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PREGNANCY-ASSOCIATED ASSAULT HOSPITALIZATIONS SELECTED U.S. STATES, 1997:

Exploring the incidence and risk for hospitalized assaults against women during pregnancy

Research Report

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810 Seventh Street N.W.

Washington, DC 20531

John Ashcroft

Attorney General

Deborah J. Daniels

Assistant Attorney General

Sarah V. Hart

Director

National Institute of Justice

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PREGNANCY-ASSOCIATED ASSAULT HOSPITALIZATIONS SELECTED U.S. STATES, 1997:

Exploring the incidence and risk for hospitalized assault against women during pregnancy

Harold B. Weiss PhD, MPH

University Of Pittsburgh

In cooperation with Dr. Bruce Lawrence

and Dr. Ted Miller

Pacific Institute for Research & Evaluation

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Preface

Injuries are the leading cause of death and a major cause of morbidity in women of reproductive age. Injuries to pregnant women are of special concern as they increase the risk of fetal loss and pre-term labor. However, little population-based work has been conducted quantifying and describing the incidence of hospitalized assaults among pregnant women and research has not yet confirmed whether pregnant women are at increased or decreased risk for serious violence during pregnancy. The purpose of this research was to describe the incidence and patterns of assault-related hospitalized injury among pregnant women in a large multi-state hospital discharge dataset and to compare the rate of violence-related hospitalization to all women of reproductive age. Secondarily, this research will help promote the use of a standard and readily replicated technique to measure the burden of serious and severe non-fatal violence against pregnant women.

The report is available on NIJ's Web site (http://www.ojp.usdoj.gov/nij/????).

The author of the report, Harold B. Weiss was affiliated with the University of Pittsburgh at the time the report was written. Weiss (hw@injurycontrol.com) can be contacted regarding this research report at University of Pittsburgh, Department of Neurosurgery, 200 Lothrop St. Suite B400, Pittsburgh, PA 15213

This report was prepared for NIJ under contract number 1998-WT-VX-0016. A related article appears in the [intentionally left to be completed when NIJ proceedings comes out]

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Executive Summary

This is the first study to ascertain the prevalence and risk of pregnancy-associated hospitalized injury for assaults in a multi-state population. The study population comprised over one-half the US population in 1997. It described a significant increase in the rate ratio (the rate among pregnant women divided by the rate among all women of reproductive age) for pregnancy-associated assaults, but demonstrated that age and race-specific rate ratios (pregnant compared to all women of the same age) were greatly reduced once adjusted for severity. Overall, after age and severity adjustment, there was no significantly elevated rate ratio, but moderate increases remained among the youngest women (15-19 year olds) and for firearm-related assaults.

Pregnancy is associated with high rates of hospitalized assaults largely because assaults are highest among young women and because pregnancy lowers the hospital admission threshold for traumatic injuries, including assaults. Practitioners should think of pregnant women as a "sensitive" population, more than an "at-risk" population. They should be targeted for preventive efforts aimed at reducing the differential impact of assault by socio-economic status, age and race.

Most other studies of assault and pregnancy have focused on small clinic or urban populations, often over-represented by socially disadvantaged minorities. Because most severe injuries will be seen in a hospital, regardless of race, social and economic class, this multiple state study represents population-based comparisons across ages, races, ethnicity, urban status, socio-economic groups, and insurance coverage. Thus, a clearer picture emerges of who is likely to be a victim of serious assault.

The poor use of perpetrator codes seen in the hospital discharge data clouds the issue of separating intimate partner violence from stranger assaults, but it can also be seen as a challenge to improve inpatient screening, medical record documentation and proper coding. Overall, these findings can be applied to better prioritize and target effective injury prevention efforts aimed toward young women for the benefit of both the mother and fetus.

Background

Violence against women during pregnancy is an issue that stirs broad interest. It is disturbing to even imagine that violence intrudes upon this poignant period in a women's life. However, intimate partner violence, if it exists in a relationship prior to pregnancy, does not always stop because a woman becomes pregnant. Whether it is more likely to increase or decrease during pregnancy is the question at hand.

The issues surrounding violence and pregnancy have focused on four main areas. The most common has addressed issues related to fetal outcome. These studies have examined the impact of violence on fetal outcomes such as low birth weight, prematurity, or mortality.[1-9] Complementing these are studies that have explored the impact of violence on maternal health, looking at physical, reproductive and psychological parameters of health and disease.[10-14] The third area that has received attention are studies measuring violence as a contributor to maternal mortality.[15-19] These studies have shown that homicide is one of the leading causes of maternal deaths in the United States. All of these perspectives, fetal and maternal, benefit from a fourth view that seeks to understand whether becoming pregnant changes the risk or nature of violence against women.

Historically, pregnancy has been reported to lead to higher rates of domestic violence.[20-22] However, these findings began to be questioned when it was pointed out that both violence and pregnancy rates are high in younger women[23] and that previous studies failed to take this relationship into account. A relationship between high birth rates in some socioeconomic groups that are concomitantly at high risk of violence could also lead to spurious conclusions regarding the risk of pregnancy and violence.

Differential patterns of medical care and entry into the medical care system for pregnant versus non-pregnant women can also complicate the picture. Medical personnel have long been taught to regard the pregnant trauma patient as a special case[24;25] since medical emergencies posing threats to either the woman or the fetus may be difficult to recognize[26] The result has been that medical recommendations have often included calls for providing specialized care and 24 hours or more of

observation and monitoring, often even for minor injuries. [26-31] Thus, the likelihood for increased selective entry of pregnant trauma patients into the medical care system should be accounted for in study designs, though historically it usually has not.

One recent North Carolina interview study should be mentioned that looked at the prevalence of physical abuse (about a quarter of those abused reported receiving medical care for the injury) before, during and after pregnancy.[32] This study showed a prevalence of abuse of 6.9% before pregnancy, 6.1% during pregnancy, and 3.2% during a mean post partum time period of about three-and-a-half months. As in other studies, previous abuse was a strong predictor of subsequent abuse. A selection bias leading to low estimates due to low response rates among women most at risk of abuse (young, unmarried, black and low education) was not ruled out. Nevertheless, to-date, this study was one of the very few population-based studies to look at the issue of changes in abuse rates during pregnancy (the other population hospital-based study is discussed below).

Are pregnant women at higher risk of violence and serious injury? Most knowledgeable observers have concluded that study design weaknesses (small shelter or clinic-based populations lacking in representativeness), differences in definitions of violence (physical injury, sexual assault, threats, psychological), different periods of coverage (violence around the time of pregnancy versus violence during pregnancy), and a lack of severity adjustment and comparison populations, have left the question of increased risk for serious violence against pregnant women unanswered.[2;11;14;33;34]

Measuring overall risk is but a part of the picture, however. Several researchers have suggested that different patterns of risk may be at play with some women being at higher risk, some at lower risk, and others with a continuation of the patterns of abuse or non-abuse that were in play before the pregnancy.[35;36] Therefore, it is important to look for different risks in subgroups of the population.

The current study examines the issue among women hospitalized for their injury. While most cases of violence against women are not hospitalized, concentrating on hospitalized cases has several advantages:

- First, it focuses on serious injuries. These are important because of the severity of the injury to the individual, as an indicator of risk to the mother, the increased risk of injury and adverse birth outcomes to the fetus, and the cost to society. Because women abused during pregnancy are thought to experience more episodes of abuse and more severe abuse overall[36], these women represent a group with several substantial risk factors and therefore are of special concern.

- Second, the existence of large population-based hospital discharge data systems makes it possible to examine prevalence and make comparisons even though serious assaults to pregnant women make up a relatively small proportion of all hospitalized injuries against women of reproductive age.

- Third, hospital data are fairly comparable across states, thus making aggregation and comparison feasible on a large scale.

- Lastly, discharge data contain financial information useful for modeling cost estimates.

The first population-based study of hospitalized maternal injury was conducted by Greenblatt et al. (1997).[37] They looked at Maryland hospital discharge data for the period 1979-90. Among 80,311 injured women 15-45, 2.7% were reported to be pregnant. They reported that 10% of the injuries involving pregnant women were assault-related and that the rate ratio (comparing pregnant patients to all women) for assault-related hospitalization was 1.14 (not statistically significant). While this study brought fresh understandings and creative methodological approaches, it contained drawbacks including incomplete E-coding (used for classifying mechanism and intent in hospital records) in the data, use of screening codes that were not as refined as desired, and it was done before accreditation mandates for hospital identification of victims of abuse were common. Recognizing these issues, the authors recommended their analyses of pregnancy-associated injury hospitalizations be repeated.

This recommendation was taken up in a pilot study by the author of the current report, borrowing the Greenblatt methods, and applying them to Pennsylvania's 1995 hospital

discharge data.[38] This study, with more diagnosis fields to search, better E-coding and an improved search algorithm, found 761 (4.6%) of the injury discharges to women of reproductive age were associated with pregnancy. Rate ratios were significantly higher for assaults (rate ratio = 3.04, 95% CI = 2.45, 3.78), especially in young women. This pilot study recognized the challenge of differentiating how much of the observed increases were due to increased *injury rates* versus increased *hospitalization rates* because of evidence that the pregnant women, as a group were more likely than non-pregnant women to be hospitalized for minor conditions.[37;39] However, the small numbers of pregnancy-associated assaults (89) limited the utility of adjusting for this concern. In addition, there were no perpetrator codes in 1995 data from which one might distinguish intimate partner violence from other forms of violence.

The current study fills those gaps by focusing on assault-related hospitalizations from a large, population-based, multi-state hospital discharge database. The data collection year of 1997 was chosen because it was the first complete year that perpetrator-specific codes and improved ICD-9-CM E-coding guidelines for intent were used. It also followed by two years the adoption of Joint Commission on Accreditation of Healthcare Organizations (JCAHO) hospital screening regulations regarding screening for intimate partner violence.

Methods

Specific Aims

The study examined the specific hypothesis that "***the hospitalization rate for assault is higher among pregnant women than all women of reproductive age (ages 15-49), once controlled for age, race and severity.*** Secondary aims included quantifying the prevalence of hospitalized assaults in a large population-based sample of pregnant women and comparing and contrasting the patterns of assault injury mechanisms, severity, demographics and costs.

Data Sources

Data were solicited from states mandating cause (E-coding) for 2 years or more or with an E-code completeness rate of 90% or better. Three states with large populations and fairly good completeness (>60%) but not mandated E-coding were also included.

States were contacted and arrangements made to receive non-confidential versions of statewide discharge data. Data were received from 19 states (AZ, CA, FL, ME, MD, MA, MI, NE, NH, NJ, NY, PA, RI, SC, UT, VT, VA, WA, and WI, see Exhibit 1), whose total population made up 51.9% of US women ages 15-49. The 19 states represented the hospitalization experience of 36 million women who were residents of those states and 1.9 million births during the study year.[40] The combined dataset covered the complete inpatient population from about 2,000 hospitals and 13 million hospital discharges for women. Of these 176,267 were injuries to women 15-49.

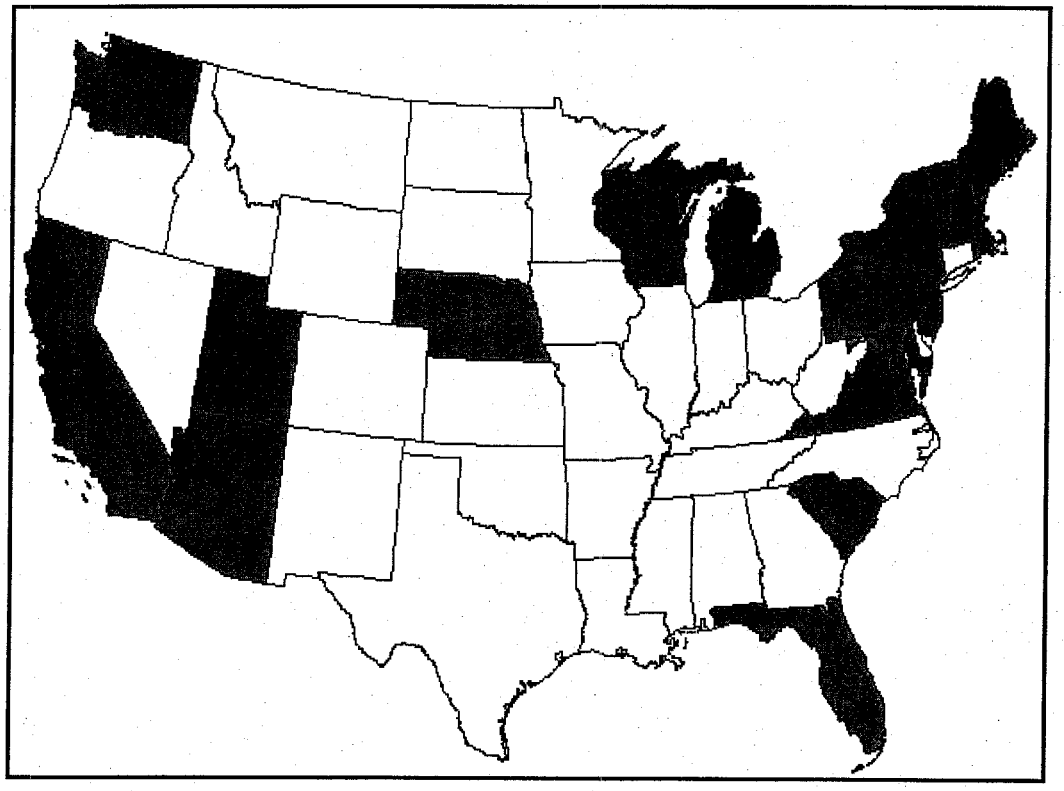

Exhibit 1. Sources of 19 State Hospital Discharge Data, 1997.

Database Preparation and Case Selection

The hospital data underwent extensive editing, filtering, grouping and development of derived variables to check for errors, enhance compatibility between state data, and to verify as much as possible the diagnosis coding validity. Detailed algorithms were applied to identify injuries based on both diagnosis codes (sometimes referred to as "N" codes) and E-codes and for the purposes of excluding cases of non-injury such as complications of surgical and medical care, injuries coded only by place of injury, adverse effects of therapeutic drugs, and late effects of injury.

Costs were imputed for each record using a complicated model derived from charges listed in the discharge and diagnosis codes. Inputs into the cost model included data from the National Medical Expenditure Survey (NNMES), the National Health Interview Survey (NHIS), Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) and from national and state hospital discharge systems. Monetary measures in this study included total hospital charges; lifetime medical costs; lifetime productivity loss; and lifetime monetized Quality-Adjusted Life Years (QALY). QALY's can be thought of as an adverse outcome measure that combines both the quantity and quality of life. The higher the QALY (expressed in dollars) the higher the negative impact on both surviving and thriving after an injury. Costs were not assigned to duplicated records, readmissions, or fatalities. Cost was estimated in 1996 dollars separately for medical and other direct costs, and quality of life loss.[41;42]

Injury severity was calculated using ICDMAP-90 (Tri-Analytics Inc. Bel Air, MD); a computerized injury coder that assigns injury severity scores (ISS) based on ICD-9-CM injury diagnoses. ISS is a widely used severity score based on an anatomically based threat-to-life scale that ranges from 1 (minor) to 75 (unsurvivable).[43] Drug and alcohol involvement was determined by searching for co-existing drug or alcohol-related diagnoses and E-codes.

Pregnancy association was defined by examining diagnosis fields for diagnostic codes including 630-669.9 (complications of pregnancy and childbirth) and 760-779.9 (certain conditions originating in perinatal period) and "V" codes including V22 (normal pregnancy), V23 (supervision of high risk pregnancy), V24.0 (postpartum

care immediately after delivery), V27 (outcome of delivery) and V28 (antenatal screening).

The above steps were applied to all age and gender injury discharges (n = 1,220,506) and the cases were progressively limited to females 15-49 years of age (n = 176,267), with acute care visit (n = 156,713), who had a valid injury E-code assigned (n = 144,260), who were residents of the state (n = 137,887), with an assault-related hospitalization (n = 7,402).

Analyses

Incidence rates were calculated per 100,000 person-years. For the pregnant population, denominators were derived from state-specific birth data and adjusted *downward* to account for the nine-month period of gestation and the assumption that the pregnancies would not be detectable in the hospital discharge data during the first two months of pregnancy. Note that adjusting denominators downward has the net effect of adjusting the estimated rates for pregnant women *upwards*.

Rate ratios were constructed between pregnant and all women for different comparison groups. Rate ratios were calculated by dividing the group-specific (age, race, mechanism, intent, etc...) rate for pregnancy-associated injury discharges by the group-specific injury rate. In accordance with previous methods,[37] consequences of multiple births and spontaneous and induced abortions in the person-year calculations were ignored (see page 31 for rationale). Point and 95% confidence interval estimates of the rate ratio, comparing the pregnant and all injured women 15-49, were computed as per standard methods.[44]

Two groups are reported in the executive summary and broader groups are included in the body of this report. First, all assaults to women of reproductive age were analyzed to present prevalence rates and rate ratios for specific sub-groups. Second, to adjust for the increased propensity of pregnant women to be hospitalized, assaults were re-analyzed; including the more serious injuries but excluding the least serious cases.

Findings

Assaults among Women 15-49

E-coding was 92% complete among women 15-49 with an injury-related diagnosis. Since E-coding was the only way to determine whether an injury was due to assault or not, non-E-coded cases were excluded. This left 137,887 resident women ages 15-49 discharged from non-rehabilitation hospitals with an acute injury diagnosis and a valid E-code for mechanism and intent.

Most hospitalized injuries to women of reproductive age were reported as unintentional (64.4%), followed by self-inflicted (28.0%), and assaults (5.4%). Among pregnancy-associated cases the distribution was unintentional (72.8%), assaults (13.6%) and self-inflicted (12.4%).

There were 7,402 assault-related discharges for a rate of 21/100,000 person-years. Pregnancy-associated cases made up 745 (10.0%) of all hospitalized assaults to women ages 15-49.

Among injured females with a pregnancy-associated diagnosis, 14% (745/5,498) were assault-related (adjusted rate = 65/100,000 person-years). For all injured women it was 5% (7,402/137,887, rate = 21/100,000 person-years). The rate ratio (pregnant versus all women), computed as described above, was 3.14 (95% CI = 2.04 to 3.39).

Among non-white injured females with a pregnancy-associated diagnosis, 21% (427/2,082) were assault-related, while for whites it was 9% (235/2,635). The rate of pregnancy-associated assaults was almost seven times higher in non-whites (178/100,000 person-years) than whites (26/100,000 person-years). However, the rate ratio was elevated similarly among both whites (2.65, 95% CI = 1.41, 3.03) and non-whites (3.34, 95% CI = 2.55, 3.69). Among non-whites 15-19, the rate of pregnancy-associated assaults per 100,000 person-years was 341 (rate ratio = 5.54 (95% CI = 4.32, 6.73).

Pregnancy-associated assault victims were younger compared to all women 15-49 (mean age = 24.2 versus 30.8 years). The proportion of pregnancy-associated assaults

within each age group climbed sharply after age 16, peaked at age 19, and declined thereafter (Exhibit 2, below).

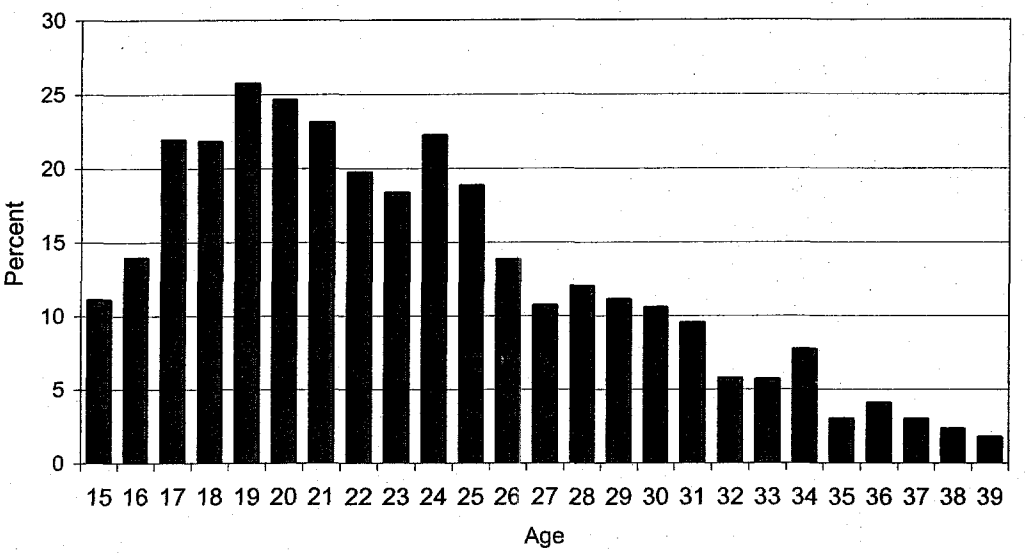

Exhibit 2. Pregnancy-associated hospitalized assaults as a proportion of all assaults by single year of age, ages 15-39, 19 States, 1997 (n=745 pregnancy-associated cases).

The pregnancy-associated rates and rate ratios were highest in the youngest age group, declining with age (see Exhibit 3, below). The leading mechanism of assaultive injury was "struck by or against" (46.7%, 348/746) with a rate ratio of 3.58 (95% CI = 3.20, 4.00). Pregnancy-associated assaults were more likely to be non-fatal (rate ratio 3.13, 95% CI = 2.93, 3.41) and of short length of stay (rate ratio for 1 day length of stay = 5.02, 95% CI = 4.50, 5.60). The average length of stay was shorter for the pregnancy-associated assaulted women, 2.6 days versus 4.0 for all women 15-49.

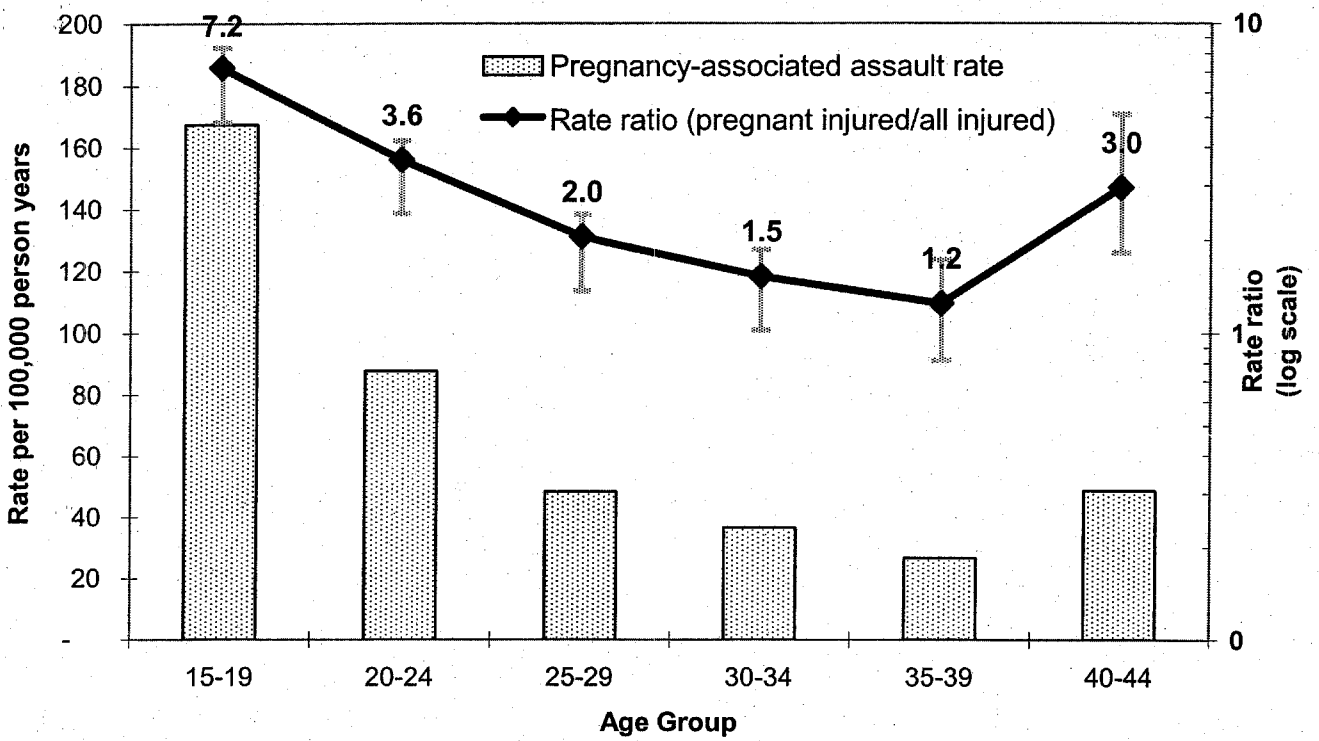

Exhibit 3. Rate of assault-related hospitalized pregnancy-associated injuries per 100,000 person-years and rate ratio (pregnant injured women/all injured women) for ages 15-44, 19 States, 1997 (n=745 pregnancy-associated cases, 95% confidence interval shown).

Pregnancy-associated cases were more likely to be paid for by Medicaid (rate ratio = 4.49, 95% CI = 4.06, 4.98). The median charge per visit was $3,351 for pregnancy-associated women and $6,775 for all injured women. Respective total costs for lifetime medical loss sum and lifetime monetized QALY (rounded) were $4,926,000, $6,296,162, and $71,620,000 for pregnancy-associated cases and $89,245,000, $111,545,000, and $1,689,194,000 for all assaults. Overall, pregnancy-associated cases represented 5% of the charge burden for hospitalized assaults among all women of reproductive age.

Unfortunately, perpetrator coding was incomplete for both pregnancy-associated and all assaults. Among pregnancy-associated assaults, 22.6% were accompanied by a perpetrator related E-code, for all assaulted women, 8.8%. Tables comparing the groups that had perpetrator codes versus those that did not are shown in Appendix F. page 89. Among the cases that were perpetrator coded, 88.0% and 83.7% were spouse or partner related among pregnancy-associated and all assaults, respectively.

The mean injury severity (ISS) among the pregnancy-associated assaulted women was 2.5, while the mean ISS among all women was 4.9. Exhibit 4, below, shows the rate ratio of assault-related hospital discharges by severity group. There was a significantly increased rate ratio for minor injuries (ISS < 4) but not for the moderate, serious and severe injuries. This finding was used as the basis for the severity adjustment, used below, which eliminated all assault–related cases with minor injuries from rate comparisons.

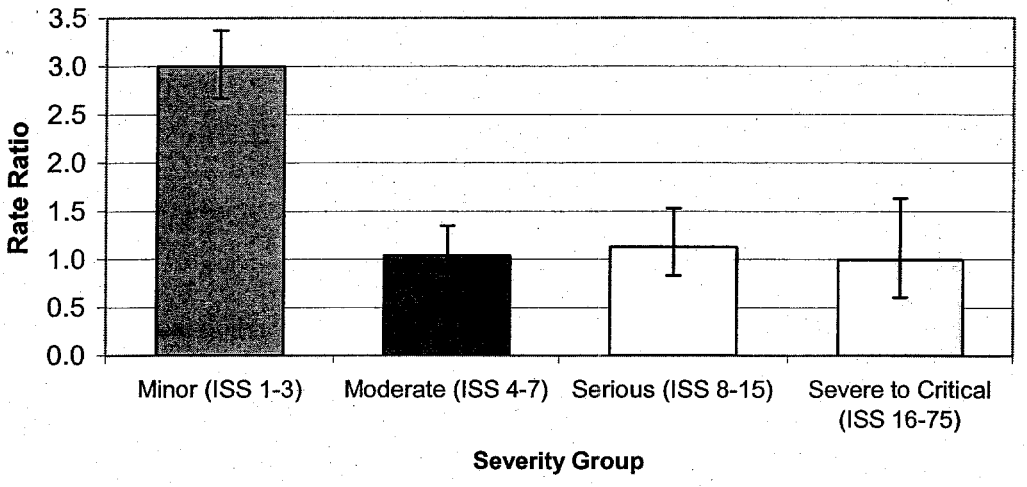

Exhibit 4. Rate ratio of assault-related hospitalized pregnancy-associated injuries per 100,000 person-years (pregnant injured women/all injured women) by severity group for ages 15-49, 19 States, 1997 (n=422, with 95% confidence interval shown).

Serious Assaults, Women 15-49

There were 3,457 assaults with an ISS ≥4. Among these, 118 (3.4%) were pregnancy-associated. Exhibit 5 (below) details the frequency, rates and rate ratios of selected characteristics for hospitalized assaults in the sub-group of seriously injured cases. Proportionally eliminating the less severe pregnancy-associated cases reduced most of the rate ratios to values not significantly different from one (Exhibit 5, below). The overall rate ratio fell to a non-significant 1.07 (95% CI = 0.57, 1.28). However, rate ratios were significantly elevated for a few sub-groups including the youngest (rate

ratio = 2.49, 95% CI = 1.31, 3.63) and for firearm-related assaults (rate ratio = 1.55, 95% CI = 1.07, 2.23).

