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Female Sterilization and Poor Mental Health: Rates and Relatedness Among American Indian and Alaska Native Women

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Author Descriptions

Christina J. J. Cackler, MPH, MSW, drew on research conducted for the MPH/MSW program at University of California, Berkeley for this study. She is interested in mental health practice and reproductive health research with American Indian/Alaska Native and minority women.

Valerie B. Shapiro, PhD, is an assistant professor at UC Berkeley. Her research seeks to prevent mental, emotional, and behavioral problems through the adoption, implementation, and sustainability of effective prevention practices. She was the first author's primary mentor on this manuscript.

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Abstract

Objective: To describe the reproductive and mental health of American Indian and Alaska Native (AI/AN) women – an understudied population.

Methods: Data from the 2004 Behavioral Risk Factor Surveillance System survey were analyzed to determine (1) the prevalence of female sterilization among a nationally representative sample of reproductive age AI/AN women and (2) the association of female sterilization and poor mental health among AI/AN women compared with non-Hispanic White, non-Hispanic Black, and Hispanic women.

Results: Nearly 25% of AI/AN women reported female sterilization, a prevalence higher than the comparison racial/ethnic groups ($P<0.005$). Adjusting for socio-demographic characteristics, AI/AN women reporting female sterilization had nearly 2.5 times the odds of poor mental health compared to AI/AN women not reporting female sterilization ($P=0.001$). The same magnitude of relationship between female sterilization and poor mental health was not found for non-Hispanic White, non-Hispanic Black, and Hispanic women.

Conclusions: AI/AN women reporting female sterilization have significantly higher odds of reporting poor mental health. Common cultural experiences, such as a shared ancestral history of forced sterilizations, may be relevant, and could be considered when providing health and mental health services to AI/AN women.

INTRODUCTION

Mental illness is the most common form of morbidity among adults in the United States (Reeves et al., 2011; U.S. Department of Health and Human Services [HHS], 1999), and American Indians and Alaska Natives (AI/AN) disproportionately experience poor mental health. Compared to other groups, AI/ANs report the highest rate of serious psychological distress (characterized by feelings of worthlessness, hopelessness, and depression) (Blackwell, Lucas, & Clarke, 2014) and have elevated rates of serious mental illness (Substance Abuse and Mental Health Services Administration [SAMHSA], 2012), post-traumatic stress disorder (Beals, Manson, et al., 2005), and suicide (SAMHSA, 2012). Poor mental health has been linked to poor health outcomes, decreased labor market participation, and increased health risk behaviors, including high rates of substance use/abuse in AI/AN populations (Banta et al., 2009; Beals, Manson, et al., 2005; Beals, Novins, et al., 2005; Masterson, Hopenhayn, & Christian, 2010; Reeves et al., 2011; Tann, Yabiku, Okamoto, & Yanow, 2007; Urban Indian Health Institute [UIHI], 2012; UIHI, 2014; HHS, 1999). Although the inequitable burden of disease among AI/AN populations is well documented, small AI/AN sample sizes limit the capacity to demonstrate relationships with plausible individual and structural factors associated with such problems. The lack of available data is problematic for efforts to promote AI/AN health equity because it inhibits the exploration of the etiology of disease and the design of effective interventions (Shreffler, McQuillan, Greil, & Johnson, 2015; HHS, 2007; UIHI, 2010; Watanabe-Galloway, Duran, Stimpson, & Smith, 2013).

A small but growing body of literature documents that AI/AN women are particularly impacted by poor mental health (Amparo, Farr, & Dietz, 2011; Beals, Manson, et al., 2005; Beals, Novins, et al., 2005; UIHI, 2012; Walters & Simoni, 2002). Studies provide evidence of

harm to the mental and physical integrity of AI/AN women, because compared to women from other racial/ethnic groups in the United States, AI/AN women are more likely to be victims of violent crime (Greenfield & Smith, 1999; Walters & Simoni, 2002), experience rape and/or physical assault (Tjaden & Thoennes, 1998; Urban Indian Health Institute [UIHI], 2010), and to report interpersonal violence and victimization (Black, Breiding, & National Center for Injury Prevention and Control, 2005; Evans-Campbell, Lindhorst, Huang, & Walters, 2006; Fisher, Fenaughty, Paschane, & Cagle, 2000; Malcoe, Duran, & Montgomery, 2004). This violence can have mental health repercussions as AI/AN women who have experienced trauma are more likely to be depressed or dysphoric (Evans-Campbell et al., 2006) and are more likely to have post-traumatic stress and mood disorders over their lifetimes (Bohn, 2003; Robin, Chester, Rasmussen, Jaranson, & Goldman, 1997). The experiences of AI/AN women that contribute to and reflect psychological distress, as well as those that provide choice and agency, merit further investigation.

