Home is Where the Hurt is:
A Statistical Analysis of Injuries Caused By Spousal Assault[+]

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Abstract

Using data on injuries presenting at the Emergency Departments of participating hospitals in the Australian state of Queensland we examine the nature of injuries resulting from spousal assault and compare them to injuries from non-spousal assault and accidental injuries. We ask: who are the persons most vulnerable to spousal assault? Are spousal assault injuries more (or less) severe than injuries from non-spousal assault and accidental injuries? Do the recorded figures for assault injuries on women understate the true number of assault injuries and, if so, by how much?

Key words: Spousal Assault, Injuries, Triage, Logit, Ordered Logit, Bayes' Theorem

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"But for my bonny Kate, she must with me. I will be master of what is mine own. She is my goods, my chattels" (Taming of the Shrew).

1. Introduction

There is no place like home – at least not as far as getting injured is concerned. The Queensland Injuries Surveillance Unit (QISU), which records details of injuries presenting at the Emergency Departments of participating hospitals in the Australian state of Queensland[1] (hereafter simply "injuries"), reported that of the 84,583 injuries recorded between 1 January 2003 and 31 December 2005, 48 percent (40,656 injuries), occurred in the home; and only 9 percent (7,951 injuries), occurred in the workplace.[2]

Yet, the vast bulk of the literature which analyses personal injuries is concerned with injuries which occur in the workplace (or in the course of performing one's work) [3] There is very little analysis of injuries which occur in the home even though, as noted above, such injuries comprise a large proportion of the total. The purpose of this paper is to provide a partial remedy for this neglect by analyzing, using the injuries recorded on the QISU data base between 1 January 2003 and 31 December 2005, injuries which are

[1] For details of the QISU data see http://www.qisu.qld.gov.au.
[2] 10 percent of all injuries occurred at school or other public institutions; 13 percent occurred in recreation or sports areas; 8 percent occurred in the street; and 12 percent occurred at "other places".
[3] Research into workplace injuries has been mainly concerned with issues relating to severity and recovery time, for example, see Johnson and Fry (2002) and Borooah and Mangan, J. (1998) or attempts to quantify the economic and social costs of work place injuries such as Andrioni, (1986).

the result of spousal abuse and which occurs mainly – though not exclusively – in the home. [4]

Studies of spousal abuse have, in the main, been concerned with three aspects (*inter alia* Day, 1995; Greaves, Hankivsky and Kingston-Riechers, 1995; Kingston-Riechers 1997, and Bowlus and Seitz 1998, 2000):

1. the psychology of spousal abuse and the characteristics of the abuser(s)

2. the incidence and gender distribution of abuse

3. the economic and social cost of abuse.

In this context, this paper is concerned with: identifying persons who are most at risk of suffering spousal assault; the incidence of spousal assault; and the severity of injuries resulting from spousal assault. It asks: who are the persons most vulnerable to being assaulted by their spouse? Are spousal assault injuries more (or less) severe than injuries from non-spousal assault and accidental injuries? Do the recorded figures for assault injuries on women understate the true number of assault injuries and, if so, by how much?

McCauley *et al* (1995), Eisenstat and Bancroft (1999), Mollon (2004) and Woods (2005) have reported on the profiles of females most likely to suffer spousal abuse.[5] Much of this work has been through case studies and small sample surveys of victims. By contrast, this study applies econometric methods to a relatively large data base to establish the probabilities of woman with different characteristics of being injured through spousal assault.

[4] Casualty ward data has been used to study spousal abuse in many studies including: the US Centre for Disease Control and Prevention (1993); Roberts *et.al.* (1994) and Roberts (1995). Lawler (1996) has discussed the value of casualty ward screening as a means of identifying "hidden" incidents

[5] Those less than 40 years of age, with a past history of abuse, who have undergone recent separation or divorce and who have a partner who is over-attentive.

While the frequency of spousal assault has attracted academic attention, the severity of injuries resulting from spousal assault has attracted much less attention.[6] The QISU data contain information on the severity of injuries – through a triage assessment of the urgency of the injury – and this study was able to exploit this data to compare the relative severity of injuries from different causes.

