level, married individuals appear to have overall better health.

Cohabitors an emerging demographic group:

        Historically, marital status of mothers was considered as potentially a dichotomous variable (married v. unmarried-widowed/single) (37). Then, research expanded to look at those separated/divorced from their partners(38). Now cohabitating partnerships and same-sex couples

are of interest to researchers with potential implications for family health and policy(32, 34, 39, 40).

Women are increasingly delaying marriage, but not necessarily delaying childbearing. On average, according to a 2013 report, a woman's age at first birth is now lower than age at first marriage (24). According to the National Report Card 2010 approximately 30% head of households are single women, cohabitation, or living with an intimate sexual partner outside of marriage, is an increasingly common practice in the US (41, 42). Non-marital childrearing (defined as raising children while living with but not married to an intimate sexual partner) is an increasingly prevalent social practice in the US (35). Among US women ages 15–44 in 2002, 50% had cohabited at some point in their lives, 23% had married but not cohabited, and 27% had never married or cohabited (35). This pattern varies somewhat along racial/ethnic lines, but the general trend holds. Among young women (ages 18-19), cohabitation is the most common form of union (11%), suggesting that younger generations accept this practice more than older generations (40). Notably, the socio-demographic characteristics of those who married differ from those who do not marry including age, education and employment differences in cohabiters (40, 43) In the US, higher levels of education, income, and health status are selection factors for marriage. Approximately 9% of those between age 15 and 44 in the US were cohabiting in 2002(41).

Furthermore, roughly 3.3 million children today live in cohabiting households, with 40% of all children expected to experience a cohabiting household at some point in their childhood (41). The limitations of cohabitation as compared to marriage include lack of legal sanctions making social imperatives against adverse outcomes associated with cohabitation, such as intimate partner violence, more difficult to enforce (43). Since prior practices and social norms increasingly view cohabitation as a viable option for childrearing, assessing the influence of non-marital childrearing on the health of the parents and children is important.

Disparities in Maternal and Child Health Outcomes based on Marital Status

Adverse birth outcomes differ for married women, cohabiting women, and single, unmarried women, suggesting a moderating effect of social support and health(44-46). In a systematic review and meta-analysis of maternal marital status and birth outcomes, cohabiting women fared marginally worse than married women yet better than their single, unmarried counterparts in terms of low birth weight, preterm birth, and births small for gestational age (44). Nonmarital childrearing was associated with an increased risk of stillbirths and fetal deaths in 40 million United States births between 1995 and 2004 (45). Overall, from 1989 and 2006, the risk of preterm birth among married mothers increased while risk among unmarried mothers decreased (46). Mothers who experience adverse birth effects also have adverse health effects (10).

Single parenting is established as a stressful activity with long-term health implications on maternal health(38) (47, 48). However, not all single mothers have the same life experiences (23, 49, 50) Divorced mothers are more likely than married mothers to experience psychological distress for small and major stressful life events which have implications could potentially influence their health (49). In a study of single mothers in rural New England, researchers observed that divorced and single, never married mothers had a different set of life experiences with respect to resources and perceptions of stress (23, 49). Divorced women had more stress exposure, more vulnerability to stress and did not experience family support at the same level as single, never married mothers(23, 50).

Quality of Life in the Maternal Context:

Motherhood has been associated with symptoms of chronic fatigue, headache, gastrointestinal symptoms and depression (51). Furthermore, the postpartum period and the transition into motherhood are associated with a variety of physical, emotional and life changes associated with having a new baby in the house (52). Women who suffered from postpartum depression were more likely to have poorer general health status and health-related quality of life (52). Symptoms of depression manifest differently in women who have children as compared to

women who do not have children thus maternal populations are distinct from the general population of women of reproductive age (53).

Gap in the literature: General United States population-based studies focused solely on maternal health status are hard to find. The following review summarizes literature relating to maternal quality of life with an emphasis on studies conducted in the United States.

Literature Critique

How have maternal health-related quality of life (HRQOL) measures (including general health status) been used to assess maternal health in the context of social support in the United States?

To assess quality of life, specifically health status, in the maternal context, I retrieved articles from Embase, Cochrane, PsycInfo, and PubMed that reported on the health and marital status of women of reproductive age in the United States using keywords maternal, mother, and quality of life, health status and social/partner/marital support. In order to be included in this review, the peer-reviewed studies needed to consider maternal quality of life domains and general health status as a primary outcome and assess social support and marital status. I included systematic reviews and literature reviews on maternal health related quality of life were reviewed for inclusion criteria (13) (54). I made note of the study design as well as specific maternal population (population, pregnant women, and mothers whose children have special health needs). More detailed critiques of United States- specific studies by study type are provided below.

Systematic Literature reviews:

In 2009 Susan Coyle published an interdisciplinary, international literature review on the maternal health related quality of life research with an aim of finding biopsychosocial variables that influence quality of life. In this review, she employed a broad definition of health-related quality of life and focused on 17 articles (12 cross-sectional, 1 longitudinal, 1 quasi-experimental, 3 RCT) published from 1997-2009 in nine countries including the United States. The review was grounded in the social process of mothering and considered constructs of maternal support,

maternal demands, environmental context, and intervention strategies. The main hypothesis was that motherhood is a time of stress. Marital status was not an explicitly stated variable although Coyle discussed it briefly in the maternal support section of the review.   Strength of this review was the presentation of evidence from longitudinal, experimental and RCT interventions specifically focused on improving quality of life in the Canadian and British contexts. Of the five studies, one study provided evidence that increasing a mother's perceived social support had influence on her self-reported mental well-being.   Limitations of the data for this review are 1) focus on factors relating to both physical and mental health of mothers, 2) considerable diversity in country of populations, 3) five different measures of quality of life which make cross-study comparisons across the 17 studies difficult, and 4) large prevalence of cross-sectional study designs that preclude causality (54).

Longitudinal studies/randomized control trials:

A longitudinal 8-year panel survey in the United States using the Americans' Changing Lives dataset examined the influence of marital strain on health especially amongst older adults, aged 59 and older (25). In Umberson et al., marital strain assessed using six elements of positive and negative marital experiences over time using latent growth curve analysis. The study also assessed parental strain using indicator variables for young or adult children living at home. The study found that older adults (older than 65) were most likely to experience a decline in self-rated health influenced by marital strain. Parental status was not a statistically significant source of decline in self-rated health. Notably, those with more positive marital experiences were more likely to have higher self-rated health at baseline. This study is limited in that it oversampled older adults and thus does not provide insight into the role of marital strain when younger children are present in the household. The study also oversampled African Americans, but did not explore the health status of other non-white minorities. To my knowledge, no recent longitudinal studies or randomized control trials assess maternal health among women of reproductive age in the United States(25).

As I mentioned before, quality of life outcomes have garnered considerably more attention in international settings (UK, Canada, Australia, etc.) through longitudinal, randomized control and cross-sectional studies (54-56). Several studies (Salsberry et. al, 1999; Nicholson et al., 2006; Da Costa et al., 2006) reviewed by Coyle were limited to pregnancy and the postpartum period. In one study of postpartum women, social support was identified as a predictor of maternal mental health (Da Costa, et al. 2006).