Among the top four (by frequency) body part groupings, pregnancy-associated rates per 100,000 person-years and rate ratios were as follows: abdomen and pelvic organs 2.1 (rate ratio 1.6, 95% CI = 1.1, 2.4) skull and brain 2.0 (rate ratio 1.0, 95% CI = 0.7, 1.5), face 1.4 (rate ratio 0.9, 95% CI = 0.5, 1.5), and upper extremity 1.4 (rate ratio 1.1, 95% CI = 0.7, 1.9).

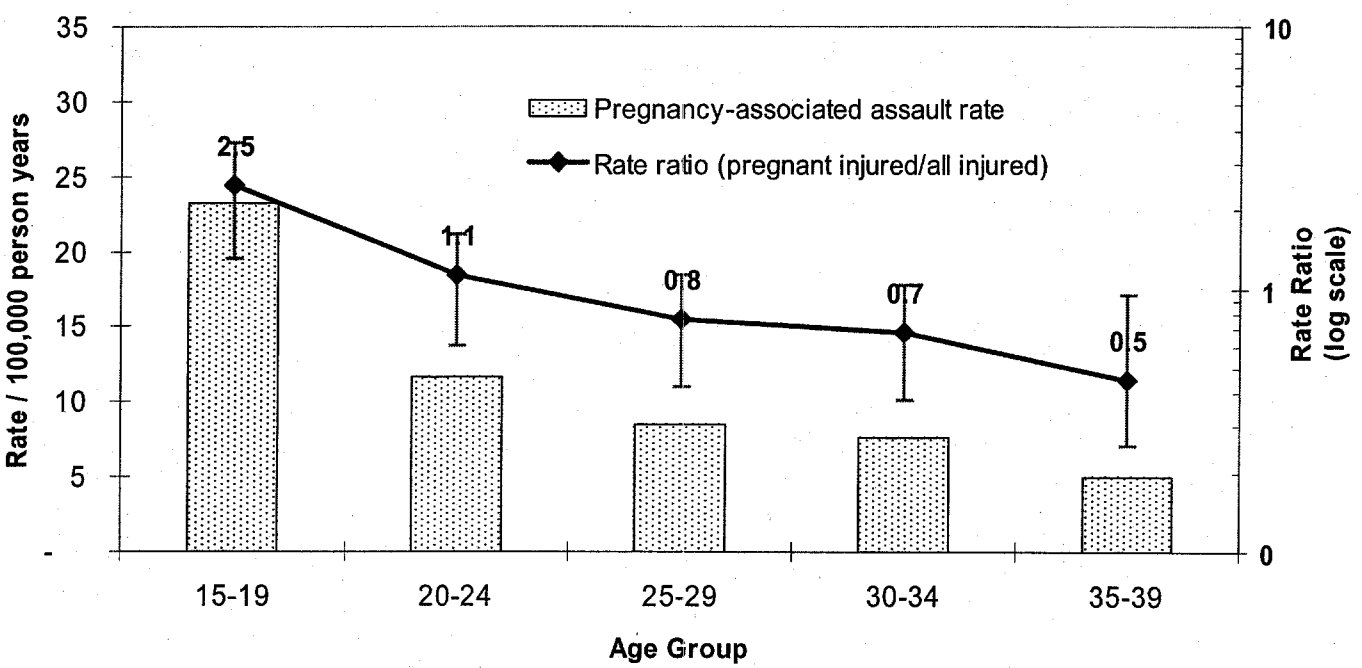

Exhibit 5. Rate of serious assault-related hospitalized pregnancy-associated injuries per 100,000 person-years and rate ratio (pregnant injured women/all injured women) for ages 15-39, 19 States, 1997 (n=118 pregnancy-associated cases, 95% confidence interval shown).

Limitations

Hospital discharge data have some disadvantages. Waller and colleagues have described these as they relate to violence against women.[45] They include concerns about quality and completeness of intent and perpetrator coding, difficulty detecting non injury-related conditions (stress, depression, and other diseases), and duplicate counts. While the data suggested that most hospitalized assaults were spouse or

partner related, the poor use of perpetrator coded cases dictates caution with this interpretation. Regarding duplicate counts, individuals would have needed multiple admissions with both a pregnancy and an assault code, rendering multiple admissions in our study population less likely.

Other limitations stem from the ecologic nature of the study design. Individual women were not followed-up, thus the study did not elucidate violence patterns before, during or after pregnancy. Neither did it describe the relationship of violence to pregnancy intendedness, sexual assault, gestational age, previous births, parity, prenatal care, pregnancy outcome, marital status or relationship of the fetus to the assailant.

Hospital discharge data are affected by the quality of coding among contributing hospitals.[46-48] For intentional injuries, methods for screening and documentation are not always specified and may vary. As long as these vagaries are consistently applied within and among hospitals, the results contrasting pregnant women may be more valid from a comparative standpoint, but less so from a vantage seeking accurate prevalence rates. Miscoding and undercounting will occur, but it is difficult to conjecture how systematic inclusions of pregnancy-associated codes among non-pregnant women, the type of error that could most affect the results, would happen.

Another limitation is that women in early pregnancy are not likely, or much less likely, than women in later pregnancy to have the pregnancy identified during a hospital stay. These cases will be misclassified into the non-pregnant group. Therefore, the diagnosis-based pregnancy definition used in the current study, is biased towards detection of later gestation pregnancies and does not measure early pregnancy risks. Future studies in this area would greatly benefit from routine pregnancy screening among young women and documentation of the results in the summary discharge record and data systems.

Conclusions & Implications

This is the first study to address the prevalence and risk of pregnancy-associated hospitalized assaults in a large multi-state population. It described a significant increase in the non-age and non-race stratified rate ratio for pregnancy-associated assaults but showed the importance of examining the issue of pregnancy risk by age, race and severity. Without taking these factors into account, it will almost always appear from studies in clinical settings where non-injury abuse events are frequently examined or injuries are not as serious, that pregnancy-associated cases are much more likely to be seen for assault-related conditions. However, this study demonstrated that both age and race-specific rate ratios were markedly reduced once they are adjusted for injury severity. Only moderate increases in the rate ratio remained among the 15-19 year-old age group (significant in non-whites, not significant for whites), for firearm related assaults and for abdomen and pelvic organ injuries.

These results update and refine the estimates of pregnancy-associated hospitalized assaults to women derived by Greenblatt et. al. in Maryland. In our larger study with better E-coding and a broader population base, assaults made up 5.4% of hospitalized injuries to all women of reproductive age (21/100,00 person years) and 13.6% among pregnancy-associated patients 65/100,00 person years). Once adjusted for age and severity, overall there was little difference in the risk of serious injury from assault during pregnancy, in accordance with the only other analogous population-based study that looked at changes in abuse risk during pregnancy. [32]

Most other studies of assault and pregnancy have focused on small clinics or urban populations, often over-represented by socially disadvantaged minorities. Because most serious injuries (except women who die before admission) will be seen in a hospital, regardless of race, social and economic class, the findings of this report represents demographic comparisons cutting across all ages, urban and rural areas, socio-economic groups, insurance coverage, races, and time. Thus, a clearer picture

emerges of the relative risks of serious assaults leading to serious injury to women in different population groups.

Another advantage of this population approach was the ability to track large numbers of women. The hospitalization experience of 36 million women of reproductive age was examined. Because of the increasingly small proportions of those women hospitalized for an injury, while pregnant, and among those, hospitalized for an assaultive injury and among those, hospitalized for a serious assaultive injury, it took a large population to examine the question with enough cases left over to look at risk within race and age groups. By doing so the project met its stated aims.

Because the study found widespread poor perpetrator E-coding, an implication of this research is the need to strengthen the completeness of perpetrator documentation and coding. This might be accomplished by more and better training of coders, changes to electronic systems to allow the better use of multiple E-codes and better documentation by clinicians in the ED and among inpatients of the perpetrators relationship to the patient. Perhaps the rate of perpetrator coding among hospitalized assaults by different institutions can be used as a widespread measure to monitor the outcomes of policies designed to improve the screening and surveillance of intimate partner violence.

Once the coding is improved, E-codes can more precisely be used to monitor the efficacy of community programs to prevent both pregnancy-associated and non-pregnancy associated assaults and intimate partner violence. The demonstration that pregnancy related assaults can be identified from hospital records also brings up the possibility of child welfare and enforcement agencies using such information for early interventions in situations where young children may be at high risk of subsequent abuse.

The five-fold disparity in the rates of serious hospitalized assaults of young non-white compared to white women, regardless of pregnancy status, means there needs to be more attention paid to the cultural and socio-economic implications of these findings. While domestic violence advocates have gone to great lengths to emphasize that

domestic violence can happen to anyone, this study, along with others[49;50] makes it clear that the risks of serious assaultive injury are not evenly divided between white and non-white, regardless of pregnancy status.

It may be helpful for practitioners to think of pregnant women as a "sensitive" population, more than an "at-risk" population. They are sensitive to assaults because they are young when assaults rates are high. They are sensitive because birth rates are higher in non-whites who are also at higher risk for assaults. They are sensitive to being hospitalized because the hospitalization threshold appears to be considerably lower for pregnant women for all types of trauma.

As a sensitive population, pregnant women are a special group worth addressing for both primary and secondary preventive efforts. Because women who are abused during pregnancy have been shown in other studies to be at higher risk for serious injury and continued abuse and because the child is at increased risk for abuse later in life, it is especially necessary that women be identified by screening for abuse at each prenatal visit. As a marker of potentially serious abuse, detection of abuse during pregnancy should initiate further follow-up such as post-partum home visits that include assessment for further family violence and referral if problems continue.

However, attention to pregnant women should probably take place in conjunction with broader efforts aimed at reducing the differential of the rate of assault by age, socio-economic status and race, regardless of current pregnancy status. This is because women drop in and out of the pregnancy-associated group over short periods of time (no more than nine-months, by definition) and it is difficult to predict which young women will be pregnant at the next encounter with the health or judicial system and which will not. Thus, most young women at high risk of assault should be seen as women who may become pregnant. Non-pregnant young women at high risk for intimate partner violence compared to those young women in a risky intimate relationship that become pregnant, probably have much more in common then they do differences. Thus, promoting effective screening for abuse of all young women in both obstetric and non-obstetric settings is appropriate.

Detailed Project Report

Background

Violence and Pregnancy

Violence against women during pregnancy is an issue that stirs broad interest. It is disturbing to even imagine that violence can intrude upon this poignant period in a women's life. But intimate partner violence, if it exists in a relationship prior to pregnancy, does not always stop because a woman becomes pregnant. The question whether it is more likely to increase or decrease during pregnancy period has heretofore not been resolved.

The issue of violence against pregnant women has focused on four main areas. The most common has addressed issues related to fetal outcome, examining the impact of violence on fetal outcomes such as low birth weight, prematurity, or mortality.[1-9;51;52] Based on recent reviews in this area, it is not yet clear whether violence during pregnancy is by itself a strong independent factor for adverse fetal outcomes, though for some women it appears to be part of a constellation of problems with adverse impacts on low birth weight in the mostly lower socioeconomic groups that have been studied.[14] Complementing these studies are those that explore the impact of violence on maternal health, looking at physical, reproductive and psychological parameters of health and disease.[10-14] The third area that has received attention are studies measuring violence as a contributor to maternal mortality.[15-19] These studies have shown that homicide is one of the leading causes of maternal deaths in the United States. All of the proceeding perspectives, fetal and maternal, benefit from a third view that seeks to understand whether becoming pregnant changes the risk or nature of violence against women. This later focus is addressed by this report.

Why might pregnant women be at increased risk for violence? Campbell et. al. explored this question in detail in a literature review and a series of interviews.[36] They described four major themes: a) Partner jealousy of the unborn child, b) Partner anger towards the child, c) Continuation by the partner of previous violence ("business as usual") and a variety of other reasons. Webster et. al. have suggested that pregnancy may result in the reinitiation or escalation of abusive partners or family. Emotions

based on jealousy, possessiveness and lack of self-worth have been suggested as possible motivators.[53] Changes in patterns of sexual relationships, sexual frustration, family stress and victim defenselessness and other relationship behaviors during this time may play a role.[54] Whatever the reasons, these are but possibilities for explaining an ill-defined risk.

Historically, pregnancy has been reported to lead to higher rates of domestic violence.[20-22] However, these findings began to be questioned when it was pointed out that both violence and pregnancy rates are high in younger women[23] and most previous studies failed to take this relationship into full account. A relationship between high birth rates in some socioeconomic groups that are concomitantly at high risk of violence could also lead to spurious conclusions regarding the risk of pregnancy and violence.

Differential patterns of medical care and entry into the medical care system for pregnant versus non-pregnant women can also complicate the epidemiologic picture. Medical personnel have long been taught to regard the pregnant trauma patient as a special case.[24;25] Surgical and other medical emergencies posing threats to either the woman or the fetus may be difficult to recognize[26] and it has been pointed out that that a clinically stable mother may be the result of physiologic compensation at the peril of the fetus.[31] The result has been that medical recommendations have often included calls for providing specialized care and 24 hours or more of observation and monitoring, often even for minor injuries.[26-31] Thus, the likelihood for increased selective entry of pregnant trauma patients into the medical care system should be accounted for in study designs, though it usually has not.

One recent study should be mentioned that used the North Carolina Pregnancy Risk Assessment Monitoring System (NC PRAMS) to look at the prevalence of physical abuse (not necessarily serious injury) before during and after pregnancy.[32] This study showed a prevalence of abuse of 6.9% before pregnancy, 6.1% during pregnancy, and 3.2% during a mean post partum time period of about three-and-a-half months. About a quarter reported receiving any medical care for the injury. As in other studies, previous abuse was a strong predictor of subsequent abuse. A selection bias leading to

low estimates due to low response rates among women most at risk of abuse (young, unmarried, black and low education) was not ruled out. Nevertheless to date, this study was one of the very few population-based studies to look at the issue of changes in abuse rates during pregnancy (the other population hospital-based injury study is discussed below).

Are pregnant women at higher risk of violence and serious injury? Most knowledgeable observers have concluded that study design weaknesses (small shelter or clinic-based populations lacking in representativeness), differences in definitions of violence (physical injury, sexual assault, threats, psychological), different periods of coverage (violence around the time of pregnancy versus violence during pregnancy), and a lack of severity adjustment and comparison populations, have left the question of increased risk for serious violence against pregnant women unanswered.[2;11;14;33;34]

Measuring overall risk is but a part of the picture, however. Several researchers have suggested that different patterns of risk may be at play with some women being at higher risk, some at lower risk, and others with a continuation of the patterns of abuse or non-abuse that were in play before the pregnancy.[35;36] Therefore, it is important to look for different risks in subgroups of the population.

Why Focus on Hospitalized Assaults?

The current study examines the issue among women hospitalized with their injury. While most cases of violence against women are not hospitalized and indeed may not even come to the attention of medical providers, focusing on hospitalized cases has several advantages:

- First, this group contains women who may have suffered serious injuries. Serious injuries from violence are an important component of the spectrum of violence against women for several reasons: a) because of the severity of the injury to the individual, b) as an indicator of continued risk to the mother, c) the increased risk of injury and adverse birth outcomes to the fetus, and d) the cost to individuals and society for more intensive treatment. Because women

abused during pregnancy are thought to experience more episodes of abuse and more severe abuse overall[36], these women represent a group with two substantial risk factors and therefore are of special concern.

- Second, the existence of large population-based hospital discharge data systems makes it possible to examine prevalence and make comparisons even though serious assaults to pregnant women make up a relatively small proportion of all hospitalized injuries against women of reproductive age.
- Third, hospital data are fairly comparable across states, thus making aggregation and comparison on a large scale feasible.
- Fourth, discharge data contain financial information that can be used to model average cost estimates.
- Finally, unlike clinic and emergency department settings where the encounter is brief, inpatients have more time to confide in and relate the abusive nature of the injuries to health care personnel. Theoretically, this might lead to improved detection and documentation of assault-related cases compared to out-patient settings.

Previous Research on Hospitalized Maternal Injury & Assaults

The first population-based study of hospitalized maternal injury (including assaults) was conducted by Greenblatt et al. (1997).[37] They looked at Maryland hospital discharge data for the 12-year period 1979-90. Among 80,311 injured women 15-45, 2.7% were reported to be pregnant. They reported that 10% of the injuries involving pregnant women were assault-related and that the rate ratio (comparing pregnant patients to all women 15-45) for assault-related hospitalization was 1.14 (not statistically significant). While this study brought fresh understandings and creative methodological approaches, it contained several drawbacks including incomplete E-coding (used for classifying mechanism and intent) in the data, use of screening codes that were not as refined as desired, and it was done before accreditation mandates for hospital identification of victims of abuse were common. Recognizing these issues, the

authors recommended their analyses of pregnancy-associated injury hospitalizations be repeated.

This recommendation was taken up in a pilot study by the author of the current report, borrowing the Greenblatt methods, and applying them to Pennsylvania's 1995 hospital discharge data.[38] This study, with more diagnosis fields to search, better E-coding and an improved search algorithm, found 761 (4.6%) of the discharges to injured women of reproductive age were associated with pregnancy. Rate ratios were significantly higher for assaults (rate ratio = 3.04, 95% CI = 2.45, 3.78) especially in young women. This pilot study recognized the challenge of differentiating how much of the observed increases were due to increased *injury rates* versus increased *hospitalization rates* because of evidence that pregnant women were more likely than non-pregnant women to be hospitalized for relatively minor conditions.[37;39] However, the small numbers of pregnancy-associated assaults in that study (n = 89) limited the utility of trying to adjust for this concern. In addition, there were no perpetrator codes in 1995 data from which one might distinguish intimate partner violence from other forms of violence.

The current study fills the gaps identified above by focusing on assault-related hospitalizations from a large, population-based, multi-state hospital discharge database from 1997. The data collection year of 1997 was chosen because it was the first complete year that perpetrator-specific codes and improved ICD-9-CM E-coding guidelines for intent were used. It also followed by two years the adoption of Joint Commission on Accreditation of Healthcare Organizations (JCAHO) hospital screening regulations for domestic violence.

Scope and Methodology

Specific Aims

The study examined the specific hypothesis that:

The hospitalization rate for assault is higher among pregnant women than all women of reproductive age, once controlled for age, race and severity.

There were also several secondary aims for this project. They included:

- Quantifying the incidence of assaults in a large population-based sample of hospitalized pregnant women and comparing and contrasting the patterns of assault injury mechanisms, severity, demographics and costs;
- Bringing to prominence the use of a standard and easily replicated technique to measure on a state-by-state basis the burden and trends of serious violence against pregnant women.
- Creating a large population-based sample of hospitalized assaults against women useful for other summary reports and researchers.

Data Sources and Collection

The initial goal of the project was to obtain hospital discharge data from nine states covering about 20 percent of the U.S. population for 1997. Although it took longer to collect the data then planned, successful partnering with other researchers and expanding the data collection scope led to gathering data from more than double the population of the original goal.

Data were solicited from all US states that mandated cause (E-coding) for 2 years or more or exhibited an E-code completeness rate of 90% or better and at least 5 diagnosis fields to search for pregnancy-associated codes. Three states with large populations and fairly good completeness (>60%) but not mandated E-coding were also included (this lowered the overall E-coding rate but enhanced case finding).

States were contacted and arrangements made to receive non-confidential versions of statewide hospital discharge data. Most states required submitting some form of detailed data request that was reviewed by each state for compliance with its data confidentiality and release policies.

Costs to obtain the data varied considerably from state to state, ranging from a high of $4,000 from one state to no charge for several states. This averaged out to about $800 per state or looking at it from a cost per case perspective, about 1 cent for each injury record that was received (all age and gender, before subsetting).

Exhibit 6. List of states from which data was collected and selected population characteristics.

State	Female Population 15-49	Live Births	Approximate Cost to Obtain Data
1. Arizona	1,133,425	75,764	$ Waived
2. California	8,346,538	525,242	$ Waived
3. Florida	3,472,001	192,598	$320
4. Maine	325,770	13,474	$ Waived
5. Maryland	1,382,898	65,990	$ Waived
6. Massachusetts	1,617,378	81,270	$2,000
7. Michigan	2,578,465	132,501	$ Waived
8. Nebraska	419,350	23,631	$1,315
9. New Hampshire	316,640	13,842	$350
10. New Jersey	2,070,010	110,443	$600
11. New York	4,723,298	258,538	$400
12. Pennsylvania	3,022,351	144,937	$4,000
13. Rhode Island	253,810	13,315	$100
14. South Carolina	1,012,650	50,030	$ Waived
15. Utah	547,231	43,870	$1,500
16. Vermont	157,450	6,332	$42
17. Virginia	1,838,271	89,668	$3,140
18. Washington	1,475,347	77,143	$700
19. Wisconsin	1,341,135	65,461	$1,000
TOTAL 19 States	**36,034,018**	**1,984,049**	**$15,467**
TOTAL US	**69,367,151**	**3,880,894**	**-**

Data used for this project were ultimately received from 19 states (AZ, CA, FL, ME, MD, MA, MI, NE, NH, NJ, NY, PA, RI, SC, UT, VT, VA, WA, and WI, see table above, also Map Exhibit 7, below), whose population made up 51.9% of US women ages 15-49 and 51.1% of all live births.

The 19 states in the study represented the hospitalization experience of 36 million women who were residents of those states, among whom there were 1.9 million resident births.[40] From those states, the dataset compiled was a census covering the entire (meaning it was not a sample) inpatient population from about 2,000 acute care hospitals and 13 million hospital discharges for women. Of these hospitalizations, 176,267 were injuries to women 15-49.

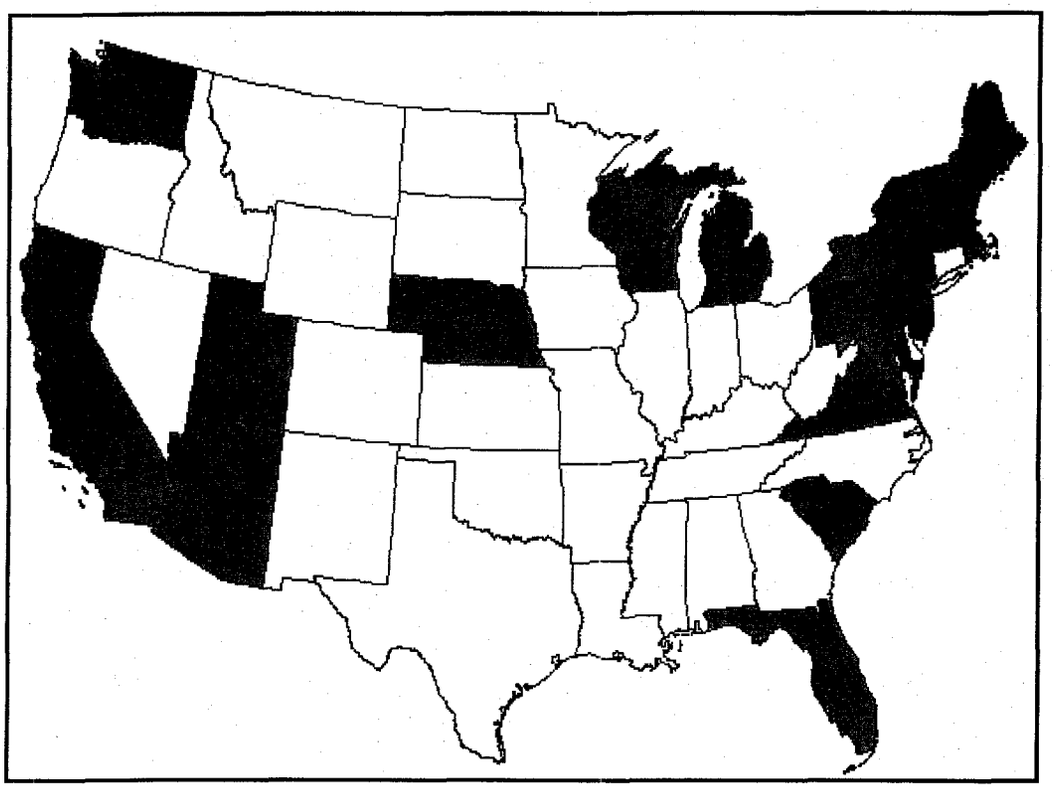

Exhibit 7. Sources of 19 State Hospital Discharge Data, 1997.

Comparisons Between States Selected and the US Population as Whole

Because the selected states were a large convenience population and not a random sample among the 50 states (plus the District of Columbia), some selected demographic and health indicator comparisons need to be made to understand if and how the selected states differed from the nation as a whole. Although such differences are not major, they exist. Various comparisons, shown in Exhibit 8 below, help point the direction and magnitude of demographic differences between the 19 state sample and the rest of the United States. For example, the 19 states had age/gender specific injury death rates and assault death rates by race and ethnicity that were slightly lower than the US as a whole. Birth and poverty rates, on the other hand, varied only slightly.

Exhibit 8. Selected comparisons between the 19 states from which data was collected and the US as a whole.

Comparison Demographic, Injury Type & Population	*19 State Rate*	*US Rate*	*Percent Difference*
All Injury Death Rate, Females 15-49, per 100,000	24.9	27.7	-10%
Homicide Rate, Females 15-49, per 100,000	4.0	4.4	-9%
Homicide Rate, Black Females 15-49, per 100,000	11.7	13.3	-12%
Homicide Rate, Hispanic Females 15-49, per 100,000	4.4	4.5	-2%
Birth Rate for Black Women (live births/age specific population per 1000)	60.9	62.2	-2%
Birth Rate (live births/age specific female population per 1000)	55.4	56.0	-1%
Proportion of Black Women age 15-49 Among All Women (per 1,000)	33.2	35.5	-6%
Percent Black (all age and sex)	11.8	12.6	-6%
Poverty Rate (Percent)	13.1	13.1	0

Database Preparation and Case Selection

The hospital discharge data underwent extensive editing, filtering, grouping and development of derived variables to check for errors, enhance compatibility between state data, and to verify as much as possible the diagnosis coding validity. Detailed algorithms were applied to identify injuries based on both diagnosis codes (sometimes referred to as "N" codes) and E-codes and for the purposes of excluding cases of non-injury such as complications of surgical and medical care, injuries coded only by place of injury, adverse effects of therapeutic drugs, and late effects of injury. Detail on the edits and inclusion criteria can be found in Appendix A. , on page 77.

Cost Model Imputations

Costs were imputed for each record using a sophisticated model derived from charges listed in the discharge record and diagnosis codes. Inputs into the cost model included data from the National Medical Expenditure Survey (NNMES), the National Health Interview Survey (NHIS), Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) and from national and state hospital discharge systems. Monetary measures in this study included total hospital charges; lifetime medical costs; lifetime productivity loss; and lifetime monetized Quality-Adjusted Life Years (QALY). QALY's can be thought of as an adverse outcome measure that combines both the quantity and quality of life. The higher the QALY (expressed in dollars) the higher the impact on both surviving and thriving after an injury. Costs were not assigned to duplicated records, readmissions, or fatalities. Cost was estimated in 1996 dollars separately for medical and other direct costs, and quality of life loss.[41] These methods are described in more detail in Appendix B. , page 83 and elsewhere.[42]

Computerized Severity Scoring

Injury severity was calculated using ICDMAP-90 (Tri-Analytics Inc. Bel Air, MD); a computerized injury coder that assigns injury severity scores (ISS) based on ICD-9-CM injury diagnoses. ISS is a widely used severity score based on an anatomically based threat-to-life scale that ranges from 1 (minor) to 75

(unsurvivable).[43] Drug and alcohol involvement was determined by searching for co-existing drug or alcohol-related diagnoses and E-codes.

Identifying Pregnancy-associated Injury Visits

Pregnancy association was defined by examining diagnosis fields for diagnostic codes including 630-669.9 (complications of pregnancy and childbirth) and 760-779.9 (certain conditions originating in perinatal period) and "V" codes including V22 (normal pregnancy), V23 (supervision of high risk pregnancy), V24.0 (postpartum care immediately after delivery), V27 (outcome of delivery) and V28 (antenatal screening).

Identifying perpetrator relationship among assaults

The data collection year of 1997 was chosen because it was the first complete year that perpetrator specific codes were added to the ICD-9-CM E-codes (see Exhibit 9, below). The proper use of these codes requires the use of *two* E-codes; one for the mechanism (stabbing, struck by, shot and so on) and one for the perpetrator relationship. More detail on how these codes are supposed to be assigned are provided in Appendix C. on page 85.

Exhibit 9. Perpetrator Specific E-codes Added to ICD-9 CM in 1997.

E-code	Description of perpetrator specific ICD-9-CM E-codes
E967.0	Battering or maltreatment by father or step-father
E967.2	Battering or maltreatment by mother or step-mother
E967.3	Battering or maltreatment by spouse or partner
E967.4	Battering or maltreatment by child
E967.5	Battering or maltreatment by sibling
E967.6	Battering or maltreatment by grandparent
E967.7	Battering or maltreatment by other relative
E967.8	Battering or maltreatment by non-related caregiver

Case Selection

The above methods were applied to all age and gender injury discharges from the 19 states (n = 1,220,506). The cases were progressively limited to females 15-49 years of age (n = 176,267), with an acute care visit (n = 156,713), who had a valid injury E-

code assigned (n = 144,260), who were residents of the state (n = 137,887), with an assault-related hospitalization (n = 7,402) (see Exhibit 10, below). Non-acute care visits were omitted to reduce the possibility of double counting events.