Contraception may be a method for women to protect their mental and physical health. Indeed, women report that it is very important to use contraception in order to have better control over their lives (Frost & Lindberg, 2013). Female sterilization, a permanent form of contraception, is one strategy that women report using to manage their fertility and improve their socio-emotional circumstances (Gilliam, Davis, Berlin, & Zite, 2008; Leyser-Whalen & Berenson, 2013; Lopez, 1993). Female sterilization can be surgical (tubal ligation or hysterectomy) or non-surgical (tubal occlusion) and is used by 17% of women in the United States (as common as the birth control pill) (Jones, Mosher, Daniels, 2012; Mosher & Jones, 2010).

The prevalence of female sterilization varies by racial/ethnic group in the United States, and minority women are more likely to report sterilization (Shreffler et al., 2015). Data from the National Survey of Family Growth shows that female sterilization is used by 20% of Hispanic and 22% of non-Hispanic Black reproductive age women, relative to 15% of non-Hispanic White women (Mosher & Jones, 2010). Shreffler and colleagues (2015) found that 42% of Native American women reported using tubal sterilization as their contraceptive. A study by the Urban Indian Health Institute (UIHI) found that one-third of urban AI/AN women aged 15-44 were sterilized compared to one-fifth of non-Hispanic Whites (UIHI, 2010). However, the generalizability of these results is constrained due to small sample sizes: 85 Native American women were included in the Shreffler et al. study and 357 urban AI/AN women were included in the UIHI study. Although limited, these data suggest that AI/AN women have higher rates of female sterilization.

Women become sterilized for a variety of reasons. Personal reasons, such as a woman's age, parity, social support systems, mental health status, and financial security, may lead some women to choose sterilization (EngenderHealth, 2002; Gomez, Fuentes, & Allina, 2014; Lopez, 1993; Shreffler et al., 2015). Other structural and social factors, including the quality of information provided by health care professionals and social beliefs around the use of sterilization, may also play a role (EngenderHealth, 2002; Leyser-Whalen & Berenson, 2013; Lopez, 1993). Maintaining access to reversible and permanent forms of contraception is a critical component in preserving women's self-determination. In providing reproductive services, the potential force of cultural, social, structural, and historical factors to choose a specific contraceptive must be considered (Gomez et al., 2014; Leyser-Whalen & Berenson, 2013; Schoen, 2005).

Given that women report using contraception, including female sterilization, to improve their circumstances, there may be a relationship between female sterilization and mental health. The majority of women reporting sterilization are satisfied with the procedure (Hillis, Marchbanks, Tylor, & Peterson, 1999; Leyser-Whalen & Berenson, 2013; Rosenfeld, Taskin, Kafkashli, Rosenfeld, & Chuong, 1998), but interviews suggest that women are more likely to be dissatisfied when external factors (e.g., medical professionals who do not provide adequate information about the finality of the procedure, forced waiting periods, and economic insecurity) influence their decision to be sterilized (EngenderHealth, 2002; Gilliam et al., 2008; Leyser-Whalen & Berenson, 2013; Lopez, 1993). One cross-sectional study controlling for socio-demographic factors found that women reporting tubal ligation or partner vasectomy were more likely to experience frequent mental distress (Farr, Curtis, Robbins, Zapata, & Dietz, 2011). There is also some evidence of racial/ethnic differences in attitudes towards sterilization. Borrero et al. (2008) found that Black women over age 30 were much more likely to desire sterilization reversal than White women, and Shreffler and colleagues (2015) described how Native American and Hispanic women in their sample were more likely to view sterilization as a barrier to having desired children. These feelings of satisfaction or regret about being sterilized appear to be a component of mental health status; a longitudinal study among women seeking tubal ligations found that women who were dissatisfied with the procedure one year later had higher pre- and post-operative depression scores (Kelekçi, Erdemoglu, Kutluk, Yılmaz, & Savan, 2005). Taken together, more research is needed to explore the rates of sterilization and psychological distress in AI/AN populations, the potential association between sterilization and mental health, and variation in rates and associations by race/ethnicity.

