

**Racial/Ethnic Disparities in the Receipt of Smoking Interventions
During Prenatal Care:
Analysis of the 2000-2001 Oregon Pregnancy Risk Assessment
Monitoring Surveillance System (PRAMS) Data**

By

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MPH Thesis

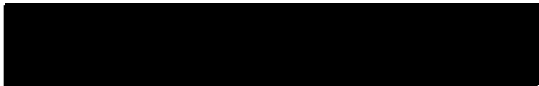
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CERTIFICATE OF APPROVAL

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Ngày nay học tập, ngày mai giúp đời.

- Vietnamese proverb

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LIST OF ABBREVIATIONS

ACOG	American College of Obstetricians and Gynecologists
A/PI	Asian/ Pacific Islander
AI/AN	American Indian/ Alaska Native
BRFSS	Behavioral Risk Factor Surveillance Survey
CDC	Centers for Disease Control and Prevention
CI	confidence interval
FIVE A's (5A's)	<i>Ask, Advice, Assess, Assist, Arrange</i> smoking cessation intervention
HMO	health maintenance organization
IMR	infant mortality rate
NMIHS	National Maternal and Infant Health Survey
OHP	Oregon Health Plan
OR	odds ratio
PNC	prenatal care
PRAMS	Pregnancy Risk Assessment Monitoring System
SIDS	Sudden Infant Death Syndrome
THREE A's (3A's)	<i>Ask, Advice, Assist</i> smoking cessation intervention
US	United States
WIC	Special supplement nutrition program for Women, Infants and Children

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ABSTRACT

Background: Maternal smoking during pregnancy has become the most preventable cause of fetal loss and preterm delivery in the United States. Prenatal care (PNC) providers are encouraged to treat tobacco dependency using an evidence-based clinician protocol called the Five A's (Ask, Advice, Assess, Assist, Arrange) which has been shown to increase quit rates by 30-70% among pregnant smokers. However, there is evidence that patients from racial/ethnic minority groups do not receive adequate health promotion counseling, including parts of the Five A's, during PNC as compared to patients from the majority white population.

Objective: To determine racial/ethnic disparities in the reported receipt of smoking counseling during prenatal care among pregnant smokers.

Methods: This was a cross-sectional analysis of self-reported data from the 2000-2001 Oregon Pregnancy Risk Assessment Monitoring Surveillance System. The PRAMS collects information about whether women received three of the Five A's (Ask, Advice, Assist; Three A's). The unweighted response rate was 72.6% (N= 3,895). Weighted logistic regression models were constructed that included the maternal race/ethnicity variable in each case.

Results: There were 594 women who reported smoking during the first trimester of pregnancy. 42.2% of the pregnant smokers reported receiving the Three A's. Over 84% of women reported having been asked about smoking and received advice to quit, but only 53% were offered any assistance to quit. Smoking counseling was not offered uniformly across racial groups. Despite having the highest smoking prevalence, non-Hispanic American Indian/Alaska Natives (AI/AN) were 0.45 times as likely (95% CI: 0.24, 0.85) as non-Hispanic Whites to recall having received the Three A's (in a

multivariate logistic model). In contrast, non-Hispanic Blacks were 2.43 times more likely (95% CI: 1.16, 5.10) than non-Hispanic Whites to report having received counseling. The relationships remained statistically significant even after controlling for socioeconomic factors.

Conclusions: Most women of all races do not report having received adequate assistance to quit smoking during PNC visits, suggesting that there is a need for improvements in addressing tobacco dependency in this setting. American Indian women are at greatest risk for not receiving counseling to help them stop smoking.

Public Health Implications: There is a need to improve the training of prenatal care providers so they can help pregnant women stop smoking. The need for this training may be most urgent among PNC providers who care for American Indian women.

I. BACKGROUND and SIGNIFICANCE

Introduction

Maternal smoking during pregnancy has become the most preventable cause of fetal loss and preterm delivery in the United States, accounting for \$366 million in preventable neonatal healthcare costs in 1996 [1]. Prenatal care (PNC) is a unique time for providers to counsel a woman to quit smoking because a large percentage of women seek it. It is estimated that approximately 98% of the 4 million women who delivered a live birth in 1997 received some prenatal care [2]. Further, pregnancy is a time when women may be more motivated to make healthy lifestyle changes, either out of concern for their newborn's health or for their own. Women who abstain from smoking during her pregnancy can benefit from an increased likelihood for a favorable birth outcome and having a child with lower risks for asthma [3-5], sudden infant death syndrome (SIDS) [4, 6], and other childhood illnesses [7, 8]. Moreover, they can increase their chance of achieving eventual cessation and significantly improve their long-term health status. An evidence-based, pregnancy-specific protocol called the Five A's (Ask, Advice, Assess, Assist, Arrange) exists that encourages prenatal care clinicians to identify and treat tobacco dependency in pregnant smokers. However, current disparities in birth outcomes by certain racial groups suggest that the content of prenatal care, including the delivery of such health promotion guidelines, may not be uniform across racial/ethnic groups [9-14]. This has enormous public health implications as prenatal care providers are considered credible sources of health information that can help promote healthy lifestyle changes in at-risk mothers. The repeated interactions between mothers and providers during prenatal care provide multiple opportunities for providers to discuss smoking cessation that could close the gap of poor birth outcomes associated with maternal smoking during pregnancy. This study examined factors that are associated with pregnant smokers receiving smoking cessation interventions during

prenatal care. Of particular interest is whether maternal race/ethnicity is a significant predictor of differences in the receipt of the interventions, even after controlling for potential confounders.

A. Disparities in Maternal and Child Health

Variations in the access, utilization, and content of health care reside along patient demographic, economic, and racial lines [9-16]. The 2005 National Healthcare Disparities Report indicated that while disparities data are improving, disparities related to race, ethnicity, and SES still pervade the American healthcare system where they are observed across many levels and types of care, including preventive care, and acute and chronic care managements [16]. Several highlights from the report were that, for many measures, minorities and the poor have worse access to care, and among those with access to care, differences in the quality of care emerge when stratified by race, ethnicity, or SES. Some of the measures include problems with timeliness, treatment for tobacco-dependency, and problems with patient-provider communication and understanding. The federal government is cognizant of these variations as evident in the establishment of the Healthy People 2010 initiative aimed to eliminate social disparities in health and to increase the quality of life for all persons [17]. The initiative includes a nationally-disseminated report published by the United States Department of Health and Human Services containing benchmark measures for a wide range of health indicators to be achieved by the year 2010. The report's strong focus on improving maternal and child health is seen as important since these indicators reflect the current health status of a vulnerable segment of the U.S. population, and can predict the health of the next generation. The twenty-three maternal and infant health objectives were health indicators primarily affecting pregnant and postpartum women (such as indicators of maternal illness and death) and those that affect infants' health and survival (e.g., infant mortality rates, birth outcomes, prevention of birth defects, access to obstetric and pediatric care, etc.). Some of the Healthy People 2010 goals pertaining

to this study include: to increase the number of women who discuss smoking with their obstetricians and gynecologists to 75%, decrease the prevalence of maternal smoking during pregnancy to less than 2%, and reduce the infant mortality rate (IMR) to 4.5 per 1,000 live births by the year 2010 [17]. In spite of these laudable goals, and despite improvements in perinatal survival among all races in recent years [18, 19], the health disparities between white and nonwhite populations persist [19-22].

Racial disparity in perinatal outcomes within the United States has been documented as early as the 1920's [23]. In 2001, the IMR among black infants was reported to be approximately 2.5 times higher than the rate among white and Hispanic infants [19]. Many state-based and nationally representative studies have found considerable ethnic differences in the leading causes of infant health, such as dietary (folic acid intake) [24], breastfeeding habit [25], genetic [26], environmental [27], and health service factors [28, 29]. These do not account for how variations of the conditions may lead to ethnic differences in cause of infant death. California, a state that is the most populous and ethnically diverse in the nation, recently reported that babies born to Black mothers had a significantly higher mortality risk during the postneonatal period (death between 28 and 364 days of life) than those born to White mothers [21]. Much of this ethnic variation in the postneonatal period, according to the California study, is due to SIDS, which occurred at a higher rate among infants born to Black mothers, followed by White mothers, and lowest for Hispanic mothers. A racial group often neglected in racial/ethnic disparities research that is most likely due to having incomplete available data [16] is American Indian/Alaska Natives (AI/AN; Native Americans). Historically, IMR's among Native Americans have been high [30], and variations exist within the population and between tribes [31]. The major contributor to the excess infant mortality experienced by AI/AN in Idaho, Oregon, and Washington (also known as the Northwest Portland Area) is SIDS [32, 33], which has been associated with prone infant sleeping position and exposure to secondhand smoke [34].

The cause of ethnic disparities in infant mortality is poorly understood [35] and is a topic of continual research. There is some evidence that the gap may be related to inequities in the provision of health care [36] and that effective use of evidence-based interventions to prevent or treat negative maternal behaviors could help narrow the ethnic gap [37]. Treating tobacco dependency among pregnant smokers during the time period generally believed when women are more motivated to make lifestyle changes can positively contribute to the urgent need to close in on the Health People 2010 goals.

B. Health Outcomes Associated with Maternal Smoking during Pregnancy

The American College of Obstetricians and Gynecologists (ACOG) estimates that smoking accounts for approximately 29% of all cancers, 55% of all cardiovascular deaths under 65 years of age, and increased emphysema and bronchitis among all women throughout her lifespan [38]. Smoking during pregnancy can lead to adverse outcomes on a woman's reproductive health and affect her ability to carry a pregnancy to term without complications [38-40], as well as endanger the lives of other exposed children.

Maternal smoking has become the most preventable cause of fetal loss and preterm delivery in the United States. The adverse health affects on the fetus and neonate resulting from exposure to tobacco during gestation is well documented. Maternal smoking is attributable to 11% of stillbirths and 5% of newborn deaths in the United States [41]. The risk for pregnancy complications, including ectopic pregnancy, spontaneous abortion, placental abruption, preeclampsia, and preterm rupture of membranes are increased with smoking during pregnancy [38, 42]

Placental transfer of nicotine to the fetus is very high [43], leading to complications in fetal development that can include congenital limb abnormalities to neurological defects [44]. Nicotine in cigarettes causes constrictions in the blood vessels of the umbilical cord and uterus, thereby

decreasing the oxygen available to the fetus [4]. As a result, infants born to women who smoked while pregnant are twice as likely to be of low-birth weight (less than 2500g), be physically smaller for their gestational age, and more likely to have smaller head circumferences than those born to non-smoking women [4, 38]. In 1998, 12% of women smokers delivered low-birth weight babies, compared to 7.2% of non-smokers [38]. Women who continue to smoke postpartum put their infants at increased risk for reduced lung function, middle ear infections, and asthma [4]. Studies have also linked sudden infant death syndrome (SIDS), learning disabilities and behavioral problems to maternal smoking during and after pregnancy [4, 6].

The literature has also shown that women who smoke during pregnancy are associated with other negative maternal health-related behavior and beliefs during pregnancy. A cross-sectional survey of 789 postpartum women conducted by a team of researchers in the United Kingdom found that women who reported smoking during pregnancy were less likely to say they intend to breastfeed, thus denying the infant of benefits of breastfeeding [45]. Other literature, including one conducted by the Oregon Office of Family Health using PRAMS, found that women who smoke are less likely to initiate breastfeeding [46], and more likely to prematurely discontinue breastfeeding before the 10th week [47]. Further, illicit drug use and drinking during pregnancy were found to be significantly associated with smoking during pregnancy [48, 49]. These findings suggest that efforts to reduce the prevalence of smoking during pregnancy may increase positive health-related behaviors in these women.

C. Medical Care Expenditures Attributable to Smoking During Pregnancy

The adverse health outcomes associated with neonatal exposure to tobacco smoke translate to added medical care expenditures. The most recent assessment of healthcare costs associated with maternal smoking was performed by the CDC in 1996. They estimated that smoking-attributable

neonatal expenditures that year totaled \$366 million, or \$704 per maternal smoker; the cost for individual states varied from under \$1 million in smaller states to up to \$35 million in California [1]. In Oregon, about \$4.2 million was spent for neonatal care attributable to maternal smoking, or \$602 per maternal smoker, in 1996 [50]. Minorities and the underserved spent more on smoking-attributable neonatal care. Although white women were more likely than black women to smoke while pregnant in the states surveyed from 1993 to 1997, black mothers spent almost double that of white mothers on smoking-attributable neonatal costs in 1996, \$1,207 versus \$651, respectively [50]. Nationally and in Oregon, women receiving Medicaid or were uninsured spent more on smoking-attributable neonatal care than those on private or other insurance, \$753 and \$626 nationally, and \$616 versus \$575 in Oregon, respectively [50]. These estimates did not include the added healthcare costs associated with neonatal exposure to secondhand smoke. Nonetheless, they represent expenditures that could be avoided by even a temporary cessation of maternal smoking during pregnancy.