Exhibit 10. Case Selection Process, Step by Step Results.

Selection Criteria	Number	Pregnancy-associated
Original data (estimated)	13,000,000	-
Injury selection process	1,220,506	-
Age/gender filter (female, 15-49)	176,267	8,265
Acute care & rehabilitation hospital exclusion	156,713	6,274
Valid injury E-code	144,260	5,640
Resident of state	137,887	5,498 (4%)
Assaults	7,402	745 (10%)

Rate Calculations and Analyses

Incidence rates were calculated per 100,000 person-years. For the pregnant population, denominators were derived from state-specific birth data and adjusted *downward* to account for the nine-month period of gestation and the assumption that the pregnancies would not be detectable in the hospital discharge data during the first two months of pregnancy. For example, if there were one-hundred thousand live births per year, multiplying 100,000 by 7/12 represents the actual person-years of exposure, i.e., the person-years among which women could have had their pregnancies identified. Note that adjusting denominators downward has the net effect of adjusting the estimated rates for pregnant women *upwards*.

Rate ratios were constructed between pregnant and all women for different comparison groups. This comparison, rather than a pregnant versus "non-pregnant" group contrast, was done for several reasons. First, after subtracting known pregnant cases, the referent group still contains some pregnant women in the first two months of their pregnancy and other pregnant women not detected by the diagnosis algorithm. Thus, it would be a misnomer to label it a "non-pregnant" group. Secondly, since the

desire was to compare pregnant women to non-pregnant women, the comparison takes into account the five-month period of every pregnancy year in which pregnant women are not detectably pregnant. In other words, pregnant women contribute person-years to both groups since they are not pregnant over an entire year. In most instances, the issue of comparing the pregnancy-associated injuries to the entire group or the entire group minus the person-years of the pregnancy-associated injuries is academic. This is because the rates for all reproductive age women are similar to "non-pregnant" women of the same age, since for most comparisons 80-90% of women 15-49 are not pregnant at any given time.[55]

Rate ratios were calculated by dividing the group-specific (age, race, mechanism, intent, etc…) rate for pregnancy-associated injury discharges by the group-specific injury rate. In accordance with previous methods,[37] consequences of multiple births and spontaneous and induced abortions in the person-year calculations were ignored because of their small impact and the large difficulty of obtaining accurate enumerations of these conditions in the study population. Point and 95% confidence interval estimates of the rate ratio, comparing the pregnant and all injured women 15-49, were computed as per standard methods[44] by comparing the pregnant and non-pregnant injured women are computed as follows: If a_1 events are observed in t_1 person-years for the pregnant group and a_2 events are observed in t_2 person years for the non-pregnant group, a point estimate of the rate ratio (RR) is given by:

$$\widetilde{RR} = (a_1/t_1)(a_2/t_2)$$

A two-sided 100% x (1-α) Confidence Interval (CI) for *RR* is given by (c_1, c_2) where

$$c_1 = e^{d_1},\ c_2 = e^{d_2}$$

$$d_1 = \ln\left(\widetilde{RR}\right) - z_{1-\alpha/2}\sqrt{\frac{1}{a_1} + \frac{1}{a_2}} \qquad d_2 = \ln\left(\widetilde{RR}\right) - z_{1-\alpha/2}\sqrt{\frac{1}{a_1} + \frac{1}{a_2}}$$

Analysis was conducted on four different subsets in order to maximize the usefulness of the aggregate data for different audiences and purposes:

1. First, a summary of all injuries to women was prepared to help put injuries to women of reproductive age into the context of all injuries to females.

2. Second, injuries to the target population of women 15-49 were analyzed to help put assaults into the context of all serious injuries to women of reproductive age.

3. Third, assaults were analyzed separately to present prevalence rates and rate ratios for specific assault sub-groups.

4. Lastly, assaults were re-analyzed only for cases with an injury severity score of four or greater.

The size of each of these groups and their location in the report is shown in Exhibit 11.

Exhibit 11. Summary of Study Population in Each Analysis Group (acute care E-coded cases only).

Analysis Groups (page number where this section starts)	Pregnancy-associated (row %)	Not Pregnancy Associated	Total
All Injured Women, All Ages (page 33)	5,530 (1.2%)	467,763	473,310
Injured Resident Women Ages 15-49 (page 40)	5,498 (4.0%)	132,887	137,887
Assaults to Women Ages 15-49 (page 51)	745 (10.0%)	6,657	7,402
Serious Assaults to Women Ages 15-49 (page 61)	118 (3.4%)	3,339	3,457

Findings for All Injured Females

E-code Completeness

The overall rate of E-coding, necessary for assigning mechanism and intent, was very good. After filters were applied for age, gender, and acuity, 92% of the remaining cases had at least one injury E-code. The E-coding was a little more complete for the target of this report (women of reproductive age) than all persons (the latter which was 87% complete). The variation of the E-code rate by state is shown in Exhibit 12, below. Because of the focus on mechanism and intent of the injuries in this report, most of the results presented below focus only on the cases that received an E-code.

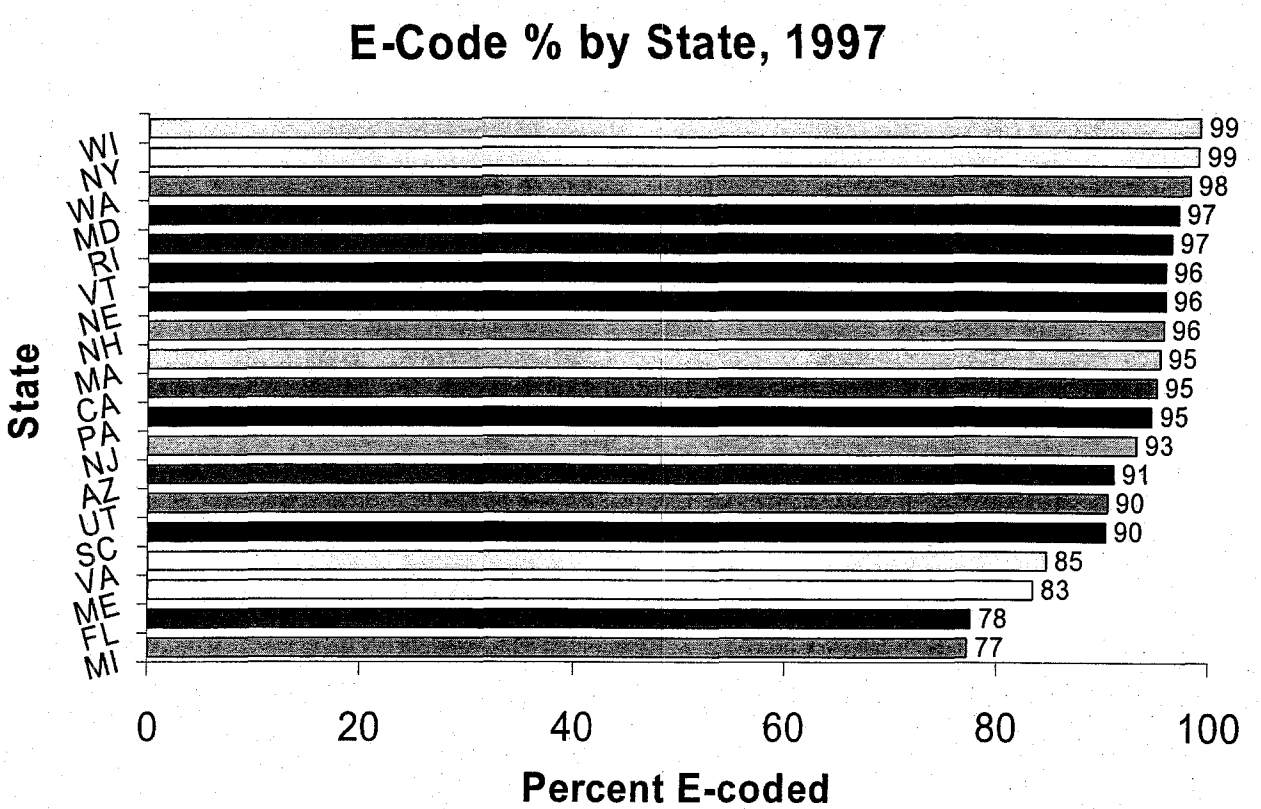

Exhibit 12. E-code completeness by State for Women 15-49, 19 State HDD, 1997.

All Age/Cause/Intent Hospitalized Injuries

This section presents an overview of hospitalized injury among women of all ages. This is done for two purposes. One it helps put the data on injuries to women of reproductive age into the context of injuries to all females. Second, it puts the burden of assaults across the lifespan into perspective before the report focuses exclusively on women of reproductive age. Presenting some of this data may be useful for policy makers and highlights the usefulness of the larger data set.

The data below are based on analysis of 473,310 E-coded hospitalized female injuries reported from the 19 states (17 cases were missing ages). As shown in Exhibit 13, below, and detailed in Appendix D. , page 86, across the life span, hospitalized female injuries are most common among the elderly.

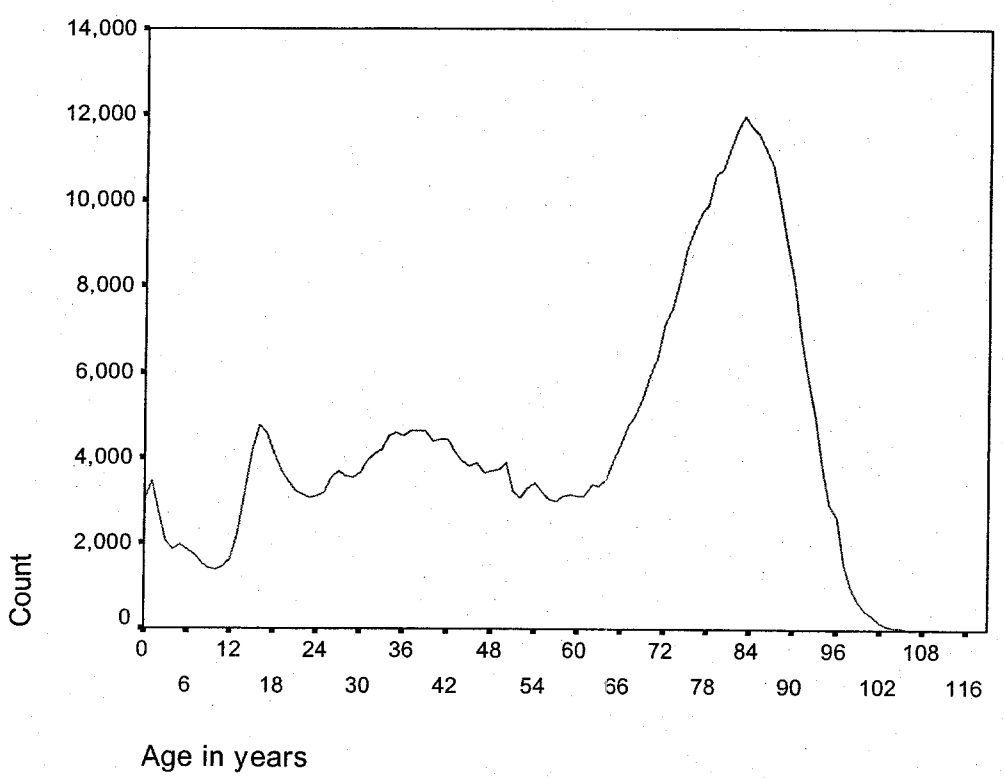

Exhibit 13. Distribution of All Hospitalized Injuries to Women of All Ages by Single Year of Age, 19 State HDD, 1997 (n=473,293).

Most injuries are caused by falls (56.5%), followed by poisoning by drugs, medicinal substances and biologicals and other substances (13.4%), injuries to motor vehicle

occupants (9%) and injuries caused by being struck by objects (2.2%). Most hospitalized injuries to women are reported as unintentional (87.1%), followed by self-inflicted (9.8%), and assaults (2.1%) (see Exhibit 14, below).

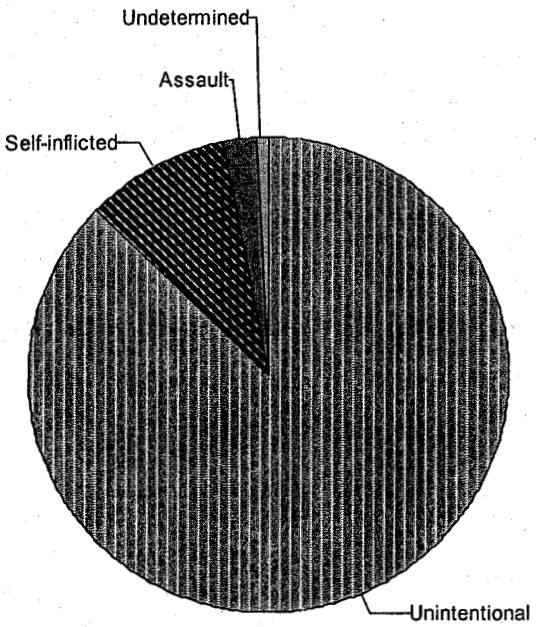

Exhibit 14. Distribution of Intent for Hospitalized Injuries to Women of All Ages, 19 State HDD, 1997 (legal intervention, n=114) not shown.

For these 19 states the mean age was 59.5 years (median=69.0). Most patients (83.7%) were white. The injury hospitalizations accounted for $5.9 billion in direct hospital charges (median=$8,368), $8.5 billion in estimated lifetime medical losses (median=$12,638), $9.3 billion in estimated lifetime production loss (median=$20,299), and $76.8 billion in estimated lifetime monetized QALY's (median=$118,128).

The average length of stay was 5.6 days (median=4), the mean injury severity score was 5.2 (median=4) and the average cost per day was $2,967 (median=$2,323).

Assaultive Hospitalized Injuries Among All Females

The data below are based on analysis of the 9,846 hospitalized female assaultive injuries reported from the 19 states. Frequencies and population rates (per 100,000 females) by 5 year age groups are shown respectively in Exhibit 15, and Exhibit 16, below. While the frequency distribution has two peaks, one in early childhood and one in young adulthood, the assault rate calculations (page 37) show an additional peak in the elderly.

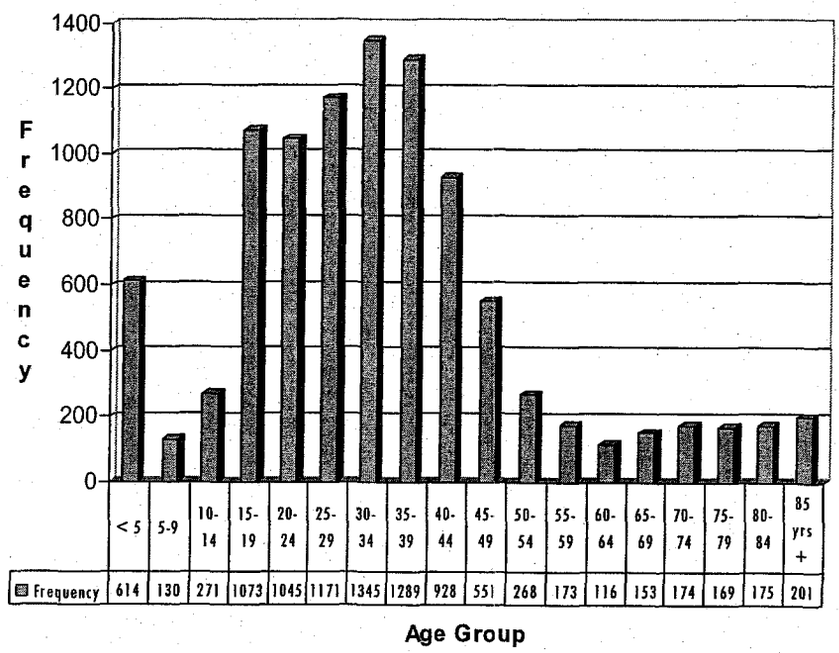

Exhibit 15. Frequency Distribution of Hospitalized Assaults to Females Across the Lifespan, 19 State HDD, 1997 (n=9,846).

The mean age among assault cases was 33.7 years (median=32.0). Most patients (52.6%) were non-white. The overall assault-related hospitalization rate among whites was much lower, 8.2 per 100,000 white females, while among non-whites it was 21.7 (missing race data ignored). Rates by age and race (white versus non-white) are shown in Exhibit 17, below, page 37.

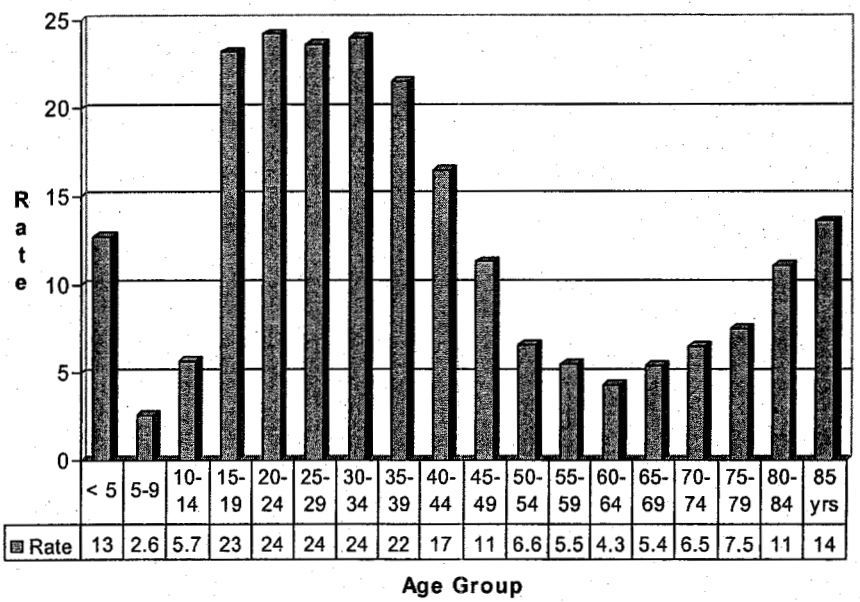

Exhibit 16. Hospitalized Assault Rate (per 100,000) to Females Across the Lifespan, 19 State HDD, 1997 (n=9,846).

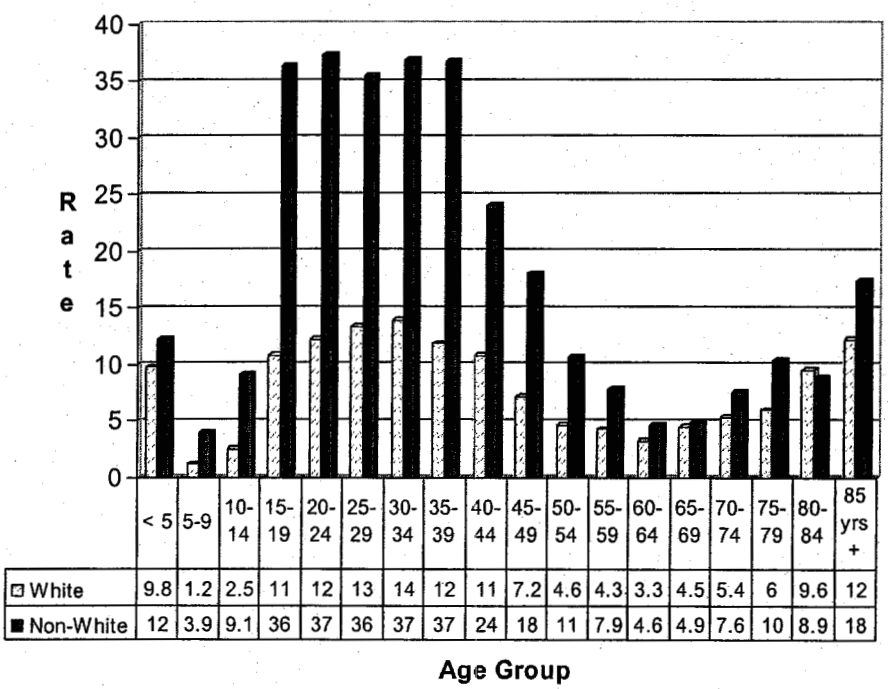

Exhibit 17. Hospitalized Assault Rate (per 100,000) to Females Across the Lifespan, By Race (White versus Non-white), 19 State HDD, 1997 (n=8,739).

In terms of severity measures, the average length of stay for assault victims was 4.7 days (median=3), the mean injury severity score was 5.0 (median=4) and the average cost per day was $3,538 (median=$2,590).

The assaultive injury hospitalizations in the 19 states accounted for $128.8 million in direct hospital charges (median=$7,024), $149.5 million in estimated lifetime medical losses (median=$9,400), $205.2 million in estimated lifetime production loss (median=$16,578), and $2.2 billion in estimated lifetime monetized QALY's (median=$165,971). Exhibit 18, below, extrapolates these cost measurements to the US as a whole to estimate the national financial burden of hospitalized assaults against females. The caveats about the differences between the female population of the 19 states in the study (52.1% of the US population), versus the 31 states and the District of Columbia that did not contribute data to the study (Exhibit 8, page 27) should be kept in mind. More specifically, since the age-specific homicide rate in the 19 state sample was 9% lower than the US as a whole, these estimates should be viewed as usefully conservative if one accepts the argument that female homicide rates likely vary proportionally to female assault hospitalization rates (see the correlation analysis examining this issue, Appendix E. , page 87). Since the extrapolation does not account for the partial lack of E-codes in the original data it further underestimates the likely national burden of hospitalized assaults against females across the lifespan.

Exhibit 18. Cost Summaries for Hospitalized Assaults to Females, 19 States and Direct Extrapolation to the US, 1997.

	Mean	Median	Sum
19 State Sample (N=9,846)			
Total hospital charge	$ 14,112	$ 7,024	$ 128,810,453
Lifetime Medical Loss (96 $, 3% disc.)	$ 16,822	$ 9,400	$ 149,543,925
Lifetime Production Loss (96 $, 3% disc.)	$ 23,078	$ 16,578	$ 205,163,545
Lifetime Monetized QALY's (96 $, 3% disc.)	$246,194	$165,971	$ 2,164,049,480
Intensity of Treatment (cost per day)	$ 3,538	$ 2,590	$ 31,696,548
Extrapolation to US (N ≈18,898)			
Total hospital charge			$ 247,236,955
Lifetime Medical Loss (96 $, 3% disc.)			$ 287,032,486
Lifetime Production Loss (96 $, 3% disc.)			$ 393,787,993
Lifetime Monetized QALY's (96 $, 3% disc.)			$ 4,153,645,835

Perpetrator coding

Perpetrator coding was very incomplete among the coded assaults. For assaulted women of all ages, only 14.5% of the records were accompanied by a secondary perpetrator E-code. Among the small minority of cases that were perpetrator coded, 55.0% reported the perpetrator as a spouse or partner, 19.3% parents or step parents, and 9.8% were child or other relative. The distribution of the perpetrator type for the small proportion of records that contained such information is shown in Exhibit 19, below. During the reproductive years, the overwhelming majority of perpetrators were coded as spouse or partner related. This is the group that will be examined next.

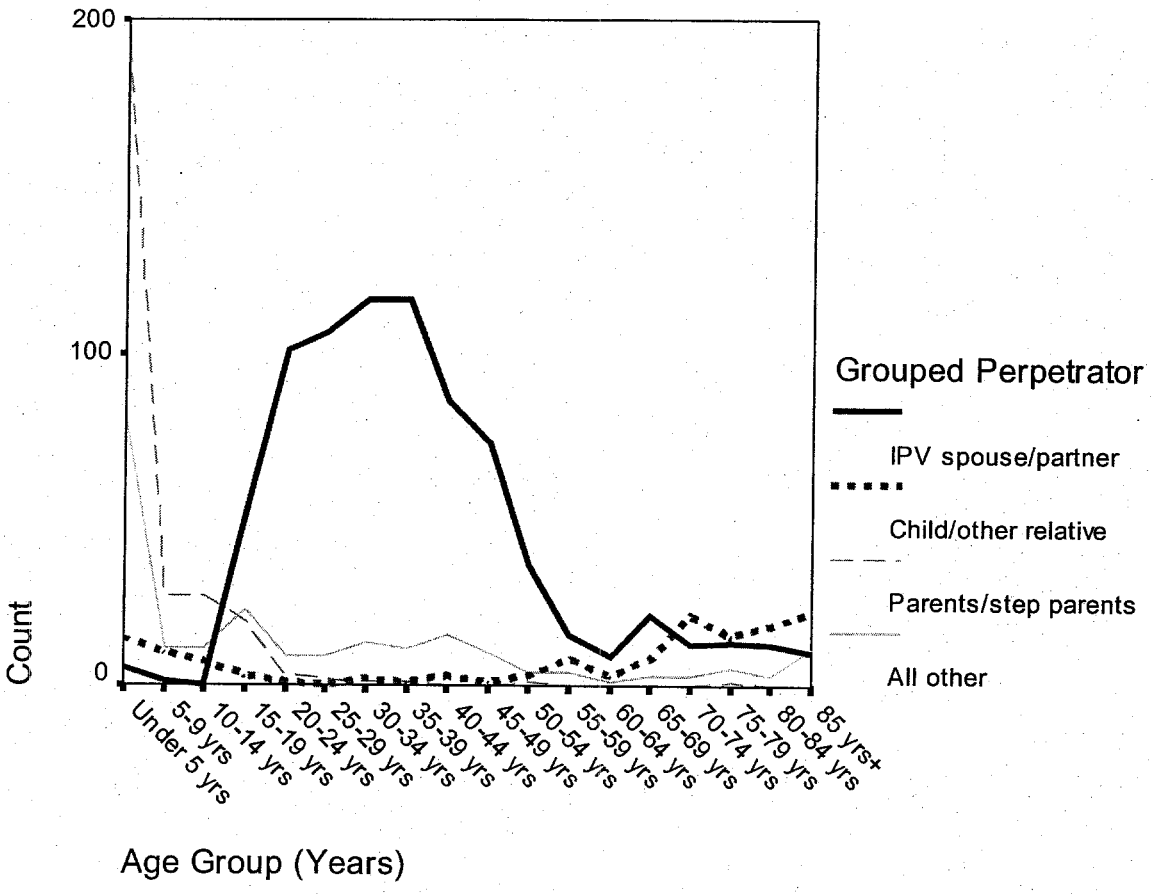

Exhibit 19. Perpetrator Distribution Among Hospitalized Assaults to Females Across the Lifespan (missing data not shown), 19 State HDD, 1997.

Hospitalized Injuries Among Women of Reproductive Age

This section reports on the 137,887 women of reproductive age hospitalized for any injury and begins to compare the pregnancy-associated cases to all women in the same age range. Its purpose is two-fold: To delineate the burden of pregnancy-associated injuries among young women; and to show how assault-related injuries fit into the broader picture of injuries to young women. Women of reproductive age are defined as women between the ages of 15 and 49, inclusively. It is noted that some subsets did not have enough observations for stable rates across all age groups or enough observations to be visible on the scales used and thus some graphs may do not show the oldest age group(s).

Data completeness

E-coding was 92% complete among women 15-49 with an injury-related diagnosis. Since E-coding was the only way to determine whether an injury was due to assault or not, non-E-coded cases were excluded from further consideration. After this and the other exclusions discussed above (page 29), there were 137,887 records left among resident women ages 15-49 discharged from non-rehabilitation hospitals with an acute injury diagnosis and a valid E-code mechanism/intent. The completeness of other selected variables, after applying the exclusionary criteria, is shown in Exhibit 20, below.

Exhibit 20. Completeness of selected key variables among resident women age 15-49 with an acute injury diagnosis, 19 State HDD, 1997.

Selected Variable	# Valid	# Missing	Percent Complete
Admission type	135,334	2,553	98%
Length of stay	135,898	1,989	99%
Payer (first field)	134,879	3,008	98%
Race White vs. Non-white	117,024	20,863	85%

Comparisons between pregnant and all women of reproductive age

Detailed tables comparing frequencies, rates, and rate ratios between pregnancy-associated cases and all women of reproductive age for selected key variables are located in the Appendix, Exhibit 53 through Exhibit 56 (between pages 92 and 95). Highlights from this data and other analyses are summarized and presented below.

Among the 137,887 injured women of reproductive age, 5,498 (4.0%) had a concomitant pregnancy-associated diagnosis. Univariate comparisons between the pregnancy-associated cases and all cases showed that pregnancy-associated cases tended to be younger, more non-white, and sustain injuries that were, by several measures, less serious (Exhibit 21, below).

Exhibit 21. Selected Comparisons of Injured Women Ages 15-49 by Pregnancy-association (excludes cases with missing data), 19 State HDD, 1997.