Although female sterilization can be an empowering method for fertility control, it has a weighty negative history as a method used to eugenically control and marginalize minority populations, including AI/AN (Lawrence, 2000; Schoen, 2005; Shreffler et al., 2015; Stern, 2005; Torpy, 2000). Several reports document sterilization abuses against AI/AN women by the Indian Health Service in the 1970s, most of which were performed by White male physicians who gave social and economic justifications for the sterilizations (Carpio, 2004; Lawrence, 2000). Alarming interviews describe AI/AN women waking up from post-delivery anesthesia to find out that they had been given a hysterectomy and girls as young as eleven being sterilized without their knowledge (Carpio, 2004).

The shared history of colonization and ethnic trauma experienced by AI/AN people has been hypothesized as a potential explanation for the high rates of morbidity and mortality in this population (Evans-Campbell, 2008). Termed "historical trauma," Maria Yellow Horse Brave Heart conceptualized it as a "cumulative emotional and psychological wounding across generations, including the lifespan, which emanates from massive group trauma" (Brave Heart, Chase, Elkins, & Altschul, 2011). The theory suggests that an event or set of events can impact an individual, even if not been personally experienced, through shared memories and through the sustained deleterious effects of the trauma on the group's language, cultural practices, and ethnic identification (Walters, 2013). Whitbeck and colleagues found that the strength of the perception of historical losses was significantly tied to feelings of depression and anger (Whitbeck, Adams, Hoyt, & Chen, 2004). Therefore, while contemporary experiences of trauma, abuse, and discrimination surely affect psychological functioning, this theory suggests that the shared memory of forced sterilizations may be internalized and transmitted across generations and could be a potential influence on AI/AN mental health (Walters & Simoni, 2002). With this shared

history and the potential for intergenerational transmission of trauma in mind, exploring the contemporary association between sterilization and mental health among AI/AN women may further our understanding of possible etiological pathways for AI/AN health inequities.

This study aims to contribute to our understanding of the health of AI/AN reproductive age women. The experience of discrimination, historically traumatic events, and health disparities is not unique to AI/AN populations (Lopez, 1993; Schoen, 2005; Stern, 2005; Williams, 2008), so comparisons with non-Hispanic Whites, non-Hispanic Blacks, and Hispanics will be made. This study seeks to answer the following research questions: 1) What is the prevalence of female sterilization in a representative sample of reproductive age AI/AN women in the United States? 2) What is the prevalence of poor mental health in this population? 3) Is there an association between report of female sterilization and poor mental health in this AI/AN population? 4) Is the mental health and female sterilization relationship different among AI/AN compared to non-Hispanic White, non-Hispanic Black, and Hispanic women? To our knowledge, this is the first study seeking to test the association between female sterilization and poor mental health among AI/AN women, and to compare the odds of poor mental health among sterilized reproductive age women across racial/ethnic groups in the United States.

MATERIAL AND METHODS

Data come from the 2004 Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is an annual, national, random-digit telephone survey tracking behavioral risk factors and health behaviors of adults in the United States (Centers for Disease Control and Prevention [CDC], 2005a). Each year, the Centers for Disease Control and Prevention (CDC) oversees the state-based administration of the BRFSS and designates a set of core modules that all states must administer in English or Spanish (CDC, 2006). Households are chosen according to a multistage

sampling scheme to select a representative sample of non-institutionalized adults aged 18 and older in the United States (Hughes et al., 2006).

The BRFSS includes a relatively large sample of American Indians and Alaska Native participants. The 2004 BRFSS was chosen because it is the most recent survey to include both self-perceived mental health and female sterilization (tubal ligation and hysterectomy) questions in the set of core modules administered to a national sample of reproductive age women, and because the AI/AN racial identification is part of the publically accessible database. In 2004, the national median cooperation rate, or the proportion of interviews collected out of the total eligible households that were actually contacted, was 74.3% (CDC, 2005b). BRFSS demographic distributions in 2004 are similar to other national studies (Hughes et al., 2006), suggesting that BRFSS data adequately represent the U.S. population at that time. Data for this study were obtained through the de-identified publically available CDC database; therefore, this analysis was deemed exempt from Institutional Review Board review.

