INTIMATE PARTNER VIOLENCE DURING PREGNANCY:

Risk Factors From the

Oregon Pregnancy Risk Assessment Monitoring System

by

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LIST OF ABREVIATIONS

CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
DHS	Department of Human Services
IPV	Intimate Partner Violence
IPVP	Intimate Partner Violence in Pregnancy
IPVD	Intimate Partner Violence During Pregnancy
LBW	Low Birth Weight
MVM	Multivariate Model
OR	Odds Ratio
PRAMS	Pregnancy Risk Assessment Monitoring System
PSTD	Post Traumatic Stress Disorder
SES	Socio-economic Status
US	United States

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ABSTRACT

Introduction: The prevalence of intimate partner violence in pregnancy (IPVP) in the United States is estimated at between 4% and 8% of all pregnancies. The cost of this public health problem exceeds $5.8 billion per year. Among other things, IPVP is associated with substance abuse, trauma, depression, poor nutrition, and sexually transmitted diseases, all detrimental to the health of the fetus as well as the mother.

Objective: The study objective was to develop a statistical model that could be used to identify which women are most at risk of intimate partner violence during pregnancy.

Methods: Using data from the Oregon Pregnancy Risk Assessment Monitoring System (PRAMS), factors were identified that were associated with (IPVP). In 2001, 1795 women completed the survey (72.1% response rate). Data were weighted for oversampling, non-response and non-coverage. The data include the responses of 1548 women who answered the question about IPVP, ("During your most recent pregnancy, did your husband or partner push, hit, slap, kick, choke or physically hurt you…?").

Results: Starting with 30 factors of interest, the variables that maintained a significant association in the final model are, "*your husband/partner said he does not want you to be pregnant"* (Odds Ratio {OR} 4.88; 95% Confidence Interval {95% CI} 1.29, 18.38), "*someone very close to you had a problem with drinking or drugs"* (OR 7.86; 95%CI 2.23, 27.75), "*you had a lot of bills you couldn't pay"* (OR 7.87; 95%CI 1.84, 33.65) and "*you've had a previous pregnancy loss"* (OR 4.88; 95%CI 1.28, 18.38). Three other variables, "*intimate partner violence before pregnancy"* (Crude OR 321.39; 95%CI 59.01, 1750.52), "*arguing more with your husband/partner"* (Crude OR

272.22; 95%CI 95.66, 780.31) and "*being involved in a physical fight"* (Crude OR 81.78; 95%CI 21.46, 311.62) are so strongly correlated that, in this data set, they are felt to be proxies for the intimate partner violence outcome variable and so were not used in the model building process, but are still important for clinicians to be aware of.

Conclusions: A tool for screening prenatal patients can be developed for Oregon, based on the results of this study. A questionnaire which would include these factors, could be placed in the chart of every prenatal patient, thus alerting the prenatal care provider to the presence of these factors in the patient's life. If we can help obstetrical providers more readily identify women who are being abused by their husbands or partners, perhaps we can begin to reduce the prevalence of IPVP in Oregon.

INTRODUCTION

Gender-based violence includes many kinds of harmful physical, emotional and sexual behaviors against women and girls—most often carried out by family members, but sometimes by strangers. The United Nations Declaration on the Elimination of Violence Against Women includes the following definition:

…any act of gender-based violence that results in or is likely to result in, physical, sexual, or psychological harm or suffering to women, including threats of such acts, coercion, or arbitrary deprivations of liberty, whether occurring in public or private life (1).

A recent review of 50 studies found that between 10 and 50% of women have experienced physical violence by an intimate partner at some point in their lives (2). Three to twenty percent report abuse during pregnancy (2,3). Characteristics that accompany intimate partner violence (IPV), based on that review and a prior World Bank review in 1994 (4), include the following:

- The great majority of perpetrators of violence are men; women are at the greatest risk from men they know.
- Physical violence is almost always accompanied by psychological abuse and in many cases by sexual abuse.
- Most women who suffer any physical aggression by a partner generally experience multiple acts over time.
- Violence against women cuts across socioeconomic class and religious and ethnic lines.
- Men who batter their partners exhibit profound controlling behavior.

Definition of Intimate Partner Violence

Intimate Partner Violence (IPV), also called domestic violence, battering, or spousal abuse, is violence committed by a spouse, ex-spouse, or a current or former boyfriend or girlfriend. The Centers for Disease Control and Prevention (CDC), in their efforts to improve surveillance, have suggested some uniform definitions of intimate partners and violence (5). Intimate partners include current and former spouses, cohabitating non-marital partners (opposite- or same-sex), boyfriends, girlfriends and dates. Violence is divided into four categories:

1. Physical violence
2. Sexual violence
    - Use of physical force to compel a person to engage in a sexual act against his or her will
    - Abusive sexual contact (e.g., touching), or either of the prior, committed when the person cannot communicate unwillingness (e.g., disabled)
3. Threat of physical or sexual violence
4. Psychological/emotional abuse
    - Although psychological and emotional abuse is damaging in and of itself, it must be within a relationship with other forms of violence or threats to meet criteria for violence

Both men and women are victims of IPV, but women are much more likely than men to suffer physical and psychological injuries from IPV (6).

Prevalence of IPV

The prevalence of violence against women in the United States (US) is estimated at approximately 2.1% in women older than eighteen (7). More than two million women are victims of physical assault, including rape, annually in the United States (7). Of these women, 75%, or about 1.5% of the population are victims of an intimate partner (8). This particular public health problem is not limited to any specific race or ethnic group (6,9).

Intimate Partner Violence in Pregnancy

Early researchers believed that the incidence of abuse increased during pregnancy (10). In the 1970s and early 1980s, studies indicated that 23% to 56% of battered women experienced violence during pregnancy (11). These studies, however, were all in women in support shelters and did not reflect the population at large. Gazmararian and colleagues (11) published a review of 13 studies and determined that the prevalence of violence during pregnancy is between 0.9% and 20.1%, although the majority of the studies reported a prevalence between 3.9% and 8.3%. Although the large variation may reflect some differences in the populations studied, it is thought by many investigators that the differences are more likely to be due to differences in study methods, such as: What definition of IPVP was used? What questions were asked? Who asked the questions and how often? How long did the study take and in what time frame related to the pregnancies? How large was the sample? Was this a clinic based or a population based sample? What was the main focus of the study? (12)

Does Pregnancy Increase the Risk for IPV?

Although some studies have shown that pregnant women are not any more or less likely to suffer IPV than non-pregnant women (13), others show a decrease in IPV during pregnancy. The PRAMS surveillance system of self-reported maternal behaviors and experiences before, during and after pregnancy, operating in 32 states, has found a decrease in IPV during pregnancy, dropping from 7.2% in the 12 months prior to pregnancy to 5.3% during pregnancy (14). But PRAMS only samples women who have recently been pregnant, asks only 4 questions about abuse (see Appendix A), and is a survey where self-reported abuse is only a very small part of the multiple areas of the pregnancy experience that are being evaluated. Studies using national probability samples of all women of childbearing age, regardless of pregnancy status, rather than using samples of women in prenatal or postpartum clinics, reveal no difference in the risk due to pregnancy (12).

Consequences of IPVP

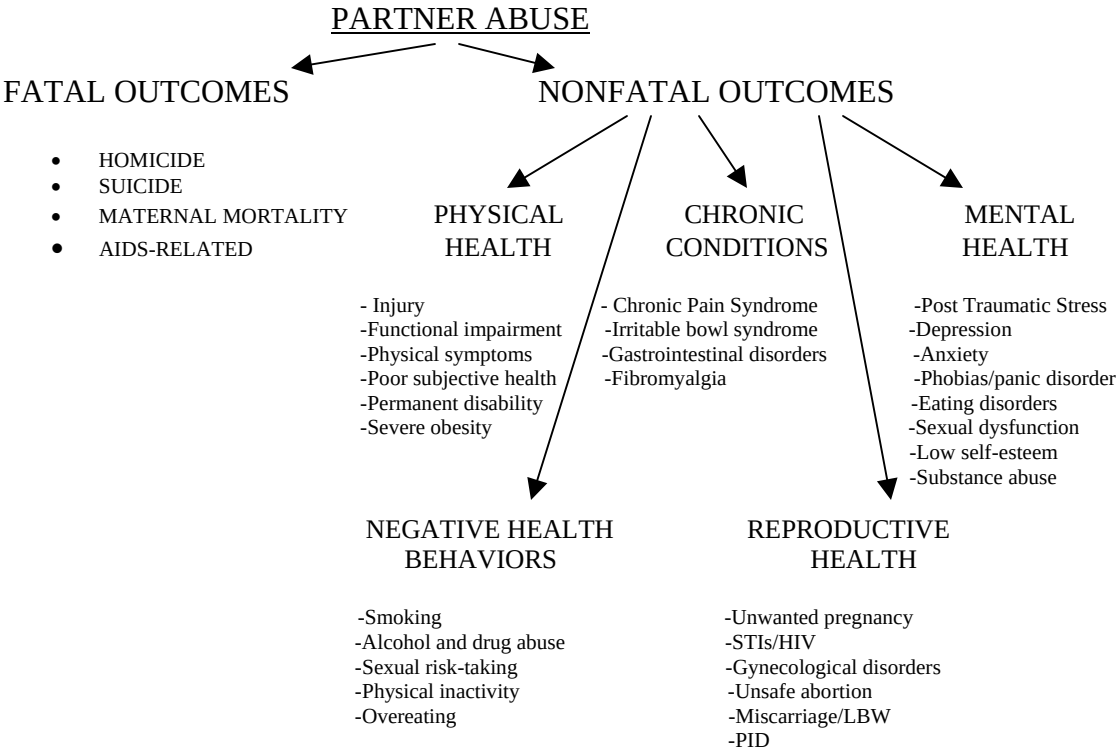
Abuse puts the pregnant woman and her fetus at increased risk for many physical and mental health problems. In addition to trauma, physical abuse during pregnancy increases the risk of sexually transmitted diseases, urinary tract infections, substance abuse and depression (15). Abuse during pregnancy is associated with low birth weight (LBW). Among middle class women, abuse during pregnancy has been found to be even more significantly related to LBW than among poor women, possible because so many other factors associated with poverty confound the association of abuse and LBW among poor women (16). It has been shown that the more women are abused, the more likely