D. Maternal Smoking Trends in the United States and in Oregon

Smoking during pregnancy has declined nationally in the last decade, most likely in response to public education and public health campaigns. Of the 6 million women who become pregnant each year in the U.S., about 20-35% of them smoke and between 13-20% of them will continue smoking during their pregnancy [51]. In 2002, the percentage of pregnant smokers was 11.4% nationally which was a 38% decrease from 1990 when 18.4% smoked [52]. While the prevalence of pregnant smokers in Oregon also declined during the same period, the burden was greater in Oregon than nationally with 12.4% in 2002 versus 22.3% in 1990 [52]. These estimates were analyzed by the CDC using birth certificates that were then confirmed with data from PRAMS and the National Survey of Family Growth.

The highest smoking rates are found among women with limited economic resources and those who are younger (under 25 years of age), have less than a high school education, are of non-Hispanic ethnicity, and who reside in rural environments [52-55]. In a report published in 2001, the Oregon Tobacco Prevention and Education Program estimated that 5,753 infants in Oregon were born to mothers who used tobacco during her pregnancy [56]. Pregnant smokers were more likely to be American Indian (25%), between ages 18-19 years (23%), did not have a high school diploma (21%), and received Medicaid or Oregon Health Plan (25%). In contrast, women least likely to smoke during pregnancy were Asian/Pacific Islander (3%) or Hispanic (3%), aged 30 or above (8%), possessed a college degree (1%), and had private insurance. The disparities in the smoking prevalence suggest that certain groups need more help than others to quit, or would at least benefit more from smoking cessation counseling during prenatal visits.

The proportion of women who spontaneously quit before her first prenatal visit range from as low as 15% in a largely African-American public maternity clinic to as high as 42% in a primarily White, HMO population [57]. However, 21-35% of them will relapse before delivery [40] while the majority of pregnant smokers will continue to smoking throughout pregnancy. Even though past research have demonstrated some success in prenatal smoking cessation [58-64], relapse remains a problem [65]. More than one quarter of women who quit spontaneously relapse by 6 weeks postpartum, and approximately half to two-thirds will have relapsed by 6 months postpartum [66-69]. Primiparous, privately insured, college-educated women are more likely to quit and least likely to resume smoking after delivery, compared to multiparous, Medicaid-insured, and high school-educated women [67].

According to the 1988 Surgeon General's Report on nicotine addiction, smoking is as addictive as, if not more than, heroin and cocaine (1988 Surgeon General Report). There are many barriers to prevent smokers from successfully quitting smoking [70, 71]. Multiple stresses and

lifestyle changes associated with pregnancy, breastfeeding, and normal postpartum depression are some of the factors contributing to the difficulty in quitting during pregnancy and the continued abstinence at postpartum [53, 72].

E. The Fives A's Smoking Cessation Intervention

The frequent contact pregnant women have with their health providers during prenatal care provides a window of opportunity for providers to encourage smoking cessation. The motivation to quit may come from concern for the woman's own health and/or her unborn child's. Since the 1980's, research aimed at identifying effective interventions for pregnant smokers has accumulated steadily. In 1995, the National Cancer Institute published a four-step smoking cessation guideline for that encouraged physicians to identify every patient's smoking status, advise and assist the patient to quit, and arrange follow-up care [73]. In the following year in 1996, the U.S. Public Health Service improved the guideline, adding an additional step, and released it as the Five A's for five components: Ask, Advise, Assess, Assist, and Arrange (Figure 1). Almost immediately the intervention was adapted for use in obstetric setting to address tobacco dependency among pregnant smokers.

The Five A's is a brief, yet directed, smoking intervention to help guide dialogue between mother and provider about her smoking habit that exceeds the minimal advice to quit. The protocol requires PNC providers to consider smoking status as a vital sign and to identify, document, and treat every pregnant patient that uses tobacco. The strategies proposed are designed to be brief, requiring 3 minutes or less of direct clinician time [38]. Therefore, it is expected that implementation of the Five A's would not inhibit other important aspects of PNC or disrupt patient flow [38].

Table 1. Components of the Five A's smoking cessation counseling intervention for pregnant women

ASK

- Ask the patient about her smoking status.

ADVISE

- Provide clear, strong advice to quit with personalized messages about the impact of smoking and quitting on mother and fetus.

ASSESS

- Assess the willingness of the patient to make a quit attempt within the next 30 days.

ASSIST

- Suggest and encourage the use of problem-solving methods and skills for cessation.
- Provide pregnancy-specific self-help smoking cessation materials.
- Arrange social support in the smoker's environment.
- Provide social support as part of the treatment.

ARRANGE

- Periodically assess smoking status at every subsequent prenatal visit and, if she is a continuing smoker, encourage cessation.

SOURCE: Melvin C, Dolan Mullen P, Windsor RA, Whiteside HP, Goldenberg RL. Recommended cessation counseling for pregnant women who smoke: a review of the evidence. *Tobacco Control* 2000; 9 (suppl III): III80-84.

An especially important component of the Five A's is the Assist component that encourages providers to take a more active and supportive role in the intervention process. One strategy is to help the woman map out a quit plan, such as help her select a firm quit date, or identify problem-solving techniques to overcome specific situations of her urge to smoke. Moreover, physicians are encouraged to provide the women with pregnancy-specific self-help materials. Currently, in Oregon, referrals to the Oregon Quit Line—a free telephone counseling service that provides quit support specifically tailored to issues around pregnancy—remain a common supplement to the Assist step. Other supplements include offering brochures and consistent personal encouragements to the patient [4].

The Five A's guideline has shown promising results since its inception in 1996 [38, 74]. In one study, the researchers performed meta-analyses of all studies of various existing smoking interventions conducted up to 1997 and concluded that the Five A's model presented the "best practical intervention for pregnant smokers", with the potential to increase quit rates by 30-70% when delivered by a prenatal care provider [57, 74, 75]. The American College of Obstetricians and Gynecologists (ACOG) recommends the Five A's to be the standard protocol for treating tobacco-dependency in pregnant women. There are reports that the Five A's is at least as effective with ethnic minority women, notably African-American women, as with white, non-Hispanic women [74]. However, effectiveness with heavy smokers (vs. light smokers) has yet to be demonstrated [74].

F. Research about Smoking Interventions Offered During Prenatal Care

While the publication of the Five A's guideline is relatively recent, the practice of identifying maternal tobacco use and treating nicotine dependency has been encouraged in clinical settings since the 1980's. However, like many healthcare services [9-11, 13], the content of prenatal care may not be identical for all population. A nationally representative study led by Kogan et al. (1994) that used a birth cohort in the 1988 National Maternal and Infant Health Survey (NMIHS) demonstrated that African-American women were significantly less likely to report receiving advice on smoking and alcohol cessation during pregnancy [14, 76]. This was significant after controlling for sociodemographic and medical factors and utilization of care. The results from Kogan et al. , however, conflicted with an earlier study by Petitti et al. (1991) that found that African-American women reported more advice about cigarette smoking, but less advice about alcohol during prenatal care based on records from two facilities of the same major hospital [77]. In both studies, the extent of the disparities was not assessed for other ethnic minority groups.

Several other studies that did not explore the race/ethnic variable show that receipt of various smoking cessation help from prenatal care providers is associated with maternal smoking pattern pre-pregnancy (light versus heavy smoker), parity, having a previous low-birth weight baby, and socioeconomic factors [78-80]. The outcome variables for these studies were: discussing the health implications of smoking with the clinician [78], receiving advice to quit from the clinician [78, 79], and referrals to a cessation program [80].

G. Public Health Implications

Clinicians who provide health care to women have an important role to play in reducing the burden of smoking among women. The Five A's is a clinically-proven smoking cessation protocol that can be delivered in primary care settings and particularly with pregnant smokers. Health promotion messages from providers may be particularly important in minority populations who have higher rates of infant morbidity and mortality. It is expected that reducing the prevalence of smoking during pregnancy will significantly improve infant health outcomes, promote the eventual smoking cessation in these women, and reduce the health costs associated with maternal smoking. Yet, the equivalency of the content of prenatal care, particularly of smoking cessation counseling, has yet to be demonstrated, especially for all racial groups. There exists limited research that assesses the quality of prenatal care content among non-Black minority groups as compared to the dominant White population. The Pregnancy Risk Assessment Monitoring Surveillance (PRAMS) survey oversamples minority groups, including Hispanics, non-Hispanic Asians/Pacific Islander, non-Hispanic American Indian/ Alaska Natives, and non-Hispanic Blacks, to record women's reporting of her smoking status during pregnancy and whether she received any smoking interventions during prenatal care. Because the causes of disparities and the priorities for addressing them vary state by state and even within states, to successfully address disparities will require focused state- or

community-based projects that are supported by detailed local data [16]. The Oregon PRAMS data may provide important answers for public health and medical professionals in Oregon to identify and treat women at highest risk for not receiving interventions that could reduce their chance of poor birth outcomes.

II. METHODS

Overview

The goal of the study was to determine factors that are associated with Oregon pregnant smokers receiving smoking counseling during prenatal care (PNC) that included the PNC provider asking the woman about her smoking status, advising her to quit, and assisting or offering help to quit. Because the Oregon PRAMS collects information only about whether the woman received the Ask, Advice, and Assist components of the Five A's, for the purpose of this study, these three interventions are called the Three A's and serves as a proxy for receipt of the Five A's. Of particular interest was whether race/ethnicity can explain differences in the receipt of the Three A's intervention during prenatal care. If so, was the association confounded by socioeconomic factors?

This was a retrospective analysis of secondary, self-reported data from the 2000-2001 Oregon Pregnancy Risk Assessment Monitoring System (PRAMS). Simple and multiple logistic regression analyses were performed to assess the association of explanatory variables with the receipt of the Three A's during PNC.

A. PRAMS Data Source

PRAMS is a state-based surveillance of maternal behaviors, attitudes and experiences before, during, and after pregnancy. The PRAMS survey responses are linked to Oregon birth certificates. PRAMS questionnaires are mailed to mothers randomly selected each month from the birth certificates. This occurs approximately two to four months after a live-birth. Women who are indicated as Hispanic on the birth certificate are sent all materials in both English and Spanish. Non-respondents receive a reminder note approximately 7 days after the first mailing, followed by a second mailing of the survey 7 to 14 days subsequent to the reminder note. If the survey is still not received 7 to 14 days after the second mailing, follow-up telephone interviews are conducted by

trained survey interviewers and are available in both English and Spanish. Up to 15 call attempts are made to a number in order to reach the mother [81]. A total of 3,895 Oregonian women completed the survey in 2000-2001, making the unweighted response rate 72.6%.

PRAMS Sampling and Weighting Methods

Oregon birth certificates were randomly sampled from five strata based on maternal race/ethnicity in 2000-2001: Hispanics, non-Hispanic Whites, non-Hispanic Blacks, non-Hispanic Asian/Pacific Islanders (Asian/PI), and non-Hispanic American Indians/Alaskan Natives (AI/AN) groups. To ensure sufficient numbers for weighted analysis, ethnic minority (non-White) women were over-sampled so that each stratum would have about 400 women. In the case of multiple births to one mother, one baby was randomly sampled before the overall sample was chosen. The mothers of these babies were asked to answer questions about only the selected baby.

The stratified sampling scheme requires weighting in the analysis to allow generalizability to the Oregon population of pregnant women. As with other large, complex datasets, various weighting strategies were applied to the PRAMS data to reduce or eliminate certain errors so that essentially, each respondent would represent a proportion of women like herself in the general population. The final analysis weight was calculated as the product of the three separate weights as discussed individually below: the sampling, non-response, and non-coverage weights.

Sampling errors occur because estimates are based only on a sample of the population rather than on the entire population. The sampling weight accounts for the sampling design (e.g., over-sampling) to restore the proper demographic proportions to the dataset. It is calculated by dividing the total number of eligible mothers in a stratum for the year by the actual number sampled in that stratum. For example, the sampling proportion for a White woman would be smaller than that for an

American Indian woman because the White woman represents a greater absolute number of women in the population than the American Indian woman.