Pregnancy-related and postpartum maternal quality of life:

Mogos et al enumerate several scales used to assess quality of life measurement instruments in the context of pregnancy and postpartum health evaluation. Of the 64 studies national and international studies evaluated by the authors, general health measures (like the general health status question) were assessed in 51 studies. Mogos et al. argue that pregnancy and postpartum studies of health-related quality of life should consider the condition-specific unique experiences of pregnancy in addition to general measures of health. Like Coyle, Mogos evaluated a large number of international studies on this topic. They found eight measures that specifically address the maternal context in the literature. However, they criticized the lack of a consistent definition of health related-quality of life or a life course perspective of motherhood. For example, the mother generated index (MGI) focuses only on the early postpartum period. This large amount of variability in measures makes comparative effectiveness research impractical and generates considerable confusion among clinicians, policymakers and program evaluators.

Cross-sectional studies:

In my review, I found an overwhelming majority of studies assessing maternal health status in the United States are cross-sectional (11, 13, 34, 54, 57-59). The studies often focus on a sub-population of mothers who are pregnant, postpartum, low-income, or mothers of children with significant health burdens. A major limitation of cross-sectional studies is that causation cannot be established. Cross-sectional data of subpopulations are further limited because marital

conditions during pregnancy, postpartum and children with special needs populations have a unique set of risk factors and considerations that limit generalizability to all mothers at the population level.

Children with special needs:

The general hypothesis in assessing maternal health for these studies is that motherhood is stressful under normal circumstances, but it is even more stressful when one's child has special needs (10). These studies assess parenting styles, coping strategies and overall health of mothers whose children have developmental/intellectual disabilities(60). In the United States, the health status of mothers in general has not been established and only population level reports are available so no comparison group exists for United States mothers of children with special needs.

Racial and ethnically diverse mothers:

More population level data on racial and ethnic minorities can provide health status information among racial and ethnic minorities. In the United States, population based reports look at White, Black and Hispanic populations but Asian and immigrant populations more sparsely (2). Transitional experiences of motherhood may be different among different racial and ethnic groups. Coyles' review reported conflicting results with respect to racial differences in health-related quality of life(57, 59) Salsberry et al. found no differences between White and African American mothers. Nicholson et al. found a significantly lower functional status among African American mothers as compared to white mothers in a population of mothers in early pregnancy. More data is needed to assess whether minority mothers have different health statuses as compared to White mothers. The health of Hispanic, Asian and immigrant women has not been assessed in the United States at the population level.

Summary of findings in the literature:

Searching the literature resulted in a majority of cross-sectional studies along with a few international longitudinal and experimental/intervention-based studies assessing maternal health related quality of life (including general health status) and social/marital support. Considerable

variation exists in the sample sizes and measures used in quality of life studies. Key differences in choice of study population, operational definitions of health related quality of life and measures assessed for maternal health status make cross-study comparisons challenging. Very few studies have been conducted in the United States among mothers. Racial and ethnic minority health status is not well reported.

Summary of Chapter 1

General health status is a five category question that serves as an indication of overall health and well-being. At the US population level, approximately 10% of the population reports fair or poor health. This provides a barometer for comparing other subpopulations including maternal health status. Considerable variability exists in assessing maternal health with respect to life course.

Links between marital status and health are a topic of public health interest due to changes in demographic characteristics. In the US, shifts in marital status are apparent. Marital status is influenced by age, education level, race/ethnicity, and social norms. Cohabitation is an increasingly common practice in the United States. An increase in non-marital childrearing has resulted in the emergence of cohabiting (living with an intimate partner outside of marriage). The health status of those cohabitating could be an intermediate level in marital status somewhere between married and single individuals.

Two models dominate sociological theory on the health benefits of marriage: 1) the marital resource model and 2) the stress/crisis model. The marital resource model posits that those who are married have more economic, institutional and instrumental resources which results in better health outcomes. According to stress/crisis model, in the absence of marriage or a partnering relationship, single people are more vulnerable to life's stressors. Those within the single status (either separated, divorced or widowed as compared to never married) may have different health statuses due to varying presence of social and emotional support.

Health status and quality of life indicators have been researched more heavily in international contexts. Although there is information on the health of women of reproductive age, general population based data on the health related quality of life of mothers in the United States is non-existent. This Masters thesis contributes to maternal quality of life research in the United States through a cross-sectional study design. The secondary data analysis in Chapter 2 aims to 1) analyze the association of marital status and health status among Californian mothers of reproductive age (ages 20-44) with children under the age of 14 and 2) describe racial/ethnic variations in health status for Latinos, Asians and those born outside the United States.

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CHAPTER 2: MANUSCRIPT

The Association between General Health Status and Marital Status among Mothers of
Reproductive Age (20-44) living with Children under 14—A Secondary Analysis of the 2009
California Health Interview Survey
By Kashika M. Sahay

Abstract

Background: Motherhood is a transitional time when general health status may vary by social supports, operationalized in this study as marital status.

Hypothesis: Among mothers with young children living in California, those who are married or living with partners will have reduced odds of self-reported fair or poor health when compared to mothers who are not living with a partner.

Methods: We used the cross-sectional 2009 Adult California Health Interview Survey to obtain a sample of mothers ages 20-44 (N = 4228) who reported having children under age 14 living at home. We assessed our primary outcome using the five category general health status question at interview. We defined the primary exposure of interest of marital status at interview by a single question assessing if the individual is now married, living with a partner in a marriage-like relationship, or single. We examined the potential effect modifiers of the mother's country of birth, as well as her education, age and race. We identified potential confounders using a 10% difference rule between the crude (cOR) and adjusted odds ratios (aOR). We performed logistic regression in SUDAAN to account for jackknife replicate weights the complex survey design with married mothers as the reference group.

Results: The unadjusted odds ratio (cOR) for fair or poor health was significantly higher for single (cOR = 3.29, 95% CI: 1.99-5.45) and cohabiting (cOR 2.38, 95% CI: 1.54-3.69) mothers as compared to married mothers. Non-native born mothers comprised 46% of the sample (n=1935). Preliminary analyses found effect modification for country of origin. However, all

women were included in the final model which adjusts for education and race. Compared to married mothers, adjusted odds ratio (aOR) for fair or poor health for single mothers was (aOR= 2.50, 95% CI 1.39-4.51); and for cohabiting mothers (aOR=1.45, 95% CI: 0.93-2.27).

Conclusion: Married women with young children are healthier than either single or cohabiting women. Cohabiting women are healthier than women rearing children alone.   Owing to the cross-sectional nature of the survey, the data capture a moment in time rather than a longitudinal follow-up; therefore, causation cannot be established.

<u>Introduction</u>

Measuring quality of life is increasingly important to fully assessing health and well-being. Quality of life measures are used to measure trends in general community health status over time. Healthy People 2020 includes the general health status question as a part of foundation general health status measures for comparison across different health conditions and populations (1). The CDC defines health-related quality of life as 'an individual's or group's perceived physical and mental health over time.(2)' Measuring health perceptions is important in assessing morbidity due to potential disease and assessing the overall health of populations (3, 4). The general health status question has been used to assess various clinical populations from cancer to cardiovascular disease (4-8). The California Health Interview Survey is a state-based population survey that assesses health indicators of California residents. The 2009 CHIS includes the general health status question.