Study Population

American Indian and Alaska Native reproductive age (18-44 years old) females were selected according to the BRFSS constructed "*preferred race*" variable. Participants were asked to identify which racial group (*White, Black or African American, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native,* or *Other*) best represented his/her race. The AI/AN preferred race definition, as used in other research (UIHI, 2010), included women who indicated AI/AN as their singular racial identification or who chose multiple racial identifications and indicated that AI/AN best represented their race (n=1,601).

AI/AN reproductive age women were compared to reproductive age non-Hispanic White, non-Hispanic Black, and Hispanic women through a constructed race/ethnicity variable. This

variable combined responses to the questions regarding racial group identification and Hispanic ethnicity. All respondents reporting Hispanic origin were coded as Hispanic (CDC, 2005c). Because the "*preferred race*" variable does not distinguish according to Hispanic ethnicity, those reporting AI/AN preferred race who also reported Hispanic ethnicity were only represented in the AI/AN preferred race group.

To determine the prevalence of female sterilization among this nationally representative sample of reproductive age women, the population estimate of female sterilization was calculated using the race/ethnicity groups described above. To determine the prevalence of poor mental health and to test the association between female sterilization and poor mental health, additional exclusion criteria of current pregnancy and invalid mental health data were applied for the multivariate analyses (n=1,501 for AI/AN).

Measures

Women who reported hysterectomy or tubal ligation at any point in the survey were coded as having female sterilization. The survey asked all female participants about having had a hysterectomy, and then women aged 18-44 years old who had not previously reported hysterectomy were asked about current contraceptive use. Respondents reporting contraceptive use were asked to identify their current method, which included "*tubes tied*" and "*hysterectomy (female sterilization)."* If the woman denied contraceptive use, she was asked her primary reason. Coded responses included "*you had your tubes tied (sterilization)"* and "*you had a hysterectomy*." For both questions, interviewers were instructed to read the list of options only if necessary (CDC, 2004).

Poor mental health was defined from the 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?" Those reporting 0 days were coded as "none" and those reporting 1-30 days were coded as "any." Published studies have used a range of cut-points to operationalize the BRFSS poor mental health days question (Amparo et al., 2011; Banta et al., 2009; Chowdhury, Balluz, & Strine, 2008; Farr et al., 2011; Masterson et al., 2010; Vandemark & Mueller, 2008). Stigma around the report of poor mental health increases the likelihood of underreporting (Grandbois, 2005; HHS, 1999), so a dichotomous definition was chosen to capture the full population of respondents experiencing poor mental health. The poor mental health days question was explicitly designed to include perceived mental health (Moriarty, Zack, & Kobau, 2003) and has been shown to correlate moderately well or well with scales more directly or comprehensively assessing depression and mental health (U.S. Department of Health and Human Services [HHS], 2000).

Analytic Approach

In all analyses, survey weights were applied to obtain optimally representative estimates of population proportions, accounting for disproportionate sampling by geographic and density strata, number of phones, and number of adults in the household (CDC, 2005a). Univariate analyses were conducted to obtain descriptive statistics of the study sample. A review of the literature and results of the univariate analyses informed the inclusion of the following categorical covariates: age, household income, marital status, and number of children in the household under 18 years of age. Self-perceived health status and insurance coverage were among the variables considered for inclusion, but the univariate analyses demonstrated that these variables were not confounders in the AI/AN population at $P<0.05$. Bivariate analyses produced prevalence estimates of female sterilization and poor mental health in representative samples of reproductive age women in the United States. Logistic regression was used to test the

association between female sterilization and poor mental health, and a significance level of $P<0.05$ was applied. Four separate models stratified by race/ethnicity were created to obtain odds ratios and test statistics for each race/ethnicity group. Effect modification by race/ethnicity was tested due to the hypothesized interaction between race and female sterilization on poor mental health. Analyses were conducted using weighted survey commands in STATA 13 (StataCorp, 2011) and the Rao-Scott χ^2 adjustment was used to obtain test statistics (StataCorp, 2013).