Characteristic	*Pregnancy associated*	All women *aged 15 to 49*
Number	5,498 (4.0%)	137,887
Rate (per 100,000 person years)	476 ↑	383
Average age	26 ↓	32
% white	56 ↓	73
Average length of stay (days)	3.1 ↓	3.9
Mean injury severity score (ISS)	2.7 ↓	3.6
Drug or alcohol involvement (%)	19.9 ↓	39.6
Median charge per visit	$4,206 ↓	$5,872

While pregnancy-associated cases comprised 4% of all injured women of reproductive age, during peak reproductive years (ages 19-26), they made up as many as 8% to 10% of the injured population (see Exhibit 22, below).

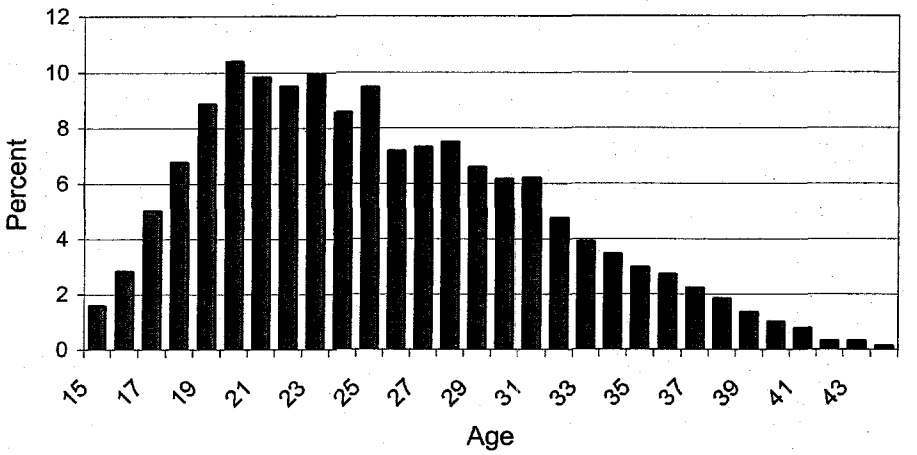

Exhibit 22. Percent of pregnancy-associated cases by single year of age among resident women age 15-44 with an acute injury diagnosis, 19 State HDD, 1997.

As shown in Exhibit 23, below, when pregnancy-associated cases are compared to women of reproductive age by rate (per 100,000 person years) and race (white versus non-white), the highest rates of hospitalized injury are in the youngest non-white pregnancy-associated groups. The highest rate was observed among non-white pregnancy-associated females 15-19, 1,273 per 100,000 person years, which is almost 3 times their white counterpart (475 per 100,000 person years). These rates take into account differences in birth rates since they are constructed using age and race specific birth data (see methods, page 30). Differences in rates between pregnancy-associated groups and all women of reproductive age are discussed and displayed more conveniently in the section introducing rate ratio comparisons (page 45).

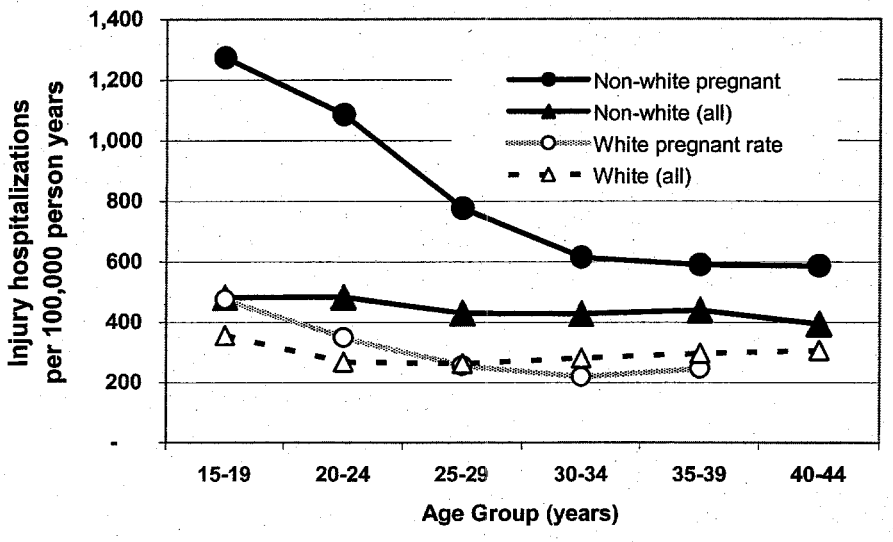

Exhibit 23. Injury Rate for Race (white/non-white) by Age and Pregnancy-associated Status, Women 15-44, 19 State HDD, 1997.

Leading Mechanisms and Intent of Injury by Pregnancy Status

Among women of reproductive age, the leading causes of injury were different than that of women of all ages (listed earlier on page 34) and different from the pregnancy-associated cases (see below). The leading mechanism for women ages 15-49 was poisonings (34%), followed by transportation related injuries (22%) and falls (18%). The leading causes among pregnancy-associated cases were transportation injuries (32%) followed by falls (22%) and then poisonings (17%). Struck by injuries were the fourth leading cause for both groups, but was proportionately higher among the pregnancy-associated cases.

Most hospitalized injuries to women of reproductive age were reported as unintentional (64.4%), followed by self-inflicted (28.0%), and assaults (5.4%). Among pregnancy-associated cases the distribution was unintentional (72.8%), assaults (13.6%) and self-inflicted (12.4%) (Exhibit 25, below).

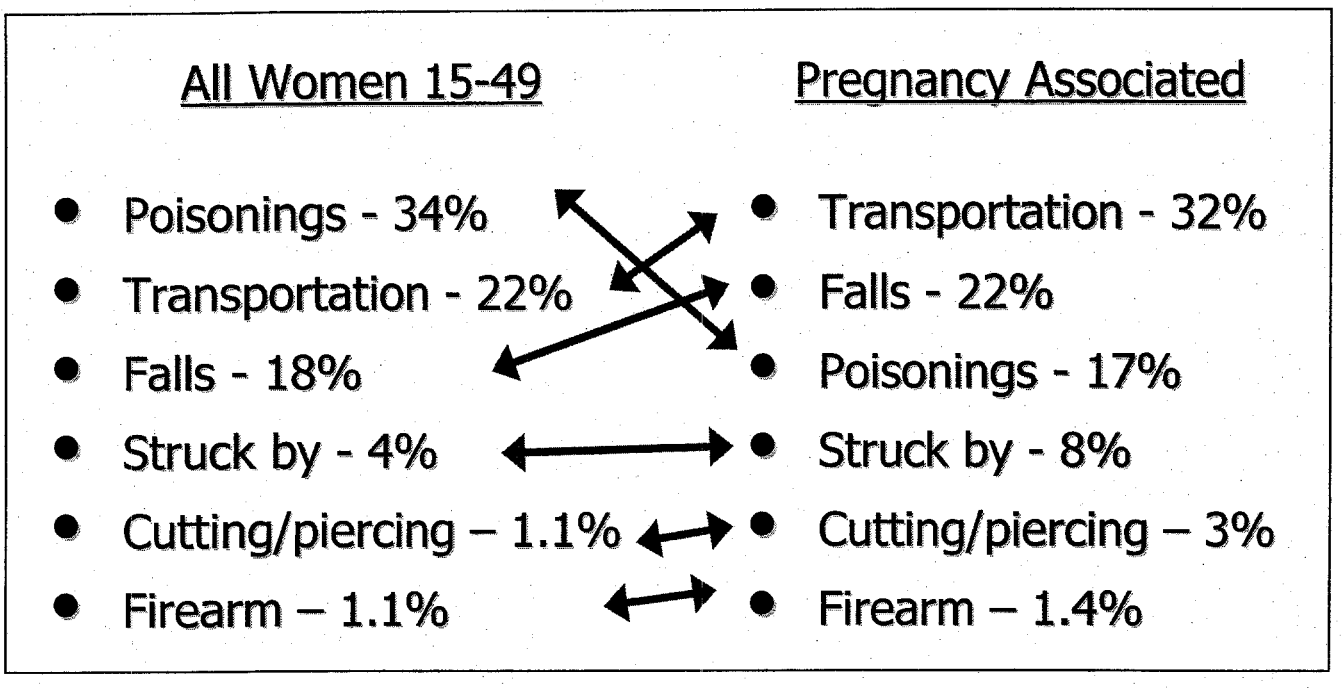

Exhibit 24. Selected mechanisms of injury for women of reproductive age, all women compared to pregnancy-associated cases, 19 State HDD, 1997.

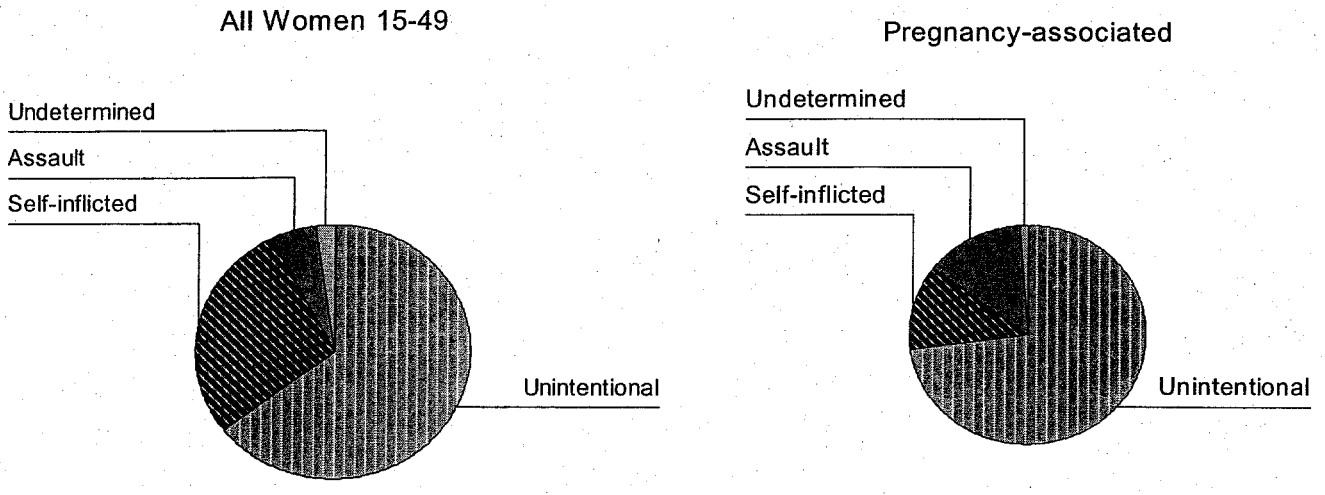

Exhibit 25. Intent of injury for women of reproductive age, pregnancy-associated cases versus all women (excludes missing and legal intervention, pie size not drawn to exact scale), 19 State HDD, 1997.

Rate Ratios for Mechanism, Intent and Age

Rate ratios (pregnancy-associated versus all women of reproductive age) for leading injury mechanisms are shown below (Exhibit 26). It is emphasized that rates describe the burden of a factor in the population while the rate ratio is a relative comparison between two rates. A problem such as poisonings, for example, may occur at a relatively high rate and be an important public health problem, but the rate ratio (pregnancy-associated to all women in that age group) may be low, or vice versa. The rate ratio is a measure of increased (if significantly above one) or decreased risk (if significantly below one) that is relative to the specific populations being compared.

The highest rate ratios were associated with "struck by" events (rate ratio = 2.56, 95% CI = 2.33 to 2.82, often associated with assaults) followed by motor-vehicle occupant injuries (rate ratio = 1.88 95% CI = 1.78 to 1.98), firearms (rate ratio = 1.54, 95% CI = 1.23 to 1.94) and falls (rate ratio = 1.50, 95% CI = 1.41 to 1.59). These four mechanisms had rate ratios that were significantly over one. Again, rate ratios greater than one mean that these types of injuries occurred at a higher rate among pregnancy-associated cases. Note from Exhibit 26 and the detailed table on page 93, that several mechanisms had rate ratios significantly under one, such as poisonings, pedal cycle injuries (bicycles) and motorcycle injuries. Once again, rate ratios less than one mean that these types of injuries occurred at a lower rate among pregnancy-associated cases than all women of reproductive age indicating a decreased risk during pregnancy.

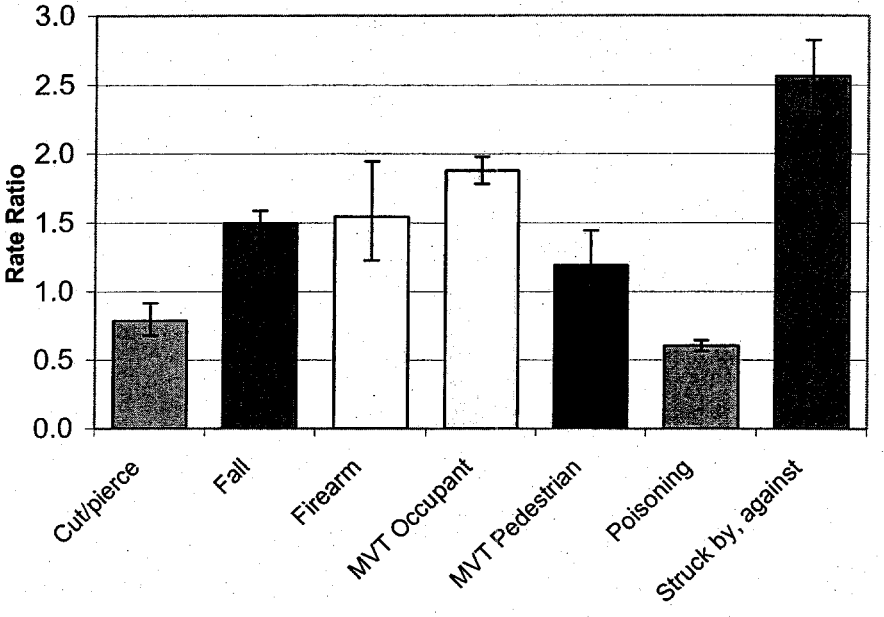

Exhibit 26. Rate Ratio for Leading Injury Mechanisms, Pregnancy-associated Versus All Women 15-49, 19 State HDD, 1997 (with 95% confidence intervals).

Rate ratios (pregnancy-associated versus all women of reproductive age) by injury intent are shown below (Exhibit 27). The highest rate ratios were associated with assaultive (intentional) injuries (rate ratio = 3.13, 95% CI = 2.91 to 3.38).

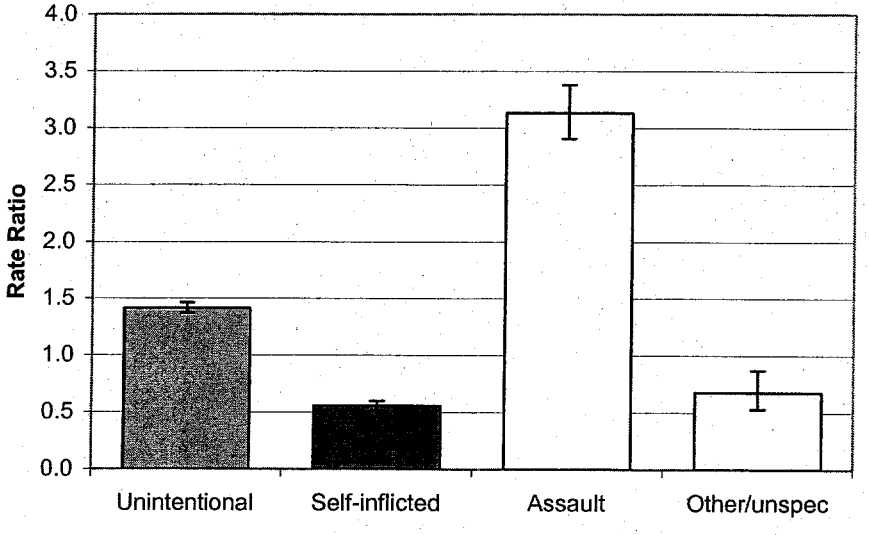

Exhibit 27. Rate Ratio by Intent, Pregnancy-associated Versus All Women 15-49, 19 State HDD, 1997 (with 95% confidence intervals).

When intent rate ratios are examined by race, the disparity between white and non-white, seen in the absolute population rates shown in Exhibit 23 (page 43), while still

present, is not as large. The all reproductive age pregnancy-associated rate ratios for assaults between whites and non-whites are not significantly different from each other, but are both significantly greater than one (Exhibit 28).

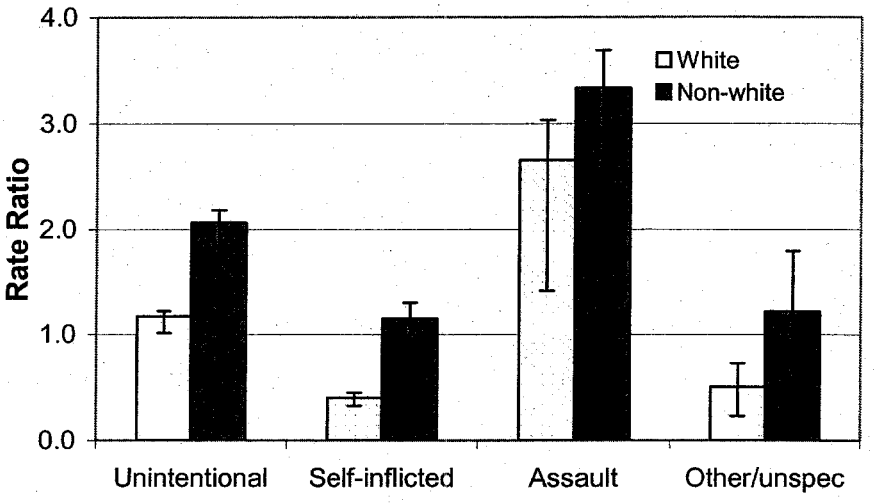

Exhibit 28. Rate Ratio for Intent Categories by Race, Pregnancy-associated Versus All Women 15-49, 19 State HDD, 1997 (with 95% confidence intervals).

The next series of combination charts concurrently displays several different items (Exhibit 29 is for example only, the data should be ignored). The *shaded bars* represent age-specific population rates for pregnancy-associated cases only (expressed as the rate per 100,000 person-years) using the left "Y" axis for its scale. The ratio of the pregnancy-associated rate, divided by the age specific rate for all women, is shown by the rate ratio *line* which draws its scale from the right "Y" axis. Rate ratios are often graphed using a logarithmic scale since it more clearly delineates when a particular comparison value crosses the important threshold of rate equality; where the rate ratio = 1. This convention is followed for the more complex combination charts. Ninety-five percent confidence intervals for the rate ratio of each age group are shown by the "Y" error bars.

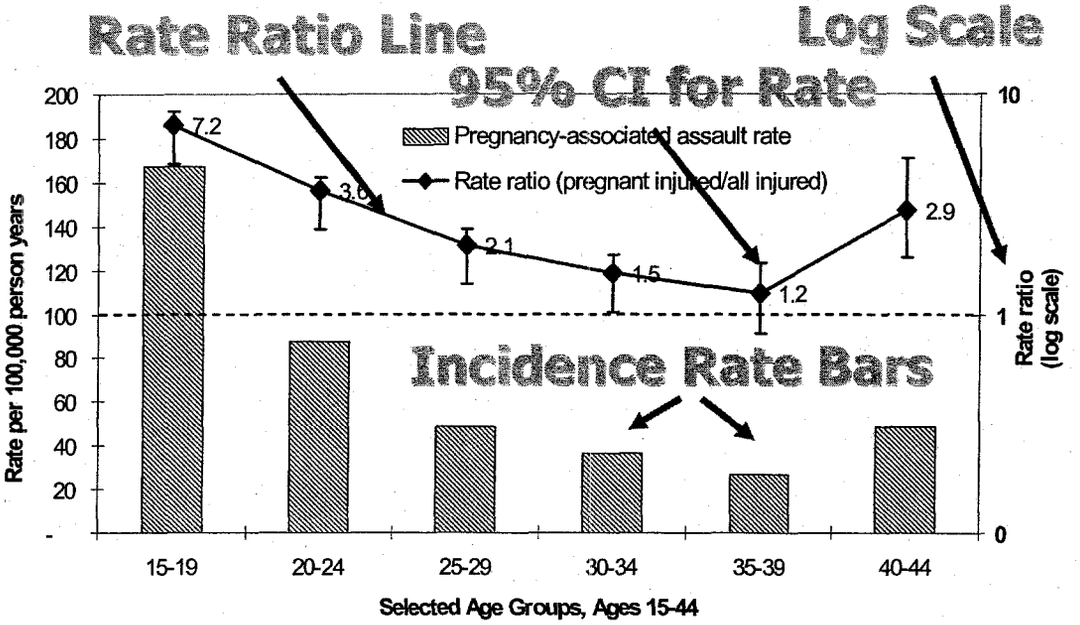

Exhibit 29. How to Interpret Pregnancy-associated Rate and Rate Ratio Combination Charts (data points are for example only).

The first of these "rate, rate ratio" combination charts (Exhibit 30, below) shows the pregnancy-associated rates and rate ratios, by age group, for all injuries to women of reproductive age. It shows significant rate ratios above one for the youngest age groups and a generally decreasing age-specific risk of hospitalized pregnancy-associated injury as the age of the women increases.

Exhibit 31 and Exhibit 32 show the same data separately for whites and non-whites respectively. These are drawn on the same scale to portray the differences in the absolute rates of pregnancy-associated injury between whites and non-whites. The rate ratios for non-whites were higher compared to whites for all age groups. The lowest injury rate among non-white pregnancy-associated women (in the 35-39 year age group) exceeded the highest injury rate shown among white pregnancy-associated women (in the 15-19 year age group). All non-white age-group specific rate ratios were significantly greater than one, whereas for whites they were significantly greater than one only among 15-24 year olds.

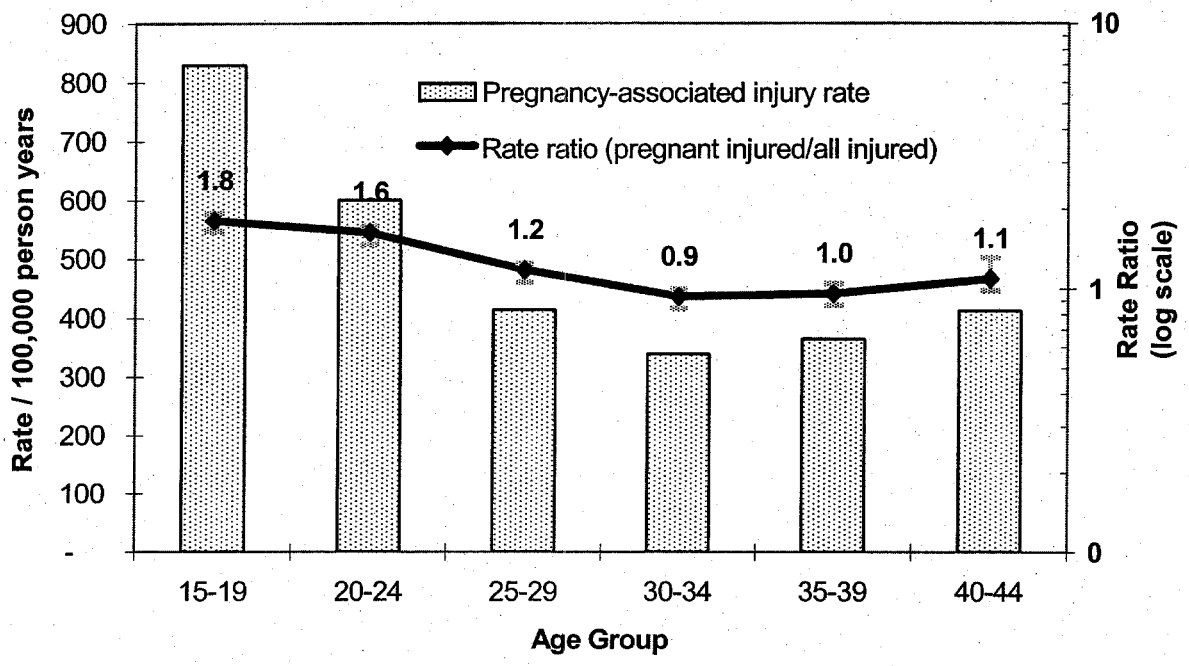

Exhibit 30. Rate and Rate Ratio by Age Group, Pregnancy-associated Versus All Women 15-44, 19 State HDD, 1997 (n=5,498 pregnancy-associated cases, 95% confidence interval shown).

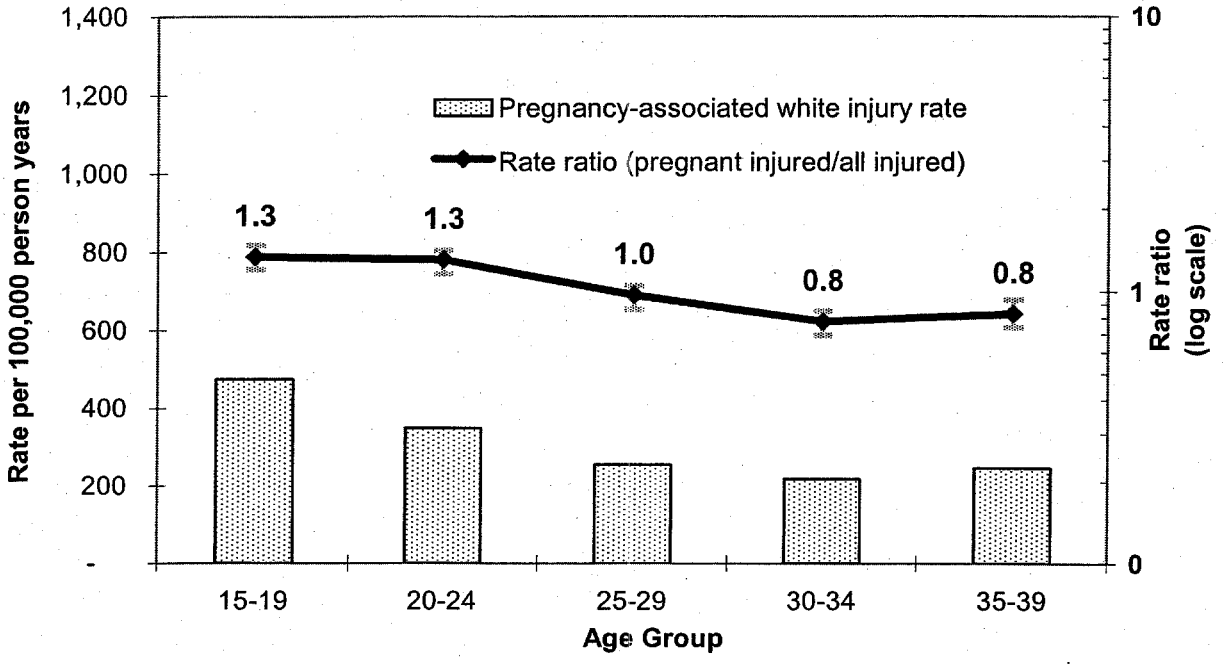

Exhibit 31. Rate and Rate Ratio for Whites by Age Group, Pregnancy-associated Versus All Women 15-39, 19 State HDD, 1997 (n=2,635 pregnancy-associated cases, 95% confidence interval shown).

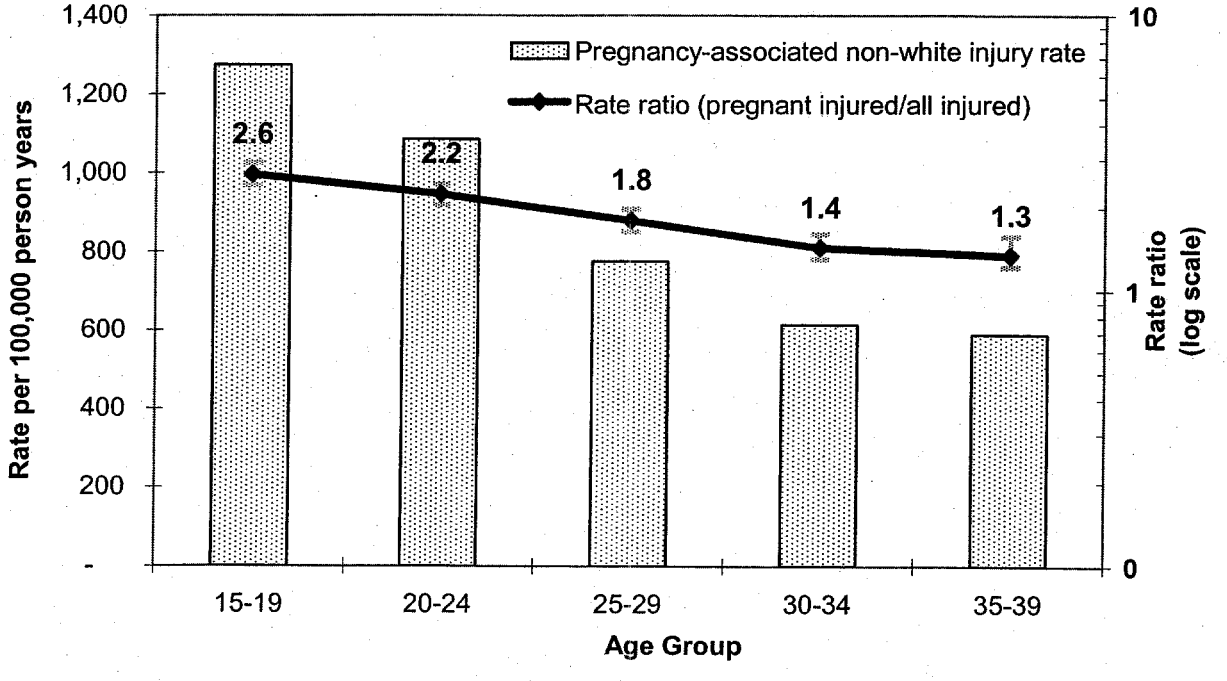

Exhibit 32. Rate and Rate Ratio for Non-whites by Age Group, Pregnancy-associated Versus All Women 15-39, 19 State HDD, 1997 (n=2,082 pregnancy-associated cases, 95% confidence interval shown).