Non-response errors result from women not returning the questionnaire and refusing to participate in the follow-up telephone interview or they were not available. The rationale for applying a non-response weight was the assumption that, on average, non-respondents would have provided similar answers to respondents belonging to that stratum. The CDC identified several variables that could affect the mother's inclination to respond: marital status, parity, initiation of prenatal care, age, and education. Where logistic analysis shows that these characteristics affected the propensity to respond in a particular stratum, the adjustment factor was the ratio of the sample size in that category to the number of respondents in the category. If analysis showed that no characteristic distinguished respondents from non-respondents, the adjustment factor was the ratio of the sample size in that stratum to the number of respondents in the stratum [81].

In PRAMS, the most common reason for *non-coverage* was that a duplicate birth certificate was generated and the birth certificate had disappeared by the time of data collection. The non-coverage weight was calculated as the ratio of the number of files in the current birth certificate list to the number in the sampling frame for the same period. In mail/telephone surveillance, the magnitude of non-coverage is small (typically from 1% to 5%), so the adjustment factor for non-coverage is not much greater than 1 [81].

Each entry in the PRAMS dataset came with a final weight variable that was the product of the sampling, non-response, and non-coverage weights. The weight can be interpreted as the proportion of women in the population that each respondent represents. With weighting, the findings can be generalizable to the whole population of pregnant women in Oregon, and not just those who participated in the survey.

Data Management and Confidentiality

PRAMS data is linked to birth certificates and its management is coordinated through a protocol developed by CDC. Generally, participating states collect, enter, clean and edit the data before submitting copies to CDC. The process of cleaning and editing comprise of checking the data files for data entry errors and inconsistencies. Data and report files sent to CDC do not include personal identifiers such as names and addresses but contains the identification number for each record. CDC performs an automated consistency check on the files and returns them to the states. The final data in SPSS format are de-identified and do not contain any personal identifying information about the respondents.

This study was approved by the Oregon Health & Science University IRB. The dataset has been transferred into Statistical Package for the Social Sciences (SPSS, SPSS, Inc.) format by the staff at the Office of Family Health of the Oregon Department of Human Services. There was no personal identifying information in the dataset that could be traced back to the respondents.

B. Study Population

Oregon resident women with live births between January 1, 2000 through November 4, 2001 and who reported smoking any cigarettes during the *first trimester* of pregnancy were studied for any smoking interventions received during prenatal care. Unlike other states' PRAMS, the 2000-2001 Oregon PRAMS was unique in that it collected the woman's smoking status during the first trimester of pregnancy. The advantage of using first trimester pregnant smokers was that the majority of women initiate prenatal care during the first trimester of pregnancy when providers are supposed to be offering the smoking interventions to any woman who smokes. As a result, the sub-sample of first trimester pregnant smokers may be the least biased and the best proxy for women who smoked at the time the prenatal care provider should have intervened with this behavior.

Excluded women were those not living with their infant or whose child died at the time of the survey. The study population comprised 594 women who met the inclusion criteria.

C. Analysis Methods

SPSS and STATA

The original data obtained from the Office of Family Health of the Oregon Department of Human Services was in SPSS format, and was then copied and transferred into STATA format using STATA Transfer Software (Circle Systems, Version 8.2). SPSS Version 13.0 and STATA Version 9.1 (STATA Corp LP, College Station, TX) were used to analyze the data. STATA is designed to analyze datasets that utilize a complex sampling scheme involving a stratified weighted sample, such as the PRAMS. Data that were analyzed by STATA were sorted by sampling strata with weights calculated as described above applied to the data. SPSS was used to generate variable frequencies and crosstabulations. STATA was used to generate crosstabulations and to perform weighted simple and multiple logistic regression modeling. All estimations of the odds ratios and the significance testing were based on the weighted data. Missing responses were removed from the majority of the analyses.

Variable Recoding

Maternal Smoking Status

Question #32 from the PRAMS questionnaire was used to determine smoking status and eligibility into the study sample: "In the *first 3 months* of your pregnancy, how many cigarettes or packs of cigarettes did you smoke on an average day?". Women who selected "Less than 1 cigarette a day", "I don't know", or indicated the number of cigarettes or packs of cigarettes were classified as smokers. They were at risk for continuing to smoke throughout the pregnancy and therefore could

benefit from being offered a full smoking intervention. Women who answered, “I didn’t smoke” were designated as non-smokers. Any missing responses were excluded from the analyses. Smokers were included in the study population for assessing the full intervention outcome.

Receipt of Smoking Interventions

Women who smoked or reported a history of smoking some time in their life were asked about any interventions received during or after pregnancy from prenatal care providers. Because the PRAMS only collects information on whether women received the Ask, Advice, and Assist components of the Five A’s, the term “Three A’s” will be used to describe the outcome of interest where women were asked about her smoking status, and then advised and assisted to quit during PNC.

Questions #36, 37, and 38 on the PRAMS questionnaire were used collectively to designate whether the woman received the Three A’s during prenatal care. The Ask component was determined from Question #36 on the PRAMS: “During your visits to your doctor or midwife for prenatal care or after the baby was born, did someone ask if you smoked, either by questionnaire or in person?” If she answered “Yes, before my baby was born”, or “Yes, both times”, she was given the Ask intervention. Question #37 asked about the Advice component: “During your visits for prenatal care or after the baby was born, did your doctor or midwife ever advise you to quit smoking?” Question #38 was about the Assist component: “During your visits for prenatal care or after the baby was born, did your doctor or midwife offer advice or help on how to quit smoking?” An affirmative response to the question indicated that she had received the intervention. She was designated as having received a full Three A’s intervention if she answered affirmatively to all three intervention components. For use in logistic regression as the outcome variable, receipt of the Three A’s was coded as 1 in STATA, and no/incomplete intervention was coded as 0 for the referent group.

Maternal Race/Ethnicity

The mother's race/ethnicity was determined from the birth certificates. It was divided into five categories: Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic American Indian/Alaska Native, and non-Hispanic Asian/Pacific Islander (Table 2).

Maternal race/ethnicity was chosen as the explanatory variable of interest because its association with the delivery of certain health promotion advice during prenatal care had been demonstrated in past studies [14, 76, 77], and because racial/ethnic disparities in any aspects of prenatal care in Oregon would have important implications on the racial/ethnic disparities in the maternal and child health status of Oregon residents.

Socioeconomic Status (SES) Variables

Birth certificate data was used for variables that were not available from PRAMS, except for age that was available from both sources but was taken from birth certificates as they tend to be more complete and accurate. Demographic variables were age, education, household income, insurance status before delivery, residence setting (rural vs. urban), and participation in the WIC program (Table 2). Age and income were originally in continuous forms and were divided into data-driven categories obtained from public health reports. Age was categorized into four groups that were adapted from the CDC: ≤18yr, 19-24, 25-34, and 35 and older. Household income was divided into categories generally used by the Office of Family Health of the Oregon Department of Human Services.

Maternal education was obtained from birth certificates and divided into three standard levels: less than a high school education (<12 yrs), high school educated (12 yrs), and beyond a high school education (>12 yrs).

Maternal urban/rural residence setting was determined from the newborn's birth certificate that documents each woman's home address at the time she gave birth. Rural was defined as residence in any county with less than 60 people per square mile in 2001. All other counties were defined as urban. In Oregon, there are 26 rural counties and 10 urban counties (see Appendix A).

Health insurance before pregnancy and enrollment status for the Women, Infants, and Children (WIC) program were obtained from PRAMS and birth certificates, respectively. Oregon Health Plan (OHP) is the state's Medicaid program that provides health insurance for low-income Oregonians. WIC is a special supplemental nutrition program for women, infants, and children designed to improve health outcomes and influence lifetime nutrition and health behaviors in a targeted, at-risk population [82]. Because the OHP and WIC programs generally serve the underserved population, they were chosen as indicators of socioeconomic status.

Table 2. Recoding of race/ethnicity variable and socioeconomic variables for logistic regression analyses (Oregon PRAMS, 2000-2001)

	Demographic Variable	Referent Group	Comparison Groups	Source
1	Maternal race/ethnicity	0: Non-Hispanic White	1: Non-Hispanic Black 2: Non-Hispanic American Indian/ Alaskan Native (AI/AN) 3: Non-Hispanic Asian/Pacific Islander (A/PI) 4: Hispanic	Birth certificate
2	Maternal age	0: ≤ 18 yr	1: 19-24 yr 2: 25-34 yr 3: 35+ yr	Birth certificate
3	Maternal education level	0: < 12 yr	1: 12 yr (high school) 2: > 12 yr	Birth certificate
4	Family income	0: <\$20 000	1: \$20 000- 34 999 2: \$35 000+	PRAMS
5	Residence setting	0: Rural	1: Urban	Birth certificate
6	Health insurance before pregnancy	0: Not OHP	1: Oregon Health Plan (OHP)	PRAMS
7	WIC participation	0: No	1: Yes	Birth certificate

Other Independent Variables

The independent variables selected for analyses were based on the relevant literature findings [13, 14, 78-80], or seemed interesting to examine for associations with the smoking counseling outcome (Table 3).

Smokers were further divided into light and heavy smokers (< 10 vs. ≥ 10 cigarettes per day) so that the pattern of her tobacco use during the three months prior to becoming pregnant could be described. The 10-cigarette cutoff was simulated from a study conducted by the staff at the Oregon Office of Family Health using PRAMS that explored breastfeeding duration and perinatal cigarette smoking [47]. In this study, the light and heavy designations using a 10-cigarette cutoff were used to describe the patterns of maternal tobacco use before and during pregnancy, and at postpartum.

Other independent variables chosen were marital status, parity, childbearing intention, time of prenatal care initiation, insurance payer for the delivery, primary prenatal care service site, and maternal alcohol use before pregnancy and during pregnancy.

Table 3. Recoding of additional independent variables chosen from literature reviews, were considered clinically significant or interesting to explore (Oregon PRAMS, 2000-2001)

	Independent Variable	Referent Group	Comparison Groups	Source
1	Pattern of tobacco use at 3 months before pregnancy	0: Light (<10 cig/day)	1: Heavy (10+ cig/day)	PRAMS
2	Marital status	0: Not married	1: Married	Birth certificate
3	Parity	0: Firstborn	1: Not firstborn	PRAMS
4	Childbearing intention (excludes elective termination and fetal deaths)	0: Intended	1: Unintended- mistimed 2: Unintended- unwanted	PRAMS
5	Time of prenatal care initiation	0: Within 1 st trimester	1: After 1 st trimester	Birth certificate
6	Insurance payer for delivery	0: Public (OHP/ Medicaid/ Indian Health Care program)	1: Private/Other 2: None	PRAMS
7	Prenatal care service site	0: Health Dept Clinic	1: Hospital clinic 2: Private/HMO clinic 3: Other	PRAMS
8	Any alcohol use during the 3 months before pregnancy	0: None	1: Yes	PRAMS
9	Any alcohol use during the last 3 months of pregnancy	0: None	1: Yes	PRAMS

Statistical Analysis

Descriptive Analysis

PRAMS data for 2000-2001 were obtained and then transferred into STATA format. Frequency distribution and crosstabulations were used to explore variables and the relationship between important explanatory variables and the Three A's outcome. Crosstabulations were also performed for race/ethnicity and the outcomes: smoking at three months prior to pregnancy and receipt of any of the smoking interventions. Unweighted counts and weighted proportions were reported.

Simple Logistic Regression Analysis

The analyses included only women who were classified as smokers in the first three months of pregnancy. A weighted univariate analysis of each independent variable with the Three A's outcome was performed using simple logistic regression and the likelihood ratio test was used to determine the crude relationship between the smoking intervention outcome and the various explanatory covariates. Weighted crude odds ratios (OR's) and 95% confidence intervals (95% CI) were generated. Variables that had a univariate p-value of <0.25 were selected for multivariate modeling in the next step. The cut-off for significance at 0.25 was based on the work by Bendel and Afifi (1977) on linear regression and on the work by Mickey and Greenland (1989) on logistic regression, and is an acceptable model-building approach [83]. Clinically significant variables, regardless of its p-values, were also selected.

Multivariable Logistic Regression

The maternal race/ethnicity variable, variables with p-value <0.25 identified in simple logistic regression, and those with clinical significance were entered into a model with the Three A's

intervention for the outcome. Backward stepwise elimination was used to construct a model containing the main effect variables. The process of variable elimination involved singly removing statistically insignificant variables, starting with the one with the highest p-value, and finishing with only clinically important variables and those with p-values <0.10 left in the model. In model building the significant p-value cut-off is arbitrary and 0.10 was chosen to allow more variables to be included in the model, especially those that were only marginally significant. Race/ethnicity was left in the model regardless of statistical significance. Every time a variable was removed, the OR's for race/ethnicity and the full intervention outcome was observed for any changes in direction or in magnitude beyond 10%. This would indicate that the removed variable was a potential confounder and was important in the sense of providing a needed adjustment of the effect of the race/ethnicity variable on the outcome.