they are to smoke and not gain weight during pregnancy, both factors for delivery of a LBW infant (17). If abuse contributes to increased smoking and poor nutrition, then attempting to change these behaviors will not be successful without addressing the abuse.

As previously discussed, some studies show the prevalence of abuse in pregnancy to be as high as 17-20% (11,12,18), and multiple studies have found self-reported abuse between 4 and 8% (16,19,20,21). This suggests a risk to the fetus and mother as great as or greater than some other conditions of pregnancy that are routinely screened for at every prenatal visit, such as pre-eclampsia, gestational diabetes, and pre-term labor.

Intimate partner violence has been associated with reproductive health risks, chronic ailments, psychological consequences, injury and death. Figure 1 describes many of the consequences related to violence against women. Besides the physical trauma that can result from a beating, the women can have severe mental health problems that lead to depression and negative health behaviors such as substance abuse and poor nutrition. This in turn can lead to chronic medical problems for the woman and significant detrimental effects on her fetus.

Figure 1: Consequences related to violence against women



(From Heise, Ellsberg, and Gottemoeller 1999)

Intimate Partner Homicide

In 1995, in the United States, there were 2125 women killed by an intimate partner, according to the FBI's Uniform Crime Reports Supplementary Homicide Reports (22). Among females, one third of homicides are intimate partner homicides (IPH): 50% by legal spouses, 33% by boyfriends or girlfriends. Among male homicide victims, 5% are killed by an intimate partner (23). In Oregon about 18 IPV homicides occur each year. In a recent survey in Oregon, 25% of intimate partner physical assault victims were knocked unconscious, 20% sustained black eyes or busted lips, 11% had bones broken or joints dislocated, and 6% suffered lacerations or knife wounds (24).

Costs of IPV

In March of 2003, the Centers for Disease Control and Prevention published a report stating that the costs of IPV exceeded $5.8 billion (25). This estimate is based on the cost of direct medical care and mental health services, as well as lost productivity from paid work and lifetime earnings lost by victims of intimate partner violence. This did not include the costs of dealing with the criminal justice system, women's shelters, mental health costs for treating the children who witness the violence against their mothers, nor the cost of delivering low birth weight (LBW) or premature infants. Studies show that many children who observe their mothers being abused have problems in school, both with academics and discipline, and have trouble making friends. They have a greater absenteeism and act out by doing such things as nail biting and pulling their hair, or they may complain of headaches and stomach aches (3).

Cost estimates help to demonstrate the importance of the problem to society, and to help shape the attitudes of the people who develop public policy and allocate funds for social and health services and research. These costs were determined by taking data on non-fatal IPV resulting in health care use from the National Violence Against Women Survey (NVAWS), which estimates 5.3 million IPV victimizations among US women 18 and older. The estimated two million injuries, 550,000 requiring medical attention, represent eight million days of paid work lost, which equals 32 full-time jobs, and 5.6 million days of household productivity lost. These were then matched with the Medical Expenditure Panel Survey (MEPS) done by the Agency for Healthcare Research and Quality, and the Medicare 5% Sample Beneficiary Standard Analytic Files (25). They

arrived at a mean medical care cost per incident of IPV physical assault of $548. The mean medical care cost per incident of IPV among victims who receive treatment is $2,665.00. Based on these numbers, we can estimate that in Oregon, the state could have saved between $437,852 and $2,129,335 if IPV in pregnancy during 2001 could have been prevented.

Factors Previously Associated With IPVP

Previous research has revealed associations between IPVP and young age, nonwhite race, less education, and low income (11,26,27,28,29). PRAMS data in other states also indicate that abuse *before* pregnancy is highly associated with abuse *during* pregnancy, but the prevalence drops during pregnancy (14). Substance use and abuse are associated with IPVP, including cigarette smoking and alcohol use (17). Being single, multiparous, on public assistance, with less education and with an unintended pregnancy have also been associated with IPVP (19,21,30,31,32). Late entry into prenatal care has also been demonstrated to be associated with IPVP (16,18).

OBJECTIVES

This study was undertaken to determine if there are factors that can be used to identify Oregon women who are being abused by their intimate partners during pregnancy. My goal was to develop a model, using data from the PRAMS surveillance system, that will identify women who are being victimized by their partners. During pregnancy, women are scheduled to be seen for prenatal care on a fairly regular schedule, and the opportunity is there to develop a trusting relationship with an obstetrical care provider. This would be the ideal situation for obtaining information regarding IPV and possibly intervening before the pattern becomes fixed, or for the health and safety of the woman and her fetus if the abuse is on going. This is clearly a very significant public health problem, as well as a serious health problem for the individual woman. Pregnancy may be the only time some women see a health care provider on a regular basis, as it is an expected and accepted behavior. Since IPV tends to decrease in pregnancy (14,33), it suggests that the abuser also considers pregnancy a special, and perhaps protected, time during the woman's life, and he may not be as likely to keep her isolated from the health care system during those few months. This affords a window of opportunity to help the woman (and if he is willing, her partner) to stop the violent behavior.

METHODS

Oregon PRAMS

The Oregon Pregnancy Risk Assessment Monitoring System (PRAMS) is an ongoing public health surveillance project of the Office of Family Health of the Oregon Department of Human Services. PRAMS uses a combination of mailed questionnaires and computer-assisted telephone interviews to obtain data from a stratified random sample of women who have recently given birth to a live infant. The women in the sample are selected using birth certificate data. Oregon PRAMS began in November of 1998. The data used in this study are from the third year of the survey. These are data on women who delivered a live infant in 2001. The questionnaire contains 84 questions relating to the woman's experiences, attitudes and practices before, during and immediately after pregnancy. After the surveys are completed, PRAMS data are linked to the Oregon Birth Registry to obtain corroborating information and additional demographic and health information on the baby.

Every month, a stratified random sample of 150-300 eligible new mothers was selected from birth certificates and mailed a survey questionnaire. The sample was stratified by race and ethnicity (non-Hispanic White, non-Hispanic African American, non-Hispanic Asian and Pacific Islander, non-Hispanic Native American and Alaska Native, and Hispanic), and the minority racial and ethnic groups were over-sampled to assure adequate sample size and distribution for analysis. If the women did not respond,

a second mailing went out three weeks later. Those still not responding to the second mailing were called by a telephone survey company who administered the questionnaire using a script modeled after the written version. The data were entered into a database at the Oregon Department of Human Services (DHS) where a research analyst, with consultation form the CDC, applied appropriate weights by race-ethnicity, nonresponse, and noncoverage to each respondent to account for the sampling design and to restore the proper population proportions to the data set. (See Appendix B for details.)

Data Collection and Population

For this third year of data, 2490 surveys were mailed out to Oregon women, and 1795 responded, for a response rate of 72.1%. The racial distribution is as follows: 2.0% are African-American, 1.6% are American Indian/Alaska Native, 5.0% are Asian/Pacific Islander, 17.5% are Hispanic, and 73.9% are White. Of these, only 1574, representing 33,098 women, are used in this study. Because of mandatory child abuse reporting laws, only women twenty and older were asked about intimate partner violence. In the population surveyed, 1548 women responded to the question about IPVP. Of the 1548 women who answered the IPVP question, 10.6% were non-Hispanic African American, 11.1% were non-Hispanic American Indian/Alaska Native, 17.7% were non-Hispanic Asian/Pacific Islander, 28.0% were Hispanic, and 32.6% were Non-Hispanic White. The high percentages in the minority groups are due to the over-sampling of these groups.

Thirty-six women responded positively to question number 42p: **"During your most recent pregnancy, did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any other way?"** (See Appendix A) Using the population

weights, these 36 women represent 2.45% of Oregon women, 20 years of age or older, who delivered a live baby during 2001.