The Health Status of Women in the US:

The general health status question on the population level is usually reported as the percentage of a population with self-rated fair or poor health. According to the CDC in 2007, approximately 9.5% of the US population (men and women) had fair or poor health (9). BRFSS estimates from 1998-2003 suggest that approximately 10% women of reproductive age, ages 18-44 have fair or poor health(10). The CDC suggests using the general health status question as an indicator of population health by comparing with national estimates (i.e. if a population has fair or poor health that is significantly greater than 9.5%, then maybe lifestyle interventions should be considered (9). For perspective, older adults with chronic conditions living in community dwellings have a reported frequency of fair or poor health at 25 percent (11).

Maternal Health Status

Motherhood is a transitional time when components of health related quality of life such as health status may vary as a function of social supports(12). Social connectedness and support are

increasingly considered in public health as factors that make meaningful contributions to overall

health(13). In this analysis, marital status is used as a proxy measure for social support. As

discussed in Chapter 1, population based surveillance of maternal health status is rare. Changing

patterns of living arrangements in the US since the 1980s (see Chapter 1) has resulted in an

increase in non-marital childrearing (14). Thus, studying health patterns among married and non-

married mothers is important for assessing the relative benefits of different living arrangements.

Hypothesis:

This secondary analysis of the 2009 California Health Interview Survey (CHIS) examines the

association between general health status and marital status among different racial, ethnic, and

immigrant groups in California as measured by self-report, adjusting for socio-demographic

factors.

We distinguish three groups of mothers: married, cohabiting, and unmarried. The primary

hypothesis for this analysis is that mothers who are single, (either because she never married or

she is separated, widowed or divorced) will have higher overall odds of fair or poor health after

adjusting for potential confounders as compared to married counterparts.

This hypothesis is based on the relative merits and limitations of social supports related to

cohabiting. Compared with single women, cohabiting women may experience greater partner

support through an increased level of commitments (15, 16) and more of the informational,

emotional and tangible benefits associated with Cohen's model of health-related social supports

similar to married women (similar to the marital resource model discussed in chapter one) (14,

17). Cohabiting women may also be more protected from vulnerability to life events associated

with economic insecurity, material hardship and social dislocation that could have direct or

indirect effects on their health status than their unmarried single counterparts (similar to the

stress/crisis model described in chapter 1) (18). However, the limitations of cohabitation as

compared to marriage include lack of legal sanctions. This makes social imperatives against

adverse outcomes associated with cohabitation, such as intimate partner violence, more difficult

to enforce (15). Thus, cohabiting women may have some of the benefits of the marital resource model, but not full protection from the stressors in the stress/crisis model.

As cohabitation is increasing among those raising children, examining general health status for cohabiting mothers as well as mothers not living with partners is important (19). Roughly 3.3 million children today live in cohabiting households, with 40% of all children expected to experience a cohabiting household at some point before leaving home (20). Also, as cohabiting increases among U.S. parents, one can expect the next generation to have lower social opprobrium and higher self-efficacy for this practice than may be currently present.   Thus, we hypothesize that cohabiting mothers will report an intermediate health status (between more healthy married women and less healthy single, non-partnered women).

Another aim of this analysis is to describe the health and marital status of a representative sample of Asians and non-US born individuals using the 2009 CHIS. The secondary hypothesis is that self-reported health status will vary by race, and there may be modifying effects on self-reported health of race and marital status, or marital status and education or marital status and those born in the US.

Methods

Study Population

This analysis uses the 2009 Adult California Health Interview Survey (CHIS), a publically available data set. The CHIS sampling frame employed a multi-stage sampling design in order to provide 1) county level estimates for its population and 2) overall statewide estimates for major racial and ethnic groups and smaller ethnic subgroups. The survey used a random digit dial (RDD) for landlines and cellphones. Within each geographic region, households were given individual weights and up to three individuals (one adult, one teen, and one child) were selected to participate from each household. Cell phones were sampled by area code. Landlines were sampled based on 56 geographic strata. Korean and Vietnamese populations were oversampled by using surnames in telephone directories. In the public dataset, geographic identifiers were

removed and 80 replicate weights were formed in a raking procedure in order to estimate frequencies for the non-institutionalized population of California(21).Weights were based on the California Department of Finance's 2009 Population Estimates and 2009 Population Projections (21).

With respect to the Healthy Days Measures, the California Health Interview survey only uses the general health status question. Other health related quality of life measures included in the survey pertain to mental health, depressive symptoms, and disability (22). This analysis uses only the adult dataset(23). The aim of the analysis was to contribute to literature analyzing health status of mothers beyond the postpartum period (12, 24). Thus, based on available variables, the selected group of mothers had children under the age of 14 living with them.

This analysis has no missing values as missing values are not included in the publically available dataset. The CHIS considers surveys complete if a participant completed 80 percent of the survey. Any incomplete portions of the survey variables were then imputed as described in the CHIS methodology report. (25).

Sample

We limited the final sample for analysis to women ages 20-44 who have given birth to a live child and have a child under the age of 14 living at home (N=4228) (See Figure 1). In order to capture a large population of adult women of reproductive age without confounding effects of education, we restricted age from 20-44. The marital status, education status, race/ethnicity, country of birth, and age distributions of the sample are illustrated in Table 1 and 1b. Country of birth differences in response patterns and model outcomes are presented in Table 1. Country of birth was not an effect modifier or confounder, so we have provided stratified results only in the initial tables.

Human Subjects Protections:

IRB exemption was received from Emory University for secondary data analysis of the dataset (see Appendix). The CHIS public use dataset de-identifies geographic information and uses general population weights in a raking procedure (21).

Outcome--General Health Status:

The general health status question is a summary measure of overall health effects (2, 9). General health status is also referred to as self-perceived or self-rated health. In this survey, adults were asked 'Would you say that in general your health is excellent, very good, good, fair or poor?(26)' For analytical purposes, general health status was dichotomized to perform compare logistic regression with fair or poor health and excellent, very good or good health=0 in a manner consistent with the literature (10, 12, 24, 27). (Raw data distributions are available in the Appendix).

Exposure of Interest: Marital Status

In this analysis, social support is operationalized using marital status by self-report. Marriage is a specific-type of social support that potentially mediates health through a variety of factors. In the 2009 CHIS, respondents were asked if they are "now married, living with a partner in a marriage-like relationship, single-never married, and single-separated, widowed or divorced" (28). However, the decision to marry, cohabit, or be single is confounded or modified nationally by several factors.

Potential Effect Modifiers and Confounders:

In the United States, higher levels of education, income, and health status are selection factors for marriage. Notably, the socio-demographic characteristics of those who married differ from those who do not marry including age, education and employment differences in cohabiters (15). With respect to marital status, the US has the highest rate of teen cohabitation in the

industrialized world (14). Among all US women ages 15–44 in 2002, 50% had cohabited at some point in their lives, 23% had married but not cohabited, and 27% had never married or cohabited(29). This pattern varies somewhat along racial/ethnic lines, but the general trend holds. Among young women (ages 18-19), cohabitation is the most common form of union (11%), suggesting that younger generations accept of this practice more than older generations (18). In the United States, native born adults have better perceptions of their mental health as compared to non-native born adults (30). Research on the social determinants of health among Canadian and non-Canadian born individuals suggests a similar modifying role for the health of those born in the US compared to those not born in the US (31). Among women of reproductive age, older women, Black and Hispanic populations and those with less than a college degree are more likely to have poorer self-perceived health (10). Income was not modeled in this analysis, as poverty level and education have been shown to be correlated. Education has been shown to be the strongest predictor of health status among socioeconomic indicators(32). This could suggest potential confounding roles for age, race, and education.