Hospitalized Assaultive Injuries Among Women of Reproductive Age

This section focuses on the 7,402 reported assaults to hospitalized injured women of reproductive age along with comparisons of the pregnancy-associated cases to all women in the same age group. Its purpose is to summarize the assault specific data among women ages 15-49 and to explore differences between pregnancy-associated assaults and all assaults similar to the way the previous section compared all pregnancy-associated injuries. Detailed tables comparing frequencies, rates, and rate ratios between assaults for pregnancy-associated cases and all women of reproductive age for selected key variables are located in the Appendix, Exhibit 57 through Exhibit 60 (between pages 96 and 99).

Perpetrator Coding Completeness

Perpetrator coding was more complete but still poor among pregnancy-associated assaults; 22.6% were accompanied by a perpetrator related E-code, whereas for all assaulted women ages 15-49, only 8.8% had a perpetrator code. Among the small proportion that were perpetrator coded in both groups, 88.0% and 83.7% were spouse or partner related among pregnancy-associated and all assaults, respectively. This provides limited evidence that most of the assaults among women of reproductive age were intimate partner violence related as opposed to stranger or non-intimate acquaintance violence. However, both groups suffer from very incomplete perpetrator reporting and reporting biases among those cases that were assigned a perpetrator code cannot be ruled out. Tables comparing the groups that had perpetrator codes versus those that did not are shown in Appendix F. , page 89.

Proportional Comparisons

There were 7,402 assault-related discharges among women of reproductive age for a rate of 21/100,000 person-years. Pregnancy-associated cases made up 745 (10.0%) of these cases (rate = 65/100,000 person-years). Similar to all hospitalized injured women of reproductive age, univariate comparisons between the pregnancy-associated

cases and all cases showed that pregnancy-associated assault cases were hospitalized at a higher rate, were younger, more non-white, and sustained less serious injuries (Exhibit 33, below).

Exhibit 33. Selected Comparisons of Assaultive Injured Women Ages 15-49 by Pregnancy-association (excludes cases with missing data), 19 State HDD, 1997.

Characteristic	*Pregnancy associated*	All women *aged 15 to 49*
Number	745 (10.0%)	7,402
Rate (per 100,000 person years)	65 ↑	21
Average age	24.2 ↓	30.8
% white	31.5 ↓	37.8
Average length of stay (days)	2.6 ↓	4.0
Mean injury severity score (ISS)	2.5 ↓	4.9
Drug or alcohol involvement (%)	15.7 ↓	27.1
Median charge per visit	$3,351 ↓	$6,775

The proportion of pregnancy-associated assaults within each single year of age climbed sharply after age 16, peaked at age 19, and declined slowly thereafter (Exhibit 34, below). While pregnancy-associated cases comprised 10% of all hospitalized assaults among women of reproductive age, during peak reproductive years (ages 17-25), they made up 18% to 25% of the assaults.

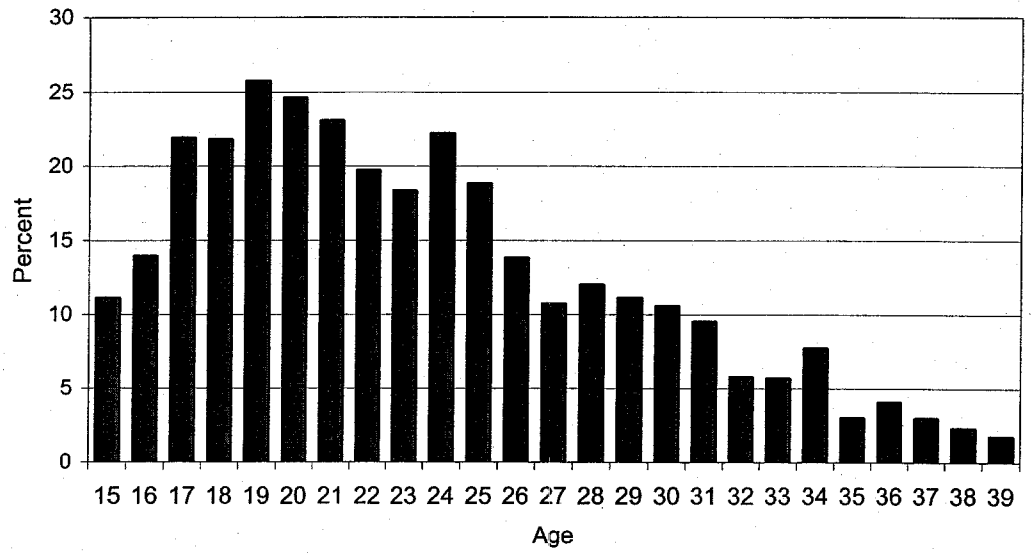

Exhibit 34. Pregnancy-associated hospitalized assaults as a proportion of all assaults within each year of age 15-39, 19 States, 1997 (n=745 pregnancy-associated cases).

Among non-white injured females with a pregnancy-associated diagnosis, 21% (427/2,082) were assault-related, while for whites it was 9% (235/2,635). Overall, the rate of pregnancy-associated assaults was almost seven times higher in non-whites (178/100,000 person-years) than whites (26/100,000 person-years, see Exhibit 35). The highest rate of hospitalized assaults was observed among non-white pregnancy-associated females 15-19, 341 per 100,000 person years, which is 5 times their white counterpart (62 per 100,000 person years). Once again, differences in rates between pregnancy-associated groups and all women of reproductive age are discussed and displayed more conveniently in the rate ratio portion of this section (page 55).

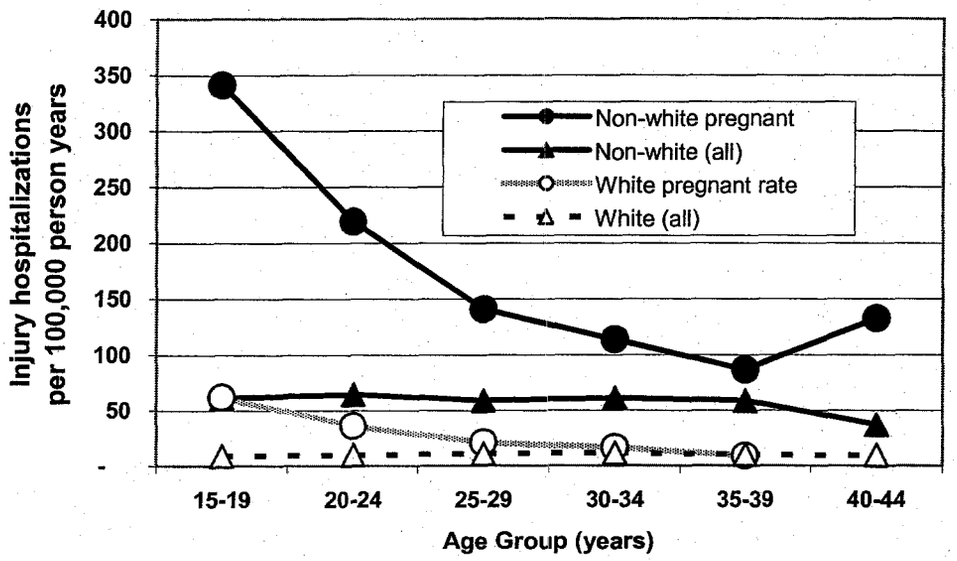

Exhibit 35. Assault Injury Rate for Race (white/non-white) by Age and Pregnancy-associated Status, Women 15-44, 19 State HDD, 1997 (n=662 pregnancy-associated cases).

The leading mechanism of assaultive injury was "struck by or against," representing about half the cases among both the pregnancy associated group and all women (see Exhibit 36, below).

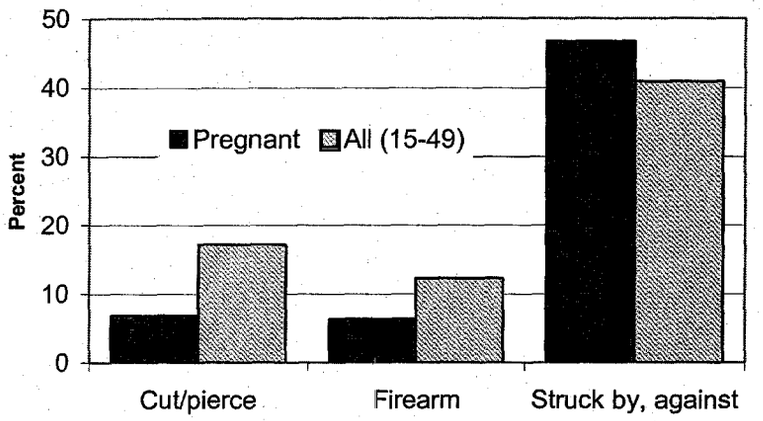

Exhibit 36. Within Group Proportion of Leading Assaultive Injury Mechanisms, Pregnant and All Women 15-49, 19 State HDD, 1997 ("other specified" group not included).

Among pregnant associated cases, the leading body parts affected were the trunk, "other", face and abdomen. For all women it was the face, upper extremity, head and abdomen (see Exhibit 37, below).

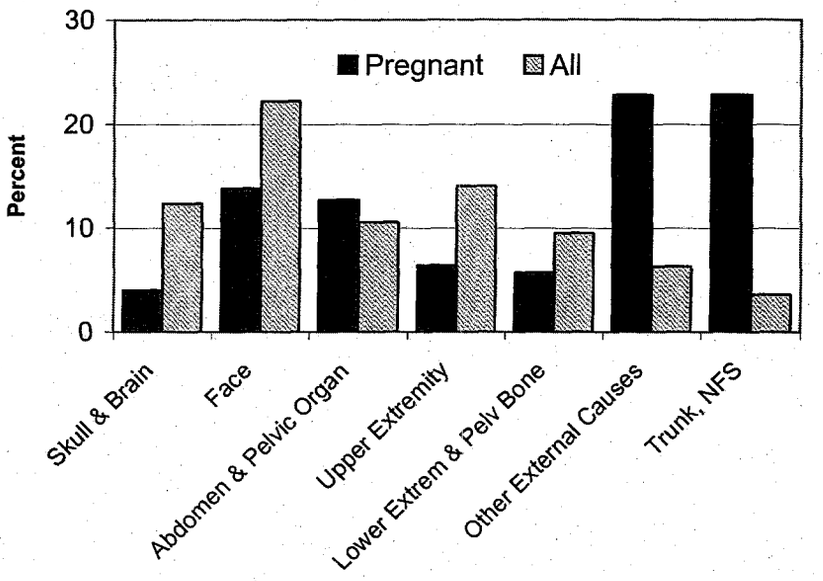

Exhibit 37. Within Group Proportion of Leading Body Part Involvement, Pregnancy Associated and All Women 15-49, 19 State HDD, 1997.

Rate Ratios for Mechanisms, Age & Race

Mechanism specific pregnancy-associated rate ratios for assaultive injury are shown in Exhibit 38. Three mechanism types had rate ratios significantly above one: "Struck

by" (rate ratio= 3.58, 95% CI = 3.20, 4.00) firearms (rate ratio= 1.61, 95% CI = 1.20, 2.16) and falls (rate ratio= 4.56, 95% CI = 1.93, 10.73), but there were very few cases in the fall group, hence the large error bars.

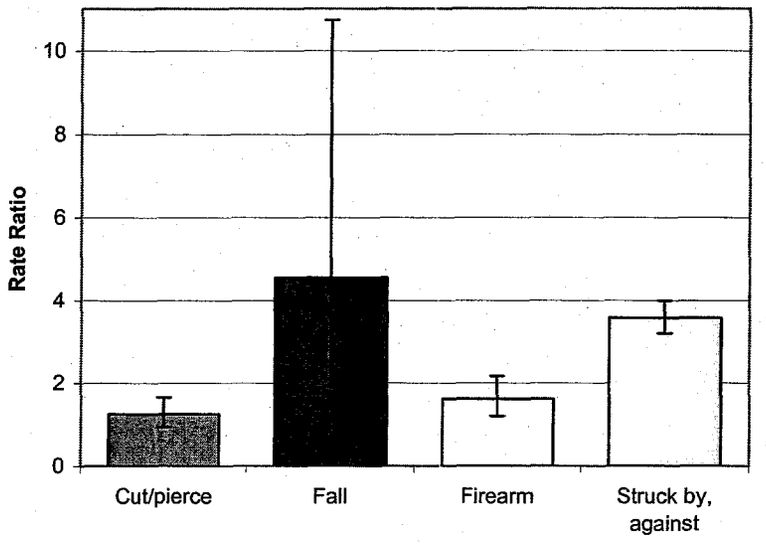

Exhibit 38. Assault Rate Ratio for Leading Injury Mechanisms, Pregnancy-associated Versus All Women 15-49, 19 State HDD, 1997 (n=745 pregnancy-associated cases, 95% confidence interval shown).

The all age rate ratio (pregnancy associated versus all women) for assaults was 3.14 (95% CI = 2.04 to 3.39). The pregnancy-associated assault rates and rate ratios were highest in the youngest age group, declining with age (see Exhibit 39, below).

The age specific pregnancy-associated assault rates and rate ratios are broken down by race in Exhibit 40 and Exhibit 41. The overall rate ratio was significantly elevated among both whites (2.65, 95% CI = 1.41, 3.03) and non-whites (3.34, 95% CI = 2.55, 3.69). Among non-whites 15-19, the rate of pregnancy-associated assaults per 100,000 person-years was 341 (rate ratio = 5.54 (95% CI = 4.32, 6.73). The lowest assault injury rate among non-white pregnancy-associated women (in the 35-39 year age group) exceeded the highest assault injury rate shown among white pregnancy-associated women (in the 15-19 year age group). All non-white age-group specific rate ratios between the ages of 15-44 were significantly greater than one, whereas for whites they were significantly greater than one among 15-29 year olds. Strong

downward trends by advancing age were evident for both rates and rate ratios among both whites and non-whites.

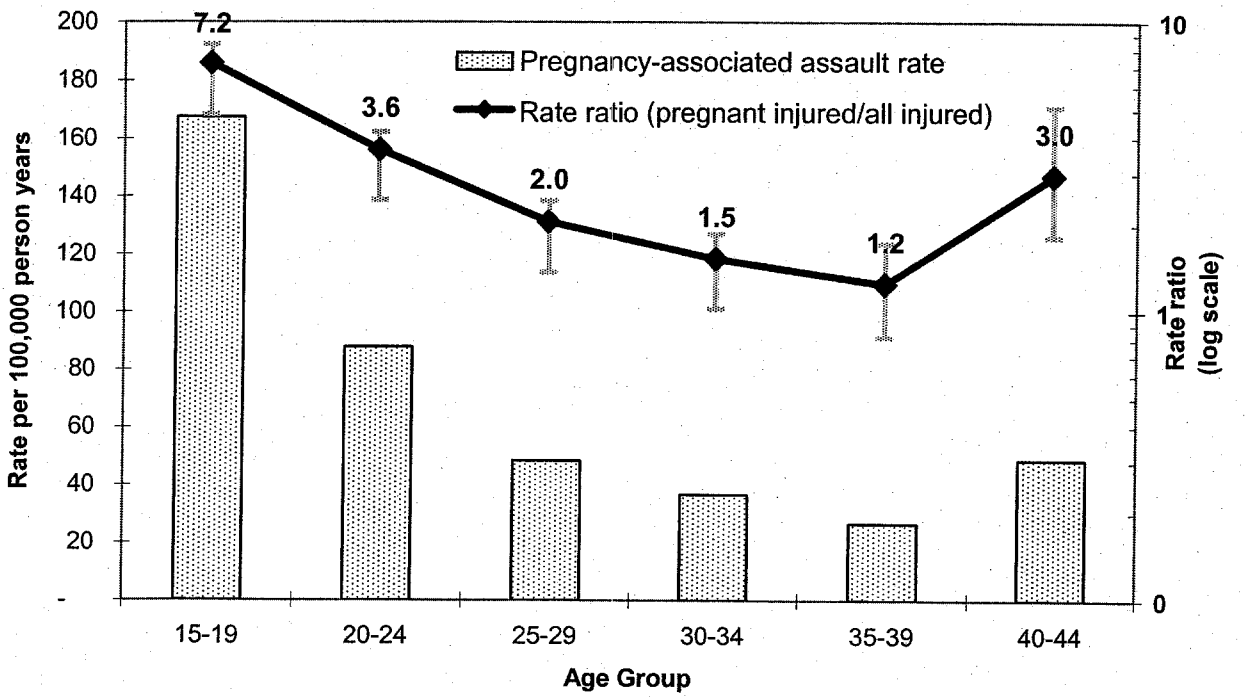

Exhibit 39. Rate of hospitalized pregnancy-associated assaultive injuries per 100,000 person-years and rate ratio (pregnant/all injured women) ages 15-44, 19 States, 1997 (n=745 pregnancy-associated cases, 95% confidence interval shown).

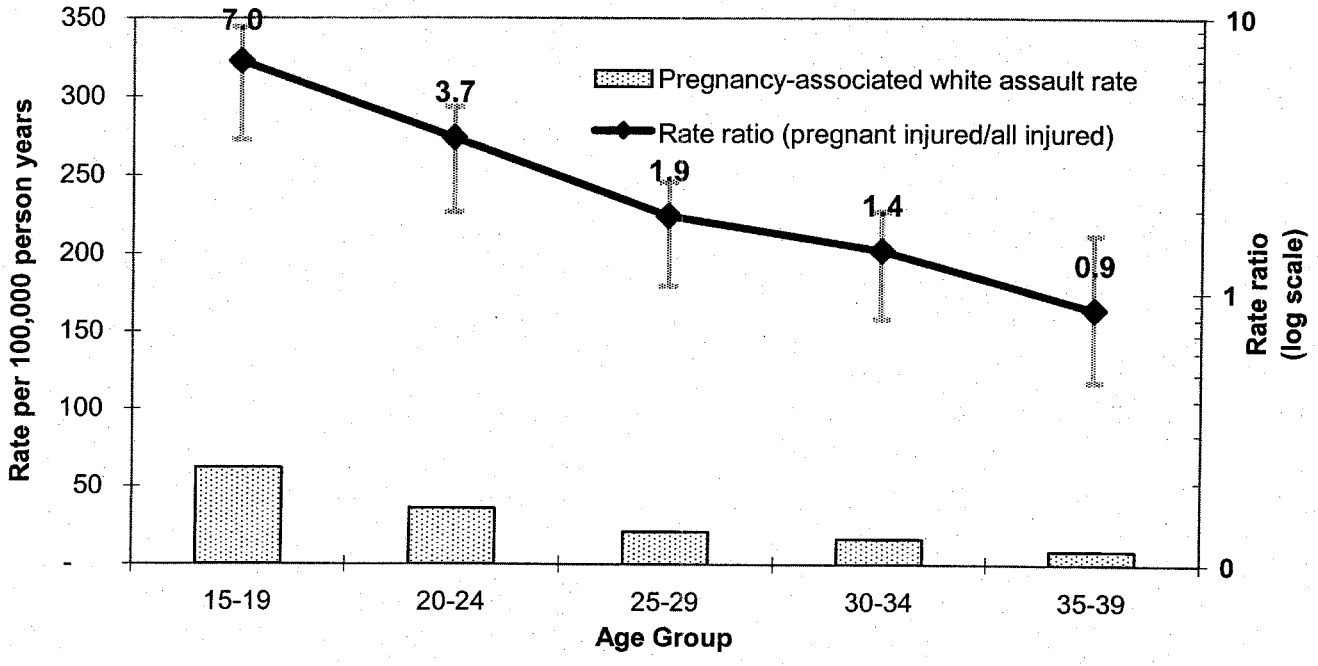

Exhibit 40. Assault Rate and Rate Ratio for Whites by Age Group, Pregnancy-associated Versus All Women 15-39, 19 State HDD, 1997 (n=235 pregnancy-associated cases, 95% confidence interval shown).

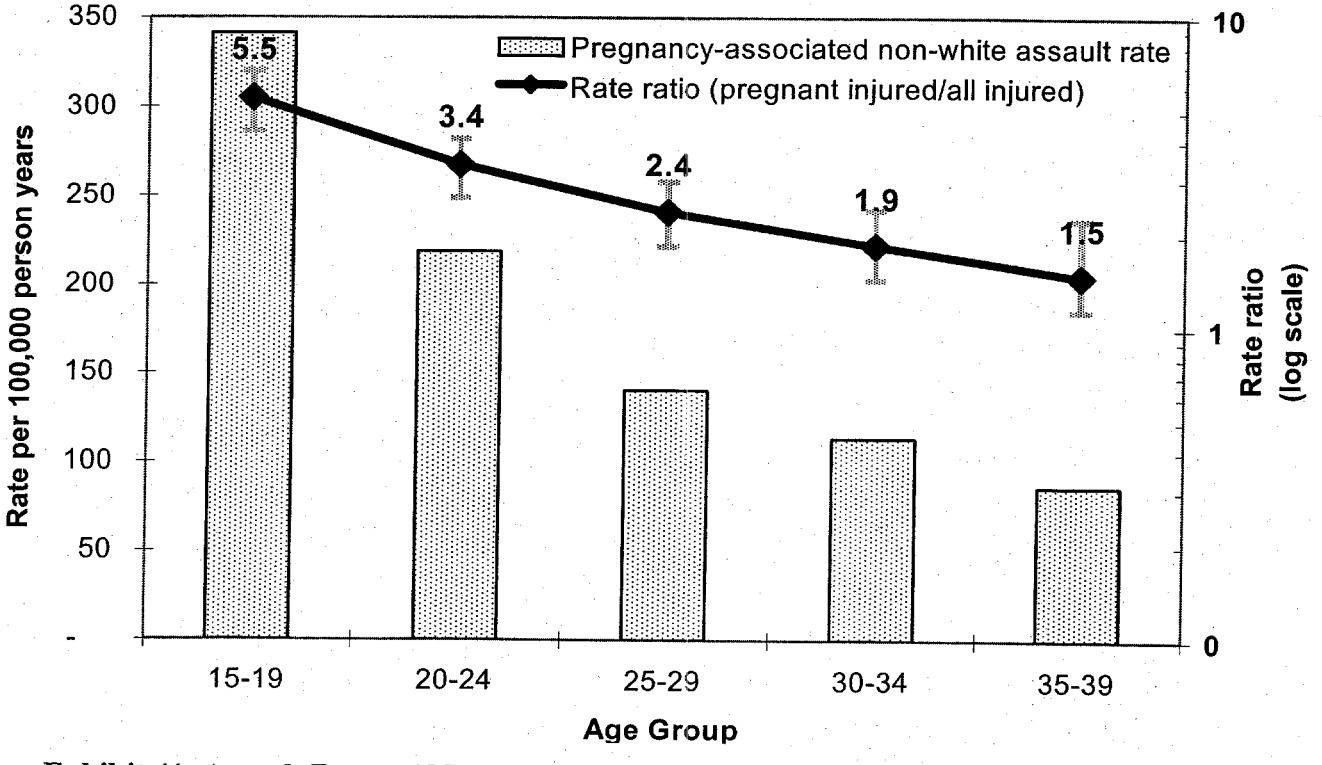

Exhibit 41. Assault Rate and Rate Ratio for Non-whites by Age Group, Pregnancy-associated Versus All Women 15-39, 19 State HDD, 1997 (n=427 pregnancy-associated cases, 95% confidence interval shown).

Rate Ratios for Payor Source

Pregnancy-associated cases were more likely to be paid for by Medicaid (rate ratio = 4.49, 95% CI = 4.06, 4.98, see page 96). The median charge per visit was $3,351 for pregnancy-associated women and $6,775 for all women. Respective total costs for lifetime medical loss sum and lifetime monetized QALY (rounded) were $4,926,000, $6,296,162, and $71,620,000 for pregnancy-associated cases and $89,245,000, $111,545,000, and $1,689,194,000 for all assaults.

Among the top three body part groupings, pregnancy-associated assault rates per 100,000 person-years and rate ratios were: trunk 14.7 (rate ratio 19.6, 95% CI = 16.2, 23.7), face 8.9 (rate ratio 2.0, 95% CI = 1.6, 2.4), abdomen and pelvic organs 8.2 (rate ratio 3.8, 95% CI = 3.1, 4.7).

Rate Ratios for Severity Indicators

By all measures, pregnancy-associated assaults tended to be less serious. They were more likely to be non-fatal (rate ratio 3.13, 95% CI = 2.93, 3.41) and of short length of stay (rate ratio for 1 day length of stay = 5.02, 95% CI = 4.50, 5.60). The average length of stay was shorter for the pregnancy-associated assaulted women, 2.6 days versus 4.0 for all women 15-49.

The mean injury severity score (ISS) among the pregnancy-associated assaulted women was 2.5, while the mean ISS among all women was 4.9. Exhibit 42, below, shows the rate ratio of assault-related hospital discharges by severity group. There was a significantly increased rate ratio for minor injuries (ISS < 4) but not for the moderate, serious and severe injuries. This finding was used as the basis for the severity adjustment, described in the next section, which eliminated all assault–related cases with minor injuries from the final set of rate ratio comparisons.

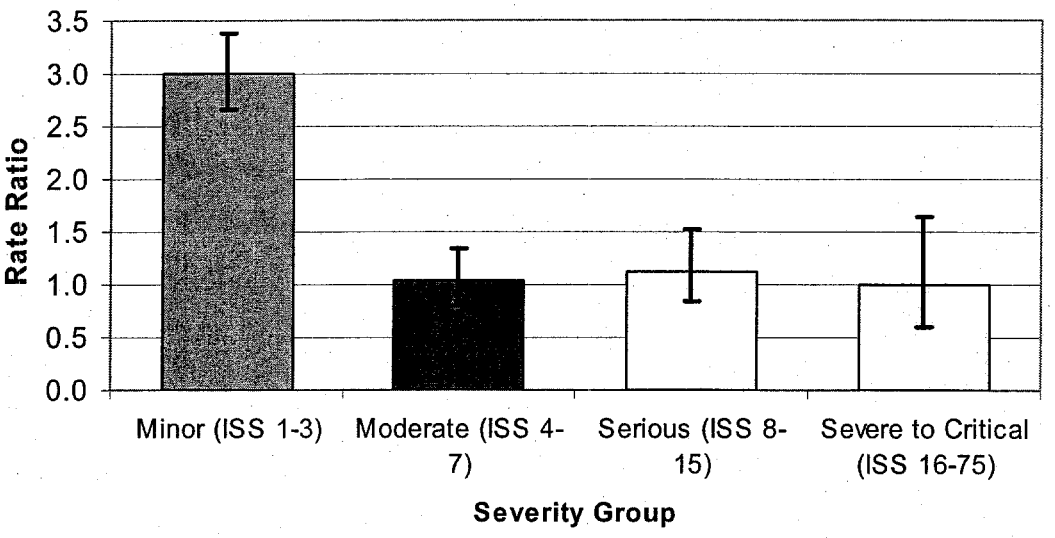

Exhibit 42. Rate ratio of assault-related hospitalized pregnancy-associated injuries per 100,000 person-years (pregnant injured women/all injured women) by severity group for ages 15-49, 19 States, 1997 (n=422 pregnancy-associated cases, 95% confidence interval shown).

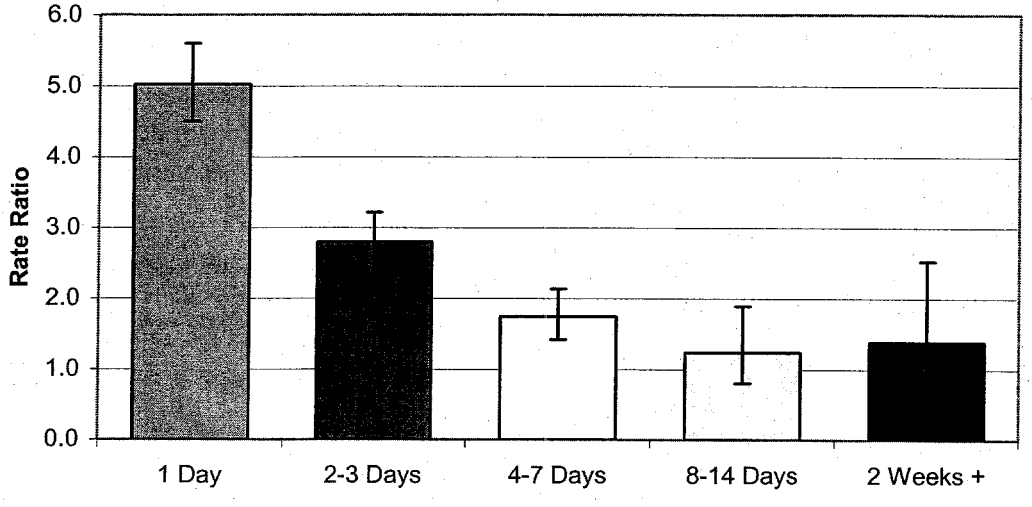

Exhibit 43. Assault Rate Ratio for Length of Stay Categories, Pregnancy-associated Versus All Women 15-49, 19 State HDD, 1997 (n=745 pregnancy-associated cases, 95% confidence interval shown).