Once the main effects model was created, any terms not selected originally were added into the model. This step was helpful in identifying variables that, by themselves, were not significantly related to the outcome but make an important contribution in the presence of other variables. Significance of $p < 0.10$ was used for the cut-off criterion for backward stepwise elimination of insignificant terms.

Interaction terms between race/ethnicity and the socioeconomic variables were created and assessed for effect modification. Backward stepwise elimination was used to obtain a final model that included significant interaction terms, if any, with the main effects variables. A variable was considered significant when its p-value was less than 0.10. Weighted odds ratios and 95% confidence intervals were reported from STATA output.

III. RESULTS

A. Descriptive Analysis of Target Variables

Table 4 shows the distribution of women, by race/ethnicity, who reported smoking during the first trimester of pregnancy after applying weights. Approximately 16% of Oregon pregnant women smoked in the first trimester of pregnancy in 2000-2001. The non-Hispanic American Indian/Alaska Native group had an overwhelming smoking prevalence of 35.7%, the highest across the racial/ethnic groups, followed by non-Hispanic Blacks at 22.1%, non-Hispanic Whites at 18.5%, and then Hispanic and non-Hispanic Asian/Pacific Islander women with the lowest prevalence at 4.5% and 4.8%, respectively.

Weighted responses to the individual smoking interventions received are summarized in Table 5 that included only first-trimester pregnant smokers. A high proportion of women reported being asked about her smoking status, 89.2%. Fewer recalled being advised (76.2%) and significantly fewer reported being assisted to quit smoking (48.3%) from providers. A total of 42.2% of pregnant smokers reported receiving all three interventions.

Table 6 shows the distribution of the full intervention outcome by race/ethnicity for all women who were designated as smokers. Despite having the highest smoking prevalence, the non-Hispanic American Indian group had only 23.5% who recalled receiving the Three A's intervention. Almost half of non-Hispanic Black women reported receiving the Three A's (44.7%) and approximately 1 out of 3 (33%) non-Hispanic White women did. Overall, the prevalence of the receipt of the Three A's intervention did not reflect the smoking prevalence when stratified by race/ethnicity.

Table 4. Distribution of women who reported smoking during the first trimester of pregnancy, by race/ethnicity (Oregon PRAMS, 2000-2001)

Characteristic	N ^{a,1}	Smokers, n ^a	Weighted %
Total	3895	594	15.9
<i>Race/ethnicity</i>			
White, non-Hispanic	1263	277	18.5
Black, non-Hispanic	444	90	22.1
AI/AN, non-Hispanic	443	150	35.7
Asian/PI, non-Hispanic	625	27	4.8
Hispanic	1120	50	4.5

^a Unweighted count

¹ All survey respondents

Table 5. Self-reported receipt of individual smoking interventions during prenatal care among first trimester pregnant smokers (Oregon PRAMS, 2000-2001)

Response	Ask No. ^a (%) ^b	Advice No. ^a (%) ^b	Assist No. ^a (%) ^b	Three A's No. ^a (%) ^b
No	82 (10.8%)	94 (15.7%)	243 (46.7%)	335 (57.8%)
Yes	510 (89.2%)	441 (84.3%)	293 (53.3%)	259 (42.2%)

^a Unweighted count

^b Weighted proportion

Table 6. Proportions of pregnant smokers¹ who reported receiving the Three A's during prenatal care, by race/ethnicity (Oregon PRAMS, 2000-2001)

Characteristic	Smokers, n ^a	Weighted %
Total	594	42.2
<i>Race/ethnicity</i>		
White, non-Hispanic	277	42.8
Black, non-Hispanic	90	60.9
AI/AN, non-Hispanic	150	30.6
Asian/PI, non-Hispanic	27	41.1
Hispanic	50	28.1

¹ First trimester pregnant smokers

^a Unweighted count

B. Weighted Regression Analyses

Maternal Smoking by Socioeconomic Factors

Table 7 summarizes the characteristics of women who reported smoking in the first three months of pregnancy. Smoking was more prevalent in younger ($p < 0.001$), less educated ($p < 0.001$), and lower-income ($p < 0.001$) women. Smokers were more likely to be from an urban residential setting ($p = 0.04$) and were more likely to have received public-funded services such as the Oregon Health Plan ($p < 0.001$) and the WIC program ($p < 0.001$). The highest smoking groups were women who were non-Hispanic, American Indian/ Alaska Natives (35.7%), less than 18 years old (34.2%), had less than a high school education (26.3%), and had a family income of less than \$20,000 (25.3%). Women who were less likely to smoke during the first trimester of pregnancy were non-Hispanic Asian/Pacific Islander (4.8%) or Hispanic (4.5%), were 35 or older (8.2%), had acquired beyond a high school education (5.6%), and had a family income of \$35,000 or more (7.0%).

Table 7. Descriptive analyses of maternal smoking status in the first trimester of pregnancy by socioeconomic variables (PRAMS, 2000-2001)

Characteristic	N ^a	Smokers, % ^b	Likelihood test p-value ¹
Total	3895	15.9	--
<i>Race/ethnicity</i>			
White, non-Hispanic	1246	18.5	<0.001
Black, non-Hispanic	436	22.1	
AI/AN, non-Hispanic	437	35.7	
Asian/PI, non-Hispanic	614	4.8	
Hispanic	1098	4.5	
Missing	64	--	
<i>Maternal age</i>			
≤ 18y	308	34.2	<0.001
19-24y	1300	22.3	
25-34y	1832	10.8	
35+ y	391	8.2	
Missing	64	--	
<i>Education level</i>			
<12yrs	1044	26.3	<0.001
12 yrs (HS)	1172	23.7	
>12yrs (Post-HS)	1552	5.6	
Missing	127	--	
<i>Family income</i>			
<\$20 000	1530	25.3	<0.001
\$20 000 – 34 999	719	16.6	
> \$35 000	1217	7.0	
Missing	429	--	
<i>Residence setting</i>			
Rural	790	20.1	0.037
Urban	3041	14.6	
Missing	64	--	
<i>Insurance before pregnancy</i>			
No OHP	3067	13.8	<0.001
OHP	723	26.8	
Missing	105	--	
<i>WIC participation</i>			
No	2085	10.0	<0.001
Yes	1746	25.3	
Missing	64	--	

^a Unweighted count of all survey respondents

^b Weighted proportion

¹ Bold values indicate statistical significance

Smoking Interventions Received During Prenatal Care

After adjusting for complex sample design, it was found that women report that providers were relatively consistent with identifying the women's smoking status and offering advice to quit during prenatal care. Approximately 89% of women smokers reported being asked about her smoking status and 84.3% were given advice. However, women report that providers were less consistent with providing any assistance to quit, as indicated by only 53.3% of the women who reported having received any assistance from doctors, nurses, or other prenatal care professionals during prenatal care (Table 8). For the Ask intervention, statistical differences were found only between the age groups. Women 35 and older recalled being asked about their smoking status significantly more often than women 18 and under (OR 5.78, 95%CI: 1.12-29.8). However, older women were less likely to recall having received the Assist intervention than the 18 and younger group.

There were no statistical differences across racial/ethnic and socioeconomic factors found for the Advice intervention outcome. For the Assist intervention outcome, it was found that non-Hispanic, Black pregnant smokers were statistically more likely than non-Hispanic, White women to report receiving the intervention (OR= 2.23, 95% CI: 1.22-4.06). Pregnant smokers who were significantly less likely to report receiving the Assist intervention were non-Hispanic, AI/AN smokers (OR= 0.59, 95% CI: 0.36-0.97), those 35 years and older (OR= 0.16, 95% CI: 0.05-0.55), and were OHP insurance recipients (OR= 2.01, 95% CI: 1.0-4.06).

Table 8. Receipt of smoking interventions during prenatal care among first trimester pregnant smokers, by socioeconomic variables (Oregon PRAMS, 2000-2001)

Characteristic	n ^a	Ask ¹		Advice ¹		Assist ¹	
		% ^b	OR ^{c,2} (95% CI)	% ^b	OR ^{c,2} (95% CI)	% ^b	OR ^{c,2} (95% CI)
Total smokers	594	89.2	--	84.3	--	53.3	--
<i>Race/ethnicity</i>							
White, non-His	277	90.1	Referent	85.3	Referent	53.8	Ref
Black, non-His	90	89.9	0.98 (0.40-2.38)	86.6	1.04 (0.47-2.30)	72.2	2.23 (1.22-4.06)
AI/AN, non-His	150	84.1	0.58 (0.29-1.18)	76.2	0.61 (0.32-1.16)	40.8	0.59 (0.36-0.97)
Asian/PI, non-His	27	78.2	0.40 (0.13-1.17)	66.2	0.40 (0.15-1.07)	53.3	0.98 (0.38-2.56)
Hispanic	50	79.8	0.44 (0.18-1.06)	74.9	0.54 (0.23-1.25)	39.7	0.56 (0.28-1.15)
<i>Maternal age</i>							
≤ 18y	86	81.8	Referent	85.4	Referent	54.6	Ref
19-24y	287	86.7	1.46 (0.45-4.78)	77.3	0.63 (0.18-2.24)	54.4	1.0 (0.39-2.52)
25-34y	179	94.4	3.72 (0.91-15.3)	91.1	1.72 (0.41-7.22)	56.9	1.10 (0.41-2.94)
35+ y	41	96.3	5.78 (1.12-29.8)	96.6	4.42 (0.77-25.4)	16.2	0.16 (0.05-0.55)
<i>Education level</i>							
< 12yrs	194	88.1	Referent	83.2	Referent	61.1	Ref
12 yrs (HS)	270	90.5	1.29 (0.47-3.58)	85.9	1.22 (0.46-3.22)	51.9	0.69 (0.34-1.39)
>12yrs	117	87.8	0.98 (0.28-3.37)	82.5	0.95 (0.30-3.0)	43.9	0.50 (0.20-1.24)
<i>Family income</i>							
<\$20 000	320	88.8	Referent	80.9	Referent	58.0	Ref
\$20 000- 34 999	119	92.2	1.49 (0.44-5.02)	90.1	2.15 (0.66-7.0)	58.6	1.02 (0.46-2.24)
> \$35 000	89	89.1	1.04 (0.33-3.32)	91.9	2.69 (0.79-9.21)	47.9	0.66 (0.27-1.61)
<i>Residence setting</i>							
Rural	170	84.1	Referent	85.7	Referent	57.8	Ref
Urban	422	91.2	1.97 (0.78-4.96)	83.7	0.86 (0.33-2.22)	51.4	0.77 (0.39-1.54)
<i>Insurance before pregnancy</i>							
No OHP	402	89.3	Referent	82.2	Referent	49.3	Referent
OHP	186	88.3	0.90 (0.33-2.47)	89.2	1.68 (0.62-4.57)	66.9	2.01 (1.00-4.06)
<i>WIC enrollment</i>							
No	239	92.0	Referent	82.9	Referent	48.5	Referent
Yes	353	87.3	0.60 (0.24-1.49)	85.2	1.13 (0.49-2.63)	56.3	1.29 (0.71-2.35)

^a Unweighted count of first trimester pregnant smokers

^b Weighted proportion

^c Crude odds ratio and 95%CI

¹ Excludes "I did not smoke" respondents

² Bold indicates statistically significant

Receipt of the Three A's during Prenatal Care

After applying weights, a substantial percentage of pregnant smokers did not receive a full smoking intervention that comprised the Ask, Advice and Assist components during prenatal care (Table 9). Among 594 pregnant smokers, 42.2% reported having received the Three A's. In evaluating the association between the Three A's and the individual socioeconomic factors, race/ethnicity was a statistically significant predictor ($p=0.013$), and maternal age was marginally significant ($p=0.08$). Compared to non-Hispanic White pregnant smokers, non-Hispanic Black women were *more* likely to report receiving the Three A's, OR= 2.08 (95% CI: 1.2-3.6). The other significantly different group was non-Hispanic Native Indians who were statistically *less* likely, compared to non-Hispanic White smokers, to have received the intervention (OR 0.59, 95% CI: 0.36-0.96). The fact that significant differences were not found for the comparisons between Whites and the Asian/PI and Hispanic groups were likely due to the small sample sizes in the minority groups. Women who belonged in the 35 and over age group were significantly *less* likely than the 18 and younger group to have received the Three A's, OR=0.21 (95% CI: 0.06-0.67).