Statistical Analysis:

We assessed descriptive statistics for variables of interest in the dataset and chi-square tests for comparisons between categorical groups in SAS 9.3. Due to the complex survey design, SAS-callable SUDAAN was used for stability of variance estimates (33, 34)The data dictionary and codebook for CHIS suggest using jackknife sampling techniques and weights (25). The assumptions associated with jackknife procedures are that clusters are statistically independent, that there are no distributional assumptions for response variables, and that variance estimates are consistent even with a large number of clusters. Jackknife procedures remain valid even when looking at intra-cluster correlation structures and multiple levels of nesting as long as the clusters are statistically independent(33). Since the general health status (outcome) variable is categorical with 5 potential levels, we considered polytomous regression. However, since the population is overwhelmingly married, polytomous regression coefficients were hard to interpret (that is

married women have higher odds of all levels of the outcome variable). Thus, we used logistic regression dichotomizing the outcome variable comparing excellent, very good, or good versus fair or poor. We interpreted the odds ratio as the odds of having fair or poor health. Married mothers were the reference group. We analyzed data using bivariate and multivariate logistic regression models. Interaction was assessed first using Wald tests for interaction with significance at p-value less than 0.05. Next, we assessed confounding by a 10% rule comparing adjusted odds ratio for a single covariate with the crude odds ratio of marital status with health. Then we assessed precision in the final models using the width of the confidence intervals (see Figure 2 for models and summary of modeling process).

Results

Table 1 provides frequency distributions for the marital status and health status for the sample of mothers. Younger mothers ages 20-24 had the most diversity among marital status with 30% of the weighted sample married, 24% living with partner, and 45% single. In older age categories, higher proportions of mothers were married. In the 25-29 age group and 30-34 age group 66% and 70% were married, 14% and 10% were living with partner and 19% were single respectively. Marital status patterns differed by race as well. Latinos, Blacks and Other racial groups were least likely to be married (60%, 65% and 38% respectively). Latinos were most likely to be living with their partners (16%) and those in other racial categories were most likely to be single. Those with higher education levels were most likely to be married (those with graduate school or higher). Those with no formal education or less than a high school diploma were more likely to be living with partner or single (17% and 25% respectively).

The appendix provides a stratified analysis of weighted frequency distributions by born in US status. Nearly half of the sample (46%) was born outside of the United States and the two groups were different with respect to distribution of race and education level. Among mothers born in the United States, 11% indicated fair or poor health as compared to 22% of mothers born outside the United States. Patterns of marital status also varied. Irrespective of country of birth,

married mothers accounted for approximately 70% of the sample. Almost 11% of mothers born in the United States are single, never married as compared to 5.5% of mothers born outside the United States.

Striking differences in education level are apparent. Among those non-native born, 43% have no formal education or less than a high school diploma as compared to 7% of those born in the US. Approximately 40% of the native born sample has Bachelors or higher as compared to approximately 25% of the non-native born sample.

The sample is racially diverse. The overall sample contains about one third Whites, one third Latinos and one third Asians, African American and other combined. Non-native born mothers predominantly self-identify as Latino 56%, Asian 19% African American 15%. Native born mothers are predominantly White (59%). Due to small sample sizes, we combined the Pacific Islander, Alaskan Native and more than one race, single race other categories. The age distribution was fairly similar between those native-born in the United States and not native-born in the United States.

Table 2 provides bivariate associations between marital status and race/ethnicity each with weighted frequencies of excellent, very good or good health. At a population level, mothers in the 2009 CHIS have a higher weighted frequency of fair or poor health (17%) than of women of reproductive age in the United States (10%). Single mothers have the highest frequency of poor health in the sample (31%) as compared to cohabiting (24%) or married (12%) mothers.

Table 3 provides data for the secondary aim of this analysis to examine the health status of Asians, Latinos and those born outside the United States through weighted bivariate frequencies of health status and race. Latinos and other races had a high frequency of fair or poor health (24 and 23% respectively), followed by African Americans (13%), Asians (11%) and Whites (8%).   Non-native born mothers had a higher frequency of fair or poor health (21%) as compared to those native born (11%). Native born Asians had incredibly low weighted frequencies of fair or poor health (2%).

Interaction Assessment:

Initially, we considered all 4 categories of marital status as distinct. We considered the interaction of country of birth, race and education separately. In this analysis, country of birth was found to be an effect modifier and 46% of the population was born outside the US. Interaction was assessed by including each interaction term in a hierarchically well formulated model with the exposure variable. Using this approach, the interaction terms for race and country of birth were both significant. When both interaction terms were included in the model however, then neither interaction term was significant. Thus, we stratified on country of birth and fit two separate models based with 4 categories of marital status. As compared to married mothers, the overall crude odds ratio (cOR) for fair or poor health is 2.94 (95% CI: 1.83, 4.71) for single never married mothers; 3.59 (95% CI: 1.67, 7.74) for widowed, separated or divorced moms; and 2.38 (95% CI: 1.57, 3.65) for cohabiting mothers. For mothers born in the United States, as compared to married mothers, cOR = 5.31 (95% CI: 3.00-9.40) for single never married mothers;crude cOR = 2.95 (95% CI: 0.99-8.78) for widowed, separated or divorced moms; and cOR = 1.37 (95% CI: 0.65-2.88) for cohabiting mothers. For mothers born outside the United States, as compared to married mothers, cOR = 1.67 (95% CI: 0.64-4.35) for single never married mothers; cOR = 3.89 (95% CI: 1.37-11.05) for widowed, separated or divorced moms; and cOR = 2.46 (95% CI: 1.37-4.40) for cohabiting mothers.

The effect modification of race was assessed on each stratum of country of birth. However, due to small cell sizes, this analysis produced unstable estimates (data not shown). The two groups of single women were collapsed into one category due to small sample sizes and lack of statistical difference in chi-statistic for self-reported health status between the never married and widowed, separated, divorced mothers (p-value=0.10). Thus, subsequent analysis involved three categories: married, cohabiting and single. Table 4 shows the stratified unadjusted analysis of odds ratios for the 3 marital status categories. The interaction assessment described above was repeated. In this

analysis, no interaction terms for race, education, or age were significant (data not shown). The confidence intervals for the groups also produced more stable estimates. Thus, no interaction terms were included in the final model. The entire population was considered as a whole and no stratified analysis was conducted.

Confounding Assessment:

The four variables (age, race, education, country of birth) were assessed individually and the adjusted and crude odds ratios were compared. If the adjusted estimate was within 10% of the crude estimate, the variable was not considered a confounder (see Table 5). The crude estimate provides an unadjusted association between marital status and health. The crude odds of fair or poor health for single mothers is

Using this method, race and education were identified as potential confounders. Adjusting for level of education, the adjusted odds of fair or poor health are for single mothers is (aOR= 2.32, 95% CI 1.38-3.91) times that of married mothers. The adjusted odds for mothers living with partner is not statistically different (aOR=1.45, 95% CI: 0.94-2.24) from married mothers after adjusting for education.

Adjusting for race with white as the reference group, the odds of fair or poor health are for single mothers is (aOR= 2.84, 95% CI 1.62-4.99) times that of married mothers. The adjusted odds for mothers living with partner is also higher (aOR= 1.84, 95% CI: 1.18-2.86) than married mothers after adjusting for race.