Data Management

Data management and recoding were done on SAS System for Windows, version 8e. I obtained the de-identified data from DHS on a disk in the form of an SPSS file. This original data contained 417 variables. Approval was obtained from the Oregon Health and Science University Institutional Review Board, after which I chose 97 variables to study, based on background reading, that indicated some of these variables have been associated with IPVP in previous studies. I imported this data into SAS where I created some new variables that might be predictive of intimate partner violence in pregnancy (IPVP). These included variables corresponding to an increase in smoking or alcohol use between the first and second trimester, and the degree of difference in the ages of the woman and her partner.

I chose as my outcome variable intimate partner violence in pregnancy (IPVP) and used a coding for IPVP of **"1=yes"** and **"2=no"** for the crosstab procedures, and recoded the variable into IPVD to comply with the SUDAAN requirements that, for the outcome variable in logistic regression, **"1=yes"** and **"0=no"**. I collapsed years of education for the father into <12 or >=12, and created several variations on maternal age, including continuous from 20 to 49, dichotomous 20-29 and 30+, <34 & >=35, and a 5 category variable with ages 20-24, 25-29, 30-34, 35-39, and 40+. I re-categorized pregnancy intendedness from the PRAMS variable asking if the woman wanted to be pregnant "when she got pregnant, sooner than when she got pregnant, later than when she

got pregnant, or never," into two other variables. One variable combined **"**now**"**, **"**sooner**"** and **"**later**"** into **"wanted pregnancy"** and **"**never**"** into **"unwanted pregnancy."** The other variable combined **"**now**"** and **"**sooner**"** into **"intended pregnancy"** and **"**later**"** or **"**never**"** into **"unintended pregnancy."** I re-categorized weeks of pregnancy when prenatal care began into **"did or did not begin care in the first trimester."** I re-categorized **"**number of cigarettes smoked before pregnancy, in the first trimester, and in the second trimester**"** into **"increase in smoking in the first trimester"** and **"increase in smoking between the first and second trimesters,"** and I did the same with **"number of alcohol drinks from before pregnancy to the third trimester."**

Statistical Analysis

Cross-tabulation and logistic regression analysis were done using SAS-callable SUDAAN 8.02. SUDAAN is specifically designed for analysis of data from studies involving stratified designs and unequally weighted data. PRAMS data fall into this category, and SUDAAN software takes into account the weighted stratified sample design and is able to calculate correct variances, standard errors, and test statistics for complex data sets (34).

I selected 30 variables to evaluate for their association with IPVP. I used the crosstab procedures in SUDAAN to determine association of each with IPVP. I looked at cell sizes, weighted percents, and using the Cochran-Mantel-Hanzel Chi-squared test (CMH) with its associated p-value, I selected variables to study further. I selected variables with p-values smaller than .05 and variables that were of special interest to me

in view of their perceived association in previously published studies on IPVP. Crude odds ratios were obtained on several of the variables and those with significant crude OR, based on a 95% confidence interval, were selected for further analysis. (Table 1)

I elected not to include two of the most strongly associated variables in the multiple logistic regression model. Because they were so strongly correlated, they were probably acting as proxy variables for IPVP. Other investigators have also suggested this (14). I removed **"During the 12 months before your baby was born you and your husband or partner argued more than usual"** and **"During the 12 months before your baby was born you were involved in a physical fight."** I also did not use **"During the 12 months before you got pregnant, did your husband or partner push, hit, slap, kick choke or physically hurt you in any other way?"** These three variables are so strongly correlated that they overwhelm the model and although they cannot be ignored as important and significant for evaluating IPVP, they are too much like IPVP, and like each other, to be used as independent variables in a model trying to predict IPVP. Because of their strong association, however, I feel it is important to keep them in the surveillance tool used to evaluate the possibility of intimate partner violence in pregnancy.

I checked for independence among potential predictors using crosstabs to determine whether some variables should be removed from consideration due to high association (collinearity). I then subcategorized the variables into four areas of interest:

- Male partner characteristics (i.e., husband/partner said he did not want you to be pregnant, father's education < 12 years, husband/partner lost a

job in the last 12 months, you or your partner went to jail, and father's age)

- Pregnancy characteristics (i.e., pregnancy was unintended, prenatal care started after 1st trimester, and you had a previous pregnancy loss)
- Relationship characteristics (i.e., you were separated or divorced from your husband/partner in last 12 months, husband/partner did not want pregnancy, and someone close has problem with drinking or drugs)
- Maternal socio-economic status (SES) indicators and demographics (i.e., single, homeless, lots of bills you couldn't pay, someone close has a problem with drinking or drugs, and age)

The variable **"you or your partner went to jail"** may not really be a characteristic of the partner, but I chose to put it in the male partner's characteristics as a potential factor relating to him. The variable **"you or someone close to you has a problem with drinking or drugs"** again, may not relate to the woman herself, but fits best in the description of her socio-demographic status.

Using a backwards elimination stepwise process with multiple logistic regression, and using the OR with its 95% CI as my criteria for significance, I removed from the model the variable with the smallest OR and a confidence interval that contained the null. At each step I repeated the removal of the least significant variable and at the last step in each model, I kept the variables that remained significant. Using these variables that remained significantly associated with IPVP, I built a final model containing as the outcome variable IPVP (IPVD) and the dependent variables **"your husband/partner said he did not want you to be pregnant," "you had a previous pregnancy loss,"**

“someone close has a problem with drinking or drugs” and **“you had a lot of bills you couldn’t pay.”** In controlling for race/ethnicity, I chose *Asian/Pacific Islander* as the referent variable for race because, of the five races, this group had the lowest risk of IPVP. Race/ethnicity was not significant, nor was age, and they added nothing to the model so I removed them.

RESULTS

Variables Evaluated

Table 1 lists the number of overall PRAMS respondents and the subset of women that were used in our study, i.e., 1548 women who responded to the question about IPVP. The table includes the number responding to each factor that we were interested in evaluating, the weighted percentage of women in that category claiming to be battered, and the CMH Chi-square and p-values, as well as the crude odds ratios with the corresponding 95% confidence intervals for each of the factors when regressed against IPVP.

Table 1: Variables evaluated in the analysis of risk factors for intimate partner violence in pregnancy.

Characteristic	n-unweighted	Physically abused during pregnancy (weighted)	CMH Chi-square / p-value	Crude Odds Ratio (95% CI)
Overall PRAMS 2001 respondents	1795			
Overall PRAMS 2001 20+ years old	1574			
Number who responded to "During your most recent pregnancy, did your husband/partner push, hit slap, kick, choke. Or physically hurt you in any other way?"	1548	2.5%		
Maternal age: continuous 20-49	1548	2.5%		0.91 (0.83 – 1.01)
Maternal age:			4 / 0.0348	
20–24	507	4.03%		2.26 (0.49 – 10.38)
25-29	491	2.19%		1.20 (0.22 – 6.57)
30-34	367	1.82%		referent
35-39	154	0.10%		0.06 (0.01 - 0.49)
40+	29	0		0

Characteristic	n-unweighted	%-weighted	CMH chi-square / p-value	Crude OR (95% CI)
Maternal age			2.14 / 0.1441	2.52 (0.60 - 10.53 0)
20-29	998	3.20%		
30 +	550	2.30%		
Maternal age				
<=34	1365	2.77%		33.69 (5.39 – 210.57)
35+	183	8.00%		referent
Paternal age			1.68 / 0.4312	
<25	411	4.11%		2.05 (0.60 – 6.95)
25-34	796	2.05%		referent
35+	341	1.46%		0.71 (0.12 – 4.19)
Age difference (dad-mom)				0.97 (0.83 – 1.14)
Absolute age difference				1.00 (0.85 – 1.17)
Q42g You and your husband or partner argued more than usual.			12.11 / 0.0005	
yes	336	11.60%		272.22 (95.66 - 780.31)
no	1188	0.05%		referent
Q42i You had a lot of bills you couldn't pay.			8.90 / 0 .0029	
yes	490	7.00%		13.56 (3.34 - 63.26)
no	1031	0.50%		referent
Q42j You were involved in a physical fight.			8.51 / 0.0036	
yes	71	38.17%		81.78 (21.46 - 311.62)
no	1452	0.75%		referrent
Q42l Someone very close to you had a problem with drinking or drugs.			2.28 / 0.1311	
yes	204	12.11%		15.10 (4.49 - 50.80)
no	1321	0.90%		referent
You were homeless.			1.64 / 0.2010	
yes	75	10.45%		5.26 (1.23 - 22.46)
no	1450	2.17%		referent