The socioeconomic factors that were *not* statistically independently associated with the Three A's outcome were maternal education ($p=0.29$), family income ($p=0.45$), residential setting ($p=0.66$), OHP insurance status ($p=0.18$), and WIC enrollment ($p=0.31$).

Table 10 summarizes the weighted, simple logistic regression analyses for other explanatory variables against the Three A's outcome. Alcohol use during pregnancy was independently associated with the Three A's ($p=0.02$) outcome. Women who reported drinking any alcoholic beverage during the last three months of pregnancy were approximately four times (OR= 4.08, 95% CI: 1.13-14.75) more likely than non-drinkers to have received the outcome. The woman's pre-pregnancy smoking habit ($p=0.27$), marital status ($p=0.51$), insurance payer for the delivery ($p=0.19$), parity ($p=0.75$), childbearing intention ($p=0.30$), PNC clinic ($p=0.73$), timing of prenatal care initiation

($p=0.89$), and alcohol use before pregnancy ($p=0.82$) were not independently associated with receipt of the Three A's.

Explanatory variables whose p -value <0.25 from simple logistic regression analyses were selected for the multivariable logistic modeling. They included: race/ethnicity, maternal age, OHP insurance status, insurance payer for the delivery, and drinking during pregnancy.

Table 9. Simple logistic regression analyses for the Three A's outcome and socioeconomic variables, among first trimester pregnant smokers (Oregon PRAMS, 2000-2001)

Characteristic	n ^a	Three A's % ^b	Crude OR ^{c,1} (95% CI)	Likelihood test p-value
Total smokers	594	42.2	--	--
<i>Race/ethnicity</i>				
White, non-Hispanic	277	42.8	Referent	0.013
Black, non-Hispanic	90	60.9	2.08 (1.20-3.60)	
AI/AN, non-Hispanic	150	30.6	0.59 (0.36-0.96)	
Asian/PI, non-Hispanic	27	41.1	0.93 (0.38-2.30)	
Hispanic	50	28.1	0.52 (0.26-1.06)	
<i>Maternal age</i>				
≤ 18y	87	43.0	Referent	0.081
19-24y	287	40.2	0.89 (0.36-2.19)	
25-34y	179	49.4	1.29 (0.50-3.33)	
35+ y	41	13.5	0.21 (0.06-0.67)	
<i>Education level</i>				
< 12yrs	195	48.5	Referent	0.29
12 yrs (HS)	271	41.9	0.77 (0.39-1.49)	
>12yrs	117	31.7	0.49 (0.20-1.19)	
<i>Family income</i>				
<\$20 000	322	44.4	Referent	0.45
\$20 000- 34 999	119	49.9	1.25 (0.59-2.63)	
> \$35 000	89	35.1	0.68 (0.29-1.60)	
<i>Residence setting</i>				
Rural	172	44.8	Referent	0.66
Urban	422	41.1	0.86 (0.45-1.66)	
<i>Insurance before pregnancy</i>				
No OHP	404	40.0	Referent	0.18
OHP	186	51.2	1.57 (0.81-3.07)	
<i>WIC enrollment</i>				
No	239	37.6	Referent	0.31
Yes	355	45.2	1.37 (0.75-2.51)	

^a Unweighted count of smokers during 1st trimester

^b Weighted proportion

^c Weighted, crude odds ratio and 95%CI

¹ Bold indicates statistical significance

Table 10. Simple logistic regression analyses for the Three A's outcome and explanatory variables, among first trimester pregnant smokers (Oregon PRAMS, 2000-2001)

Characteristic	n	Three A's, % ^b	Crude OR ^{c,1} (95% CI)	Likelihood test p-value
Total smokers	594	42.2	--	--
<i>Daily smoking before pregnancy</i>				
Light (1-9 cigarettes)	156	35.6	Referent	0.27
Heavy (10+ cig)	395	45.5	1.52 (0.72-3.17)	
Missing	43	--	--	
<i>Marital status</i>				
Not married	397	42.4	Referent	0.51
Married	197	41.9	0.75 (0.32-1.76)	
<i>Insurance payer for delivery</i>				
Public insurance	402	46.9	Referent	0.19
Private/Other insurance	170	36.5	0.65 (0.34-1.25)	
None/ I don't know	22	--	--	
<i>Parity</i>				
Firstborn	251	40.8	Referent	0.75
Not firstborn	343	43.2	1.10 (0.61-2.0)	
<i>Childbearing intention</i>				
Intended	221	42.7	Referent	0.30
Unintended: mistimed	247	37.1	0.79 (0.41-1.54)	
Unintended: unwanted	116	53.0	1.51 (0.67-3.44)	
Missing	10	--	--	
<i>Primary PNC clinic</i>				
Health Dept clinic	68	45.0	Referent	0.73
Hospital clinic	118	51.8	1.32 (0.44-3.95)	
Private / HMO clinic	326	41.0	0.85 (0.33-2.20)	
Other	57	45.3	1.01 (0.25-4.05)	
Missing	25	--	--	
<i>Prenatal care initiation</i>				
Within 1 st trimester	419	43.4	Referent	0.89
After 1 st trimester	162	42.2	0.95 (0.48-1.88)	
Missing/ excluded ²	13	--	--	
<i>Alcohol use before pregnancy</i>				
None	227	41.0	Referent	0.82
Yes	365	42.8	1.08 (0.58-1.99)	
Missing	2	--	--	
<i>Alcohol use during pregnancy</i>				
None	553	40.2	Referent	0.022
Yes	36	73.3	4.08 (1.13-14.75)	
Missing	5	--	--	

^bWeighted proportion^cWeighted, crude OR and 95% CI¹ Bold denotes statistically significant²Excludes women who did not seek prenatal care

Model Building using Logistic Regression

The initial multivariate model contained maternal race/ethnicity, age, OHP insurance status, insurance payer for the delivery, and drinking during pregnancy met the p -value <0.25 criterion. Of these variables, age and alcohol use during pregnancy remained significant in the model as well as race/ethnicity. The stepwise removal of variables with a p -value equal or greater than 0.10 did not significantly alter the direction or magnitude of the OR's for race/ethnicity by more than 10%. Non-Hispanic Blacks and non-Hispanic American Indians were consistently statistically different from non-Hispanic Whites in the receipt of the Three A's in the presence of other variables.

Next, all other variables not previously included were added into the model created from the above steps. Of the newly added variables, education was found to meet the $p<0.10$ criterion, and was kept in the model. It remained significant at $p<0.10$ while the rest of the variables were removed. Removing WIC participation, income, residence setting, and OHP insurance did not alter the direction or magnitude of OR's for race/ethnicity beyond 10%.

Interactions for race/ethnicity by age, education, OHP insurance pre-pregnancy, income, residence setting, and WIC enrollment were assessed. However, there were insufficient sample sizes in the stratified groups to determine if the associations were statistically significance.

The final, weighted multivariate model containing only statistically significant explanatory variables (Model 1) is summarized in Table 11. To assess possible confounding effects of the remaining socioeconomic factors on the observed racial disparities, a fully adjusted model was developed (Model 2) and shown in Table 11. The significant relationships found in simple regression analysis within race/ethnicity remained statistically significant, with or without the presence of all the SES variables. Non-Hispanic Blacks were over twice as likely to have recalled being offered the Three A's when compared to non-Hispanic Whites (adjusted OR 2.43, 95% CI: 1.16-5.01) in the model controlling for SES. In contrast, non-Hispanic Native Indians were 0.45 (95% CI: 0.24-0.85)

times as likely, compared to non-Hispanic Whites. Compared to the crude associations determined from simple logistic regression, the direction and magnitude of the OR's for the racial/ethnic groups remained relatively stable in the final multivariate model. The comparisons between non-Hispanic Asian/PI and Hispanic groups against non-Hispanic Whites were not statistically significant in the multivariate model. This was likely due to the small sample sizes in the minority groups.

Of the socioeconomic variables assessed, only age and education remained significant in the multivariate model with only significant variables (Table 11). However, when other SES variables were added, education remained the only statistically significant SES variable, $p \geq 0.021$. After adjusting for other SES factors, women whose education was beyond high school level was statistically less likely than those without a high school diploma to receive the Three A's (adjusted OR 0.27, 95% CI: 0.10-0.76). This relationship was also found in simple logistic regression, but it was not statistically significant.

Alcohol use during the last trimester of pregnancy was a significant predictor of the Three A's outcome in a multivariate model controlling for SES. Women who reported drinking any alcohol in the last trimester of pregnancy were over eight times (adjusted OR 8.49, 95% CI: 2.59-41.3) more likely to report having received the Three A's. This was about twice as high as the crude OR (crude OR 4.08, 95% CI: 1.13-14.75), suggesting that at least one of the eliminated variables was a confounder of the association between drinking during pregnancy and Three A's outcome. However, this was not explored further because alcohol during pregnancy was not a variable of interest for this study.

Table 11. Multivariate logistic model for the Three A's intervention outcome, controlling for socioeconomic factors in model (Oregon PRAMS, 2000-2001)

Variables in model	Category	Crude OR (95% CI) ^{b,1}	Model 1, OR (95% CI) ^{b,1}	Model 2, OR (95% CI) ^{b,1}
<i>Race/ethnicity</i> (vs. White*)	Black*	2.08 (1.20-3.60)	2.58 (1.38-4.81)	2.43 (1.16-5.10)
	AI/AN*	0.59 (0.36-0.96)	0.53 (0.31-0.92)	0.45 (0.24-0.85)
	Asian/PI*	0.93 (0.38-2.30)	0.90 (0.35-2.30)	1.03 (0.38-2.76)
	Hispanic	0.52 (0.26-1.06)	0.57 (0.26-1.22)	0.54 (0.23-1.26)
<i>Age (vs. ≤18yr)</i>	19-24y	0.89 (0.36-2.19)	1.12 (0.41-3.09)	1.15 (0.36-3.68)
	25-34y	1.29 (0.50-3.33)	1.44 (0.50-4.20)	1.76 (0.52-6.01)
	35+y	0.21 (0.06-0.67)	0.20 (0.05-0.84)	0.21 (0.03-1.23)
<i>Education (vs. <12y)</i>	12 yr	0.77 (0.39-1.49)	0.71 (0.34-1.50)	0.60 (0.26-1.37)
	>12y	0.49 (0.20-1.19)	0.35 (0.12-0.98)	0.27 (0.10-0.76)
<i>Alcohol use during pregnancy</i>	Yes (vs. None)	4.08 (1.13-14.75)	7.18 (2.07-24.9)	8.49 (2.45-29.44)
<i>Income (vs. <\$20 000)</i>	\$20 000- 34 999	1.25 (0.59-2.63)		1.66 (0.71-3.89)
	> \$35 000	0.68 (0.29-1.60)		0.96 (0.31-2.99)
<i>Residence setting</i>	Urban (vs. Rural)	0.86 (0.45-1.66)		0.91 (0.40-2.04)
<i>Insurance before pregnancy</i>	OHP (vs. not OHP)	1.57 (0.81-3.07)		1.58 (0.71-3.54)
<i>WIC enrollment</i>	Yes (vs. No)	1.37 (0.75-2.51)		1.25 (0.56-2.76)

* non-Hispanic

^a Unweighted count of first trimester pregnant smokers^b Weighted OR and 95% CI¹ Bold denotes statistically significant

IV. DISCUSSION

To our knowledge, this is the first study since Kogan et al. in 1994 to assess racial disparities in the receipt of smoking cessation interventions during prenatal care. While Kogan et al. provided one national perspective of the state of racial disparity in the content of prenatal care, it is important to recognize that the causes of disparities and the priorities for addressing them vary nationwide and even statewide. As a result, to successfully address disparities requires focused state- or community-based projects that are supported by detailed local data [16]. The present study investigated factors that are associated with pregnant Oregonian smokers receiving optimal smoking intervention during prenatal care through utilizing the 2000-2001 Oregon PRAMS dataset. The PRAMS asks about three components of the Five A's smoking cessation protocol, including the Ask, Advice, and Assist. In this study, these three components were considered as the Three A's intervention, serving as the best proxy for the Five A's using what was available from the PRAMS survey.

Three key findings were elucidated in this investigation: 1) most pregnant smokers of all races do not receive assistance to quit from prenatal care providers, 2) racial/ethnic disparities exist among pregnant smokers receiving optimal smoking intervention during prenatal care, and 3) non-Hispanic American Indian/ Alaska Native pregnant smokers are at greatest risk for not receiving cessation counseling.