Lastly, the under-reporting of cases of spousal assault is a problem faced by all studies of spousal abuse. This under-reporting occurs in two distinct ways. First, there is under reporting of the number of cases of spousal abuse. Second there is the under-reporting of the severity of spousal abuse injuries. These two facets of under-reporting are related in that less severe injuries are likely to remain unreported while more severe injuries are often blamed on "accidents". Arriving at the "true", as opposed to the reported, number of injuries due to spousal assault is, therefore, an important aspect of enquiry in this area. We employ Bayes' theorem, in conjunction with information on the external cause of injury contained in the QISU data, to estimate the number of "accidental" injuries that were, in fact, the consequence of spousal assault.

Violence within marriage has obvious implications for the stability of the affected families and the happiness of its members but it also imposes wider social and economic costs. Though an analysis of such costs is outside this study's remit, we note that Max *et. al.* (2004), using measures of the direct and indirect costs of spousal violence against US adult women,[7] estimated the total costs of spousal violence to be at least $5.8

[6] This point has been raised by Sherman (1992) and Rodenberg and Fantuzzo (1993).
[7] In their study, direct costs of spousal abuse included spending for health care related services such as visits to emergency departments, hospitalization, and payments to health care professionals. Indirect costs included the value of lost productivity from both paid work and household production and was evaluated using data on the mean daily value of work and household production from the 1996 US Bureau of Labor Statistics.

billion per year. Studies for Australia, using similar methods, have also estimated the costs associated with spousal abuse as substantial.[8]

2. The Nature of Injuries Due To Spousal Assault

The QISU reports the *intention* underlying an injury: 93 percent of the total number of injuries was accidental; 3 percent was the result of (non-parental/non-spousal) assault; 2 percent was due to "other intentions"; 1 percent was the result of self-harm; and the remainder was due to parental or spousal abuse. In total, over the three year period 2003-05, the QISU identified 313 cases where the injury was due to an alleged assault by a spouse or a partner.[9]

By way of comparison, Hegarty *et. al.* (2000) for Australia, report that 1.3 percent of females and 0.14 percent of males *admitted* to emergency departments on any one day were there as a result of partner-inflicted injury. The QISU data also show that of the female with injuries admitted to hospital, or who were advised admission but refused, 1.3 percent had injuries caused by spousal assault; the corresponding figure for men was 0.21 percent.[10]

Table 1 sets out the salient features of injuries due to three intentions: spousal assault; non-spousal assault; and accidents. Injuries resulting from spousal assault are mainly - though not exclusively - to women. Table 1 show that of the total of injuries due to spousal assault, four in five were to women. By contrast, three in four non-spousal assault injuries, and nearly two in three accidental injuries, were to men. The gender bias

[8] See, Australian Bureau of Statistics (1996).
[9] Needless to say, many cases of domestic assault do not lead to injuries which are treated at a hospital and hence will not appear on the QISU data; at the same time, injuries from spousal assault could be misreported on the QISU data as being accidental.
[10] The violence against women surveys (VAWS) involving 15,000 Canadian Women and conducted by Statistics Canada's (1993); found that 29% of ever married and 50% of divorced women in the survey had been victims of domestic abuse of varying degrees of severity.

in spousal assault is well documented. For example, Australian police records show that women were eight times more likely to be victims of spousal assault than men while Statistics Canada (1993, 1999) suggested that, compared to men, women were six times more likely to suffer spousal abuse.

The average age of the injured parties in cases of spousal assault was, at 32 years, four years greater than the average age of those injured through non-spousal assault and 12 years greater than the average age of those who suffered accidental injury.

Table 1 also shows that 46 percent of spousal assault injuries were to the "head" (head, face (excluding eyes), or neck) compared to 50 percent of non-spousal assault injuries, and 23 percent of accidental injuries. The overwhelming number of spousal assault injuries were sustained in the home (77 percent) compared to 27 percent of non-spousal assault injuries and 49 percent of accidental injuries.