Thus, race and education were considered together. In this adjusted model, the odds of fair or poor health are for single mothers is (aOR= 2.50, 95% CI 1.39-4.51) times that of married mothers. The adjusted odds for mothers living with partner is not statistically different (aOR=1.45, 95% CI: 0.93-2.27) from married mothers after adjusting for education and race.

Precision Assessment:

Three adjusted models (including 1-education, 2-race, 3-race and education) were compared to the unadjusted model for precision (see Table 6). The point estimates did not vary significantly between the model that adjusts for education (Model 1) and the model that adjusts for education and race (Model 3). Model 1, which adjusts only for education, has the highest precision.

Final Model:

In Model 3, adjusting for race and education, the odds of fair or poor health for single mothers is (aOR= 2.50, 95% CI 1.39-4.51) times that of married mothers. The adjusted odds for mothers living with partner is not statistically different (aOR=1.45, 95% CI: 0.93-2.27) from married mothers after adjusting for education and race. Race is included in the final model to allow for comparisons across different racial and ethnic groups. We discuss our rationale for including race in the final model below.

Discussion

The primary hypothesis for this analysis was that mothers who are single, (either because she never married or she is separated, widowed or divorced) will have higher overall odds of fair or poor health after adjusting for potential confounders. The results of this analysis support this hypothesis. The results of this analysis suggest an association is present between marital status and health related quality of life among mothers who have children under the age of 14 in this California population even after controlling for the potentially confounding effects of education and race.

The association between marriage and health is a complex interplay that involves a multitude of factors. In this analysis, cohabiting mothers were not statistically different from married mothers. From a theoretical perspective, from a cross-sectional dataset, it is difficult to determine which theory of marital health benefit this data supports. In this sample, married people are more likely to be more highly educated providing some evidence for the marital resource model. Equally likely is the possibility that single mothers' health suffer as a result of the absence of marriage.

Another aim of this thesis was to assess the general health status of Asians and Latinos. Asian and Latinos are not always representatively sampled in population based datasets. However, CHIS takes considerable linguistic efforts to increase sample size of these groups. In this analysis, self-reported health status varied widely by race. Latinos, Blacks and others had the highest frequencies of fair or poor health. Asians had the second highest health status overall and native-born Asians had higher health status than native-born Whites. Factors that influence the relative better health of Asians could involve education status (data not shown) or high rates of marriage. Asians may provide a comparison for minority groups that have generally positive health status.

A secondary hypothesis of this analysis was that self-reported health status will vary by race, and there may be modifying effects on self-reported health of race and marital status, or marital status and education or marital status and country of birth. Based on the Wald test for interaction, race, age, education and country of birth could were not statistically significant mediator of marital status. Based on the data, education level was the strongest confounder of health status and marital status followed by race. After adjusting for education, the effects of race were minimal. Race is included in the final model to allow for additional explanation of variation in health status. Age and country of birth were not confounders in this analysis. The relationship between health status and marriage is potentially confounded by educational attainment and race. Those with no formal education or less than a high school diploma had the highest odds of poor health in the adjusted model (data not shown). Considerable variation in health status exists by racial groups. Asians are not usually represented at the population level; but in this analysis, Asians had higher health status than Whites. Asians in the sample were more likely to have at least a high school diploma (data not shown). Although country of birth was not an effect modifier or confounder, non-native born individuals were more likely to have no formal education or less than a high school diploma.

<u>Strengths and Limitations</u>

The strengths of this analysis include 1) multivariate logistic regression, 2) representative population based data at the state level. Multivariate logistic regression is useful for adjusting for several factors at once without stratifying and creating smaller subsamples of the dataset. Analysis in SUDAAN provides stable variance estimates that accurately account for the complex survey weighting. Another strength of this analysis is that the data source is a representative sample of the state of California. CHIS is the largest state cross-sectional health survey in the country. Its strengths include population and geographically based weighting, data is collected continuously for current, up-to-date estimates, and a diverse sample (21, 25). California has some unique situations with respect to ethnic diversity. For example, 10.5% of households live in linguistic isolation as compared to 4.7% of households nationwide (35). To compensate for this, CHIS administers the survey in English, Spanish, Chinese (Mandarin and Cantonese dialects), Vietnamese, and Korean (21).

This analysis has several limitations mainly due to 1) the cross-sectional study design and 2) small sample sizes for single, non-married women and 3) validity of health status question in racial and ethnically diverse populations.

A major limitation of this analysis involves the cross-sectional study design. This analysis was based on a cross-sectional dataset which means causation cannot be established. In other words, we cannot tell whether healthier mothers get married or marriage bestows health on mothers in our sample. We cannot fully assess either the marital resource model or the stress/crisis model because we do not have enough information on the circumstances of mothers' lives. To fully consider the association between marriage and health, a longitudinal study design would be more appropriate. Additional measures of social support, relationship quality and partner support could be included for a more rich analysis. Single never married mothers may have different life experiences from single separated, divorced or widowed mothers (36). In this analysis, small numbers of never married and divorced, widowed, separated mothers precluded this comparison.

This limitation could potentially be overcome by gaining access to data from multiple years and pooling data for larger sample sizes.

Overall Generalizability:

At a population level, mothers in the 2009 CHIS have a higher weighted frequency of fair or poor health (17%) than of women of reproductive age in the United States (10%). Single mothers have the highest frequency of poor health in the sample (31%) as compared to cohabiting (24%) or married (12%) mothers.

However, these results should be interpreted with caution. California is more racially/ethnically diverse and has a larger immigrant population as compared to the rest of the United States. California has more Latinos and fewer African Americans than the overall United States and Latinos consistently reported lower self-rated health than other racial/ethnic groups (9, 10). Thus, the health of mothers in California may not be representative of the health of mothers across the country. For this reason, race is included in the final model to explain variations in health status.

More generally, with regards to the measurement of general health status, a body of literature suggests the health status measures may not be suitable for appropriately assessing the health of indigenous groups and the diverse US population(37, 38). Some argue that general health measures were developed in a highly educated, non-minority population and therefore do not have validity in diverse groups. Liao et al. report that there is substantial variation in the perceived health status among various racial and ethnic communities that may not be translated appropriately across languages (39). As mentioned before, in population-based data, all across the United States, Hispanic populations consistently report higher instances of fair or poor health in comparison to other minority/ethnic groups suggesting a role for cultural differences in interpretation of terms (9, 10). It is unclear whether this variation in health status is due to health-

deficits or cultural perceptions of health status (39). Further research in ethnic and minority health is needed in order to validly assess self-perception of health among and between diverse cultural groups.

Summary:

The results of this analysis support an association between marital status and health status. Single women are more likely to have fair or poor health status as compared to their married and cohabiting counterparts. After adjusting for race and education, single mothers have higher odds of fair or poor health (aOR= 2.50, 95% CI 1.39-4.51) as compared to married mothers. The adjusted odds for fair or poor health for mothers living with partner is not statistically different (aOR=1.45, 95% CI: 0.93-2.27) from married mothers. Education is a strong predictor of both marital status and health. Racial variations in self-rated health and marital status are also apparent.

The public health implications and suggestions for future directions are presented in Chapter 3. This thesis supports at least three directions for future research 1) Marital status including cohabiting and same-sex partnerships should be researched from a public health perspective as a potential determinant of health. 2) Maternal educational attainment is a potential maternal health determinant in its own right. 3) Racial differences in self-rated health should be explored further and valid culturally competent measures established.