A. Smoking During Pregnancy

The prevalence of smoking during pregnancy in Oregon is far from meeting the *Health People 2010* benchmark of less than 2% [17]. Our finding of the maternal smoking prevalence at approximately 16% is consistent with the literature, including the 2001 Oregon Tobacco Prevention and Education Program report that estimated 13% of women used tobacco during pregnancy. In the

same report, the highest prevalence belonged to Native American women at 25%, and the lowest were Hispanic and non-Hispanic Asian/Pacific Islanders at approximately 3% [56]. The data were analyzed from the Oregon Behavioral Risk Factor Surveillance Survey (BRFSS), a random sample, telephone-based survey conducted on Oregon households. In comparison, smoking during pregnancy calculated using the 2000-2001 PRAMS was highest among Native American women at 35.7% and lowest among Hispanic and non-Hispanic Asian/Pacific Islander at less than 5% each.

Oregon prevalence of pregnant smokers in 2000-2001 was higher than nationally. According to the March of Dimes, approximately 13% of pregnant women nationally smoke during pregnancy [41]. Consistent with our results, the Report of the Surgeon General in 2004 identified women of Native American race at highest risk for smoking during pregnancy [42].

B. Receipt of the Individual Smoking Intervention Components

While most Oregon pregnant women reported that smoking was addressed during prenatal care, a smaller percentage of them did not report receiving the most important component of the Five A's—assistance from providers to quit (Assist). This is consistent with several studies that examined the receipt of any quit help during prenatal care from the perspectives of the clinicians [65, 84], and from large state-based surveys [78]. Two surveys of healthcare providers found that most clinicians caring for pregnant patients reported identification of smoking status but that provision of smoking counseling to pregnant smokers was not consistent [65, 84]. However, both studies were small state-based surveys of PNC caregivers with low response rates. In another study that utilized the National Ambulatory Medical Care Survey (NAMCS), an annual survey of U.S. office-based physicians, the authors also found that physicians were frequent in identifying pregnant smokers (81%) but substantially less frequent in counseling smokers about quitting (23%) [79]. This was consistent with Mullen et al. (1998) whom surveyed 204 obstetricians in Texas about smoking

cessation practices and found that 50% or less of the respondents reported assisting smokers to quit, even though 95% of obstetricians reported taking a smoking history at the initial visit most or all of the time [84]. In another small survey of prenatal healthcare providers in Massachusetts, Zapka et al. (2000) found that the majority of the 54 clinician respondents assessed smoking status most of the time but provided smoking cessation counseling less often [65]. These results suggest that there is a need to improve the clinician's role in smoking cessation intervention beyond the minimal requirement to identify smoking status.

Other studies using self-reported data to examine topics discussed with prenatal care providers found that the setting through which patients receive PNC is important. Kogan et al. (1994) and Freda et al. (1993) found that women in a private setting are less likely to discuss preventive health advice than those in a public setting [85, 86]. However, we did not observe PNC service site to be significantly associated with the Three A's intervention in a multivariable model.

We were surprised to find that older women (35 and older) reported receiving the Assist intervention less frequently than those 18 and under (crude OR 0.16, 95% CI: 0.05-0.55), despite being almost six times more likely to have had their smoking status identified (crude OR 5.78, 95% CI: 1.12-29.8). The differences could very well reflect the variation in older women's higher expectations of what constitute "assistance" or "help to quit" from providers as compared to younger women. Whereas questions about being asked and advised about smoking on the PRAMS survey are relatively straight-forward and are essentially binary (yes/no) variables, the determination of whether the woman received any "assistance" from providers can vary by what she considers is adequate assistance.

There are other possible reasons for differences in the age groups, including the clinicians' behavioral differences toward younger and older women. Older pregnant women could also be more likely to utilize private PNC clinics while younger women use public clinics that tend to be

more protocol-driven and may have a stronger emphasis in preventive care and education, due to the fact that the clientele are more likely to be from underserved communities. However, this alone seems insufficient in explaining why providers' performance was better on some counseling steps than others when comparing women of older and younger age groups.

C. Racial Disparities in the Receipt of Smoking Interventions

This study found that smoking cessation counseling given during prenatal care was not uniform across racial groups, even when adjusting for the potential confounding effect of socioeconomic factors. The women with the highest risk of not receiving counseling that could significantly reduce their chance of a fatal birth outcome were non-Hispanic American Indian/Alaska Native women. Despite having the highest smoking prevalence across racial groups, non-Hispanic AI/AN were the second to *least* likely to have recalled receiving the Three A's intervention during prenatal care. The group least likely to have reported receiving the Three A's was Hispanics (28%, weighted) whom happened to have the lowest smoking prevalence. We are unaware of any studies that evaluated the content of prenatal care given to Native American women relative to other racial/ethnic groups to compare with findings from our study. However, in a large telephone-based surveillance study of the general U.S. population, it was found that Native Americans were more likely as compared to Whites to recall being advised about smoking during their general health care visit [87], though the relationship was not statistically significant in a multivariate model (Adjusted OR 1.14, 95% CI: 0.68-1.93).

The reasons for the lesser likelihood of Native American and Hispanic women, compared to White women, to report having received the Three A's cannot be ascertained from this study. However, a possible explanation for the racial differences may reflect clinicians' varying perceptions of the patients' cultural background and his/her ability to influence change. For example, smoking is

generally known to be associated with a longstanding cultural tradition in the Native populations dating back since prior to the arrival of Europeans in North America [88]. Historically, tobacco has been used in Native American cultures for sacred, medicinal, and ceremonial purposes [88, 89]. The ancient beliefs, attitudes and behaviors related to tobacco, coupled with today's commercialism of tobacco, are partly responsible for the high smoking rates in Native Americans and the transformation of tobacco use from sacred to social purposes among the young Native Americans [90]. Perhaps practitioners who are cognizant of the cultural history of tobacco in the Native population are less confident in their ability to significantly change the women's tobacco-related habit, leading to less involvement in the Assist component. Alternatively, it is possible that the racial differences in maternal recall of the Assist intervention, namely that Native American and Hispanic women received less than White women, is a result of inadequate (i.e., culturally inappropriate) content and not to a lack of exposure to the intervention. However, culturally inappropriate interventions can be viewed as another way of not providing the service because women's perception of the health promotion messages received is most likely to be linked to health behavior changes. Given the increasingly diverse U.S. patient population, for whom English may be a second language, cultural competency and sensitivity are pertinent aspects of health care delivery. Consideration should also be given to how patient-physician racial discordance influences the effectiveness of smoking interventions given to minority women. One study confirmed the importance of racial and cultural factors in the patient-physician relationship and reaffirm the role of minority physicians in caring for minority patients [91]. The importance of the contribution of providers to the continued health care gaps we see in the U.S. is emphasized by the recent Institute of Medicine report, which suggests that pre-formed biases and stereotypes explain a large part of the racial health disparities in this country [92]. Improving cultural competency among physicians may enhance the quality of care for minority populations [91].

Another possible explanation for the lower prevalence of Hispanic women receiving the Three A's intervention is untimely care. In a 2001 study conducted in California using the state PRAMS data, the researchers found that Latina women were more likely than non-Latina White women to have untimely care, defined as care after the first trimester [93]. Women who receive delayed prenatal care could miss out on receiving certain health promotion interventions. One nationally representative study of office-based medical practitioners showed that physicians were less likely to identify a pregnant woman's smoking status at a first office visit than at a return visit, which could be explained by the physicians' hesitation in confronting new patients about smoking while attempting to establish rapport [79].

Our finding that non-Hispanic Blacks were more likely to have reported receiving the Three's A was consistent with a 1991 California study by Petitti et al. that reported Black women recalled receiving advice about cigarette and street drug use more frequently than White women. However, a nationally representative study by Kogan et al. (1994) found Black pregnant women to have been less likely offered smoking advice from PNC providers based on her self-reports.

D. Potential Cost Savings of Treating Tobacco Dependency during PNC

It has been estimated that the cost of implementing the Five A's by a trained health professional who also provide pregnancy specific self-help material can range from \$24 to \$34 per pregnant smoker, which includes the cost for provider time and any materials or supplies used with the intervention [94]. In contrast, the excess neonatal cost for infants of mothers who smoked was estimated at \$881 per maternal smoker in 2002 dollars by the CDC [2]. The excess neonatal costs per maternal smoker are the potential cost-savings that could be accrued from the reduced use of a neonatal intensive unit, shorter lengths of stay, and decreased service intensity achieved from women who quit smoking during pregnancy as a result of an effective intervention [94]. Given the

Five A's success rate of 30-70% reduction in smoking prevalence among pregnant smokers, the potential neonatal net savings is enormous for individuals and society if providers were more consistent with offering the Five A's intervention during prenatal care. The savings can also be substantial for costs associated with women's tobacco-related diseases in the long-term if they remain smoke-free at postpartum.

E. Strengths and Limitations

To our knowledge, this is the first study to assess racial disparities in the receipt of smoking cessation interventions since Kogan et al. in 1994 that utilized a national dataset. One significant advantage of this study, however, was that we were able to assess disparities beyond the common Black versus White comparisons and was able to identify an important segment of smokers, namely Native American pregnant women, who may not be given adequate smoking cessation interventions from prenatal care providers. Data available for some health measures for Native Americans have been largely incomplete or of inconsistent quality [16], resulting in the difficulty of tracking the health status of this population. From data that are available and reliable, however, Native Americans consistently score worse on core health indicators and access to care measures than Whites [16], thus adding urgency to the need to improve data collection for this population.

An additional strength of this study was that we examined smoking interventions beyond just quit advice from providers. Provider-delivered interventions are effective in promoting smoking cessation [58, 59, 95], and at least one study has shown that intervention successes increase with the number of intervention modalities employed [58, 95], including increased practitioner assistance in the counseling process beyond the minimal advice to quit. Past similar studies, including Kogan et al.'s, are limited in that they assessed only whether providers offered cessation advice [14, 76, 77, 87], which illustrates only part of the optimal intervention schema.

Another strength of this study is the selection of first trimester pregnant smokers for the study population that minimizes the misclassification of women who quit before their first prenatal care visit. The majority of women initiate prenatal care during the first trimester of pregnancy and between 15-42% of those who smoke will quit before their first prenatal care visit [2]. Similar past studies, including Kogan et al.'s, investigated smoking counseling among *pre-pregnancy* smokers or women who reported smoking up to one year *before* pregnancy [76, 96], hence making their study more prone to misclassification bias.

The results of the present study should be interpreted in light of several limitations, including recall bias, incomplete data, and the potential discrepancies between maternal and provider reports. The quality of the data depends directly on the ability of the study participants to recall, at postpartum, counseling and behaviors that occurred during prenatal care. On average the Oregon Office of Family Health receives the PRAMS surveys, at two to four months after the woman has given birth. Previous studies have differed in their findings of the validity of maternal recall of pregnancy and prenatal care events [97, 98]. Additionally, patients and providers may differ on their recall of services provided [99, 100].

Under- or over-reporting of maternal risk factors (e.g., smoking), and the severity or intensity thereof (e.g., number of cigarettes smoked daily), could also affect our results. It is possible that women who had an unfavorable birth outcome would be more likely to recall engaging in negative behaviors (selective recall), such as smoking or drinking during pregnancy, than those with a favorable birth outcome. Alternatively, underreporting of maternal smoking could occur when women who are aware of the detrimental effects of tobacco are more likely to report that they did not smoke, particularly if being questioned about the habit during pregnancy when it is more socially unacceptable. At least one study has found significant discordance between pregnant women's self-reports of current substance use, including cigarette smoking, and positive

biochemical assessments [101]. Likewise, selective recall bias could occur for recalling the interventions received during prenatal care. It is possible that women with an unfavorable birth outcome would be more likely to report a lack of intervention from providers about her negative behavior.

Another limitation is that we are unable to assess the type of provider who delivered the smoking interventions (e.g. medical doctor, nurse practitioner, public health case workers, etc) and the extent of their involvement in the Assist step for us to offer provider-specific improvements. As discussed earlier, the activities that providers can perform to carry out the Assist component can vary from as “hands-off” an approach as referring the patients to a Quit Line or offering self-help materials, to as “hands-on” as actively helping the patient to map out a quit plan or providing inpatient counseling. Because PRAMS does not ask about the details of clinicians’ involvement in assistance efforts, we are unable to assess the adequacy of the different Assist activities.