Characteristic	n-unweighted	% weighted	CMH chi-square/p-value	Crude OR (95% CI)
Q42e Your husband or partner lost a job.			4.44 / 0.0352	
yes	253	8.69%		6.38 (2.17 - 21.49)
no	1267	1.38%		referent
Woman had a previous pregnancy loss.			4.87 / 0.0298	
yes	428	5.75%		5.25 (1.64 - 16.75)
no	1120	1.15%		referent
Q42b You got separated or divorced from your husband or partner.			5.23 / 0.0224	
yes	191	11.37%		9.38 (2.94 - 29.93)
no	1337	1.35%		referent
Previous pregnancy was less than 13 months ago.			2.06 / 0.1516	
yes	16	51.50%		52.28 (8.45 - 323.42)
no	1532	1.99%		referent
Q42h Your husband or partner said he did not want you to be pregnant.			4.43 / 0.0354	
yes	170	10.52%		8.00 (2.51 - 25.50)
no	1348	1.45%		referent
Father education < 12 years.			3.02 / 0.0825	
yes	342	6.51%		4.31 (1.37 - 13.59)
no	1206	1.59%		referent
Prenatal care started in the first trimester.			4.15 / 0.0419	
yes	1300	2.66%		3.31 (1.08 - 10.15)
no	248	0.82%		referent
Q42c You moved to a new address.			5.65 / 0.0176	
yes	633	4.71%		5.54 (1.37 - 22.42)
no	898	0.88%		referent

Characteristic	n-unweighted	%-weighted	CMH Chi-square / p-value	OR (95% CI)
Q42c You or your husband/partner went to jail			3.81 / 0.053	
yes	73	23.53%		18.32 (2.17 - 21.49)
no	1447	1.65%		referent
Q6 Just before you got pregnant did you have health insurance?			6.33 / 0.0425	
yes	87	6.30%		0.87 (0.13 - 5.74)
no	479	5.51%		referent
Q7 Just before you got pregnant, did you have health insurance through the Oregon Health Plan?			1.06 / 0.3025	
yes	286	4.62%		2.25 (0.65 - 7.72)
no	1247	2.11%		referent
Mother education <12 years.			0.30 / 0.5809	
yes	364	3.44%		1.57 (0.39 - 6.29)
no	1184	2.22%		referent
Annual income			2.00 / 0.574	
< = $15,000	568	4.30%		2.48 (0.78 - 7.48)
$15,000 +	890	1.78%		referent
Q83 How many people does this income support?			5.42 / 0.0669	
< = 3	1176	2.80%		0.49 (0.11 - 2.25)
4-6	350	1.39%		referent
7 +	22	0		
Q70 Are any firearms now kept in or around your home?			0.0002 /0.9999	
yes	330	2.47%		0.99 (0.28 - 3.5)
no	1157	2.49%		referent
Q42f You lost your job even thought you wanted to go on working.			1.10 / 0.2943	
yes	212	1.55%		0.59 (0.22 - 1.57)
no	1307	2.61%		referent
Q42m Someone close to you died.			1.02 / 0.3115	
yes	268	4.42%		2.2 (0.64 - 7.57)
no	1256	2.06%		referent

Characteristic	n-unweighted	%-weighted	CMH chi-square/p-value	Crude OR (95% CI)
Q42a I needed to see a dentist for a problem.			1.69 / 0.1935	
yes	424	4.33%		2.36 (0.75 - 7.36)
no	1064	1.88%		referent
Mother's race/ethnicity as defined by CDC for PRAMS.			14.68 / 0.0056	1.59 (0.62 - 4.13)
African American	164	4.32%		6.39 (1.49 - 27.43)
Am. Ind./Alaska Native	172	4.75%		7.05 (1.70 - 29.28)
Asian/Pacific Islander	274	0.70%		referent
Hispanic	434	1.15%		1.65 (0.35 - 7.73)
White	504	2.57%		4.01 (0.94 - 17.10)
Increased smoking in the first trimester	1358	2.09%	0.89 / 0.3448	2.17 (0.60 – 7.83)
Increased smoking between first and second trimesters	1452	2.05%	1.54 / 0.2145	4.37 (1.06 – 18.04)
Drank alcohol during pregnancy			7.22 / 0.0073	
Yes	11	27.3%		16.33 (1.66 - 160.96)
No	1520	2.25%		referent
Increase in alcohol during pregnancy			1.15 / 0.2836	
Yes	616	2.41%		0.97 (0.31 – 3.03)
No	932	2.48%		referent
How did you feel about being pregnant?			6.29 / 0.0987	
wanted to be later	282	0.50%		0.08 (0.02 - 0.42)
wanted to be then	435	2.80%		0.49 (0.10 - 2.43)
never wanted to be	650	1.90%		0.33 (0.07 - 1.58)
wanted to be sooner	155	5.57%		referent
Did you intend to conceive when you did?			1.77 / 0.1833	
Yes	932	1.5%		referent
No	590	3.56%		2.42 (0.73 – 8.01)
You wanted this pregnancy			2.06 / 0.1510	
yes	1367	1.88%		referent
no	181	7.20%		4.06 (1.16 – 14.19)

Characteristic	n-unweighted	%-weighted	CMH chi-aquare/p-value	Crude OR (95% CI)
Q9 When you got pregnant with your new baby, were you and your husband or partner using any form of birth control?				
yes	341	1.88%		0.72 (0.17 - 3.11)
no	1200	2.59%		referent

Statewide the intimate partner abuse prevalence during pregnancy for 2001 was 2.5%. I built the following models using the categorical variables I had selected.

IPVP Association With Male Partner Characteristics

In the first model of factors relating to the male partner, four maintained their significance in the multivariate logistic regression model using a backward elimination stepwise process. (Table 2) The significance of each factor, based on the odds ratio, is reduced by one-third to two-thirds in the multiple regression model, compared to the bivariate model. The confidence intervals are somewhat wide, and they come very close to including one, but, other than Father's Age, the variables remain significant. The wide 95%CI may be related to small numbers.

Table 2: Category model 1-A: Intimate partner violence in pregnancy: association with variables relating to male partner characteristics

Characteristic	n-unweighted	% weighted	Crude OR (95% CI)	MVM* A-1 OR (95% CI)	MVM** A-2 OR (95% CI)
Partner said he didn't want	170	10.5%	8.00 (2.51, 5.50)	4.68 (1.26, 17.43)	**4.63 (1.25, 17.17)**
Partner lost a job	253	8.7%	6.38 (2,17, 1.49)	4.42 (1.41, 13.90)	**4.53 (1.37, 14.98)**
You or partner went to jail.	73	23.5%	18.31 (2.17, 21.49)	5.90 (1.11, 24.14)	**5.29 (1.31, 21.31)**
Father's education <12 years	342	6.5%	4.31 (1.37, 13.59)	3.58 (1.23, 10.36)	**3.40 (1.02, 11.27)**
Father's age				1.10 (0.17, 7.36)	
<25	18	4.1%	2.90 (0.49, 17.00)		
25-34	13	2.1%	1.41 (0.24, 8.39)		
35+	5	1.5%	referent		

*MVM A-1 = multivariate model of all male partner variables
**MVM A-2 = multivariate model after dropping father's age

IPVP Association With Pregnancy Characteristics

In the model of factors related to the pregnancy itself, only previous pregnancy loss remained significant. (Table 3) Here the confidence interval is narrower than in the bivariate logistic regression and the OR remains high.

Table 3: Category Model 1-B: Intimate partner violence in pregnancy: association with variables relating to pregnancy

Characteristic	n-unweighted	% weighted	Crude OR (95% CI)	MVM* B-1 OR (95% CI)	MVM**B-2 OR (95% CI)
Pregnancy unintended	932	1.5%	2.42 (0.73, 8.01)	0.41 (0.13, 1.33)	
Prenatal care started after 1st Trimester	248	8.2%	5.54 (1.37, 2.42)	0.32 (.01, 1.02)	2.89 (0.92, 9.04)
Lost a previous pregnancy	428	5.8%	5.25 (1.64, 6.75)	4.20 (1.31, 3.49)	**5.12 (1.60, 6.34)**

*MVM B-1 = multivariate model with all the variables relating to pregnancy
**MVM B-2 = multivariate model without pregnancy unintended variable, leaving only one significant variable: "lost a previous pregnancy"

IPVP Association With the Couple's Relationship Characteristics

In the model evaluating factors in the relationship between the male partner and the woman, two variables remained significant in the backward elimination stepwise process, **"the partner said he did not want you to be pregnant"** and **"someone close has a problem with drinking and drugs"**. (Table 4) The confidence interval for the partner not wanting the pregnancy is wider than when regressed with the male factors, but the OR is stronger. The OR and 95% CI for the factor relating to drugs and alcohol is the strongest factor yet, with an OR of 11.59 and a 95% CI of 3.05 – 46.75.