Tables

Table 1: Unweighted N and Weighted Row Percents for Bivariate Associations between Marital Status and Selected Demographic Characteristics for Mothers ages 20-44 with children under age 14, 2009 California Health Interview Survey (N=4228)

	Married (N=3034)					Living with Partner (N=369)				Single (N=825)			
	Unweighted N	% weighted frequency	95% CI low	95% CI high		Unweighted N	% weighted frequency	95% CI low	95% CI high	Unweighted N	% weighted frequency	95% CI low	95% CI high
Age													
20-24	69	30.7	22.23	40.74		48	23.9	17.03	32.50	86	45.4	35.21	55.93
25-29	315	66.4	56.39	75.08		76	14.3	8.67	22.64	112	19.3	13.00	27.79
30-34	675	70.5	63.50	76.70		100	10.6	7.69	14.55	196	18.8	12.59	27.21
34-39	1001	78.7	73.31	83.22		89	6.2	4.84	7.85	211	15.1	10.61	21.16
40-44	974	78.9	74.28	82.87		56	5.8	3.10	10.60	220	15.3	11.94	19.42
Race/Ethnicity													
Latino	752	60.2	53.47	74.33		202	16.0	12.71	11.40	291	23.8	18.00	21.55
Asian	507	91.1	86.21	66.54		21	5.5	2.85	19.92	41	3.5	2.00	30.83
White	1381	84.1	80.70	94.37		81	4.9	2.96	10.14	271	11.1	9.17	5.88
African American	333	64.7	56.80	86.91		58	9.6	6.82	7.90	137	25.8	18.76	13.34
Other1	61	38.1	25.49	71.81		7	4.4	2.02	13.26	85	57.5	43.18	34.30
Education Level													
No formal OR Less than High School	456	57.2	48.13	65.76		153	17.2	13.57	21.50	174	25.7	17.45	36.02
HS Diploma completed	558	63.1	56.55	69.27		93	10.3	6.75	15.51	231	26.5	21.54	32.20
Some college, Technical school	613	68.5	62.40	74.08		81	10.5	6.83	15.88	247	20.9	16.40	26.35
BA	838	89.3	86.26	91.66		28	2.6	1.61	4.29	124	8.1	6.03	10.82
Grad School (some to PhD)	569	91.7	87.82	94.36		14	3.2	1.71	6.01	49	5.1	3.05	8.46

1-Other includes, Alaskan Native, Pacific Islander, Single race other and multiracial race categories

Stratified Analysis--- Selected Demographic Characteristics for California Mothers ages 20-44 with Children under 14, Stratified by Country of Birth (N=4228), 2009 California Health Interview Survey.													
	Total (N=4228)					Born in the United States (N=2293)					Not Born in United States (N=1935)			
	Unweighted N	%Weighted Sample	95% CI low	95% CI high		Unweighted N	%Weighted Sample	95% CI low	95% CI high		Unweighted N	%Weighted Sample	95% CI low	95% CI high
Age														
20-24	211	6.4	5.35	7.47		127	8.19	6.35	10.03		76	4.58	3.19	5.97
25-29	517	15.9	13.60	18.14		285	16.14	13.10	19.18		218	15.59	12.14	19.04
30-34	1016	24.7	22.27	27.05		528	24.29	21.66	26.92		443	25.05	21.33	28.77
34-39	1444	30.2	27.98	32.34		653	25.88	23.31	28.45		648	34.54	30.74	38.34
40-44	1680	22.9	21.19	24.61		700	25.51	22.53	28.49		550	20.23	18.00	22.46
Race/Ethnicity														
Latino	1245	36.5	33.87	39.21		319	17.5	14.92	20.02		926	56.1	52.12	60.00
Asian	569	11.6	10.01	13.19		58	3.9	2.49	5.39		511	19.4	16.87	22.01
White	1735	34.3	32.01	36.63		1528	59.0	55.40	62.50		205	9.1	7.24	11.00
African American	153	13.6	11.50	15.62		134	12.6	9.42	15.78		19	14.5	11.93	17.15
Other1	528	4.0	3.02	4.94		254	7.0	5.17	8.89		274	0.9	0.38	1.32
Education Level														
No formal OR Less than High School	783	24.8	22.44	27.14		106	6.5	4.60	8.44		677	43.5	39.48	47.48
HS Diploma completed	882	21.1	18.80	23.42		465	21.8	18.96	24.60		417	20.4	17.09	23.79
Some college, Technical school	941	21.2	19.01	23.41		675	30.1	26.70	33.56		266	12.1	9.72	14.46
BA	990	20.4	18.47	22.31		650	26.0	23.20	28.8424		340	14.6	12.30	16.96
Grad School (some to PhD)	632	12.5	11.19	13.81		397	15.6	13.57	17.53		235	9.4	7.53	11.21
Marital Status														
Married	3034	71.69	69.00	74.38		1640	72.8	69.704	75.976		1394	70.5	65.73	75.29
Living with Partner	369	9.61	7.98	11.24		147	7.1	5.09	9.01		222	12.2	9.49	14.97
Single	825	18.70				506	20.11				319	17.3		

1-Other includes, Alaskan Native, Pacific Islander, Single race other and multiracial race categories

Table 2. Weighted percent frequency of Fair or Poor Health by Marital Status, Mothers ages 20-44 with Children under 14, Stratified on Country of Birth, 2009 California Health Interview Survey (N=4228)

	TOTAL (N=4228)			Born in US (N=2293)			Not Born in US (N=1935)		
	Weighted Row Percent	95%CI low	95%CI high	Weighted Row Percent	95%CI low	95%CI high	Weighted Row Percent	95%CI low	95%CI high
Total	16.5	14.72	18.34	11.12	9.44	13.05	21.91	18.6	25.62
Married	11.8	9.85	13.99	7.43	5.31	10.32	16.34	13.38	19.8
Living w/partner	24.1	17.69	31.89	9.91	5.24	17.94	32.44	22.64	44.06
Single	30.5	23.00	39.24	24.91	17.59	34.01	37.21	21.94	55.54

Table 3. Weighted Percent Frequency of Fair or Poor Health by Race, Mothers ages 20-44 with Children under 14, 2009 California Health Interview Survey (N=4228)

Race/ethnicity	Total (N=4228)				Born in the United States (N=2293)				Not Born in the United States (N=1935)		
	weighted %	lower 95%CI	upper 95%CI		weighted %	lower 95%CI	upper 95%CI		weighted %	lower 95%CI	upper 95%CI
Latino	23.98	19.93	28.55		12.91	8.54	19.05		27.51	22.21	33.51
Asian	10.78	7.23	15.78		2.39	0.83	6.72		12.52	8.31	18.43
White	8.06	5.95	10.83		8.91	6.49	12.12		2.43	1.11	5.25
African American	12.98	8.04	20.3		12.6	7.47	20.47		16.23	3.84	48.42
Other1	23.3	17.06	30.97		20.89	11.09	35.87		25.43	18.62	33.7
Overall	16.45	14.72	18.34		11.12	9.44	13.05		21.91	18.6	25.62

Table 4. Unadjusted Stratified Analysis of Born in US status when Collapsing the Marital Status variable into 3 categories, loss of significance of Interaction Term, Mothers ages 20-44 with Children under 14, 2009 California Health Interview Survey (N=4228).