V. CONCLUSIONS

Disparities in health between racial groups are pervasive, chronic, and have many direct and indirect adverse consequences [92]. There is a great need for continued research into health prevention and public health surveillance to explain factors that are responsible for the large racial disparity in, for example, the IMR between Native American and White babies. This study about smoking interventions offered during prenatal care to at-risk pregnant women will help health researchers and professionals to formulate means of improving these conditions.

This was a retrospective cross-sectional study of pregnant Oregon smokers who reported on whether they received any smoking counseling during prenatal care. While the majority of women reported their clinician asked them about smoking and advised them to quit, a substantial number of them do not recall having received adequate assistance to quit. This was true across all races, suggesting that there is a need for improvements in addressing tobacco dependency in prenatal care. Non-Hispanic American Indian/ Alaska Native women are at greatest risk for not receiving counseling to help them stop smoking.

Future Research Directions

Despite the knowledge that disparities exist for a diverse representation of minority groups, most research pertaining to access to healthcare has been limited to comparing Black versus White races. Often, patients from other races and ethnicities are excluded, or are clumped together to be analyzed as part of a larger collective group. This may be a result of the fact that these groups are difficult to identify or are underrepresented in existing datasets. Future effort should focus on improving data collection for these underrepresented groups, particularly Native Americans, for whom few data are available in general. In addition to improving data collection for minority

groups, future research should assess the adequacy of preventive health counseling across prenatal settings, especially for the specific topic of smoking.

It would also be worthwhile to examine the barriers associated with prenatal care providers offering the Five A's. Recently, the Oregon Tobacco Prevention and Education Program has begun promoting a similar, but shorter, clinician-targeted protocol called AAR, an acronym for Ask, Advice, and Referral to the Oregon Quit Line. The advantage of AAR is that the pressure to provide smoking counseling to pregnant smokers, which could be a time-consuming endeavor, is relieved from the prenatal care provider who may not be trained in delivering the Five A's in the first place. Instead, providers are encouraged to refer patients to the Oregon Quit Line that provides various smoking cessation strategies, counseling, and products for quitting. If reasons for the low rate of providers offering the Five A's include the issue of patient-provider time, it would help support the need to promote an intervention requiring less of the provider's time, such as the AAR, but should be as effective as, or more so than, the Five A's, which the AAR has yet to demonstrate.

Finally, many studies have shown that provider-delivered interventions are effective in promoting smoking cessation, especially when there is an office system to cue providers [65, 102, 103]. In the future, attention to systems interventions for smoking cessation, including office systems and research in this area, could help improve the providers' performance in delivering the Assist component of the Five A's intervention. Randomized studies have demonstrated that training plus reminders for physicians and other medical staff significantly increases cessation rates among pregnant smokers [104, 105]. Therefore, "systemizing" the Five A's protocol in clinics serving pregnant and postpartum women can potentially increase the effectiveness of the intervention.

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APPENDIX A. DEFINITION OF URBAN AND RURAL COUNTIES IN OREGON, 2000-2001

The PRAMS survey participants were randomly selected from Oregon birth certificates. We therefore know the home address of each woman at the time she gave birth. Rural is defined as residence in any county with less than 60 people per square mile in 2001. All other counties are treated as urban. [Note: Starting with 2002 births, the Office of Family Health assigned urban and rural residence according to the U.S. Census Bureau’s definition by assigning each address to specific census block groups and census blocks.]

Rural Counties (26)	Baker, Clatsop, Coos, Crook, Curry, Deschutes, Douglas, Gilliam, Grant, Harney, Hood River, Jefferson, Josephine, Klamath, Lake, Lincoln, Linn, alheur, Morrow, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco, Wheeler
Urban Counties (10)	Benton, Clackamas, Columbia, Jackson, Lane, Marion, Multnomah, Polk, Washington, Yamhill

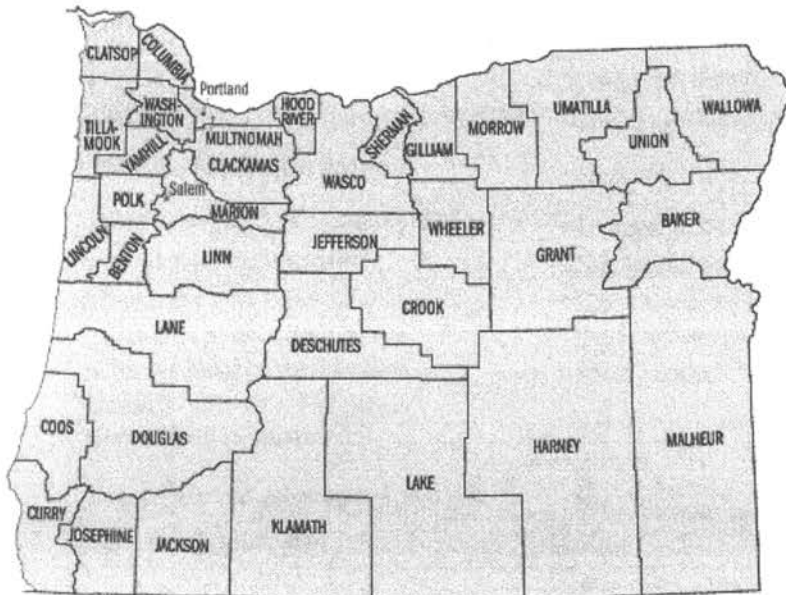


Figure A1. Map of the counties of Oregon

APPENDIX B. 2000-2001 Oregon PRAMS Questionnaire

First, please tell us:
 1. What is today's date? _____ / _____ / _____
 month day year

2. What is your date of birth? _____ / _____ / _____
 month day year

Next, we would like to ask you some questions about the time just before and during your pregnancy with your new baby. It may help to look at the calendar when you answer these questions.

3. Where did you have a pregnancy test? **Check all that apply.**

- Home
- Private doctor's office or HMO clinic
- Planned Parenthood
- Health department clinic
- Community health clinic
- "Crisis pregnancy center"
- Didn't take a pregnancy test
- Other • Please tell us: _____

4. How many weeks or months pregnant were you when you were *sure* you were pregnant? _____ Weeks or _____ Months

- I don't remember

5. Thinking back to *just before* you got pregnant, how did you feel about becoming pregnant? **Check the best answer. (Feel free to note any reason why the answer you checked doesn't quite fit -- but please check the best answer.)**

- I wanted to be pregnant sooner
- I wanted to be pregnant later
- I wanted to be pregnant then
- I didn't want to be pregnant then or at any time in the future
- I don't know

6. *Just before* you got pregnant, did you have health insurance?

- No
- Yes

<p>7. <i>Just before</i> you got pregnant, did you have health insurance through the Oregon Health Plan?</p>	<ul style="list-style-type: none"> • No • Yes
<p>8. When you got pregnant with your new baby, were you or your husband or partner using any kind of birth control? Birth control means the pill, condoms, diaphragm, foam, rhythm, Norplant®, shots (Depo-Provera®), or ANY other way to keep from getting pregnant.</p>	<ul style="list-style-type: none"> • No • Yes • Go to Question 10
<p>9. Why were you or your husband or partner not using any birth control? Check all that apply. the birth control I used</p>	<ul style="list-style-type: none"> • I wanted to get pregnant • I didn't think I could get pregnant • I had been having side effects from • I didn't want to use birth control • I didn't think I was going to have sex • My husband or partner didn't want to use birth control • Other • Please tell us: <hr/>
<p>If you were not using birth control when you got pregnant, go to Question 12 on Page 3.</p>	
<p>10., <i>When you got pregnant</i> what kinds of birth control were you or your partner using? Check all that apply.</p>	<ul style="list-style-type: none"> • Pill • Condoms • Foam, jelly, cream • Diaphragm • Norplant® • Shots (Depo-Provera®) • Withdrawal • Other • Please tell us: <hr/> <ul style="list-style-type: none"> • Don't know/Not sure

11. Where were you or your partner getting your birth control method(s)?
Check all that apply.

- A family planning clinic (for example, Planned Parenthood)
- A health department clinic
- A community health center
- A private gynecologist
- A general or family physician
- A drug store or other store
- Other • Please tell us:

-
- No place
 - Don't know/Not sure

12. These questions ask about things you knew about birth control **before you got pregnant.**
For each thing, please circle N (No) or Y (Yes).

- | | No | Yes |
|--|----|-----|
| a. Did you know there was free or low cost birth control at health departments and Planned Parenthood clinics? | N | Y |
| b. Had you ever read or heard about emergency birth control (the "morning-after" pill)?
This special combination of regular birth control pills is used to prevent pregnancy up to three days after unprotected sex. | N | Y |

13. *Before you got pregnant,* did your health insurance cover the cost of birth control?
Check the best answer.

- Yes, it covered all or part of the cost of my birth control method
- Yes, it covered birth control, but *not the method I wanted*
- Yes, it covered birth control, but *I didn't use a method*
- No, it did not cover birth control
- I didn't have any health insurance
- Don't know/Not sure

14. Just before you got pregnant, how much did you weigh?

- ___ Pounds
- I don't know

15. How tall are you without shoes?

___ Feet ___ Inches

23. Did any of these things keep you from getting prenatal care as early in your pregnancy as you wanted? Check all that apply.

- I couldn't get an appointment earlier in my pregnancy
- I didn't have enough money or insurance to pay for my visits
- I didn't know that I was pregnant
- I had no way to get to the clinic or doctor's office
- I couldn't find a doctor or a nurse who would take me as a patient
- I had no one to take care of my children
- I had too many other things going on
- Other • Please tell us: _____

If you did not go for prenatal care, go to Question 27 on Page 6.

	Month of Pregnancy	How many visits?
24. During each month of your pregnancy, about how many visits for prenatal care did you have? If you don't know exactly how many, please give us your best guess. Don't count visits for WIC. It may help to use the calendar.	First Month	_____
	Second Month	_____
	Third Month	_____
	Fourth Month	_____
	Fifth Month	_____
	Sixth Month	_____
	Seventh Month	_____
	Eighth Month	_____
	Ninth Month	_____

25. Where did you go most of the time for your prenatal visits? **Don't include visits for WIC. Check one answer.**

- Hospital clinic
- Health department clinic
- Private doctor's office or HMO clinic
- Other • Please tell us: _____

26. During any of your prenatal care visits, did a doctor, nurse, or other health care worker talk with you about any of the things listed below? **For each thing, please circle N (No), Y (Yes), or DK (Don't Know).**

	No	Yes	Don't Know
a. What you should eat during your pregnancy	N	Y	DK
b. How smoking during pregnancy could affect your baby	N	Y	DK
c. How secondhand smoke could affect your baby after birth	N	Y	DK
d. Breast-feeding your baby	N	Y	DK
e. How drinking alcohol during pregnancy could affect your baby	N	Y	DK
f. Using a seat belt during your pregnancy	N	Y	DK
g. Birth control methods to use after your pregnancy	N	Y	DK
h. How using illegal drugs could affect your baby	N	Y	DK
i. How to keep from getting HIV (the virus that causes AIDS)	N	Y	DK
j. Getting your blood tested for HIV (the virus that causes AIDS)	N	Y	DK
k. Physical abuse to women by their husbands or partners	N	Y	DK

27. If you were on WIC (Women, Infants and Children nutrition program) during this pregnancy, how many weeks or months pregnant were you when you had your first visit for WIC? Weeks or Months

- I was not on WIC
- I don't remember

28., *Before having your baby* who talked to you about immunizations for your newborn baby?
Check all that apply.

- Obstetrician/gynecologist
- Pediatrician
- Midwife
- Health department employ
- Childbirth educator
- WIC
- Other • Please tell us:

• No one talked to me about immunizations for my newborn baby

29. At any time during your most recent pregnancy did a doctor or midwife suggest that you get a blood test for HIV (the virus that causes AIDS)?

- No
- Yes
- I don't know

30. At any time during your most recent pregnancy, did you have a blood test for HIV (the virus that causes AIDS)?
- No
 - Yes
 - I don't know
31. Have you ever heard or read that taking the vitamin folic acid can help prevent some birth defects?
- No
 - Yes
32. Were you taking the vitamin folic acid most days in *the month before* you became pregnant?
- No
 - Yes
 - I don't know

The next questions are about smoking cigarettes and drinking alcohol.