Table 4: Category Model 1-C: Intimate partner violence in pregnancy: association with variables relating to the couple's relationship

Characteristic	n-unweighted	% weighted	Crude OR (95% CI)	MVM* C-1 OR (95% CI)	MVM** C-2 OR (95%CI)
Separated or divorced	191	11.4%	9.38 (2.94, 9.93)	2.82 (0.59, 3.51)	
Partner did not want you to be pregnant	170	10.5%	8.00 (2.51, 15.50	3.50 (0.90, 3.59)	**5.39 (1.35, 21.62)**
Someone close has problem with drugs or alcohol	204	12.1%	15.10 (4.49, 0.80)	9.42 (1.85, 8.10)	**11.95 (3.05, 46.75)**

*MVM C-1= multivariate model with all the variable relating to couples relationship
**MVM C-2 = multivariate model without "separated or divorced"

IPVP Association With Maternal Socio-demographic Characteristics

The model including factors relating to maternal socio-demographics also had two significant variables in the final step (Table 5). These both have strong ORs, although both are approximately one-half of the crude OR and the confidence intervals are moderately wide.

Table 5: Category Model 1-D: Intimate partner violence in pregnancy: association with variables relating to maternal socio-demographic factors

Characteristic	n-unweighted	% weighted	Crude OR (95% CI)	MVM* D-1 OR (95% CI)	MVM** D-2 OR (95% CI)	MVM*** D-3 OR (95% CI)
Single mother	473	5.32%	3.69 (1.17, 11.67)	0.97 (0.22,4.30)		
Homeless	75	10.45%	5.26 (1.23, 22.46)	1.03 (0.12, 9.26)	1.02 (0.15, 6.87)	
Lots of bills	490	7%	13.55 (3.34, 63.26)	7.42 (1.51, 36.35)	7.38 1.42, 38.44)	**7.14 (1.59, 32.10)**
Someone close has problem with drugs or alcohol.	204	12.1%	15.10 (4.49, 50.80)	8.33 (2.36, 29.43)	8.26 (2.09, 32.69)	**8.41 (2.05, 34.49)**
Maternal age						
20-24	507	4.03%	2.26 (0.49, 10.38)	1.14 (0.24, 5.43)	1.13 (0.26, 4.96)	1.15 (0.26, 5.06)
25-29	491	2.19%	1.20 0.22, 6.57)	0.83 (0.16, 4.23)	0.83 (0.17, 4.07)	0.84 (0.16, 4.26)
30-34	367	1.82%	1	1	1	1
35-39	154	0.10%	0.06 (0.01, 0.49)	0.07 (0.01, 0.64)	0.07 (0.01, 0.63)	0.07 (0.01, 0.68)
40+	29	0	0	…	…	

*MVM D-1= multivariate model with all the variables relating to maternal socio-demographic factors
**MVM D-2 = multivariate model with "single mother" removed
***MVM d-3 = multivariate model with "homeless" removed , leaving only "lots of bills", & "someone close has problem with drinking and drugs" as significant variables

From these three models, I chose the seven variables that remained significant in each. (Table 6)

Table 6: Significant variables for use in final model building

Source Model	Characteristic	n-unweighted	%-weighted	Crude OR (95% CI)
1-A & 1-C	Partner did not want you pregnant	170	10.5%	8.00 (2.51, 25.50)
1-A	Father's education < 12 years	342	6.5%	4.31 (1.37, 13.59)
1-A	Partner lost a job	253	8.7%	6.38 (2.17, 21.49)
1-A	You or partner went to jail	73	23.5%	18.32 (5.13, 65.41)
1-B	Lost a previous pregnancy	426	5.8%	5.25 (1.64, 16.75)
1-C & 1-D	Close to someone with drug and alcohol problem	204	12.1%	15.10 (4.49, 50.80)
1-D	Lots of bills you couldn't pay	490	7.0%	13.55 (3.34, 63.26)

1-A Male partner factors, **1-B** pregnancy factors, **1-C** relationship factors, **1-D** maternal socio-demographic factors.

Risk Factors for IPVP

Taking these seven significant variables and entering all of them into a multiple logistic regression model, I ended up with four variables that maintained significance after the backward elimination stepwise procedure. The final four variables in my model are **"partner said he did not want you to be pregnant," "loss of a previous pregnancy," "someone close to you with a drinking or drug problem,"** and **"lots of bills you couldn't pay."**

(Table 7)

Table 7: Final Model: Intimate partner violence in pregnancy: associated variables

Characteristic	Model –1 OR(95%CI)	Model – 2 OR(95%CI)	Model – 3 OR(95%CI)	Final Model OR(95%CI)
Partner did not want you pregnant	3.94 (0.98, 15.80)	4.30 (1.09, 17.03)	4.52 (1.26, 16.23)	**4.88 (1.29, 18.38)**
Lost a previous pregnancy	4.58 (1, 20.87)	5.05 (1.25, 20.32)	5.33 (1.39, 20.51)	**4.88 (1.28, 18.38)**
Close to someone with drug/alcohol problem	5.18 (1.18, 22.82)	6.08 (1.62, 22.85)	6.95 (1.98, 24.49)	**7.86 (2.23, 27.75)**
Lots of bills you couldn't pay	5.88 (1.43, 24.15)	5.58 (1.31, 23.82)	7.05 (1.67, 29.81)	**7.87 (1.84, 33.65)**
Father's education <12 years	2.42 (0.67, 8.81)	2.70 (0.64, 11.32)		
Partner lost a job	2.45 (0.53, 11.32)	2.80 (0.70, 11.22)	2.39 (0.63, 9.04)	
You or partner went to jail	2.00 (0.25, 16.05)			

Probablilities of IPVP

Using the model**:** logit (IPVP) =-6.9 + 1.58 X1 + 2.06 X2 + 2.06 X3 + 1.58 X4

Where X1= Your husband/partner said he did not want you to be pregnant

X2 = You had a lot of bills you couldn't pay

X3 = Someone close to you had a problem with drinking or drugs and

X4 = You've lost a previous pregnancy

with various combinations of positive responses to different factors, probabilities of IPVP can be seen estimated.. The Xs will be ones or twos, depending on whether the woman answers "yes" or "no" to the particular question, and solving for the logit will give one the estimated probability of battering in this particular woman.

Table 8: Probability of IPVP with different positive responses to four variables in the final model.

	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7	Pattern 8	Pattern 9
Husband/partner did not want you to be pregnant	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	No	**Yes**
Lots of bills you couldn't pay	No	**Yes**	No	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**
Someone very close with drinking or drug problem	No	No	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**
You've lost a previous pregnancy	**Yes**	No	No	No	**Yes**	**Yes**	No	**Yes**	**Yes**
Estimated Probability of IPVP	0.02	0.04	0.04	0.06	0.16	0.16	0.23	0.23	0.59

IPV Before Versus During Pregnancy

As in many other studies, (14,16,17) the prevalence of IPV among PRAMS respondents, is lower during pregnancy than before pregnancy. In our data it dropped from 4.17% (weighted) prior to pregnancy to 2.45% (weighted) during pregnancy. Although the history of abuse prior to pregnancy is highly associated with abuse during pregnancy, OR 321 (95% CI 59.01, 1750.52), the data show that the physical abuse drops to 45.6% (unweighted) of the pre-pregnancy abuse level. Five women, 13.9% (unweighted) of this population of women, indicate the abuse started during pregnancy, although there was none before pregnancy. (Table 9)

Table 9: Frequency Table: Abuse before compared to abuse during pregnancy (Raw un-weighted data)

	IPV during pregnancy		
IPV prior to pregnancy	Yes	No	Total
Yes	31	37	68
No	**5**	1474	1479
Total	36	1511	1547

Prenatal Screening

According our PRAMS data for 2001, only 45.6% of the weighted sample recalled being asked about IPVP during the prenatal period. Of the women who admitted to physical abuse, 42.4% recalled being asked, compared to 45.7% of the women who denied physical abuse.

DISCUSSION

Variables in Final Model

Four variables remain strongly associated with intimate partner violence in pregnancy (IPVP) after controlling for many other factors in the model. These same factors have been found to be significant in other studies, especially in bivariate modeling (14,35). In my study, these four factors maintained their significance even in the multivariate model, and so are of particular interest:

1. Loss of a previous pregnancy
2. Someone close to you had a problem with drinking or drugs
3. You had a lot of bills you couldn't pay
4. Your husband/partner said he did not want you to be pregnant

Loss of Previous Pregnancy

Other studies have documented a significant increase in miscarriage among women abused during pregnancy (15,36,37), although some studies did not show a significant association between miscarriage and IPVP. (30) The 16 state PRAMS study by Saltzman (14) did not discuss previous pregnancy loss. In my study, 66% of the women who stated they were abused by their intimate partner during pregnancy gave a history of having lost a previous pregnancy. These data do not indicate how many previous pregnancies have been lost, or why, but in a medical provider's office, those questions are on the prenatal sheet and can be evaluated. History of previous pregnancy loss, especially in combination with other risk factors, should alert the obstetrical care provider to the possibility of abuse. PRAMS survey does not ask about previous low

birth weight (LBW) babies, but in the birth certificate data there is a question about the outcome of the most recent pregnancy. LBW has been associated with abuse in many previous studies, and the history of the birth of a previous LBW baby could also be considered as a possible indicator of abuse, since what causes a pregnancy loss in a more severe abuse situation, may cause a LBW baby as well, i.e., trauma to the uterus and placenta, sexually transmitted disease including HIV, depression, inadequate diet, smoking and drug use. (17,38) Although previous pregnancy loss was significantly associated with IPVP in our study, IPVP was not significantly associated with LBW outcome in these PRAMS data. (CMH chi-square 0.0009 p-value 0.9758)

Someone Close to You Had a Problem with Drinking and Drugs

The use of drugs and alcohol by someone close to the woman is not a surprising risk factor. Other studies have concluded that substance abuse is strongly associated with IPVP (14,16,17,19,20,30,39). Substance abuse is frequently a coping mechanism for stress and post-traumatic stress disorder (PTSD) and may be one explanation for the high association in many studies with IPVP (40). Whether the increased stress from the use of harmful substances leads to IPVP, or the abuse of harmful substances is a result of the stress of IPVP, is not determined by our data, but the association is significant. Stark and Flitcraft (41) found that 16 % of battered women were alcoholic and 74% of the women became alcoholics after the onset of IPV. They also found no more drug abuse in battered women before physical abuse began than in non-battered women, but found nine times greater than expected rates of drug abuse after the onset of battering. In traditional prenatal care programs as well, there have been studies that link violence and substance use, especially alcohol and illicit drugs (39,42).