RESULTS

Table 1 describes the demographic characteristics of the study sample. The 2004 BRFSS included 1,601 AI/AN reproductive age women. Although the crude number of participants is not statistically relevant due to the weighted nature of the data, this sample size is much larger than most studies conducted with this population and allows for more statistically rigorous estimates of population proportions.

Female Sterilization

As shown in Table 1, nearly 24.7% of AI/AN women aged 18-44 reported female sterilization. 70.6% of the AI/AN women with female sterilization reported tubal ligation and 29.4% reported hysterectomy (results not shown). Non-Hispanic White women had the lowest prevalence of female sterilization at 17.9%, with higher rates among non-Hispanic Black (22.7%) and Hispanic (20.1%) women. The across-group difference in report of female sterilization was statistically significant ($P<0.0005$).

Poor Mental Health

Table 2 shows the proportion of women reporting any days of poor mental health in the last 30 days. The prevalence of poor mental health was highest for AI/AN women, with 54.9%

of AI/AN reporting any poor mental health days in the last 30 days, compared to 48.9% for non-Hispanic White women, 45.0% for non-Hispanic Black women, and 43.8% for Hispanic women (*P*<0.0005).

Female Sterilization and Poor Mental Health

After adjusting for age, household income, marital status, and number of children less than 18 years old in the household, reproductive age AI/AN women reporting female sterilization had nearly 2.5 times the odds of reporting poor mental health compared to those not reporting female sterilization (Table 2; *P*=0.001). Non-Hispanic White women reporting female sterilization had slightly increased odds of reporting poor mental health (adjusted OR=1.16; *P*<0.0005). There was not a statistically significant relationship between poor mental health and female sterilization for non-Hispanic Black and Hispanic women. The test for interaction by race/ethnicity in the association between female sterilization and poor mental health produced a *P*-value of 0.077. The adjusted odds ratios reported in Table 2 and the 95% confidence intervals of poor mental health of women reporting female sterilization compared to women not reporting female sterilization across the four racial/ethnic groups are illustrated in Figure 1.

DISCUSSION

This study, using a nationally representative sample of reproductive age women in the United States, found that nearly 25% of AI/AN women report female sterilization and nearly 55% of AI/AN women report poor mental health. Rates of female sterilization and poor mental health were lower for non-Hispanic White women (female sterilization: 17.9%, poor mental health: 48.9%), non-Hispanic Black women (female sterilization: 22.7%, poor mental health: 45%), and Hispanic women (female sterilization: 20.1%, poor mental health: 43.8%); the higher proportions observed in the AI/AN population were significant in the across group comparisons

at $P<0.005$. Controlling for socio-demographic covariates, AI/AN with female sterilization were 2.5 times more likely to report poor mental health than unsterilized AI/AN women, an association not observed in other racial/ethnic groups.

To our knowledge, this is the first study to report the prevalence of tubal ligation and hysterectomy among a large, representative sample of reproductive age AI/AN women. Nearly 25% of AI/AN women in this study reported female sterilization. Shreffler and colleagues used 2005-2006 data from the National Survey of Fertility Barriers and found that 42.4% of Native American women reported having been surgically sterilized (Shreffler et al., 2015). The Urban Indian Health Institute (UIHI) analyzed data from the 2002 National Survey of Family Growth and found that 34% of urban AI/AN reproductive age women reported female sterilization (UIHI, 2010). These studies have limited generalizability due to the small sample sizes (85 and 357 respectively, versus this study's 1601); however, the high prevalence of female sterilization found among the AI/AN female study populations suggests that the elevated rate found in this study is not an anomaly. Additionally, the rates of female sterilization for non-Hispanic White (17.9%), non-Hispanic Black (22.7%), and Hispanic (20.1%) women in this study are very similar to results from the 2002 National Survey of Family Growth (14.9% for non-Hispanic White, 21.8% for non-Hispanic Black, and 19.6% for Hispanic women) (Mosher & Jones, 2010), further suggesting that the population proportions observed in this study reflect the prevalence of female sterilization in the U.S. at that time.