Serious Assaultive Injuries Among Women of Reproductive Age

Because of the data presented in the previous sections showing that pregnancy-associated cases are younger, more non-white, and sustain less serious injuries, teasing these factors apart becomes critical to understanding who is at risk for greater assaultive injury and why. It is clear that pregnant women (who are usually young) suffering an assault-related injury are more likely to hospitalized (3 times more) for less severe injuries (Exhibit 42). Whatever the exact nature of this predilection for hospitalization is, there is little doubt that the phenomena interferes with an accurate assessment of whether pregnant women are truly at increased risk of serious assault because part of the issue seems to be they are more likely to be hospitalized. In other words, looking only at hospital data (and any clinical setting for that matter) likely introduces a selection bias towards women who are pregnant.

To address this bias, one needs to look at the race and age specific rates after removing the minor severity cases. This should leave those cases that are serious enough so that the patient's decision to go to a hospital and the clinical decision to hospitalize them would be similar, regardless of pregnancy status. The injury severity score is most suitable for this purpose because it is not assigned on the basis of pregnancy status. From Exhibit 42 (above) one can see that after the minor ISS (1 through 3) cases are removed, there is no overall difference in the hospitalization rates between pregnancy-associated women and all women of reproductive age. This levels the playing field, so-to-speak, and allows the stratified comparisons by age and race to proceed with less concern about selection bias.

This last section focuses on the 3,457 reported assaults to hospitalized injured women of reproductive age with an ISS $\geq$4. Among these, 118 (3.4%) were pregnancy-associated. Detailed tables comparing frequencies, rates, and rate ratios between assaults for pregnancy-associated cases and all women of reproductive age for selected key variables are located in the Appendix, Exhibit 61 through Exhibit 64 (pages 100 and 103). Data highlights are presented below. Although some group descriptions and summaries are given, the focus here is more on the pregnancy-related rate ratios.

Univariate comparisons between the pregnancy-associated cases and all cases showed that pregnancy-associated seriously injured cases still were younger and more non-white, but the differences in mean length of stay, injury severity score, charges and the overall rate disappeared (Exhibit 44).

Exhibit 44. Selected Comparisons of Assaultive Seriously Injured Women Ages 15-49 by Pregnancy-association (excludes cases with missing data), 19 State HDD, 1997.

Characteristic	*Pregnancy associated*	All women *aged 15 to 49*
Number	118 (3.4%)	3,457
Average age	25.3 ↓	31.5
Rate (per 100,000 person years)	10	10
% white	28.0 ↓	38.8
Average length of stay (days)	5.0	4.9
Mean injury severity score (ISS)	9.1	8.9
Drug or alcohol involvement (%)	22.0 ↓	25.3
Median charge per visit	$10,283	$9,767

Exhibit 46 (see page 64) details the frequency, rates and rate ratios of selected characteristics for hospitalized assaults in the sub-group of seriously injured cases. Proportionally eliminating the less severe pregnancy-associated cases reduced most of the rate ratios to values not significantly different from one. The overall rate ratio fell to a non-significant 1.07 (95% CI = 0.57, 1.28). However, rate ratios were significantly elevated for a few sub-groups including the youngest age group (rate ratio = 2.49, 95% CI = 1.31, 3.63) and for firearm-related assaults (rate ratio = 1.55, 95% CI = 1.07, 2.23).

Among the top four (by frequency) body part groupings, pregnancy-associated rates per 100,000 person-years and rate ratios were as follows: abdomen and pelvic organs 2.1 (rate ratio 1.6, 95% CI = 1.1, 2.4) skull and brain 2.0 (rate ratio 1.0, 95% CI = 0.7, 1.5), face 1.4 (rate ratio 0.9, 95% CI = 0.5, 1.5), and upper extremity 1.4 (rate ratio 1.1, 95% CI = 0.7, 1.9).

Rate Ratios for Mechanisms, Age & Race

Mechanism rate ratios for important causes of serious assaultive injury are shown in Exhibit 45. Only the firearms rate ratio was significantly greater than 1 (rate ratio= 1.55, 95% CI = 1.07, 2.23). "Struck by" incidents were still the most frequent, but their rate ratio was 0.88 (95% CI = 0.64, 1.19).

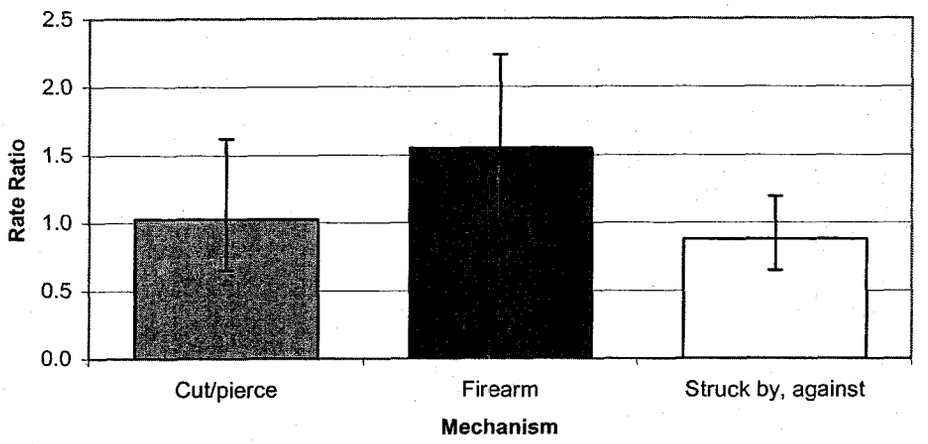

Exhibit 45. Serious Assault Rate Ratio for Leading Injury Mechanisms, Pregnancy-associated Versus All Women 15-49, 19 State HDD, 1997 (n=118 pregnancy-associated cases, 95% confidence interval shown).

The overall rate ratio (pregnancy associated versus all women) was already mentioned above (1.07, 95% CI = 0.57 to 1.28). Examining the rate ratios by age groups, it was significantly greater than one only for the youngest age group (ages 15-19) rate ratio = 2.49, 95% CI = 1.31, 3.63, see Exhibit 46).

The all reproductive age rate ratio was not significantly greater than one for either whites or non-whites (white rate ratio = 0.78, 95% CI = 0.31, non-white rate ratio = 1.27, 95% CI = 0.85, 1.60. On an age specific basis, moderate increases in the rate ratio were observed only in the youngest age groups by race, significant among non-whites (where numbers were greater) but insignificant among whites (see Exhibit 47 and Exhibit 48).

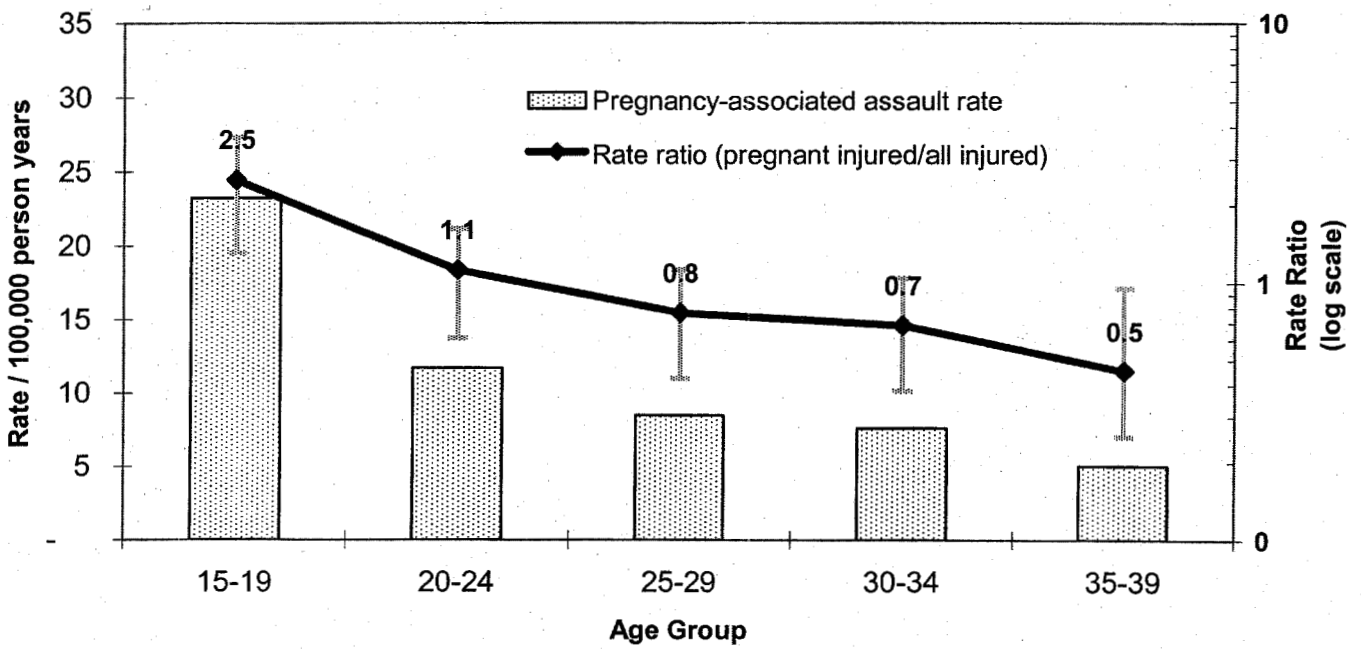

Exhibit 46. Serious Assault Rate and Rate Ratio by Age Group, Pregnancy-associated Versus All Women 15-44, 19 State HDD, 1997 (n=118 pregnancy-associated cases, 95% confidence interval shown).

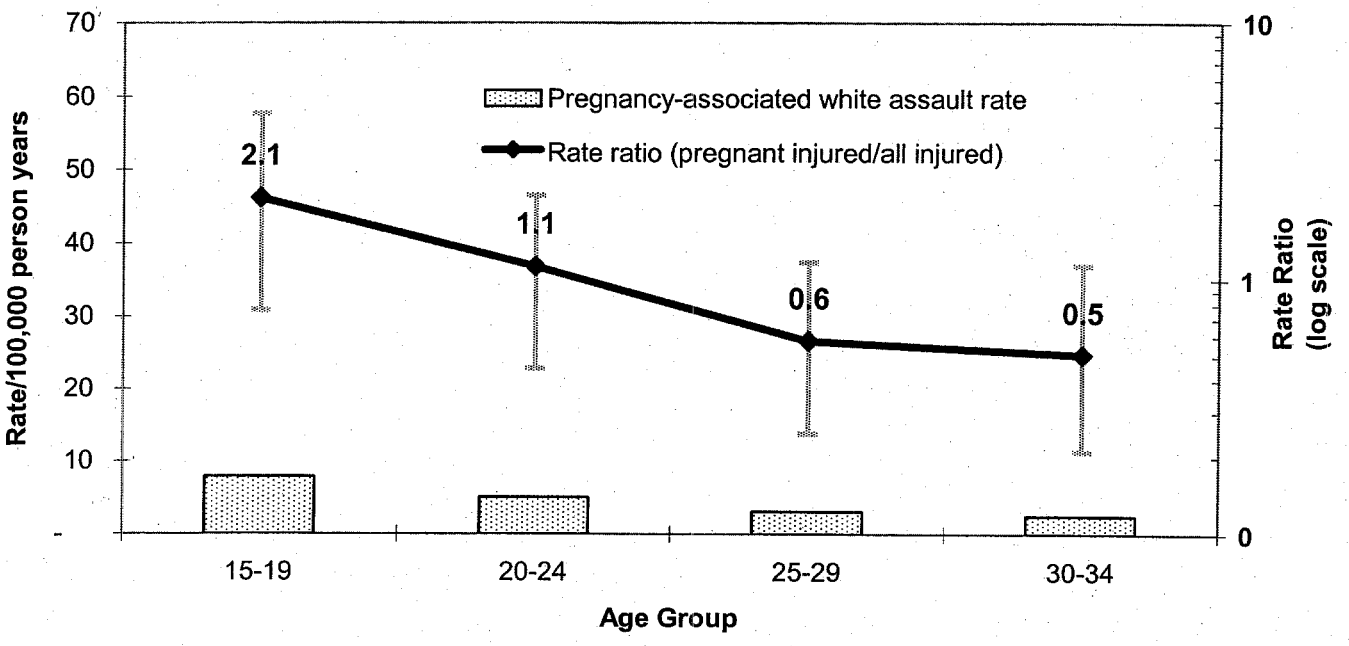

Exhibit 47. Serious Assault Rate and Rate Ratio for Whites by Age Group, Pregnancy-associated Versus All Women 15-39, 19 State HDD, 1997 (n=33 pregnancy-associated cases, 95% confidence interval shown).

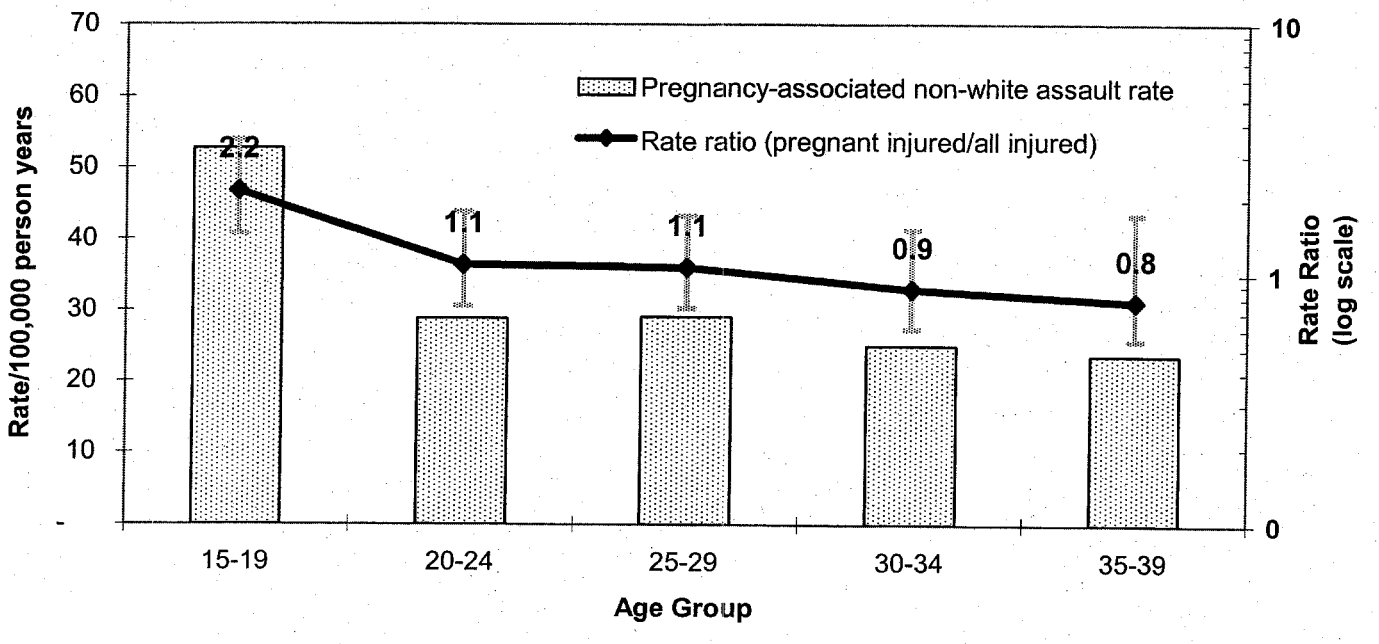

Exhibit 48. Serious Assault Rate and Rate Ratio for Non-whites by Age Group, Pregnancy-associated Versus All Women 15-39, 19 State HDD, 1997 (n=75 pregnancy-associated cases, 95% confidence interval shown).

Limitations

While the scope and expanse of multi-state hospital discharge data have distinct advantages, they also have disadvantages. Waller and colleagues have described these as they relate to violence against women.[45] They include concerns about quality and completeness of intent and perpetrator coding (observed clearly in this study), difficulty detecting intimate partner violence related conditions that are not injury-related (stress, depression, and other diseases), and possible duplicate counts. While the data suggested that most hospitalized assaults were spouse or partner related, the low percentage of perpetrator coded cases dictates caution with this interpretation. Regarding duplicate counts, individuals would have needed multiple admissions with both a pregnancy and an assault code, rendering multiple admissions in our study population less likely.

Other limitations stem from the ecologic nature of the study design. Individual women were not followed-up, thus the study did not elucidate violence patterns before or after pregnancy. Neither could it describe the relationship of violence to pregnancy intendedness, sexual assault, gestational age, previous births, parity, prenatal care, pregnancy outcome, marital status or relationship of the fetus to the assailant. Understanding these patterns is important, but remains for future longitudinal research to characterize.

The assumption that population rates used for constructing rate ratios for all reproductive-age women are similar to non-pregnant women of the same age, slightly lowers the power to show differences in risk between the pregnant and non-pregnant groups and has a potential for introducing bias by age, race, and other factors associated with the probability of being pregnant. Among assault cases, pregnancy-associated cases made up as much as 25% of the cases of some age groups (10.1% overall), however, this was corrected in the severely injured group where pregnancy-associated cases did not make up such a large proportion (3.4% overall).

Hospital discharge data are affected by the quality of coding among contributing hospitals.[46-48] For intentional injuries, methods for screening and documentation are

not always specified and may vary among locales. As long as these vagaries are consistently applied within and among hospitals, the results contrasting pregnant women may be more valid from a comparative standpoint, but less so from a vantage seeking accurate prevalence rates. Miscoding and undercounting will occur, but it is difficult to conjecture how systematic inclusions of pregnancy-associated codes among non-pregnant women, the type of error that could most affect the comparative results, would happen. However, it is acknowledged that inter-hospital coding differences combined with variation in hospital-specific rates could lead to some confounding and clustering effects, that the possibility remains that pregnant women may have different reasons for reporting or not reporting an injury as assault related and that the pregnancy screening algorithm was not validated.

One coding bias we could investigate to some degree was whether the E-coding rate differed between pregnancy-associated cases and the non-pregnancy associated cases. While we have no way to know the difference in E-coding for assaults specifically, because assaults are defined by E-codes themselves, we can look at general E-coding rates for all injury diagnoses by pregnancy status among all woman of child bearing age. Among resident women 15-49 with an acute diagnosis the proportion not E-coded was a little higher in the pregnant group (10.1%) versus the non-pregnant group (7.8%). The impact of this bias could lead to an underestimate of assaults among pregnant women and lowered rate ratio estimates. However it is pointed out that the difference was a little less of a factor once controlled by severity (see table below).

Exhibit 49. E-coding Completeness by Pregnancy status Women 15-39, 19 State HDD, 1997.

		Ecoded: Y or N				Table Total	
		Not E-coded					
		Count		Row %		Count	
		Whether pregnant		Whether pregnant		Whether pregnant	
		Not pregnant	Pregnant	Not pregnant	Pregnant	Not pregnant	Pregnant
ISS Group	Mild (ISS 1-12)	8924	442	10.8%	12.2%	83006	3621
	Moderate (ISS 13-19)	691	16	11.3%	11.8%	6117	136
	Severe (ISS 20-75)	584	16	14.8%	16.8%	3938	95
Table Total		11234	616	7.8%	10.1%	143623	6114

Another limitation is that women in early pregnancy are not likely, or at best, much less likely, than women in later pregnancy, to have the pregnancy identified and coded during a hospital stay. These cases will be misclassified into the non-pregnant group. Therefore, a diagnosis-based pregnancy definition, such as that used in the current study, is biased towards detection of later gestation pregnancies and does not measure risks well in early pregnancy. Future studies in this area would greatly benefit from routine pregnancy screening among young women and documentation of the results in the summary discharge record and data systems.

The last limitation mentioned is that the study did not and could not adjust for the amount of exposure to the agent of intimate partner violence, namely the intimate partner himself. This is a potential confounder when looking at pregnancy-associated assaults because by definition, pregnant women have been exposed to an intimate partner. Since the comparison population is all women, it seems possible that a portion of the comparison population was not in a intimate relationship and thus was not "exposed" as often to men who carryout the violence that ends up in hospitalization. Or put another way, the excess assault risk associated with pregnancy in the youngest age group may be partly due to the fact that pregnant women are more likely to be in an intimate relationship than their non-pregnant counterpart, and not the pregnancy itself. The impact of this inability to adjust for exposure is not quantifiable with this study, but if it occurs, its effect would be to overestimate the risk of pregnancy-associated violence. Thus, at least part of the remaining excess risk after severity adjustment seen among the 15-19 year olds, may be derived from the limitations of the study methods.

Sensitivity of the Pregnancy Screening Algorithm

Because of confidentiality restrictions, the large number of cases that were identified and resource limitations, it was not possible to verify from original medical records whether the pregnancy screening algorithm picked up most of the cases it was designed to. One indication, however, that the screen was reasonably sensitive can be garnered by comparing the rate of pregnancy-associated injury hospitalization in the

19 state data used in this report with a recent study of pregnancy-associated injury hospitalization that used a completely different technique.

In a recently published paper, Schiff and colleagues identified pregnant and injured women by linking birth and fetal death certificate files with Washington State hospital discharge data for the years 1989 to 1997. [51;56] Excluding poisonings, they reported the overall incidence of pregnancy-associated injury hospitalizations of 243/100,000 live births. For comparison, the 19 state data showed a rate of 232 pregnancy-associated hospitalized injuries (excluding poisonings) per 100,000 live births. A priori, assuming the availability and completeness of good linkage variables (names in this case) the linkage technique would be expected to be a more sensitive way to assign pregnancy to a particular hospitalization. The fact that both techniques came up with fairly similar injury rates provides some circumstantial evidence that the ICD screening used in this report was reasonably complete.

Conclusions & Implications

This is the first study to address the prevalence and risk of pregnancy-associated hospitalized assaults in a large multi-state population. While it described a significant increase in the non-age and non-race stratified rate ratio for pregnancy-associated assaults, it showed the importance of examining the issue of pregnancy risk by three important factors:

- Age; because assaults against women occur most often in the young and young women are most likely to be pregnant, even among a population limited to women of reproductive age,
- Race; because rates of assaults are much higher in non-whites, and pregnancy rates are considerably higher among non-whites,
- Severity; because pregnancy-associated cases are much more likely to be admitted for less serious injuries for both intentional and unintentional injuries.

Without taking these factors into account, it will almost always appear from studies in clinical settings where non-injury abuse events are frequently examined or injuries are not as serious, that pregnancy-associated cases are much more likely to be seen for assault-related conditions. However, this study demonstrated that both age and race-specific rate ratios were markedly reduced once they are adjusted for injury severity. For both whites and non-whites overall, after severity adjustment, there was no significantly elevated rate ratio. Only moderate increases in the rate ratio remained among the 15-19 year-old age group (significant in non-whites, not significant for whites), for firearm related assaults and for abdomen and pelvic organ injuries.

These results update and refine the estimates of pregnancy-associated hospitalized assaults to women derived by Greenblatt et. al. in Maryland. In our larger study with better E-coding and a broader population base, assaults made up 5.4% of hospitalized injuries to all women of reproductive age (21/100,00 person years) and 13.6% among pregnancy-associated patients 65/100,00 person years). Once adjusted for age and severity, overall there was little difference in the risk of serious injury from assault

during pregnancy, in accordance with the only other analogous population-based study that looked at changes in abuse risk during pregnancy. [32]

In terms of costs, due to their lower severity, the median charge per visit for pregnancy-associated assault cases in this study was less that the median for all women of reproductive age ($3,351 versus $6,775). Overall, pregnancy-associated cases represented 5% of the charge burden for hospitalized assaults among all women of reproductive age.

While this report quantified the propensity for pregnant women to be admitted for more minor assaultive (and other) injuries, it cannot tell why this occurs. Likely explanations include that given identical injuries, pregnant women are more likely to be hospitalized due to medical concerns over the fetus. Related to that, another reason may be a desire by clinicians and hospital personnel to protect pregnant women by having them safely away from home for a period of time until the social situation can be better clarified. Another reason may be that pregnant women have more contact with the health care system and may find access easier. Because of concern over their baby, pregnant women may also be more likely to present themselves or be encouraged to go to a hospital for treatment of less serious injuries. While this study cannot rule out the possibility that pregnant women are more likely to be disproportionately assaulted with less serous injury (lower severity), this seems unlikely and would be difficult to investigate.

Most other studies of assault and pregnancy have focused on small clinics or urban populations, often over-represented by socially disadvantaged minorities. Because most serious injuries will be seen in a hospital, regardless of race, social and economic class, the findings of this report represents demographic comparisons cutting across all ages, urban and rural areas, socio-economic groups, insurance coverage, races, and time. Thus, a clearer picture emerges of the relative risks of serious assaults leading to serious injury to women in different population groups. Another advantage of this population approach was the ability to track large numbers of women. The hospitalization experience of 36 million women of reproductive age was examined. Because of the increasingly small proportions of those women hospitalized for an

injury, while pregnant, and among those, hospitalized for an assaultive injury and among those, hospitalized for a serious assaultive injury, it took a large population to examine the question with enough cases left over to look at risk within race and age groups. By doing so the project met its stated aims.

Because the study found widespread poor perpetrator E-coding, an important implication of this research is the need to strengthen the completeness of perpetrator documentation and coding. This might be accomplished by more and better training of coders, changes to electronic systems to allow the better use of multiple E-codes and better documentation by clinicians in the ED and among inpatients of the perpetrator's relationship to the patient. Comparative research is needed, however to determine exactly what practices and systems enhance perpetrator E-coding and what factors may be important barriers. The findings that pregnant women and white women are more likely to receive a perpetrator code suggest new areas of research to explore.

Better documentation and coding, however, is not likely to emerge simply because of regulations or requests. Health care providers need to made aware of the value of screening and documentation to the individual, the health care system, and the public's health.[57] For the individual, it may help uncover overlooked injuries or conditions, suggest ways to prevent future episodes of violence leading to injury, and lead to safer situations for the mother and child. Since women who are victims of violence have higher health care costs,[58] prevention even of the mild injuries may have an impact on the bottom line of managed care health systems.

Better documentation and coding may also lead to improved surveillance and characterization of domestic violence in state based hospital discharge systems, whether directly or through linking databases to look at special populations.[51] Perhaps the rate of perpetrator coding among hospitalized assaults by different institutions can be used as a widespread measure to monitor the outcomes of policies designed to improve the screening and surveillance of intimate partner violence. Once the coding is improved, E-codes can more precisely be used to monitor the efficacy of community programs to prevent both pregnancy-associated and non-pregnancy associated assaults and intimate partner violence. The demonstration that pregnancy

related assaults can be identified from hospital records also brings up the possibility of researchers using such data to examine links between serious assaults during pregnancy and subsequent birth outcomes and child abuse risk. Child welfare and enforcement agencies should consider using such information for early interventions in situations where the young children may be at high risk of subsequent abuse or as supplements to domestic violence homicide and child fatality review investigations.

The large race disparity in the rates of hospitalized assaults of young women , regardless of pregnancy status, means there needs to be more attention paid to the cultural and socio-economic implications of these findings. While domestic violence advocates have gone to great lengths to emphasize that domestic violence can happen to anyone, this study, along with others[49;50] makes it clear that the risks of serious assaultive injury are not evenly divided between white and non-white, regardless of pregnancy status. We need to better understand why this is so and what interventions are effective in reducing this disparity.

Returning to the pregnancy issue, it may be helpful for practitioners to think of pregnant women as a "sensitive" population, more than an "at-risk" population. They are sensitive to assaults because they are young and that is when assaults rates are high. They are sensitive because birth rates are higher in non-whites who are at higher risk for assaults. They are sensitive to being hospitalized because the hospitalization threshold appears to be considerably lower for pregnant women for all types of trauma (including those caused by motor vehicle crashes, falls, overexertion as well as mechanisms associated with assaults) because of concerns for the two lives that are involved.

As a sensitive population, pregnant women are a special group worth addressing for both primary and secondary preventive efforts. Because women who are abused during pregnancy have been shown in other studies to be a higher risk for serious injury and continued abuse and because the child is at increased risk for abuse later in life, it is especially necessary that women be identified by screening for abuse at each prenatal visit. As a marker of potentially serious abuse, detection of abuse during

pregnancy should initiate further follow-up such as post-partum home visits that include assessment for further family violence and referral if problems continue.