In our study, the risk of IPVP with a history of **"someone close having a problem with drinking or drugs"** is almost 8 times as high when controlled for the other three factors in our model, compared to someone who does not have that history. This variable is particularly interesting because it does not ask *who* has a problem with drugs or alcohol, but merely asks if *anyone closely related* has a problem with drugs or alcohol. It could be the woman herself, her partner, or someone else very closely related that could be helping to increase the stress level in the home. This vagueness may elicit more honest responses than if she were asked if she herself had a problem, or if her husband/partner had a problem, since this may be interpreted as an accusation.

Alcohol use, which has been significantly associated with IPVP in other studies, (17,19,43) was not significant in our study. The variable **"in the twelve months before your baby was born, someone close to you had a problem with drinking and drugs,"** which asks about "drugs or alcohol" is independent of the variable **"During your most recent pregnancy, did you drink alcohol?"** which asks about the use of alcohol by the woman herself during the pregnancy (chi-square for independence 1.53 with a p-value of 0.4665). A problem with this variable in this data is the very small number in the IPVP cell, (i.e., only one woman who admitted to physical abuse admitted to drinking alcohol during the pregnancy). Whether this means that the woman is referring more to illicit drugs when she answers "yes" to the question about drugs and alcohol, or whether it means someone other than she is involved in drugs and alcohol cannot be determined from this data.

Lots of Bills You Couldn't Pay

Financial problems, (i.e., **"lots of bills you couldn't pay"**), remained significant throughout the analysis. Income was not significantly related to IPVP in our study, even with incomes as low as $15,000 per year. Martin, (27) also found an association with inability to pay bills. Inability to pay bills was consistently more significant than income. Several studies, including studies of both private and public clinic patients, have not found an association between income and IPVP either (20,21). This suggests that, independent of income, if you are having debt problems, this stress is more significant than the dollar amount of the income itself. Other studies have shown that being on Medicaid is associated with a greater risk of IPVP, (26,30) and the investigators have considered being on Medicaid a proxy for poverty. Our data do not show a significant association between the women on the Oregon Health Plan (Medicaid) and IPVP (OR 2.25; 95%CI 0.65, 7.72). Bachman (44) and Paulozzi (23) did find a higher risk of IPVP associated with poverty in their surveys. Women in our study who stated that they had a lot of bills they couldn't pay had a risk of IPVP about eight times as high as women without this financial problem, when controlled for the other three factors in the model.

Husband or Partner Did Not Want You To Be Pregnant

Those women who stated that their husband/partner did not want them to be pregnant had about a five times greater chance of being physically abused during pregnancy. An unplanned or unwanted pregnancy would certainly increase the stress level in a couple already having problems, and this might lead to violence by the male partner who may feel he has lost control. One PRAMS study did find that the prevalence

of abuse was greater when the male partner did not want the baby (12,45). In the study on stressful life events, Martin et al. (27) did not find a statistically significant association between the pregnancy not being wanted by the male partner and IPVP (chi-square p-value 0.08). In our study this is an interesting survey question, because the woman is asked if her husband/partner *said* he did not want her to be pregnant, so it is difficult to know the true feeling of the partner in regard to the pregnancy. One study describes the bewilderment of the women when they are asked about why they thought their partner beat them during pregnancy when, in most cases, the men had said they wanted the baby (43). Some women thought that the men were jealous of the unborn child. Others thought the men were angry about the pregnancy because they did not think it was their baby and were trying to cause a miscarriage by directing blows at her abdomen. A third group thought the man was angry because she could no longer cater to him like he was used to because of her pregnancy symptoms (36).

Proxy Variables

Very highly associated variables not used in the model are the variables relating to arguing more with her husband/partner (OR 272.22) and being involved in a physical fight (OR 81.78). In all the studies that looked at these factors, the risk ratios for IPVP are the largest observed. Because these two questions probably in part measure the same things as the intimate partner violence question, I considered them very significant but, in essence, proxies for IPVP. They are strongly correlated with each other (chi-square 17.97 with p-value <0.00001) and with IPVP (chi-square 12.11 with p-value 0.0005 for arguing more and chi-square 8.51 with p-value 0.0036 for physical fight). Both Martin

(27) in the PRAMS data from North Carolina and Saltzman (14) in the 16 state PRAMS data study found this very high correlation and agreed that we are essentially asking about abuse when we ask about the increased arguing and any physical fight. The other highly correlated variable is intimate partner violence before pregnancy (OR 321.39). But if you have established that she was being abused before pregnancy, then you have established that she needs counseling regarding all the ramifications of IPV and she needs to be linked to a support network and, therefore, there is no point in using it in a predictive model.

Estimated Probabilities of IPVP From the Model

The probability of abuse increases as the woman admits to more of the factors in this model, from 2.33% with two factors, to 59% when she admits to all four stress factors in the model. (See Table 8)

Variables Not In the Model

Mother's Age

Several factors that have been shown to be associated with IPVP in other studies were also evaluated and found not to be significant in our data. Younger pregnant women are more likely to have been abused than older pregnant women, and in almost every study which includes adolescent women, they are at the highest risk for intimate partner violence (12,14,17,23,26,40). In our data, age was not significantly related to IPVP. This may be because, first we did not ask women less than 20 years of age about IPVP, and second, there were only 36 women who admitted to IPVP and the ages ranged

from 20 to 49. I tried categorizing the ages in several ways, as can be seen from Table 1. There is definitely a higher prevalence in the women younger than 30, but this was not statistically significant in the multiple regression models. I tried looking at the age differences between the mother and her partner, both the directional difference (father's age minus mother's age), and the absolute difference, and again, no significant association (OR .97 and 1.0 respectively). Attempting to categorize the age ranges in the mother also did not yield any significant cut points, until one separates the groups at 35. But, only one woman over age 35 admitted to IPVP.

Race/Ethnicity

In my study, crude odds ratios for non-Hispanic African American women and non-Hispanic American Indian/ Alaska Native women indicated that they were significantly more likely to have been abused in pregnancy (see Table 1), but race/ethnicity did not remain in the model because it was not significant in multivariate analysis. Non-Hispanic Asian or Pacific Island women were less likely to be abused in pregnancy but the odds ratios were not significant. Other studies have found no racial/ethnic differences (12,32,36,46). In another study, McFarlane (18) found 19% prevalence of IPVP in African-American and white women, but a lower prevalence in Latina women (14%). This same study found that white women were the most severely abused. In some studies the differences disappear when income is controlled for (40,47).

Education

Low education of the mother has been shown to be significant in other studies of IPVP (14,30). In this study it was not significant. Education less than 12 years for the male partner had a CMH chi-square value of 4.43 with a p-value of 0.0825, and for the mother, chi-square 0.30 with p-value of 0.5809. Crude odds ratio for the male partner's education was 4.32 (95% CI 1.37, 13.59), showing a somewhat statistically significant association with IPVP, but this did not hold up in multiple logistic regression.

Presence of Guns

The presence of guns in the house, which has been predictive of intimate partner homicide is several studies, (23) and associated with higher levels of abuse (48), had no association with IPVP in these data (chi-square 0.0002 with p-value 0.9999). Levels of abuse were not evaluated in the PRAMS survey, and certainly victims of previous homicide were not surveyed.

Spacing of Pregnancies

Spacing of less than thirteen months between the termination of the previous pregnancy and the delivery of the most recent pregnancy has a high crude odds ratio (OR 52.28), but the cross tab shows some very small cells with only 3 women stating they were abused and had their babies less than 13 months apart. This was evaluated because some studies focusing on "rapid repeat pregnancies" have shown that victims of abuse tend to have a very short interval between pregnancies (12,32,49). Perhaps this is seen in situations where the women feel that pregnancy protects them from abuse, since some men will stop battering when the woman is pregnant.