This study reinforces the high rates of psychological distress found in AI/AN populations as nearly 55% of AI/AN women in this study reported one or more days of poor mental health in the last 30 days. This study's dichotomous definition of self-perceived emotional distress excluded participants who did not answer the poor mental health days question. Nonetheless, this

population percent is likely an underestimate as mental health stigma can contribute to non-response and underreporting of poor mental health days (Clement et al., 2014), biasing results towards the null.

This is the first study to test the association between female sterilization and poor mental health within a representative sample of AI/AN women and to compare the odds of poor mental health of sterilized reproductive age women across racial/ethnic groups in the United States. The significantly increased odds of poor mental health for AI/AN reproductive age women reporting female sterilization compared to AI/AN women not reporting sterilization suggest that psychosocial factors beyond socio-economic status could be contributing to this association. Historical trauma theory posits that the legacy of forced sterilizations could be impacting the mental health status of AI/AN women before and after sterilization (Walters, 2013). It could also be that external social and relational forces are implicitly or explicitly influencing AI/AN women's decision to become sterilized, an experience that may result in dissatisfaction and poor mental health. Shreffler and colleagues (2015) reported that 59.5% of the American Indian women in their sample reported sterilization regret, which was significantly higher than for the other racial/ethnic groups. Given that sterilization regret has been associated with depression (Kelekçi et al., 2005), the high level of regret reported by Shreffler et al. (2015) may help explain the increased odds of poor mental health given sterilization found in this study. The results of this study point to the need for additional exploration of the range of psychosocial factors – including contemporary and historical trauma – that may affect mental health outcomes among AI/AN women.

The same magnitude of increased odds of poor mental health given female sterilization was not found for non-Hispanic Black or Hispanic women in this study. For non-Hispanic Black

women, there was a moderate increase (19%) in the odds of poor mental health for women reporting female sterilization at borderline statistical significance *(P*=0.055). However, there was no difference in the odds of poor mental health for Hispanic women reporting sterilization compared to those not reporting sterilization. Socio-demographic characteristics may mediate the relationship between sterilization and poor mental health for Hispanic women, such that controlling for covariates obscures any association. Non-Hispanic Black and Hispanic women have historically also been victims of eugenics policies and forced sterilizations (Schoen, 2005; Stern, 2005), and this study points to the need for further research to examine the effect of these policies on minority groups in the United States.

The results of this study must be interpreted conservatively due to the cross-sectional nature of the data. The BRFSS only asks whether or not a woman has had a hysterectomy or tubal ligation; it does not ask why the procedure occurred or how long ago it was conducted. Ascertaining the situation surrounding a woman's sterilization and proximity to the date of procedure would be relevant additions to the exploration of how mental health is related to sterilization status. Future research should also consider exploring other factors that may be associated with hysterectomy/tubal ligation, such as endometriosis and uterine pain. Gathering data longitudinally would further strengthen analyses to determine whether pre-existing poor mental health is associated with sterilization and continued poor mental health. Additionally, the measure of poor mental health included in the BRFSS is limited as it only assesses the frequency and not severity or duration of an experience of poor mental health. It is a generic measure, which could capture a range of different mental and emotional experiences, including sadness, anxiety, and anger. Furthermore, this measure is an assessment of mental health in the last month and may not be directly related to a woman's sterilization procedure performed years

before; there could be a confounding factor that happens to contribute to both sterilizations and poor mental health. Finally, the AI/AN population is extremely heterogeneous, with differences in tribal location, cultural practices, and history. This analysis was unable to account for this cultural richness as controlling for location or tribal affiliation in this study would have resulted in a substantially reduced sample size due to missing data.

Implications for Policy and/or Practice

This study highlights important considerations for public health policy and the provision of reproductive and mental health services to AI/AN women. Recent research describes the importance of reproductive autonomy and highlights the social and environmental pressures impacting contraceptive choice (Gold, 2014; Gomez et al., 2014). Since poorer mental health outcomes appear to occur among women who experienced contraceptive coercion, it is critical that the full range of reproductive options be available to all women. The increased odds of poor mental health among AI/AN women reporting female sterilization found in this study point to the need for future research investigating the circumstances surrounding an AI/AN woman's sterilization procedure. Sadly, forced sterilization is not only a practice of the past – recent reports describe the use of reproductive coercion for individuals engaged with the justice system, including the sterilization of female prisoners without due process in California between 2006 and 2010 (Campos, 2013). Therefore, policies are needed to ensure that women are given reproductive choices that include female sterilization, but also are not restricted or coerced into any particular method (Gold, 2014).