Marital Status	Total (N=4228)			*Born in US (N=2293)			Not Born in US (N=1935)		
	cOR	95% low	95% high	cOR	95% low	95% high	cOR	95% low	95% high
Married	REF	REF	REF	REF	REF	REF	REF	REF	REF
Living with Partner	2.38	1.54	3.69	1.37	0.65	2.88	2.46	1.37	4.4
Single-Widowed, Separated, Divorced	3.59	1.67	7.74	2.95	0.99	8.78	3.89	1.37	11.05
^Single-Never Married	2.94	1.83	4.71	5.31	3.00	9.40	1.67	0.64	4.35

*Wald test for interaction p-value= 0.042

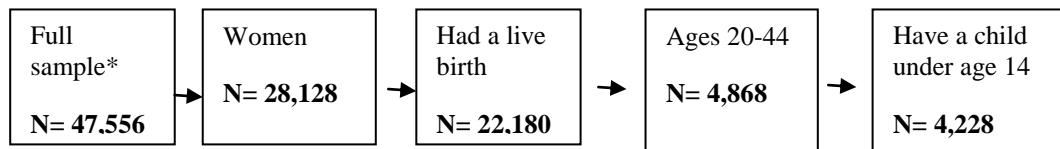^Chi-Square for differences between single-widowed, separated, divorced and single never married= 0.10

Table 5: Confounding Assessment-age, race and education, born in US based on varying marital status among mothers ages 20-44 with children under 14, 2009 California Health Interview Survey

	Total Population (N=4228)	
CRUDE	95% CI for Point Estimate of cOR	
LIVING W/ PARTNER	2.142	2.618
SINGLE	2.961	3.619
ADJUSTED	aOR	Is aOR within 10% of cOR?
AGE		
LIVING W/ PARTNER	2.36	yes
SINGLE	3.16	yes
EDUCATION		
LIVING W/ PARTI	1.45	no
SINGLE	2.32	no
RACE		
LIVING W/ PARTNER	1.84	no
SINGLE	2.84	no
Country of birth	aOR	
LIVING W/ PARTI	2.16	yes
SINGLE	3.49	yes
Summary of Confounders	RACE, EDUCATION	

TABLE 6. Models Considered for Assessing Association of Marital Status and Health Status, Unadjusted and Adjusted Odds of Fair or Poor Health based on varying marital status among mothers ages 20-44, 2009 California Health Interview Survey (N=4228)

Unadjusted	OR	95% low	95% high	
MARRIED	ref	ref	ref	
LIVING W/ PARTNER	2.38	1.54	3.69	
SINGLE	3.29	1.99	5.45	
Most precise model: Adjusted for education				CI width
MARRIED	ref	ref	ref	na
LIVING W/ PARTNER	1.45	0.94	2.24	2.4
SINGLE	2.32	1.38	3.91	2.8
Adjusted for race				
MARRIED	ref	ref	ref	na
LIVING W/ PARTNER	1.84	1.18	2.86	2.4
SINGLE	2.84	1.62	4.99	3.1
Final model: Adjusted for race and education				
MARRIED	ref	ref	ref	na
LIVING W/ PARTNER	1.45	0.93	2.27	2.4
SINGLE	2.5	1.39	4.51	3.2

Figures

Figure 1. Flowchart of Sample of Mothers aged 20-44 with Children younger than age 14, California Health Interview Survey, 2009.

Full sample* N= 47,556	→	Women N= 28,128	→	Had a live birth N= 22,180	→	Ages 20-44 N= 4,868	→	Have a child under age 14 N= 4,228

*A survey was considered to be complete if 80% complete. Any missing values were imputed.

Figure 2. Models considered for modeling the Association between General Health Status and Marital Status Considering the Interaction, Confounding, and Precision Effects of Age, Country of Birth, Education, and Race in Mothers aged 20-44 with Children younger than age 14, California Health Interview Survey, 2009.

Full Model (FM):

$$\text{logit } P(\mathbf{X}) = \alpha + \beta_1 E_1 + \gamma_1 C_1 + \gamma_2 C_2 + \gamma_3 C_3 + \gamma_4 C_4 + \delta_{11} E_1 C_1 + \delta_{12} E_1 C_{2+} \; \delta_{13} E_1 C_3 + \delta_{12} E_1 C_4$$

Where:

$P(\mathbf{X})$= health status (dichotomized 0,1 where 1=fair or poor health ; 0=excellent, very good or good health, the model predicts odds of poor health)

E_1=marital status (Categorical; 1=married; 2=living with partner; 3=single; reference group married)

C_1=age (categorical: 1=20-24; 2=25-29; 3=30-34; 4=35-39; 5=40-44; reference group 25-29)

C_2=race (dummy variables for different race ethnicities; 1=Latino; 2=Asian; 3=White 4=African American; 5=OTHER; reference group white)

C_3=education (1=no formal education or less than high school (HS); 2=HS complete;

C_4=born in US (0, 1: 0 born in US, 1 not born in US; the other option is to stratify on this variable)

Interaction assessment:

Wald test at 0.05 confidence suggest no interaction terms significant

Model **IM:** $\text{logit } P(\mathbf{X}) = \alpha + \beta_1 E_1 + \gamma_1 C_1 + \gamma_2 C_2 + \gamma_3 C_3 + \gamma_4 C_4$

Confounding assessment of Model IM:

Potential confounders: C1, C2, C3, and C4;

Selection Criteria: Used a 10% comparison rule between crude and adjusted OR with marital status

Potential Confounders identified: C_2 and C_3

Models considered 1) $\text{logit } P(\mathbf{X}) = \alpha + \beta_1 E_1 + \gamma_3 C_3$

2) $\text{logit } P(\mathbf{X}) = \alpha + \beta_1 E_1 + \gamma_2 C_2$

3) $\text{logit } P(\mathbf{X}) = \alpha + \beta_1 E_1 + \gamma_2 C_2 + \gamma_3 C_3$

Precision Assessment of Model CM: Most precise model--1) $\text{logit } P(\mathbf{X}) = \alpha + \beta_1 E_1 + \gamma_3 C_3$

Final model: 3) $\text{logit } P(\mathbf{X}) = \alpha + \beta_1 E_1 + \gamma_2 C_2 + \gamma_3 C_3$

Chosen for greatest explanatory potential considering all identified confounders

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CHAPTER 3: FUTURE DIRECTIONS AND PUBLIC HEALTH IMPLICATIONS

The Association between General Health Status and Marital Status among Mothers of Reproductive Age (20-44) living with Children under 14—A Secondary Analysis of the 2009 California Health Interview Survey

By Kashika M. Sahay

Summary

This thesis examines the general maternal health status ages 20-44 with children younger than 14 years of age in the context of marital status based on a cross-sectional state population-based questionnaire. This analysis uses multivariate regression to assess several factors at once and accounts for complex survey weighting in variance estimates. The results of this analysis support an association between marital status and health status. Single women are more likely to have fair or poor health status as compared to their married and cohabiting counterparts. After adjusting for race and education, single mothers have higher odds of fair or poor health (aOR= 2.50, 95% CI 1.39-4.51) as compared to married mothers. The adjusted odds for fair or poor health for mothers living with partner is not statistically different (aOR=1.45, 95% CI: 0.93-2.27) from married mothers. Education is a strong predictor of both marital status and health.