Intendedness of Pregnancy

Whether or not the mother had intended to conceive the pregnancy has been shown in other studies to be associated with IPVP (14,31). In our data, maternal intendedness of pregnancy was not statistically significantly associated with IPVP (chi-square 1.77 with p-value 0.1833).

Rates of IPV Before and During Pregnancy

In looking at the rates of IPV before pregnancy compared to the rates during pregnancy in these same women, the decrease is about 50%. Something about pregnancy is protective for some women, whether it is that they are more careful, avoiding too much contact with their partner to prevent injury to their fetus, or whether something in the abuser is triggered to stop the abuse during the pregnancy, would be an interesting question to pursue. Perhaps the abuser recognizes that his genes are present, and somehow his paternal instincts are strong enough to protect the unborn child. Another possible explanation is that the women leave their abuser when they get pregnant. Interestingly, the father's race/ethnicity, which is significantly related to IPV *before* pregnancy (chi-square 18.98 with a p-value of 0.0098), is not significant when regressed against IPV *during* pregnancy (chi-square 9.32 with a p-value of .2314). This could be related to the sample size, or could be a real difference in association.

In this study five women who were not abused before pregnancy stated that they were abused during the pregnancy. Other studies have suggested this may be related to

jealousy or skepticism about paternity, but again, an interesting question to study further (36,43,50).

Limitations

There are several limitations in this study. Women younger than 20 years old were not asked about IPV, and multiple studies show that it is these women that suffer the most abuse, not only from their intimate partners, but from family as well (14,16,40). Because PRAMS surveys women after a live birth, the data exclude women whose pregnancies resulted in stillbirths or abortions. One can speculate that this would be a group at higher risk for IPVP. The questionnaire is mailed to the woman's home where she might be filling it out in the shadow of the fear of her abuser. This method of data collection is also a one-time encounter, which has been shown to be less successful at eliciting the true incidence of IPV (18) not only because of its one-time nature, but also because of the impersonal nature of filling out a questionnaire at home (36,46).

There is the possibility that the definitions of the exposures and outcome are vague, as is seen in the cross tab of physical fight and IPVP. (Table 10) Several women state that their husband or partner did **"push, hit, slap, kick, choke, or physically hurt her"** and yet state that they were not **"involved in a physical fight."** Perhaps if the woman did not hit back, she does not consider that she was in a physical fight.

Table 10: Crosstab between Q42j and Q42p

		Q42p: During your most recent pregnancy, did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any way?		
Q42j: You were involved in a physical fight.		yes	no	Total
yes		21	50	72
no		13	1439	1452
Total		34	1489	1523

Another limitation is the accuracy of recall, since the women are being asked to remember things that happened between 3 and 15 months ago. Women frequently are reluctant to tell the truth when being asked about sensitive and frequently embarrassing information that they would just as soon forget. Lastly, some women may be reluctant to reveal abuse to a state agency for fear of having their children removed or their partner sent to jail, or they may fear for their lives or the lives of their children. All of these limitations suggest that the numbers of women who admit to abuse in pregnancy is probably lower than the true number being abused.

Implications for Clinical Practice

Health Care Providers Don't Ask

This study's findings, based on the PRAMS data from Oregon, have important implications for health practitioners in this state. Why aren't all, or at least most, women who are victims of IPVP identified during pregnancy? In 2001 less than half the women

in prenatal care in Oregon remembered being asked about intimate partner physical violence. This held true even for those women who admit to having suffered physical abuse, so somehow the warning signs are not being picked up by health care providers, or are being ignored. Intake histories in prenatal charts of women in the Portland Metropolitan Area, ask about potential stressors and abuse, but there does not appear to be any protocol for further inquiry about abuse in subsequent prenatal visits. In view of the many studies previously discussed that show that women are more likely to admit abuse after they have been asked more than once and in person, we are underestimating the prevalence and missing many women who are in need of help by not asking more frequently during the pregnancy.

Women should be screened for IPVP at each prenatal visit, and there are validated brief clinical screens for IPV that have been used with some success in the prenatal setting (51). The highest prevalence was found in situations where a prenatal care nurse asked at each prenatal visit, using the Abuse Assessment Screen (a four-question screening tool that asks about violent tactics, further described in Appendix A), suggesting that as the patient develops trust in the health care providers, she is more likely to feel safe revealing the abuse (50). In a study commissioned by the American Medical Association, a survey of attitudes regarding IPV revealed that 85% of women believed that physicians should screen for IPV (52). In four different studies of survivors of abuse, 70-80% reported they would have liked to be asked in private about IPV by their health care provider (53,54,55,56). Studies in Sweden and Australia asking postpartum women how they felt about having been asked about IPV during pregnancy

had similar results, 80% in the Swedish study (57), and 98% in the Australian study (58) found it acceptable.

Lack of services

Another difficulty in dealing with this problem is the lack of available services for the women who are identified as being in an abusive relationship. It is hard to convince health care providers to identify women who are being abused when women's shelters are full, and frequently have rules that would prevent many of the women from seeking shelter in what is available. For example, Bradley-Angle House, one of the larger women's shelters in Portland, reported that between 7/1/2001 and 6/30/2002 they provided 562 women and children with emergency shelter and had to turn away 1628 women and 1270 children (59).

Potential Screening Tool

Based on my model, I propose a tool be designed to be placed in the chart of every prenatal patient in Oregon, with a list of "yes/no" questions, the first being **"Has your husband or partner pushed, hit, slapped, kicked, choked, or physically hurt you in any way?"** If the answer is "yes" then immediate discussion about making a plan for her safety and the safety of the fetus, whether it be referral to an agency or a person who can help her, or for counseling by someone in the office -- always with the primary purpose of keeping her and her fetus safe. If the answer is "no," then more attention to the following questions would be warranted:

1. Are you and your husband/partner arguing more than normal?
2. Have you been in a physical fight in the last six months?

3. Has your husband/partner said that he does not want you to be pregnant?
4. Does someone very close to you have a problem with drinking or drugs?
5. Are you having problems with bills you can't pay right now?
6. Have you lost a previous pregnancy?
7. Have you or your partner been in jail in the last two years?
8. Has your husband/partner lost a job in the last six months?

A "yes" answer to any of the above would alert the provider to continue to inquire about IPVP at each prenatal visit. If a woman answers "yes" to all four of the model questions (numbers 3, 4, 5, and 6 in the list above), then, based on the logistic regression analysis, she has close to a 60% probability of being battered during pregnancy. Ideally, all women should be asked at least every trimester, if not every visit, but, if a provider has a higher perception of risk, then perhaps more women will be identified earlier in the process.

If we had used this tool and were able to follow-up accurately on all the women surveyed in 2001, we would have identified 97% of the self-proclaimed abused women with the question about **"arguing more than usual,"** 70% of the women with the question about **"being in a physical fight,"** 86% of the women with the question about **"lots of bills you couldn't pay,"** 69 % of the women with the question about **"drinking and drugs,"** 66% of the women with the question about **"previous pregnancy loss,"** and 49% of the women with the question about whether their **"partner said he did not want her to be pregnant."** 56% of the women whose husband lost a job were abused, and 36% of the women who answered "yes" to the question about jail admitted to having been abused during pregnancy. Most likely, some of the women who answered "yes" to

the above questions, but denied IPVP might have also been identified as being abused if the prenatal care providers had pursued the question further and more often.

CONCLUSIONS AND FURTHER RESEARCH

This study strengthens the importance of screening all pregnant women for IPV. If the woman denies IPVP but does admit to financial problems relating to **"unable to pay bills,"** to her **"partner not wanting her to be pregnant,"** to **"previous pregnancy loss"** and to the **"problem with drinking or drugs in someone close to her,"** then every effort must be made to meet with the woman outside the presence of her partner at some point during each visit and ask again about IPVP. If the woman answers positively to the question about **"being in a physical fight"** or **"arguing more than usual,"** then she must be considered at higher risk for IPVP. In other words, these serve as "red flags" for further efforts to determine if the woman is being abused by her partner.

We should next attempt to validate the model using subsequent PRAMS data and if the model is validated, then the next logical next step would be to follow this data analysis study, with the long term goal of determining whether such a chart prompt would lead to identification of more abused women in Oregon earlier in the cycle of abuse. Intimate partner abuse, we must remember, can be fatal and can otherwise have a significant detrimental affect on the outcome of the pregnancy. It would be interesting to look at the 26 women who were eligible to be in the study, but did not answer question Q42p. How did they respond to the other questions in my proposed surveillance tool?

Although the CDC has not set a specific goal for IPVP reduction , their goal for IPV is to bring the rate down to less than 3.3/1000 people 12 and older by 2010 (22). In 2001 in Oregon our rate was 25/1000 during pregnancy, the "protected" period, for women 20 and older. We need to improve our screening for IPVP among women in prenatal care. This can be done, but will require more education and better training of

our obstetrical care providers to identify women who are being abused, and to document appropriately in the medical record when abuse is reported. We need better referral systems and more services for the women and children who are being abused directly and indirectly. We also need to start studying the problem from the perspective of the abuser and work on identifying underlying reasons for the abuse to look for solutions there. We need better surveillance and communication of the public health problem that IPVP entails, with an emphasis on early detection and primary prevention.