33. Have you smoked at least 100 cigarettes in your entire life?
- No • **Go to Question 40**
 - Yes
34. In the *3 months before* you got pregnant, how many cigarettes or packs of cigarettes did you smoke on an average day? (A pack has 20 cigarettes.)
- ___ Cigarettes or ___ Packs
 - Less than 1 cigarette a day
 - I didn't smoke
 - I don't know
35. In the *last 3 months* of your pregnancy, how many cigarettes or packs of cigarettes did you smoke on an average day?
- ___ Cigarettes or ___ Packs
 - Less than 1 cigarette a day
 - I didn't smoke
 - I don't know
36. How many cigarettes or packs of cigarettes do you smoke on an average day *now*?
- ___ Cigarettes or ___ Packs
 - Less than 1 cigarette a day
 - I don't smoke
 - I don't know
37. During your visits to your doctor or midwife for prenatal care or after the baby was born, did someone ask if you smoked, either by questionnaire or in person?
- Yes, before my baby was born
 - Yes, after my baby was born
 - Yes, both times
 - No

38.	During your visits for prenatal care or after the baby was born, did your doctor or midwife ever advise you to quit smoking?	<ul style="list-style-type: none"> • Yes, before my baby was born • Yes, after my baby was born • Yes, both times • No
39.	During your visits for prenatal care or after the baby was born, did your doctor or midwife offer advice or help on how to quit smoking?	<ul style="list-style-type: none"> • Yes, before my baby was born • Yes, after my baby was born • Yes, both times • No
40.	During the <i>3 months before</i> you got pregnant, how many alcoholic drinks did you have in an average week? (A drink is: One glass of wine. One wine cooler. One can or bottle of beer. One shot of liquor. One mixed drink.)	<ul style="list-style-type: none"> • I didn't drink then • Less than 1 drink a week • 1 to 3 drinks a week • 4 to 6 drinks a week • 7 to 13 drinks a week • 14 or more drinks a week • I don't know
41.	During the <i>3 months before</i> you got pregnant, how many times did you drink 5 or more alcoholic drinks at one sitting?	<p>____ Times</p> <ul style="list-style-type: none"> • I didn't drink then • I don't know
42.	During the <i>last 3 months</i> of your pregnancy, how many alcoholic drinks did you have in an average week?	<ul style="list-style-type: none"> • I didn't drink then • Less than 1 drink a week • 1 to 3 drinks a week • 4 to 6 drinks a week • 7 to 13 drinks a week • 14 or more drinks a week • I don't know
43.	During the <i>last 3 months</i> of your pregnancy how many times did you drink 5 or more alcoholic drinks at one sitting?	<p>____ Times</p> <ul style="list-style-type: none"> • I didn't drink then • I don't know

Pregnancy can be a difficult time for some women. The next questions are about some things that may have happened to you before and during your most recent pregnancy.

44. This question is about things that may have happened during the *12 months before you delivered* your new baby. This includes the months before you got pregnant. **For each thing, circle N (No) or Y (Yes). It may be helpful to use your calendar.**

	No	Yes
a. A close family member was very sick and had to go into the hospital	N	Y
b. You got separated or divorced from your husband or partner	N	Y
c. You moved to a new address	N	Y
d. You were homeless	N	Y
e. Your husband or partner lost a job	N	Y
f. You lost your job even though you wanted to go on working	N	Y
g. You and your husband or partner argued more than usual	N	Y
h. Your husband or partner said he did not want you to be pregnant	N	Y
I. You had a lot of bills you couldn't pay	N	Y
j. You were involved in a physical fight	N	Y
k. You or your husband or partner went to jail	N	Y
l. Someone very close to you had a bad problem with drinking or drugs	N	Y
m. Someone very close to you died	N	Y

45. Do you feel that you were ever treated differently by health care providers during your prenatal care, labor or delivery because of your:
For each thing, circle N (No) or Y (Yes).

	No	Yes
a. Race	N	Y
b. Culture	N	Y
c. Ability to speak or understand English	N	Y
d. Age	N	Y
e. Insurance status	N	Y
f. Neighborhood you lived in	N	Y
g. Religious beliefs	N	Y
h. Sexual orientation or lifestyle	N	Y
I. Marital status	N	Y
j. Desire to have out-of-hospital birth	N	Y

Comments: _____

51. How many weeks old was your baby the first time you fed him or her anything besides breast milk? **Include formula, baby food, juice, cow's milk, or anything else.**
- ___ Weeks
- My baby was less than 1 week old
 - I haven't fed my baby anything besides breast milk

If your baby was not born in a hospital, go to Question 53.

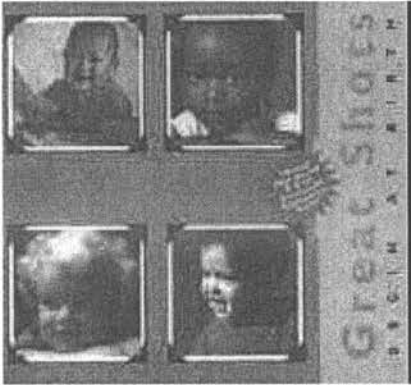
52. This question asks about things that may have happened at the hospital where your new baby was born. **For each thing, circle N (No) or Y (Yes).**

	No	Yes
a. Hospital staff gave you information about breast-feeding	N	Y
b. Your baby stayed in the same room with you at the hospital	N	Y
c. You breast-fed your baby at the hospital	N	Y
d. Hospital staff helped you learn how to breast-feed	N	Y
e. Your baby was fed only breast milk at the hospital	N	Y
f. Hospital staff told you to breast-feed whenever your baby wanted	N	Y
g. The hospital gave you a gift pack with formula	N	Y
h. The hospital gave you a telephone number to call for help about breast-feeding	N	Y
i. Hospital staff gave you information about breast-feeding	N	Y

53. *During your most recent pregnancy, what did you think about breast-feeding your new baby?*
- I knew I would breast-feed
 - I thought I might breast-feed
 - I knew I would not breast-feed
 - I didn't know what to do about breast-feeding
- Check one answer.**

54. Did any of these things prevent you from breast-feeding or stop you after you had started?
- Check all that apply.**
- I am still breast-feeding
 - I didn't want to breast-feed
 - I was planning to go to work or school
 - I tried but my baby didn't breast-feed very well
 - My baby was not with me
 - I think it's better for my baby to be bottle fed
 - I was taking medicine
 - I felt it was the right time to stop
 - My doctor told me to not to breast-feed
- Reason: _____
- Other • Please tell us: _____

55. *After having your baby,*
did you see the packet of
information with this cover?



**(The packet is called
"Great Shots Begin at Birth"
and it's blue and orange.)**

- No, I did not see the packet
- Yes, I saw the packet
 - If yes, did you look it over?
 - No
 - Yes

56. *After your new baby was born,*
did a doctor, nurse, or other health
care worker talk with you about
using birth control?

- No
- Yes

57. About how many hours a day,
on average, is your new baby
in the same room with
someone who is smoking?

- ____ Hours
- My baby is never in the same room with
someone who is smoking

58. Which of the following statements
best represents your opinion on
children's exposure to secondhand
smoke?

- Second hand smoke is *not harmful* to children
- Secondhand smoke is *not very harmful* to
children
- Secondhand smoke is *somewhat harmful* to
children
- Secondhand smoke is *very harmful* to children
- Don't know

59. Is there anyone (else) in your
household who smokes cigarettes,
cigars, or pipes?

- No
- Yes

60. Which of the following statements best describes the rules about smoking inside your home:
- No one is allowed to smoke anywhere inside my home
 - Smoking is permitted anywhere inside my home
 - Smoking is not allowed in the baby's room but is allowed in other places in the house
 - Don't know
61. How do you put your new baby down to sleep most of the time? Check one answer.
- On his or her side
 - On his or her back
 - On his or her stomach
62. How often does your new baby sleep in the same bed with you? Check only one.
- Always
 - Almost always
 - Sometimes
 - Never
63. How many times has your baby been to a doctor or nurse for *routine* well baby care? Don't count the times you took your baby for care when he or she was sick.
It may help to use the calendar.
- _____ Times
- My baby hasn't been for routine well baby care
 - Go to Question 65
64. When your baby goes for routine well baby care, where do you take him or her? Check all the places that you use.
- Hospital clinic
 - Health department clinic
 - Private doctor's office
 - Other • Please tell us: _____
65. Listed below are some things about child safety. For each, circle N (No) or Y (Yes) or DK (Don't Know).
- | | No | Yes | Don't Know |
|--|----|-----|------------|
| a. Your infant was brought home from the hospital in an infant car seat | N | Y | DK |
| b. Your baby always rides in an infant car seat | N | Y | DK |
| c. Your home has a working smoke alarm that has been tested in the last year | N | Y | DK |
| d. Any guns, rifles, or other firearms in your home are stored unloaded | N | Y | DK |
| e. Your hot water heater has been turned down or set to 120o F or below | N | Y | DK |

Here are some questions about you after your baby was born.

66. What is your health insurance coverage *now*?
- Insurance through my employer
 - Insurance through someone else's employer
 - Oregon Health Plan
 - CHAMPUS (Military)
 - Indian Health Care Program
 - Other · Please tell us:
-
- I don't have any health insurance
 - I don't know
67. Are you or your husband or partner using any kind of birth control *now*?
- Birth control means having your tubes tied, vasectomy, the pill, condoms, diaphragm, foam, rhythm, Norplant®, shots (Depo-Provera®), or ANY other way to keep from getting pregnant.**
- No
 - Yes · **Go to Question 69**
68. What are your reasons for not using any birth control *now*?
- Check all that apply.**
- I am not having sex
 - I want to get pregnant
 - I don't want to use birth control
 - My husband or partner doesn't want to use birth control
 - I don't think I can get pregnant
 - I can't pay for birth control
 - I am pregnant now
 - Other · Please tell us:

If you are not using any birth control now, go to Question 71.

69. What kinds of birth control are you or your partner using *now*?
Check all that apply.
- Tubes tied (sterilization)
 - Vasectomy (sterilization)
 - Pill
 - Condoms
 - Foam, jelly, cream
 - Diaphragm
 - Norplant®
 - Shots (Depo-Provera®)
 - Withdrawal
 - Other · Please tell us:
-
- Don't know/Not sure
70. Where are you or your partner getting your birth control method(s) *now*?
Check all that apply.
- A family planning clinic (for example, Planned Parenthood)
 - A health department clinic
 - A community health center
 - A private gynecologist
 - A general or family physician
 - A drug store or other store
 - Other · Please tell us:
-
- No place
 - Don't know/Not sure
71. Does your health insurance cover the cost of birth control *now*?
Check the best answer.
- Yes, it covers all or a part of the cost of my birth control method
 - Yes, it covers birth control, but *not the method I want*
 - Yes, it covers birth control, but *I don't use a method*
 - No, it does not cover birth control
 - I don't have any health insurance
 - Don't know/Not sure

Please answer the next questions about family income. It will help us see how income affects the health of Mother's, babies and families. All information will be kept private.

72. What were the sources of your family income **during the past 12 months?** **Check all that apply.**
- Money from a job or business
 - Aid such as TANF (formerly AFDC), welfare, public assistance, general assistance, food stamps, or SSI
 - Unemployment benefits
 - Child support or alimony
 - Fees, rental income, commissions, interest, dividends
 - Social security, workers' compensation, veteran benefits, or pensions
 - Other · Please tell us:
-

73. What is your family income, before deductions and taxes? **Include ANY income or money you can use (for example, job, TANF [formerly AFDC], child support, etc.). Please give us your best guesses. All information will be kept private.**

a. Family income
before you got pregnant: \$ _____ .. Weekly or · Monthly or · Yearly

b. Family income now: \$ _____ .. Weekly or · Monthly or · Yearly

Thank you for giving us your best guesses in Question 73. Now we are going to ask the same questions, but about *monthly* income. Your answers will help us judge health programs that are based on *monthly* income.

74. What is your monthly family income, before deductions and taxes? **Include ANY income or money you can use. All information will be kept private.**

- a. Monthly family income *before you got pregnant*
- 659 or below
 - 660 - 879
 - 880 - 1,109
 - 1,110 - 1,219
 - 1,220 - 1,639
 - 1,640 - 2,059
 - 2,060 - 2,469
 - 2,470 - 2,889
 - 2,890 - 3,309
 - 3,310 - 3,729
 - 3,730 or above

- b. Monthly family income *now*
- 659 or below
 - 660 - 879
 - 880 - 1,109
 - 1,110 - 1,219
 - 1,220 - 1,639
 - 1,640 - 2,059
 - 2,060 - 2,469
 - 2,470 - 2,889
 - 2,890 - 3,309
 - 3,310 - 3,729
 - 3,730 or above

75. How many people does this income support? **Count yourself.**

a. Number of people *before you got pregnant* _____

b. Number of people *now* _____

Please use the space below for any comments you would like to make about the survey.

Thanks again!