Lastly, attention to pregnant women should take place in conjunction with broader efforts aimed at reducing the differential of the rate of assault by age, socio-economic status and race, regardless of current pregnancy status. This is true women drop in and out of the pregnancy-associated group over short periods of time (no more than nine-months by definition) and it may often be difficult to predict which young women will be pregnant at the next encounter with the health or judicial system and who will not. Thus, most young women at high risk of assault should be seen as women who may become pregnant. Non-pregnant young women at high risk for intimate partner violence compared to those young women in a risky intimate relationship that become pregnant, probably have much more in common then they do differences. Thus, promoting effective for screening all young women for abuse by health care personnel in both obstetric and non-obstetric settings is appropriate.

Appendix

Appendices Index

Appendix A. Case Selection Process Details

The general approach to defining the population to be studied was to identify hospital discharge cases of acute injury and poisoning among females 15-49. Readers not familiar with the sometimes arcane details of ICD9-CM coding should be aware that not all external cause of injury codes, e.g. E-codes, describe acute injury conditions, not all diagnosis codes in the range 800-995 should be deemed as acute injuries and some acute injuries are defined by codes below 800. A complicated selection process was implemented with the goal of selecting cases only with acute injuries containing associated mechanism codes. Thus, the term "injury related" is used to qualify E-code and diagnosis code ranges based on a detailed inclusion and exclusion algorithm implemented in SAS. The principles behind this algorithm are described below.

Original data – Data requests were made to all states which were known to have mandated or high rates of voluntary E-coding as of 1997. Some states charged for their data, some did not. In the end, complete (all age and gender) HDD was received from 19 states.

Injury selection process – This multi-step process filtered several types of cases. First, obvious duplicate records were removed. Next, only cases were included containing an injury related E-code[1] anywhere in the record *or* an injury related diagnosis[2] in the first three diagnosis fields. Most state databases contained an E-code specific field, but all diagnosis fields were searched for compatible E-codes. If a non-injury related E-code was found in the E-code field (e.g., place of injury code), it was replaced by the first mentioned acute injury related E-code found in sequential diagnosis fields. The first occurrence of an acute injury related diagnosis was used to define the primary acute injury related diagnosis. Cases that lacked injury diagnoses,

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[1] Injury related E-codes were all E-codes except medical misadventures (E870's), adverse effects of drugs in therapeutic use (E930-E940's), late effect E-codes, location codes (E849's) and second-hand smoke (E869.4).

[2] Injury related diagnoses were defined as 800-994 (except 909.3, which is late effect of 996-999), the maltreatment codes in 995 and the five diagnoses of 363.31, 370.24, 371.82, 388.11, and 760.5.

where the injury E-code was judged to be improperly applied to a non-injury case, were deleted.[3] Cases from identifiable psychiatric specialty hospitals were also dropped. These latter deletions affected only a small proportion of records. Injury mechanism and intent were defined on the basis of a slightly modified injury mechanism and intent E-code based matrix described elsewhere. The main modification was that cases that were coded with a diagnosis related to poisonings but no E-code were assigned to the poisoning mechanism with undetermined intent.

Age/gender inclusion filter – The data set was filtered to only include acute injury related discharges for females ages 15-49.

Rehabilitation hospital exclusion process – In order to try and avoid selecting visits to rehabilitation hospitals and visits that were not acute care related, cases were excluded if they were coded with a DRG of "462" (indicating a rehabilitation visit) or a diagnosis in one of the first three fields of "V57" (care involving rehabilitation procedures).

Acute injuries with a valid injury mechanism code – Since there were records with an acute injury related E-code without an acute primary injury related diagnoses, and vice versa, it is necessary to carefully define what is meant by an injury case based on ICD codes. Because the discharge databases were fairly completely E-coded (around 90%, averaged across the states) and the purpose of this study was to focus on mechanism and intent information available from E-codes, we examined only cases that had *both* an acute injury related E-code (derived from the computed mechanism variable) and an acute primary injury related diagnoses in any of the first three diagnosis fields. This decision had the effect of disproportionately eliminating more pregnancy-associated cases. Among the primary diagnoses of the pregnancy-associated cases excluded, 17%, were admitted for an early threat to labor, 14% for other maternal conditions and 6% were admitted for observation following an event

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[3] These included questionable coding practices such as the use of E927 (overexertion) with respiratory and circulatory disease events or E880s (falls) when the fall is the result of a disease event (e.g., heart attack) rather than the cause of an injury.

(usually motor-vehicle related) where injury to the mother was not documented in the computerized abstract. The leading injury mechanisms reported in this group were motor vehicle occupant (29%), falls (18%) and struck by (5%) with 8% reported as assault-related. Non-pregnant women suffering these "potential" injury episodes ('potential' because they were not accompanied by an injury diagnosis in the first three diagnostic fields) would probably be treated as outpatients and released or not even present at a hospital, but pregnant women are sometimes admitted for observation due to fetal concerns, even though the mother did not suffer an injury or a serious injury herself. Removing these cases makes the case stronger for the legitimacy of rate comparisons by pregnancy status for hospitalized cases, where hospitalization is meant to be a proxy for injury severity.

Pregnancy-associated definition – Pregnancy relatedness was determined by a computerized search for pregnancy-associated conditions based on selected ICD-CM codes. The search included diagnosis codes such as: Complications of pregnancy and childbirth (N630-N669.9), Ectopic and molar pregnancy (N630-N633.9), Other pregnancy with abortive outcome (N634-N639.9, spontaneous, legal, illegal, etc.), Complications mainly related to pregnancy (N640-N648.9), Normal delivery (N650-N659.9) and other indications for care in pregnancy, labor, and delivery, Complications occurring mainly in the course of labor and delivery (N660-N669.9), Certain conditions originating in perinatal period (N760-N779.9), selected V-codes,[4] and selected procedure codes (72-75, delivery related procedures, cesarean, other obstetric procedures).

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[4] Normal pregnancy (V22.0-V22.9), supervision of high risk pregnancy (V23.0-V23.9), (V27.0-V27.9)outcome of delivery (could use to possibly flag stillbirths), single liveborn (V27.0), postpartum care immediately after delivery (V24.0), single stillborn (V27.1), twins, both liveborn (V27.2), twins, one liveborn and one stillborn (V27.3), twins, both stillborn (V27.4), other multiple birth, all liveborn (V27.5), other multiple birth, some liveborn (V27.6), other multiple birth, all stillborn (V27.7), unspecified outcome of delivery (V27.9), antenatal screening (V28.0-V28.9), liveborn infants according to type of birth (V30-V39), single liveborn (V30), twin, mate liveborn (V31), twin, mate stillborn (V32), twin, unspecified (V33), other multiple, mates all liveborn (V34), other multiple, mates all stillborn (V35), other multiple, mates live- and stillborn (V36), other multiple, unspecified (V37), not a valid code (V38), unspecified (V39), multiparity (V61.5), illegitimacy or illegitimate pregnancy (V61.6), or other unwanted pregnancy (V61.7).

Multiple visits - It was not possible to identify in most states which cases may have been admitted more than once for the same condition. An approximation of the impact of duplication of cases due to multiple admissions was examined by looking at California data which contains a pseudopatient identifier.

The ACUTE variable groups cases according the acuity of the primary injury diagnosis (DX0) and the primary injury E-code (E0). It is applicable only to records that have been identified as injuries because of the presence of either an injury diagnosis or an injury E-code. Given this prerequisite for inclusion in this process, most records will be classified as acute injuries (800-904, 910-959, 991-994), acute poisoning (960-989), or acute radiation (990). In addition to the usual 800-994 injury range, a number of below-800 diagnoses that indicate acute injuries when E-coded were also grouped in these categories. Another classification that usually corresponds to acute conditions is maltreatment, which captures both the adult and child maltreatment codes under 995. The respiratory category contains respiratory conditions with an external cause, such as pneumoconioses (4930, 495, 500-508). Some of these conditions might be acute, while others are chronic, but all have an external cause and are therefore eligible to be E-coded.

The other two major types of categories are late effects and injury/poisoning/radiation-related. A record is coded as late effect if either DX0 or E0 is a late effect code. For injuries, late effects are categorized according to whether they have a late effect diagnosis (N), a late effect E-code (E), or both (E+N). Late effects of poisoning and radiation have their own late effect categories. The inj/poi/rad-related categories are catch-alls for records whose E-codes indicate incidents with injury potential, but which do not indicate treatment for injury. This category is dominated by skin conditions, musculoskeletal conditions, complications of pregnancy, general symptoms, and observation. Some of these cases are probably late effects of minor injuries that were not treated when they occurred, resulting in infection (skin conditions) or complications (musculoskeletal conditions). Others appear to be cases where a person who suffered an event with injury potential was held for observation but did not require treatment for injury. A number of these cases involved pregnant

women, who were apparently held for conditions related to the fetus, rather than the mother.

It should be emphasized that this variable is based only on DX0 and E0. Further analysis of records would demonstrate that many of these records do not represent acute hospitalizations, even though DX0 is an acute diagnosis. If a late effect or rehabilitation code appears further down the list of diagnoses or E-codes, the case would still be labeled as acute, based on DX0. The variable REHAB, which identifies hospitalizations for rehabilitation, represents an attempt to supplement ACUTE with information from other data fields.

Case selection summary – (n = number of records after inclusion criteria applied):

- **Original data** – All age, gender and cause hospital discharge records from 19 states (n ≅ 13,000,000, raw record count, duplicates not removed);
- **Injury selection process** – All injury and poisoning related hospital discharge records with duplicates removed (n = 1,220,506 records, 50% female);
- **Age/gender filter** – All injury related discharges for females ages 15-49 (n = 176,267 records, 8,265 pregnancy-associated);
- **Rehabilitation hospital exclusion process** – No DRG or V-code evidence of rehabilitation as purpose of visit, acute injury, poisoning or maltreatment code, length of stay one day or greater (n = 156,713 records, 6,274 pregnancy-associated)
- **Valid Injury E-code** – Retained only records with a valid injury diagnosis (n = 144,260 records, 5,640 pregnancy-associated);
- **Resident of State** – Retained only records of patients that were residents of the state for consistency with denominators (n = 137,887 records, 5,498 pregnancy-associated);
- **Assaults** – Focused on records coded as an assault (n = 7,402 records, 745 pregnancy-associated.

The above steps were applied to all age and gender injury discharges (n = 1,220,506) and the cases were progressively limited to females 15-49 years of age (n = 176,267), with acute care visit (n = 156,713), who had a valid injury E-code assigned (n = 144,260), who were residents of the state (n = 137,887), with an assault-related hospitalization (n = 7,402).

Selection Criteria	Number	Pregnancy-associated
Original data (estimated)	13,000,000	-
Injury selection process	1,220,506	
Age/gender filter (female, 15-49)	176,267	8,265
Acute Care and Rehabilitation hospital exclusion	156,713	6,274
Valid Injury E-code	144,260	5,640
Resident	137,887	5,498 (4%)
Assaults	7,402	745 (10%)

Appendix B. Cost Model Development

Monetary measures in this study included total hospital charges; lifetime medical costs; lifetime productivity loss; and lifetime monetized Quality-Adjusted Life Years (QALY). As recommended by the Panel on Cost-Effectiveness in Health and Medicine,[59] we report the present value of future costs computed at a 3% discount rate and adopt a societal perspective that includes all costs associated with unintentional injuries—costs to victims, families, government, insurers, and taxpayers. The incidence-based costs reported estimate the present value of all expected costs over the patient's expected life span. For costs that will occur in future years, the "present value" is estimated, defined as the amount one would have to invest today in order to pay these costs when they come due. Costs were not assigned to duplicated records, readmissions, or fatalities. Cost was estimated in 1996 dollars separately for medical and other direct costs, and quality of life loss.[59] Medical costs were estimated using the methods employed in building the U.S. Consumer Product Safety Commission's (CPSC) injury cost model. These methods have been documented elsewhere.[60]

Briefly, costs of initial treatment for the injuries were extracted from the hospital discharge data. Medical follow-up, rehabilitation, and long-term costs were computed by diagnosis from national data.

Productivity cost estimates also paralleled the CPSC injury cost model.[60] This model takes into account both the short-term and long-term productivity costs. Long-term costs may accrue due to permanent disabilities. The primary data sets used to estimate the extent of productivity losses included the 1987–1996 National Health Interview Survey (National Center for Health Statistics, US Centers for Disease Control, Hyattsville, Maryland), the 1993 Survey of Occupational Injury and Illness (U.S. Bureau of Labor Statistics, Washington, DC) and the Detailed Claims Information database (National Council on Compensation Insurance, Boca Raton, Florida).

For QALY losses associated with temporary or permanent disability, estimates by injury diagnosis and victim age were taken from a previous study.[61] These estimates combined physician ratings of the impact of injuries over time on a person's ability to think, see, walk, and feel pain.[61] The estimates also included diagnosis-specific insurance data on the probability that an injury would permanently reduce earning capacity or prevent the victim from working and on the percentage earnings reduction.[60] The estimated impairment impacts were translated into QALY losses using survey data that weighed the importance that respondents placed on different dimensions of impact.[60-64]

Appendix C. Selected Portions of the ICD-9-CM Guidelines for Coding and Reporting

The Public Health Service and the Health Care Financing Administration of the U.S. Department of Health and Human Services present the following guidelines for coding and reporting using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM).[5] These guidelines should be used as a companion document to the official versions of the ICD-9-CM. These guidelines for coding and reporting have been developed and approved by the cooperating parties for ICD-9-CM: American Hospital Association, American Health Information Management Association, Health Care Financing Administration and the National Center for Health Statistics. These guidelines previously appeared in the Coding Clinic for ICD-9-CM, published by the American Hospital Association.

These guidelines have been developed to assist the user in coding and reporting in situations where the ICD-9-CM manual does not provide direction. Coding and sequencing instructions in the three ICD-9-CM manuals take precedence over any guidelines.

11.5 CHILD AND ADULT ABUSE GUIDELINE

A. When the cause of an injury or neglect is intentional child or adult abuse, the first listed E-code should be assigned from categories E960-E968, Homicide and injury purposely inflicted by other persons, (except category E967). An E code from category E967, Child and adult battering and other maltreatment, should be added as an additional code to identify the perpetrator, if known.

B. In cases of neglect when the intent is determined to be accidental E code E904.0, Abandonment or neglect of infant and helpless person, should be the first listed E code.

11.6 UNKNOWN OR SUSPECTED INTENT GUIDELINE

A. If the intent (accident, self-harm, assault) of the cause of an injury or poisoning is unknown or unspecified, code the intent as undetermined E980-E989.

B. If the intent (accident, self-harm, assault) of the cause of an injury or poisoning is questionable, probable or suspected, code the intent as undetermined E980-E989.

11.7 UNDETERMINED CAUSE

When the intent of an injury or poisoning is known, but the cause is unknown, use codes: E928.9, Unspecified accident, E958.9, Suicide and self-inflicted injury by unspecified means, and E968.9, Assault by unspecified means. These E codes should rarely be used as the documentation in the medical record, in both the inpatient and outpatient settings, should normally provide sufficient detail to determine the cause of the injury.

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[5] National Center for Health Statistics. (1997). International Classification of Diseases, Ninth Revision, Clinical Modification, Sixth Edition: Official Guidelines and Conversion Table. http://www.cdc.gov/nchswww/datawh/ftpserv/ftpICD-9/ftpICD-9.htm, October 6, 1997.

Appendix D. Distribution of All Injuries for All Women by Mechanism and Age Group

Mechanism of injury	Age Group (Years)																		Group Total
	Under 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85 +	
1 Cut/pierce	.1%	.1%	.1%	.2%	.2%	.2%	.2%	.3%	.2%	.1%	.1%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	2.0%
2 Drowning/submersion	.1%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.1%
3 Fall	.8%	.7%	.4%	.4%	.4%	.5%	.7%	.9%	1.0%	1.2%	1.4%	1.6%	2.0%	3.2%	5.4%	8.1%	10.2%	17.2%	56.1%
4 Fire/flame	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.5%
5 Hot object/substance	.2%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.1%	.8%
6 Firearm	.0%	.0%	.0%	.1%	.1%	.1%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.4%
7 Machinery	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.2%
8 MVT Occupant	.2%	.2%	.2%	1.1%	.8%	.7%	.7%	.7%	.6%	.5%	.5%	.4%	.3%	.4%	.5%	.5%	.4%	.2%	8.9%
9 MVT Motorcyclist	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.3%
10 MVT Pedal cyclist	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.1%
11 MVT Pedestrian	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	1.5%
12 MVT Unspecified	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.5%
13 MVT Other	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.1%
14 Pedal cyclist, other	.0%	.1%	.1%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.5%
15 Pedestrian, other	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.1%
16 Transport, other	.0%	.0%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.0%	.0%	.0%	.1%	.1%	.1%	.1%	1.1%
17 Bites and stings	.1%	.1%	.0%	.0%	.0%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.0%	.0%	.0%	.0%	.0%	.0%	1.1%
18 Other natural/env	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.1%	.1%	.5%
19 Overexertion	.0%	.0%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.2%	.1%	.2%	2.0%
20 Poisoning	.5%	.1%	.6%	1.8%	1.1%	1.3%	1.5%	1.7%	1.5%	1.0%	.7%	.4%	.3%	.3%	.4%	.3%	.3%	.3%	13.9%
21 Struck by/against	.1%	.1%	.1%	.2%	.1%	.2%	.2%	.2%	.2%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	2.2%
22 Suffocation	.1%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.1%	.1%	.1%	.1%	.5%
23 Other spec & clasfbl	.3%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.1%	.0%	.0%	.0%	.1%	.1%	.1%	.1%	.1%	1.5%
24 Other specified, NEC	.0%	.0%	.0%	.0%	.0%	.0%	.1%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.1%	.6%
25 Unspecified	.1%	.0%	.1%	.1%	.1%	.1%	.2%	.2%	.2%	.2%	.2%	.2%	.2%	.3%	.4%	.5%	.5%	.7%	4.5%
Group Total	2.7%	1.8%	2.1%	4.5%	3.4%	3.7%	4.3%	4.8%	4.5%	4.0%	3.6%	3.3%	3.5%	4.9%	7.4%	10.2%	12.1%	19.4%	100.0%

Appendix E. Homicide/Hospitalized Assault Correlation

For purposes of qualifying the usefulness of data extrapolations to the national level, we tested the hypothesis that the numbers of age and gender specific homicides are highly correlated with age and gender specific hospitalized assaults. For stability purposes we used only the 14 states with the highest numbers of homicides from a three year period that bracketed the hospital discharge data from 1997 ('96-'98, source, CDC Wonder). Overall, the Pearson correlation coefficient was 0.896 (p=<.001) indicating very good correlation. However, from Exhibit 50, one can see there was fairly wide *interstate* variation in the ratio of homicides to hospitalizations. Thus, we conclude that since the states in the study differed by only 9% from the national age gender specific homicide rate, upward extrapolations, as a national conservative estimate, is realistic. However, extrapolation down to a specific state is not warranted due to large interstate variation.

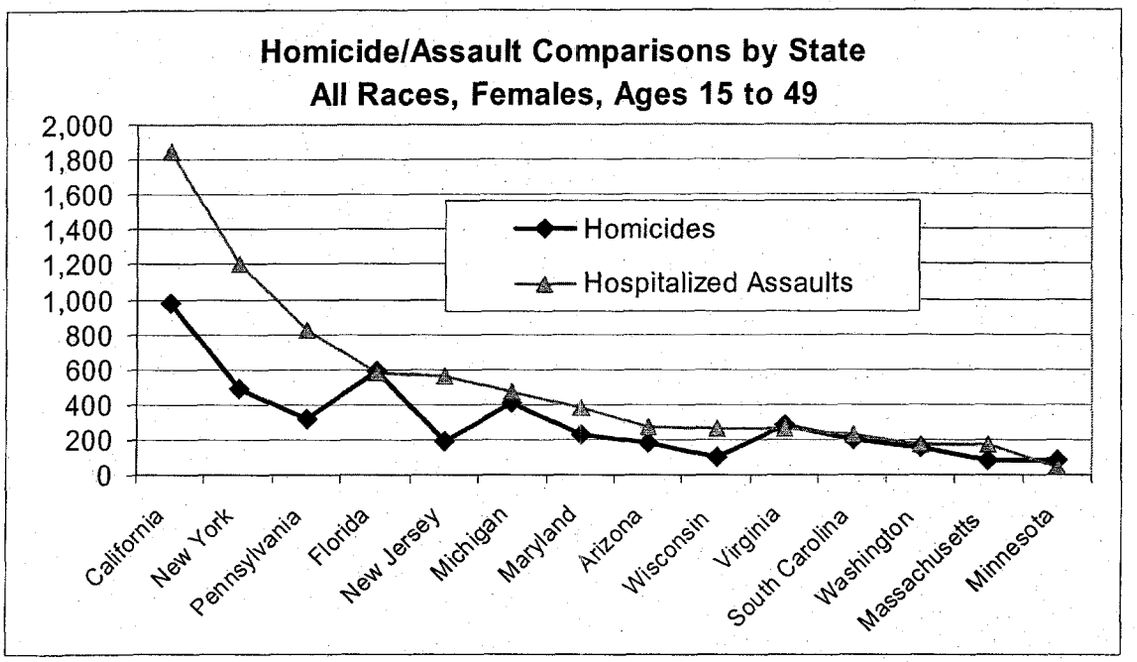

Exhibit 50. Comparison of numbers of reported female homicides, ages 15-49 from 1996-1998 (three years) to numbers of hospitalized assaults to females ages 15-47, 1997, for highest 14 states.

Further evidence for the reasonableness of the national extrapolations comes from examining other sources of national injury hospitalization estimates. Perhaps the most useful alternative is the NCHS National Hospital Ambulatory Medical Survey (NHAMCS), a nationwide sampling of emergency department visits. We averaged NHAMCS assault data for 1997 and 1998 from the Emergency Department Internet Query System (http://www.nahdo.org/ediq/index1.htm, queried Sept. 10, 2001). This query system reported an estimated 19,877 female hospitalized assaults. This compares with the 18,898 estimate (5% lower) extrapolating from the 19 state data.

Appendix F. Perpetrator Coding Completeness

Since perpetrator coding was so poor, it is useful to look at which groups were more or less likely to receive a perpetrator code. Such information can show where it needs to be improved and what factors might influence whether a case receives a perpetrator code or not. The tables below contains univariate analyses of perpetrator completeness among all women 15-49 hospitalized with an assaultive injury. The most important factors associated with an increase in the perpetrator coding completeness rate were being white and being pregnant. Considerable variation by state was also evident.

Exhibit 51. Perpetrator coding completeness for selected variables for hospitalized assaults among women of reproductive age (15-49), 19 State HDD, 1997.

		Perpetrator Coded		
		Count	Row %	Group Total
Age Group (Years)	15-19 yrs	86	8.0%	1073
	20-24 yrs	113	10.8%	1045
	25-29 yrs	115	9.8%	1171
	30-34 yrs	131	9.7%	1345
	35-39 yrs	128	9.9%	1289
	40-44 yrs	104	11.2%	928
	45-49 yrs	84	15.2%	551
Group Total		761	10.3%	7402
Race	White	403	14.4%	2799
	Black	162	5.3%	3053
	Other	77	10.3%	746
	Unknown	34	11.2%	303
Length of Stay	<=1 Day	228	9.8%	2319
	2-3 Days	278	11.7%	2383
	4-7 Days	165	9.4%	1752
	8-14 Days	54	9.7%	554
	> 2 Weeks	19	7.7%	248
ISS Group	Mild (ISS 1-12)	451	7.6%	5943
	Moderate (ISS 13-19)	30	6.7%	449
	Severe (ISS 20-75)	19	8.6%	222
Whether pregnant	Not pregnant	572	8.6%	6657
	Pregnant	189	25.4%	745
Payer Group	Government	367	10.3%	3569
	Private	222	11.8%	1877
	Other	172	8.8%	1956

Exhibit 52. Perpetrator coding completeness by state for hospitalized assaults among women of reproductive age (15-49), 19 State HDD, 1997.

	Perpetrator Coded		
State	Group Total	Row %	Group Total
AZ	42	15.3%	275
CA	246	13.3%	1846
FL	51	8.7%	583
MA	32	18.8%	170
MD	33	8.6%	384
ME	3	18.8%	16
MI	45	9.5%	473
NE	3	6.1%	49
NH	1	9.1%	11
NJ	27	4.8%	560
NY	84	7.0%	1203
PA	71	8.6%	828
RI	2	5.3%	38
SC	17	7.6%	224
UT	10	23.3%	43
VA	13	5.0%	259
VT	2	50.0%	4
WA	26	15.2%	171
WI	53	20.0%	265
Total	761	10.3%	7402

A polynomial regression model (not shown) was constructed that showed that white women of reproductive age who were assaulted were 3 times more likely to receive a perpetrator code than non-white women and pregnancy-associated women were 5 times more likely to be assigned a perpetrator code than non-pregnancy-associated cases (both were significant at p = <001).

Detailed Tables

Notes for all detailed tables:

- Rates and rate ratios are not computed for cells with 5 or less observations.
- Cells with masked rate calculations due to small numbers are indicated by "*".
- The rates are presented as discharges per 100,000 person-years.
- Cells with no observations indicated by "–".
- "#VALUE" in a cell indicates that its value could not be computed due to small numbers or missing data. As the data is subsetted to fewer and fewer cases more and more cells do not have enough cases to compute stable rates.
- Because of missing data, totals are not always constant from one variable to another.
- The 12 tables below are presented in three groups (A,B,C) of four tables each. Each lettered group is a separate subset of the data:.

  A = All women of reproductive age (starting on page 92);

  B = Only the assault cases (starting on page 96);

  C = Only assault cases with an injury severity score of 4 or greater (the serious cases) (starting on page 100).

Each numbered table within a lettered group corresponds to a similar group of descriptive variables.

Appendix G. Pregnancy-associated vs. All Women – Demographics+, Table 1A

Exhibit 53. Rates of pregnancy-associated hospitalized injury and rates for all women of reproductive age by selected characteristics, 1997 19 State HDD, 1997.

		Pregnant Women		All Women			
Variable	**Value**	**No.**	**Rate**	**No.**	**Rate**	**Rate Ratio**	**95% CI**
Race	White	2635	288	85,944	297	0.97	(0.86, 1.01)
	NonWhite (excludes unknown	2082	863	31,080	436	1.98	(1.80, 2.07)
		4717					
Hispanic	Yes	985	387	12,488	250	1.55	(1.37, 1.65)
	No	3,269	362	94,907	306	1.18	(1.06, 1.23)
		4,254					
Age	15-19	1,036	830	21,266	460	1.81	(1.65, 1.92)
	20-24	1,540	601	15,940	368	1.63	(1.47, 1.72)
	25-29	1,319	414	17,457	352	1.18	(1.06, 1.24)
	30-34	979	339	20,325	363	0.93	(0.84, 1.00)
	35-39	505	365	22,893	381	0.96	(0.87, 1.05)
	40-44	110	412	21,309	378	1.09	(0.98, 1.31)
	45-49	9	746	18,697	383	1.95	(1.76, 3.74)
	Total	5,498	476	137,887	383	1.24	(1.13, 1.28)
Age/Race - White	15-19	422	475	12,979	356	1.34	(1.20, 1.47)
	20-24	689	349	9,099	268	1.30	(1.16, 1.41)
	25-29	655	255	10,276	263	0.97	(0.86, 1.05)
	30-34	517	218	12,518	280	0.78	(0.69, 0.85)
	35-39	278	246	14,456	297	0.83	(0.74, 0.93)
	40-44	68	318	14,095	306	1.04	(0.93, 1.32)
	45-49	6	642	12,521	311	2.06	(1.85, 4.60)
	Total	2,635	288	85,944	297	0.97	(0.86, 1.01)
Age/ Race - NonWhite	15-19	459	1,273	4,740	482	2.64	(2.42, 2.91)
	20-24	640	1,085	4,475	483	2.24	(2.05, 2.44)
	25-29	480	775	4,538	429	1.80	(1.64, 1.98)
	30-34	319	614	4,857	428	1.43	(1.31, 1.61)
	35-39	150	589	4,990	439	1.34	(1.22, 1.58)
	40-44	31	586	4,060	395	1.48	(1.34, 2.11)
	45-49	3	*	3,420	399	#VALUE!	#VALUE!
	Total	2,082	868	31,080	436	1.99	(1.81, 2.08)
Severity	Minor (ISS 1-3)	1,982	171	25,990	72	2.37	(2.27, 2.49)
	Moderate (ISS 4-7)	914	79	39,628	110	0.72	(0.67, 0.77)
	Serious (ISS 8-15)	342	30	14,086	39	0.76	(0.68, 0.84)
	Severe to Critical (ISS 16-75)	140	12	6,536	18	0.67	(0.56, 0.79)
Length of Stay	1 Day	2,345	203	48,425	134	1.51	(1.45, 1.57)
	2-3 Days	1,907	165	46,297	128	1.28	(1.23, 1.34)
	4-7 Days	789	68	26,343	73	0.93	(0.87, 1.00)
	8-14 Days	203	18	10,027	28	0.63	(0.55, 0.72)
	2 Weeks +	118	10	4,806	13	0.76	(0.64, 0.92)
Payer Source	Medicare	39	3	7,416	21	0.16	(0.12, 0.22)
	Medicaid	2,122	183	29,337	81	2.25	(2.15, 2.35)
	Worker's Comp	60	5	3,469	10	0.54	(0.42, 0.70)
	Other Govt	85	7	3,749	10	0.71	(0.57, 0.88)
	BC/Commerc/PPO	1,293	112	45,204	125	0.89	(0.84, 0.94)
	HMO	1,001	86	24,346	68	1.28	(1.20, 1.36)
	Self-Pay	625	54	18,054	50	1.08	(1.00, 1.17)
	Charity, NoChg	36	3	1,415	4	0.79	(0.57, 1.10)
	Other	58	5	1,393	4	1.30	(1.00, 1.69)
	Unknown	16	1	496	1	1.00	(0.61, 1.65)

Appendix H. Pregnancy-associated vs. All Women – Mechanism & Intent, Table 2A

Exhibit 54. Rates of pregnancy-associated hospitalized injury and rates for all women of reproductive age (15-49) by mechanism and intent of injury, 19 State HDD, 1997.