As discussed in Chapter One, theoretical links between marital status and health are a topic of interdisciplinary research. Two models dominate sociological theory on the health benefits of marriage: 1) the marital resource model and 2) the stress/crisis model. The marital resource model posits that those who are married have more economic, institutional and instrumental resources which results in better health outcomes. According to stress/crisis model, in the absence of marriage or a partnering relationship, single people are more vulnerable to life's stressors. Those within the single status (either separated, divorced or widowed as compared to never married) may have different health statuses due to varying presence of social and emotional support. Changing social norms complicate these models.

As hypothesized, cohabiting mothers emerge as a potential intermediary health status. We did not find a statistical difference between married and cohabiting women. This suggests that the instrumental supports available to a mother when living with a partner may be similar to the institutionalized supports traditionally associated with marriage. These may buffer individuals from some of the stressors of living alone. The strong association with education may also indicate that education may provide instrumental support such as material resources including income and health insurance that may be beneficial for health.

Racial variations in self-rated health and marital status are also apparent. This analysis also describes the population-weighted health status of Asians, Latinos and non-United States born individuals in the state of California. These groups are previously underreported at the population level. United States-born Asians have higher health status than United States born whites. Overall Latinos and those born outside the United States had higher frequencies of fair or poor health as compared to overall Whites (24% among Latinos, 22% among non-native born mothers, and 8% overall Whites). Asians have the second-lowest frequency (11%) of fair or poor health after native-born whites.

Possible Future Directions for Research

Consider longitudinal study designs for marital status of women of reproductive age

A major limitation of this analysis is the cross-sectional design. Thus, causation cannot be established. Further research is warranted on the potential causal mechanisms for how marital status and other social factors influence quality of life and overall health through longitudinal study design.

Thus, as discussed in Chapter Two, in order to more fully consider social implications on health, a longitudinal study design with more questions about partner support, relationship quality and more domains of health status would be beneficial. Increasingly, longitudinal datasets should

be used and analyzed to gain deeper understanding of the changes in socio-demographic factors throughout the life course influence adverse health events. Recently, the National Children's study has included variables which reflect the changing demographics of marriage and advanced social epidemiological analytic related to household structure (1). These variables should continue to be analyzed in the context of maternal and child health throughout the life course.

Include maternal health status in population-level surveillance

This is the first analysis that we are aware of which considers maternal health from a life-course perspective in the state of California. As discussed in chapter 1, general health status is a population level indicator of overall health status measured in five categorical levels: excellent, very good, good, fair or poor.   At the United States population level, approximately 10% of the population reports fair or poor health. In our analysis, overall 17% of the sample had fair or poor health. Maternal health status has not been explored on the population level in the United States. Understanding the baseline health status of mothers in the general population can help us to assess differences in health needs among mothers of children with special needs, unique family structures and racial/ethnic groups.

Changing Demographics: Same-sex Couples and Childrearing

Family policy advocates have supported considering cohabitating and same sex parents as a demographic (2-4). Same-sex couples have not yet received due attention in mainstream population health status estimates. According to 2010 US Census, of the 594,000 same-sex households, 115,000 reported having children under 18 living in the household along (5). Based on these estimates, Approximately 90,000 US households with same-sex couples live in California either with their legal spouse or unmarried partner. California has performed same-sex marriage from June-November 2008(5). CHIS samples same sex partners, but the data is not

publically available for confidentiality reasons. Further analysis should be considered to understand the potentially unique public health implications of same-sex parenting.

Social Support, Education, and Race/ethnicity as Potential Points of Quality of Life Intervention

Based on this analysis and the available literature, health status could be influenced by education and race/ethnicity. Public health interventions targeted at improving maternal and infant health outcomes should consider a full spectrum of socio-demographic living situations to optimize health-related quality of life and health outcomes for mothers and children (6). Appropriate points for intervention and public health policy should be considered to promote improvements overall quality of life and promoting well-being throughout the reproductive years (7, 8).

Based on the literature review in Chapter One, the demographics of marriage and family structure are constantly changing. The United States can learn from international settings (Canada, the UK and Australia) to test and monitor strategies aimed at improve health status of single and cohabiting mothers (9-14). In the international context, educational group-based parenting programs are also effective at improving child health outcomes and expanding social networks (15).

In Canada and Australia, observing these patterns has resulted in innovative interventions for increased social and educational support for single mothers through computerized means (13, 14). In one intervention, single women received computerized emails or text messages with supportive messages and referrals to social services(14). In another intervention, mothers received group-based education on childcare, budgeting and job search(13). Follow-up qualitative research on this intervention showed that mothers felt they benefitted from budget management, resources for child care and reduced isolation as a result from the group education meetings (16).

Cairney et al. discuss several mechanisms by which lack of social support provided by an intimate partner can explain links between depression and stress between single and married mothers (17).This data suggests that improving partner relationship quality could also be an important determinant. In the United States, the CDC supports interventions that strengthen and expand social networks of mothers, although specific interventions are not mentioned (6).

The mechanisms by which social demographic factors influence health could be moderated by diverse racial/ethnic groups are current, pertinent topics. Culturally specific variables such as perceived discrimination, language proficiency in English, and improving health literacy may emerge as important themes (18).

Public Health Implications

Surveillance Implications:

The CDC recommends using ongoing surveillance of general health status to identify vulnerable subpopulations, track population trends over time, and monitor progress in achieving *Healthy People 2020* goals(19). Based on our findings, maternal health status is lower than the general United States population health status. Low health status, specifically fair or poor health, is independently linked to adverse health outcomes including mortality, morbidity and stress (20). Poor general health status has been associated with adverse mental health maternal depression and psychological distress (21). Identifying vulnerable maternal subgroups can help us to assess differences in health needs among mothers of children with special needs, unique family structures and racial/ethnic groups.

Policy Implications:

Marital status is a consideration for government-sponsored health benefits for families (22). As our data and national data indicate, cohabitation and non-marital childrearing is more common

among Latinos, African Americans and Other races. A 2008 revision of Temporary Assistance for Needy Families (TANF) bill emphasized "The Secretary shall award competitive grants to States, territories, and tribal organizations for not more than 50% of the costs of developing and implementing innovative programs to promote and support healthy, married, 2 parent families.(4)" Family policy advocates from the Population Studies Center lobbied to consider cohabiting couples as a potential family structure (4). The current approved version of the bill omits the word married from TANF purposes. In revised 2013 terms, the four purposes of TANF are: "1)   assisting needy families so that children can be cared for in their own homes; 2) reducing the dependency of needy parents by promoting job preparation, work and marriage; 3) preventing out-of-wedlock pregnancies; and 4)   encouraging the formation and maintenance of two-parent families"(22). Although marriage promotion is still encouraged in objective two, the word married does not precede 2-parent families. Our analysis shows no statistical differences between married and cohabiting partnerships supporting the idea that 2-parent families should be supported regardless of formal marriage.

<u>Final Recommendation</u>

1) I believe that we need more surveillance monitoring changes in marital status and marital quality of relationships for mothers of reproductive age.

2)   I believe we should monitor the general health of mothers overall so that these estimates can be compared to same-sex mothers, mothers with special needs children and adverse pregnancy outcomes.

3) I support the use of epidemiological methods to measure sociodemographic outcomes provided the outcome and exposure measures are defined in a consistent manner grounded in appropriate theoretical constructs.

4) The Latino and Asian racial/ ethnic minority health should also be assessed regularly and factors contributing to ill or beneficial health status within these groups explored further.

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