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APPENDIX A: QUESTIONS OF IPV

How a woman is asked about abuse determines to a large extent how she answers the question. (16) The PRAMS questionnaire asks four direct "yes/no" questions about abuse:

42n. During the *12 months before you got pregnant*, did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any other way?

42o. During the *12 months before you got pregnant*, did anyone else physically hurt you in any way?

42p. *During your most recent pregnancy*, did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any way?

42q. *During your most recent pregnancy*, did anyone else hurt you in any way?

These four questions are very similar to two of the five questions in the **Abuse Assessment Screen** tool, which has been studied extensively in research of partner abuse. (18):

1. Have you ever been emotionally or physically abused by your partner or someone important to you?…….yes no
2. **Within the last year, have you been hit slapped, kicked, or otherwise physically hurt by someone?……yes no**

   If YES, by whom (circle all that apply)

   Husband Ex-husband Boyfriend Stranger Other Multiple

   Total No. of times _____.

3. **Since you've been pregnant, have you been hit, slapped, kicked, or otherwise physically hurt by someone?……..…..yes no**

   If yes, by whom (circle all that apply)

   Husband Ex-husband Boyfriend Stranger Other Multiple

   Total NO. of times_____.

   (This question then included choosing of more descriptive severity of abuse.)

4. Within the last year, has anyone forced you to have sexual activities? yes no

   If YES, by whom (circle all that apply)

   Husband Ex-husband Boyfriend Stranger Other Multiple

   Total No. of times _____.

5. Are you afraid of your partner or anyone listed above?……..yes no

This tool has been validated against more extensive screening tools such as the Conflict Tactics Scale and Index of Spouse Abuse (18) and has the advantage of being short and therefore easy to use in the short pre-natal care visit setting. Like in the AAS, the PRAMS questions are short and straightforward, but are being asked only one time and not in person and possibly in the presence of the batterer. They are therefore more likely to lead to underreporting of the true prevalence of abuse.

APPENDIX B: DETAILED PRAMS METHODOLOGY

Overall PRAMS Methodology

One strength of the PRAMS surveillance system is the standardized data collection methodology. This standardized approach will allow for comparisons between Oregon and other states and for optimal use of the data for single-state or multistate analysis.

PRAMS combines two modes of data collection; a survey conducted by mailed questionnaire with multiple follow-up attempts, and by telephone. Here is the sequence of contacts for PRAMS surveillance:

1. **Preletter.** This letter introduces PRAMS to the mother and informs her that a questionnaire will soon arrive.
2. **Initial Mail Questionnaire Packet.** This packet is sent to all sampled mothers 3 to 7 days after the preletter. Its contents are described below.
3. **Tickler.** The tickler serves as a thank you and reminder note. It is sent 7 to 10 days after the initial mail packet.
4. **Second Mail Questionnaire Packet.** This packet is sent to all sampled mothers who have not yet responded 7 to 14 days after the tickler has been sent.
5. **Telephone Follow-up**. Telephone follow-up is initiated for all mail nonrespondents 7 to 14 days after mailing the last questionnaire.

The series of mailings commences two to four months after delivery. The questionnaire contains items asking about the early postpartum period; thus, the mailings are timed to ensure that all women will be able to respond for this period. The data

collection cycle from the mailing of the preletter to the close of telephone follow-up lasts approximately 60 days. Each month, a stratified sample is drawn from the current birth certificate file. For each of these monthly samples, or "batches", this sequence of contacts is attempted. To assist in tracking all aspects of data collection, a customized tracking system, PRAMTrac, was developed by the CDC and installed in each participating state. PRAMTrac is designed to assist with the scheduling of mailings and telephone calls, preparing letters, and tracking responses.

The mail packets contain several items. First is a multipurpose cover letter. This letter describes PRAMS and its purpose, explains how the mother was chosen and why, elicits the mother's cooperation, describes the procedures for filling out and returning the questionnaire, explains any incentive or reward, and provides a telephone number for additional information. This letter is modified slightly for the second and third mailings, primarily by adding and additional appeal for response. Second, the questionnaire booklet is included. The questionnaire booklet is 14 pages in length, has a colorful cover, and is slightly smaller than an 81/2" by 11" sheet of paper. It contains an extra page at the end for comments from the mother. A self-addressed return envelope with postage is provided for the easy return of the questionnaire. Third, a question and answer brochure is added to provide additional information about PRAMS. It contains answers to the most frequently asked questions about the survey. It can be an important tool to convince the mother to participate. Fourth, a 3-year calendar is provided to be used as a memory aid for answering the questions.

Telephone follow-up begins after the mailing of the last questionnaire. Calls to a particular number are staggered over different times of the day and different days of the week. The calling period for a batch runs 2 to 3 weeks. Up to 15 call attempts are made to a number in order to reach a mother. Often, telephone interviewers arrange call-back interviews to accommodate the mothers' schedule.

The PRAMS Questionnaire

Topics addressed in the PRAMS questionnaire include barriers to and content of prenatal care, obstetric history, maternal use of alcohol and cigarettes, physical abuse, contraception, economic status, maternal stress, and early infant development and health status. Some standard questions provide additional information on content of prenatal care, contraception, and physical abuse. Other questions address different topics, including social support and services, mental health, and injury prevention.

Because PRAMS employs a mixed-mode methodology, two types of questionnaires are available. The self-administered questionnaire is used with the mailing packets, and an interviewer-administered questionnaire is used with the telephone phase. The interviewer-administered questionnaire contains the same questions that are on the self-administered questionnaire; however, some questions have been formatted differently to facilitate the different mode of administration. The PRAMS questionnaire is available in English and in Spanish.

PRAMS Weighting Process

Oregon draws a stratified systematic sample of 150 to 300 new mothers every month from a frame of eligible birth certificates. In 2001, Oregon oversampled by mother's race or ethnicity, in the past Oregon oversampled low birth weight as well. Annual sample sizes range from 1000 to 3000, divided among three to six strata. Typically, the annual sample is large enough for estimating statewide risk factor proportions within 3.5% at 95% confidence. Estimated proportions within strata are slightly less precise (typically, they are estimated within 5% at 95% confidence).

Mothers' responses are linked to extracted birth certificate data items for analysis. Thus the PRAMS data set also contains a wealth of demographic and medical information collected through the state's vital records system. The availability of this information for all births is the basis for drawing stratified samples and ultimately, for generalizing results to the states entire population of births. Its availability for all sampled women, whether they responded or not, is key to deriving nonresponse weights.

For each respondent, the initial sampling weight is the reciprocal of the sampling fraction applied to the stratum. Sampling fractions in PRAMS range from 1 in 1 (for very low birth weight strata in small states) to about 1 in 211 (for normal birth weight, nonminority strata in populous states). Corresponding sampling weights, then, would range from 1 to 211.

Nonresponse adjustment factors attempt to compensate for the tendency of women having certain characteristics (such as being unmarried or of lower education) to respond at lower rates than women without those characteristics. Where multivariate analysis shows that these characteristics affect the propensity to respond in a particular

stratum the adjustment factor is the ration of the sample size in that category to the number of respondents in the category. If analysis shows that no characteristic distinguishes respondents from nonrespondents, the adjustment factor is the ratio of the sample size in that stratum to the number of respondents in the stratum. In the first case, each category so identified has an adjustment factor; in the second, there is a single factor for the whole stratum.

The rationale for applying nonresponse weights is the assumption that nonrespondents would have provided similar answers, on average, to respondents' answers for that stratum and adjustment category. So that cells with few respondents are not distorted by a few women's answers, small categories are collapsed until each cell contains at least 25 respondents. The magnitude of the adjustment for nonresponse depends on the response rate for a category. If 80% (or 4/5) of the women in a category respond, the nonresponse weight is 1.2 (or 5/4). Categories with lower response rates have higher nonresponse weights.

Frame omission studies are carried out to look for problems that occur during frame construction. The frame noncoverage weights are derived by comparing frame files for a year of births to the calendar year birth tape that states provided to CDC. Omitted records are usually due to late processing and are evenly scattered across the state, but sometimes they are clustered by particular hospitals or counties or even time of the year. The effect of noncoverage weights is to bring totals estimated from sample data in line with known totals from the birth tape. In mail/telephone surveillance, the magnitude of noncoverage is small (typically from 1% to 5%), so the adjustment factor for noncoverage is not much greater than 1.

Multiplying together the sampling, nonresponse, and noncoverage components of the weight yields the analysis weight. The weight can be interpreted as the number of women like herself in the population that each respondent represents.

Analyzing PRAMS data requires software that takes into account the complex sampling designs that states employ. Such software utilizes first order Taylor series approximations to calculate appropriate standard errors for the estimates it produces.

Reference: http://www.cdc.gov/reproductivehealth/methodology.htm