	Pregnant Women		All Women			
Mechanism	**No.**	**Rate**	**No.**	**Rate**	**Rate Ratio**	**95% CI**
Cut/pierce	171	15	6,757	19	0.79	(0.68, 0.92)
Drowning/submersion	-	-	126	0	-	#VALUE!
Fall	1,164	101	24,239	67	1.50	(1.41, 1.59)
Fire/flame	26	2	1,025	3	0.79	(0.54, 1.17)
Hot object/substance	58	5	1,173	3	1.54	(1.18, 2.00)
Firearm	76	7	1,534	4	1.54	(1.23, 1.94)
Machinery	8	1	426	1	0.58	(0.29, 1.18)
MVT Occupant	1,488	129	24,675	68	1.88	(1.78, 1.98)
MVT Motorcyclist	18	2	993	3	0.56	(0.35, 0.90)
MVT Pedal cyclist	6	1	329	1	0.57	(0.25, 1.27)
MVT Pedestrian	108	9	2,823	8	1.19	(0.98, 1.44)
MVT Unspecified	91	8	1,531	4	1.85	(1.50, 2.29)
MVT Other	12	1	203	1	1.84	(1.03, 3.29)
Pedal cyclist, other	11	1	831	2	0.41	(0.23, 0.75)
Pedestrian, other	9	1	180	0	1.56	(0.80, 3.04)
Transport, other	45	4	2,649	7	0.53	(0.39, 0.71)
Bites/stings	49	4	2,106	6	0.72	(0.55, 0.96)
Other natural/environ	20	2	631	2	0.99	(0.63, 1.54)
Overexertion	218	19	3,791	11	1.79	(1.56, 2.05)
Poisoning	901	78	46,570	129	0.60	(0.56, 0.64)
Struck by, against	453	39	5,501	15	2.56	(2.33, 2.82)
Suffocation	8	1	410	1	0.61	(0.30, 1.22)
Other specified and classifiabl	194	17	2,202	6	2.74	(2.37, 3.18)
Other specified, not elsewhere	126	11	1,399	4	2.80	(2.34, 3.36)
Unspecified	238	21	5,783	16	1.28	(1.13, 1.46)
Intent						
Unintentional	3,976	344	87,624	243	1.41	(1.37, 1.46)
Self-inflicted	680	59	38,126	106	0.56	(0.51, 0.60)
Assault	745	64	7,402	21	3.13	(2.91, 3.38)
Other/unspec	63	5	2,895	8	0.68	(0.53, 0.87)

Appendix I. Pregnancy-associated vs. All Women – Nature of Injury, Table 3A

Exhibit 55. Rates of pregnancy-associated hospitalized injury and rates for all women of reproductive age (15-49) by nature of injury, 19 State HDD, 1997.

	Pregnant Women		All Women			
Nature of Injury	No.	Rate	No.	Rate	Rate Ratio	95% CI
Fractures	845	73	37,376	104	0.70	(0.66, 0.75)
Dislocations	60	5	2,480	7	0.75	(0.58, 0.97)
Sprains & Strains	453	39	6,914	19	2.04	(1.85, 2.24)
Crushing Injuries	3	*	128	0	*	#VALUE!
Amputations of Limbs	6	1	303	1	0.62	(0.27, 1.38)
Intrnl Orgn Inj,incl CNS	539	47	15,747	44	1.07	(0.98, 1.16)
Nerve Injuries	30	3	479	1	1.95	(1.35, 2.82)
Blood Vessel Injuries	14	1	415	1	1.05	(0.62, 1.79)
Open Wounds	422	36	11,335	31	1.16	(1.05, 1.28)
Superficial Injuries	215	19	2,328	6	2.88	(2.50, 3.31)
Contusions	721	62	5,141	14	4.37	(4.04, 4.72)
Burns	86	7	2,233	6	1.20	(0.97, 1.49)
Foreign Bodies	22	2	1,036	3	0.66	(0.43, 1.01)
Injury, Other & Unspec	802	69	2,259	6	11.05	(10.20, 11.98)
Poisonings	828	72	44,274	123	0.58	(0.54, 0.62)
Toxic Effects	94	8	3,043	8	0.96	(0.78, 1.18)
Other External Causes	196	17	1,051	3	5.81	(4.99, 6.76)
Early Complicatns/Trauma	5	*	344	1	*	#VALUE!
Illness Attrib/Ext Cause	1	*	30	0	*	#VALUE!
Musculoskeletal	156	13	971	3	5.00	(4.22, 5.92)

Appendix J. Pregnancy-associated vs. All Women – Site of Injury, Table 4A

Exhibit 56. Rates of pregnancy-associated hospitalized injury and rates for all women of reproductive age (15-49) by site of injury, 19 States HDD, 1997.

	Pregnant Women		All Women			
Bodypart	**No.**	**Rate**	**No.**	**Rate**	**Rate Ratio**	**95% CI**
Trunk, NFS	727	62.8	1577	4.4	14.4	(13.15, 15.67)
Other External Causes	194	16.8	1005	2.8	6.0	(5.15, 7.01)
Other & Ill-Defined	148	12.8	968	2.7	4.8	(4.00, 5.66)
Abdomen & Pelvic Organ	514	44.4	4956	13.8	3.2	(2.95, 3.54)
Head/Neck, NFS	52	4.5	616	1.7	2.6	(1.98, 3.49)
Spine & Back	524	45.3	7458	20.7	2.2	(2.00, 2.39)
Face	412	35.6	7315	20.3	1.8	(1.59, 1.94)
Thorax	183	15.8	5284	14.7	1.1	(0.93, 1.25)
Skull & Brain	345	29.8	10828	30.0	1.0	(0.89, 1.10)
Lower Extrem & Pelv Bone	982	84.8	31248	86.7	1.0	(0.92, 1.04)
Toxic Effects	94	8.1	3043	8.4	1.0	(0.78, 1.18)
Upper Extremity	453	39.1	16257	45.1	0.9	(0.79, 0.95)
Foreign Bodies	22	1.9	1036	2.9	0.7	(0.43, 1.01)
Neck	8	0.7	403	1.1	0.6	(0.31, 1.24)
Poisonings	828	71.5	44274	122.9	0.6	(0.54, 0.62)
Neck of Femur	7	0.6	1275	3.5	0.2	(0.08, 0.36)
Group Total	**5498**	**475.0**	**137887**	**382.7**	**1.2**	**(1.21, 1.28)**

Appendix K. Assaults: Pregnancy-associated vs. All Women – Demographics +, Table 1B

Exhibit 57. Rates of pregnancy-associated hospitalized assaultive injury and rates for all women of reproductive age (15-49) by selected characteristics, 1997 19 State HDD, 1997.

		Pregnant Women		All Women			
Variable	**Value**	**No.**	**Rate**	**No.**	**Rate**	**Rate Ratio**	**95% CI**
Race	White	235	26	2,799	10	2.65	(1.41, 3.03)
	NonWhite (excludes unknown	427	177	3,799	53	3.32	(2.54, 3.67)
		662					
Hispanic	Yes	150	59	905	18	3.25	(2.05, 3.86)
	No	408	45	4,990	16	2.81	(1.72, 3.11)
		558					
Age	15-19	209	167	1,073	23	7.22	(4.81, 8.38)
	20-24	225	88	1,045	24	3.63	(2.44, 4.20)
	25-29	154	48	1,171	24	2.05	(1.37, 2.42)
	30-34	106	37	1,345	24	1.53	(1.02, 1.86)
	35-39	37	27	1,289	21	1.25	(0.82, 1.73)
	40-44	13	49	928	16	2.96	(1.82, 5.11)
	45-49	1	*	551	11	#VALUE!	#VALUE!
	Total	745	65	7,402	21	3.14	(2.04, 3.39)
Age/Race - White	15-19	55	62	324	9	6.97	(3.61, 9.28)
	20-24	71	36	333	10	3.67	(1.96, 4.75)
	25-29	54	21	431	11	1.91	(1.06, 2.53)
	30-34	39	16	515	12	1.43	(0.80, 1.98)
	35-39	10	9	498	10	0.87	(0.47, 1.62)
	40-44	5	*	438	10	#VALUE!	#VALUE!
	45-49	1	*	260	6	#VALUE!	#VALUE!
	Total	235	26	2,799	10	2.65	(1.41, 3.03)
Age/ Race - NonWhite	15-19	123	341	605	62	5.54	(4.32, 6.73)
	20-24	129	219	598	65	3.39	(2.65, 4.10)
	25-29	87	140	622	59	2.39	(1.85, 2.99)
	30-34	59	114	695	61	1.85	(1.44, 2.42)
	35-39	22	86	666	59	1.47	(1.14, 2.25)
	40-44	7	132	381	37	3.57	(2.59, 7.54)
	45-49	-	-	232	27	#VALUE!	#VALUE!
	Total	427	178	3,799	53	3.34	(2.55, 3.69)
Severity	Minor (ISS 1-3)	304	26	3,157	9	3.00	(2.67, 3.37)
	Moderate (ISS 4-7)	59	5	1,767	5	1.04	(0.80, 1.35)
	Serious (ISS 8-15)	43	4	1,188	3	1.13	(0.83, 1.53)
	Severe to Critical (ISS 16-75)	16	1	502	1	0.99	(0.60, 1.63)
Length of Stay	1 Day	374	32	2,319	6	5.02	(4.50, 5.60)
	2-3 Days	214	18	2,383	7	2.80	(2.43, 3.22)
	4-7 Days	98	8	1,752	5	1.74	(1.42, 2.13)
	8-14 Days	22	2	554	2	1.24	(0.81, 1.89)
	2 Weeks +	11	1	248	1	1.38	(0.75, 2.53)
Payer Source	Medicare	3	*	225	1	*	#VALUE!
	Medicaid	419	36	2,903	8	4.49	(4.06, 4.98)
	Worker's Comp	3	*	65	0	*	#VALUE!
	Other Govt	19	2	441	1	1.34	(0.85, 2.12)
	BC/Commerc/PPO	49	4	922	3	1.65	(1.24, 2.21)
	HMO	101	9	955	3	3.29	(2.68, 4.04)
	Self-Pay	116	10	1,513	4	2.39	(1.98, 2.88)
	Charity, NoChg	5	*	151	0	*	#VALUE!
	Other	8	1	76	0	3.28	(1.58, 6.79)
	Unknown	1	*	15	0	*	#VALUE!

Appendix L. Assaults: Pregnancy-associated vs. All Women – Mechanisms, Table 2B

Exhibit 58. Rates of pregnancy-associated hospitalized assaultive injury and rates for all women of reproductive age (15-49) by mechanism of injury, 19 State HDD, 1997.

	Pregnant Women		All Women			
Value	No.	Rate	No.	Rate	Rate Ratio	95% CI
Cut/pierce	51	4	1,270	4	1.25	(0.95, 1.65)
Drowning/submersion	-	-	1	*	-	#VALUE!
Fall	6	1	41	0	4.56	(1.93, 10.73)
Fire/flame	-	-	34	0	-	#VALUE!
Hot object/substance	1	*	30	0	*	#VALUE!
Firearm	47	4	907	3	1.61	(1.20, 2.16)
Machinery	-	-	-	-	-	#VALUE!
MVT Occupant	-	-	1	*	-	#VALUE!
MVT Motorcyclist	-	-	-	-	-	#VALUE!
MVT Pedal cyclist	-	-	-	-	-	#VALUE!
MVT Pedestrian	-	-	-	-	-	#VALUE!
MVT Unspecified	-	-	-	-	-	#VALUE!
MVT Other	-	-	-	-	-	#VALUE!
Pedal cyclist, other	-	-	-	-	-	#VALUE!
Pedestrian, other	-	-	-	-	-	#VALUE!
Transport, other	-	-	-	-	-	#VALUE!
Bites/stings	-	-	-	-	-	#VALUE!
Other natural/environ	-	-	-	-	-	#VALUE!
Overexertion	-	-	-	-	-	#VALUE!
Poisoning	2	*	40	0	*	#VALUE!
Struck by, against	348	30	3,030	8	3.58	(3.20, 4.00)
Suffocation	2	*	29	0	*	#VALUE!
Other specified and classifiabl	154	13	792	2	6.05	(5.09, 7.19)
Other specified, not elsewhere	75	6	566	2	4.13	(3.24, 5.25)
Unspecified	59	5	661	2	2.78	(2.13, 3.63)

Appendix M. Assaults: Pregnancy-associated vs. All Women – Nature of Injury, Table 3B

Exhibit 59. Rates of pregnancy-associated hospitalized assaultive injury and rates for all women of reproductive age (15-49) by nature of injury, 19 State HDD, 1997.

	Pregnant Women		All Women			
Nature of Injury	**No.**	**Rate**	**No.**	**Rate**	**Rate Ratio**	**95% CI**
Fractures	49	4.2	1,918	5.3	0.8	(0.60, 1.06)
Dislocations	3	*	46	0.1	*	#VALUE!
Sprains & Strains	4	*	50	0.1	*	#VALUE!
Crushing Injuries	-	-	2	*	-	#VALUE!
Amputations of Limbs	-	-	9	0.0	-	#VALUE!
Intrnl Orgn Inj,incl CNS	72	6.2	1,772	4.9	1.3	(1.00, 1.60)
Nerve Injuries	5	*	64	0.2	*	#VALUE!
Blood Vessel Injuries	2	*	92	0.3	*	#VALUE!
Open Wounds	83	7.2	1,579	4.4	1.6	(1.31, 2.04)
Superficial Injuries	24	2.1	106	0.3	7.0	(4.53, 10.98)
Contusions	127	11.0	703	2.0	5.6	(4.66, 6.79)
Burns	2	*	70	0.2	*	#VALUE!
Foreign Bodies	-	-	3	*	-	#VALUE!
Injury, Other & Unspec	193	16.7	364	1.0	16.5	(13.86, 19.66)
Poisonings	3	*	76	0.2	*	#VALUE!
Toxic Effects	1	*	13	0.0	*	#VALUE!
Other External Causes	170	14.7	469	1.3	11.3	(9.47, 13.45)
Early Complicatns/Trauma	1	*	44	0.1	*	#VALUE!
Illness Attrib/Ext Cause	-	-	4	*	-	#VALUE!
Musculoskeletal	6	0.5	18	0.0	10.4	(4.12, 26.15)
Total	**745**	**64.4**	**7,402**	**20.5**	**3.1**	**(2.91, 3.38)**

Appendix N. Assaults: Pregnancy-associated vs. All Women – Site of Injury, Table 4B

Exhibit 60. Rates of pregnancy-associated hospitalized assaultive injury and rates for all women of reproductive age (15-49) by site of injury, 19 States HDD, 1997.

	Pregnant Women		All Women			
Bodypart	**No.**	**Rate**	**No.**	**Rate**	**Rate Ratio**	**95% CI**
Trunk, NFS	170	14.7	270	0.7	19.6	(16.18, 23.75)
Other External Causes	170	14.7	469	1.3	11.3	(9.47, 13.45)
Other & Ill-Defined	19	1.6	80	0.2	7.4	(4.48, 12.19)
Head/Neck, NFS	15	1.3	83	0.2	5.6	(3.25, 9.75)
Abdomen & Pelvic Organ	95	8.2	783	2.2	3.8	(3.05, 4.67)
Spine & Back	20	1.7	275	0.8	2.3	(1.44, 3.57)
Face	103	8.9	1644	4.6	2.0	(1.60, 2.38)
Lower Extrem & Pelv Bone	43	3.7	705	2.0	1.9	(1.40, 2.58)
Upper Extremity	48	4.1	1042	2.9	1.4	(1.07, 1.92)
Skull & Brain	30	2.6	916	2.5	1.0	(0.71, 1.47)
Thorax	22	1.9	797	2.2	0.9	(0.56, 1.31)
Group Total	**745**	**64.4**	**7402**	**20.5**	**3.1**	**(2.91, 3.38)**

Appendix O. Serious Assaults: Demographics+, Table 1C

Exhibit 61. Rates of serious (ISS ≥4) pregnancy-associated hospitalized assaultive injury and rates for all women of reproductive age (15-49) by selected characteristics, 1997 19 State HDD, 1997.

		Pregnant Women		All Women			
Variable	Value	No.	Rate	No.	Rate	Rate Ratio	95% CI
Race	White	33	4	1,341	5	0.78	(0.31, 1.10)
	NonWhite (excludes unknown	75	31	1,747	25	1.27	(0.85, 1.60)
		108					
Hispanic	Yes	25	10	407	8	1.20	(0.61, 1.80)
	No	76	8	2,388	8	1.09	(0.54, 1.37)
		101					
Age	15-19	29	23	431	9	2.49	(1.31, 3.63)
	20-24	30	12	451	10	1.12	(0.61, 1.62)
	25-29	27	8	550	11	0.76	(0.42, 1.13)
	30-34	22	8	625	11	0.68	(0.38, 1.04)
	35-39	7	5	670	11	0.45	(0.25, 0.96)
	40-44	3	*	458	8	#VALUE!	#VALUE!
	45-49	-	-	272	6	#VALUE!	#VALUE!
	Total	118	10	3,457	10	1.07	(0.57, 1.28)
Age/Race - White	15-19	7	8	138	4	2.08	(0.76, 4.45)
	20-24	10	5	153	4	1.13	(0.45, 2.14)
	25-29	8	3	211	5	0.58	(0.25, 1.17)
	30-34	6	3	223	5	0.51	(0.21, 1.14)
	35-39	1	*	255	5	#VALUE!	#VALUE!
	40-44	1	*	230	5	#VALUE!	#VALUE!
	45-49	-	-	131	3	#VALUE!	#VALUE!
	Total	33	4	1,341	5	0.78	(0.31, 1.10)
Age/ Race - NonWhite	15-19	19	53	239	24	2.17	(1.46, 3.46)
	20-24	17	29	244	26	1.09	(0.75, 1.79)
	25-29	18	29	288	27	1.07	(0.73, 1.72)
	30-34	13	25	326	29	0.87	(0.60, 1.52)
	35-39	6	24	346	30	0.77	(0.54, 1.74)
	40-44	2	*	185	18	#VALUE!	#VALUE!
	45-49	-	-	119	14	#VALUE!	#VALUE!
	Total	75	31	1,747	25	1.27	(0.86, 1.61)
Severity	Minor (ISS 1-3)	-	-	-	-	-	#VALUE!
	Moderate (ISS 4-7)	59	5	1,767	5	1.04	(0.80, 1.35)
	Serious (ISS 8-15)	43	4	1,188	3	1.13	(0.83, 1.53)
	Severe to Critical (ISS 16-75)	16	1	502	1	0.99	(0.60, 1.63)
Length of Stay	1 Day	31	3	1,081	3	0.89	(0.62, 1.28)
	2-3 Days	38	3	1,032	3	1.15	(0.83, 1.58)
	4-7 Days	14	1	351	1	1.24	(0.73, 2.12)
	8-14 Days	7	1	164	0	1.33	(0.62, 2.83)
	2 Weeks +	1	*	88	0	*	#VALUE!
Payer Source	Medicare	1	*	88	0	*	#VALUE!
	Medicaid	65	6	1,298	4	1.56	(1.22, 2.00)
	Worker's Comp	-	-	37	0	-	#VALUE!
	Other Gov't	6	1	217	1	0.86	(0.38, 1.94)
	BC/Commerc/PPO	9	1	482	1	0.58	(0.30, 1.12)
	HMO	8	1	455	1	0.55	(0.27, 1.10)
	Self-Pay	22	2	687	2	1.00	(0.65, 1.52)
	Charity, NoChg	2	*	80	0	*	#VALUE!
	Other	2	*	38	0	*	#VALUE!
	Unknown	-	-	7	0	-	#VALUE!

Appendix P. Serious Assaults: Mechanisms, Table 2C

Exhibit 62. Rates of serious (ISS ≥4) pregnancy-associated hospitalized assaultive injury and rates for all women of reproductive age (15-49) by mechanism of injury, 19 State HDD, 1997.

	Pregnant Women		All Women			
Value	No.	Rate	No.	Rate	Rate Ratio	95% CI
Cut/pierce	19	2	577	2	1.03	(0.65, 1.62)
Drowning/submersion	-	-	-	-	-	#VALUE!
Fall	4	*	31	0	*	#VALUE!
Fire/flame	-	-	20	0	-	#VALUE!
Hot object/substance	-	-	8	0	-	#VALUE!
Firearm	30	3	603	2	1.55	(1.07, 2.23)
Machinery	-	-	-	-	-	#VALUE!
MVT Occupant	-	-	-	-	-	#VALUE!
MVT Motorcyclist	-	-	-	-	-	#VALUE!
MVT Pedal cyclist	-	-	-	-	-	#VALUE!
MVT Pedestrian	-	-	-	-	-	#VALUE!
MVT Unspecified	-	-	-	-	-	#VALUE!
MVT Other	-	-	-	-	-	#VALUE!
Pedal cyclist, other	-	-	-	-	-	#VALUE!
Pedestrian, other	-	-	-	-	-	#VALUE!
Transport, other	-	-	-	-	-	#VALUE!
Bites/stings	-	-	-	-	-	#VALUE!
Other natural/environ	-	-	-	-	-	#VALUE!
Overexertion	-	-	-	-	-	#VALUE!
Poisoning	-	-	1	*	-	#VALUE!
Struck by, against	42	4	1,492	4	0.88	(0.64, 1.19)
Suffocation	-	-	9	0	-	#VALUE!
Other specified and classifiabl	7	1	243	1	0.90	(0.42, 1.90)
Other specified, not elsewhere	3	*	145	0	*	#VALUE!
Unspecified	13	1	328	1	1.23	(0.71, 2.15)

Appendix Q. Serious Assaults: Nature of Injury, Table 3C

Exhibit 63. Rates of serious (ISS ≥4) pregnancy-associated hospitalized assaultive injury and rates for all women of reproductive age (15-49) by nature of injury, 19 State HDD, 1997.

	Pregnant Women		All Women			
Nature of Injury	**No.**	**Rate**	**No.**	**Rate**	**Rate Ratio**	**95% CI**
Fractures	40	3.5	1,429	4.0	0.9	(0.64, 1.19)
Dislocations	2	*	32	0.1	*	#VALUE!
Sprains & Strains	1	*	11	0.0	*	#VALUE!
Crushing Injuries	-	-	2	*	-	#VALUE!
Amputations of Limbs	-	-	9	0.0	-	#VALUE!
Intrnl Orgn Inj,incl CNS	59	5.1	1,597	4.4	1.2	(0.89, 1.49)
Nerve Injuries	1	*	25	0.1	*	#VALUE!
Blood Vessel Injuries	2	*	60	0.2	*	#VALUE!
Open Wounds	5	*	188	0.5	*	#VALUE!
Superficial Injuries	-	-	2	*	-	#VALUE!
Contusions	2	*	20	0.1	*	#VALUE!
Burns	1	*	31	0.1	*	#VALUE!
Foreign Bodies	-	-	1	*	-	#VALUE!
Injury, Other & Unspec	1	*	4	*	*	#VALUE!
Poisonings	-	-	1	*	-	#VALUE!
Toxic Effects	-	-	1	*	-	#VALUE!
Other External Causes	4	*	41	0.1	*	#VALUE!
Early Complicatns/Trauma	-	-	3	*	-	#VALUE!
Illness Attrib/Ext Cause	-	-	-	-	-	#VALUE!
Musculoskeletal	-	-	-	-	-	#VALUE!
Total	**118**	**10.2**	**3,457**	**9.6**	**1.1**	**(0.88, 1.28)**

Appendix R. Serious Assaults: Site of Injury, Table 4C

Exhibit 64. Rates of serious (ISS ≥4) pregnancy-associated hospitalized assaultive injury and rates for all women of reproductive age (15-49) by site of injury, 19 States HDD, 1997.

	Pregnant Women		All Women			
Bodypart	**No.**	**Rate**	**No.**	**Rate**	**Rate Ratio**	**95% CI**
Spine & Back	6	0.5	116	0.3	1.6	(0.71, 3.66)
Abdomen & Pelvic Organ	24	2.1	465	1.3	**1.6**	**(1.07, 2.42)**
Upper Extremity	16	1.4	436	1.2	1.1	(0.69, 1.88)
Skull & Brain	23	2.0	722	2.0	1.0	(0.65, 1.50)
Lower Extrem & Pelv Bone	11	1.0	389	1.1	0.9	(0.48, 1.60)
Face	16	1.4	566	1.6	0.9	(0.54, 1.45)
Thorax	14	1.2	612	1.7	0.7	(0.42, 1.21)
Group Total	**118**	**10.2**	**3457**	**9.6**	**1.1**	**(0.88, 1.28)**

Appendix S. CDC E-code Matrix

	Manner/Intent				
Mechanism/Cause	**Unintentional**	**Self-inflicted**	**Assault**	**Undetermined**	**Other[1]**
Cut/pierce	E920.0-.9	E956	E966	E986	E974
Drowning/submersion	E830.0-.9, E832.0-.9 E910.0-.9	E954	E964	E984	
Fall	E880.0-E886.9, E888	E957.0-.9	E968.1	E987.0-.9	
Fire/burn	E890.0-E899, E924.0-.9	E958.1,.2,.7	E961, E968.0,.3	E988.1,.2,.7	
Fire/flame	*E890.0-E899*	*E958.1*	*E968.0*	*E988.1*	
Hot object/substance	*E924.0-.9*	*E958.2,.7*	*E961, E968.3*	*E988.2,.7*	
Firearm	E922.0-.9	E955.0-.4	E965.0-.4	E985.0-.4	E970
Machinery	E919 (.0-.9)				
Motor vehicle traffic[2,3]	E810-E819 (.0-.9)	E958.5	**E968.5**	E988.5	
Occupant	*E810-E819 (.0,.1)*				
Motorcyclist	*E810-E819 (.2,.3)*				
Pedal cyclist	*E810-E819 (.6)*				
Pedestrian	*E810-E819 (.7)*				
Unspecified	*E810-E819 (.9)*				
Pedal cyclist, other	E800-E807 (.3) E820-E825 (.6), E826.1,.9 E827-E829(.1)				
Pedestrian, other	E800-807(.2) E820-E825(.7) E826-E829(.0)				
Transport, other	E800-E807 (.0,.1,.8,.9) E820-E825 (.0-.5,.8,.9) E826.2-.8 E827-E829 (.2-.9), E831.0-.9, E833.0-E845.9	E958.6		E988.6	
Natural/environmental	E900.0-E909, E928.0-.2	E958.3		E988.3	
Bites and stings[3]	*E905.0-.6,.9* *E906.0-.4,.5,.9*				
Overexertion	E927				
Poisoning	E850.0-E869.9	E950.0-E952.9	E962.0-.9	E980.0-E982.9	E972
Struck by, against	E916-E917.9		E960.0; E968.2		E973, E975
Suffocation	E911-E913.9	E953.0-.9	E963	E983.0-.9	
Other specified and classifiable[4]	E846-E848, E914-E915 E918, E921.0-.9 E923.0-.9, E925.0-E926.9 E929.0-.5	E955.5,.9 E958.0,.4	E960.1, E965.5-.9 E967.0-.9, E968.4	E985.5, E988.0,.4	E971, E978 E990-E994, E996 E997.0-.2
Other specified, not elsewhere classifiable	E928.8, E929.8	E958.8, E959	E968.8, E969	E988.8, E989	E977, E995, E997.8 E998, E999
Unspecified	E887, E928.9, E929.9	E958.9	E968.9	E988.9	E976, E997.9
All injury	E800-E869, E880-E929	E950-E959	E960-E969	E980-E989	E970-E978, E990-E999
Adverse effects					E870-E879 E930.0-E949.9
Medical care					*E870-E879*
Drugs					*E930.0-E949.9*
All external causes					E800-E999

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