This study furthermore underscores the need for appropriate mental health interventions to address the prevalent experience of poor mental health in AI/AN populations. Environmental and cultural barriers, such as inaccessibility of services and widespread cultural beliefs around

the experience and treatment of poor mental health, challenge public health practitioners to design relevant and culturally sensitive opportunities for AI/AN people to access mental health services (Evans-Campbell et al., 2006; UIHI, 2012). In addition, awareness of significant cultural traumas, including the history of forced sterilization, should be incorporated into the provision of reproductive health and mental health services to AI/AN populations.

Conclusions

This study suggests a direction for future research to promote the health of AI/AN women. AI/AN reproductive aged women had higher rates of female sterilization and poor mental health compared to non-Hispanic White, non-Hispanic Black, and Hispanic women. In addition, AI/AN women reporting sterilization had nearly 2.5 times higher odds of reporting poor mental health than AI/AN women who were not sterilized, and this magnitude of association that wasn't found in the other racial/ethnic groups. Despite its cross-sectional nature, these data demonstrate that the rates and relationship of female sterilization and poor mental health are different for reproductive age AI/AN women than for non-AI/AN women. AI/AN women are an understudied population, and more research is needed to design effective prevention and intervention strategies that ensure AI/AN women's reproductive and mental health is honored, preserved, and fully restored.

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Table 1 – Demographic Characteristics and Prevalence of Female Sterilization of Reproductive Age Women by Race/Ethnicity[a] in 2004 Behavioral Risk Factor Surveillance System, Weighted Mean and Weighted Percents

	AI/AN (n=1,601)	NH-White (n=51,594)	NH-Black (n=8,610)	Hispanic (n=7,915)
Mean Age in Years (s.e.)	31.0 (0.54)	32.0 (0.07)	30.9 (0.18)	30.8 (0.16)
Household Income				
<15,000	17.7	7.1	18.2	23.4
$15,000-$24,999	20.8	12.5	23.2	24.6
$25,000-$49,999	27.8	26.8	29.0	20.2
$50,000+	21.8	42.8	18.8	15.2
Missing	11.9	10.8	10.8	16.6
Marital Status				
Married	44.0	60.6	30.1	53.5
Div/Wid/Separated	16.0	10.5	14.1	12.2
Never Married	32.9	23.6	51.2	22.4
Unmarried Couple	7.1	5.3	4.5	12.0
Children <18 Years Old in Household				
0	24.7	34.3	28.5	20.4
1	25.8	23.8	26.6	22.7
2	22.9	26.3	24.3	30.6
3	16.5	11.0	13.1	16.9
4+	10.1	4.6	7.5	9.4
Prevalence of Female Sterilization* **	24.7	17.9	22.7	20.1

[a]AI/AN – American Indian and Alaska Native; NH-White – non-Hispanic White; NH-Black – non-Hispanic Black
*** $P<0.0005$

Table 2 – Weighted Percent of Poor Mental Health and Adjusted Odds Ratio of Poor Mental Health Comparing Non-Pregnant Reproductive Age Women Reporting Female Sterilization to Those Not Reporting Sterilization by Race/Ethnicity[a] in 2004 BRFSS

	AI/AN (n=1,501)	NH-White (n=48,992)	NH-Black (n=8,194)	Hispanic (n=7,394)
Prevalence of Poor Mental Health (1-30 days in last 30 days)* **	54.9	48.9	45.0	43.8
Adjusted Odds Ratio[b] (p-value) of Poor Mental Health Given Report of Female Sterilization	2.49 (0.001)	1.16 (<0.0005)	1.19 (0.055)	1.07 (0.546)

[a]AI/AN – American Indian and Alaska Native; NH-White – non-Hispanic White; NH-Black – non-Hispanic Black
***$P<0.001$
[b]Adjusting for age, household income, marital status, and number of children <18 years old in the household

Figure 1 – Adjusted Odds Ratios and 95% Confidence Intervals of Poor Mental Health of Non-Pregnant Reproductive Age Women Reporting Female Sterilization Compared to Women Not Reporting Sterilization by Race/Ethnicity in 2004 BRFSS