Although 29 percent of injuries due to spousal assault resulted in a superficial wound (compared to 24 percent of non-spousal assault injuries and 13 percent of accidental injuries), 22 percent of injuries due to spousal assault were regarded, by the relevant Emergency Department, as requiring "very urgent" attention (compared to 22 percent of non-spousal assault injuries and 30 percent of accidental injuries). However, there was a marked difference between men and women in the triage assessment of spousal assault injuries: 23 percent of spousal assault injuries to women were assessed as very urgent compared to 16 percent of such injuries to men.

After presentation of the injury to the relevant Emergency Department, 83 percent of persons with accidental injuries, and 89 percent with assault injuries, were discharged compared to only 71 percent with spousal assault injuries. However, 18 percent of those

with spousal assault injuries left the Emergency Department against medical advice, compared to 12 percent of those with assault injuries and 4 percent of those with accidental injuries.

Lastly, over half the injuries from spousal violence were to persons who were Aboriginal or Torres Strait Islanders (ATSI) i.e. Australia's Indigenous people. [11] At the same time, 26 percent of ATSI victims of spousal assault left the hospital against medical advice, compared to only 9 percent of non-ATSI victims.[12] The problem of domestic violence within ATSI communities is well documented: a Women's Task Force on ATSI violence reported that "the degree of violence and destruction in the Aboriginal or Torres Strait Islander Communities cannot be adequately described…not only has there been a significant increase in the number of offences recorded in Indigenous communities but the level of severity has also increased" (Queensland Government, 1999).

3. Econometric Estimates

In the econometric work we asked two questions. First, what was the relative strength of the different factors influencing the probability of a person being injured through spousal assault? Second, after controlling for other factors, were injuries from spousal assault more (or less) severe than injuries from non-spousal assault and accidental injuries?

In order to answer the first question we estimated a logit model in which the dependent variable took the value 1 if an injury in the QISU data was the result of spousal assault and the value 0 if it was not such an injury. This equation was estimated

[11] A similar pattern of spousal abuse among the indigenous population in Canada is reported by Hylton (1999).
[12] However, only 19 percent of spousal assault injuries involving ATSI, compared to 25 percent for non-ATSI, were assessed by the relevant Emergency Department as requiring treatment "very urgently".

on the 31,339 persons, older than 15 years, whose injuries were the result of accidents or assault (spousal or non-spousal). Table 2 shows the estimation results from estimating this equation. Shown alongside the estimates are the marginal probabilities of being injured through spousal assault.[13] These show that four factors significantly increased the probability of a person being injured through spousal assault: (i) gender: being female; (ii) race: being an ATSI; (iii) age: being aged 22-45 years;
(iv) labour market status: being unemployed or a home-maker.

We can consider the effects of being an ATSI woman on the likelihood of suffering a spousal assault injury by means of the following example. The QISU data recorded 10,125 injuries to women, older than 15 years, which were the result of accidents or assault (non-spousal or spousal); injuries due to spousal assault (243) comprised 2.4 percent of this total. Of these 243 spousal assault injuries (to women older than 15 years), 126 injuries (52 percent) were to ATSI women. The logit estimates of Table 2 suggest that if *all* the above10,125 female injured had been ATSI, the proportion of the total injuries to women, older than 15 years, due to spousal assault would rise from 2.4 to 9.7 percent and, in consequence, the number of spousal assault injuries to such women would rise from 243 to 982.[14]

In order to answer the second question, this study defined the severity of an injury in terms of its triage assessment and categorization by the Emergency Department to which the injury was presented. The categories used in this paper were: “very urgent”

[13] The marginal probability, associated with a determining variable, of being injured through spousal assault, is the change in the probability of being so injured, consequent upon a unit change in the determining variable, the values of the other variables remaining unchanged. For discrete variables, the marginal probabilities refer to changes consequent upon a move from the residual category for that variable to the category in question.

[14] By introducing ATSI interaction terms, we also allowed for the slope coefficients to be different between ATSI and non-ATSI. However, the coefficients on these interaction terms were never significantly different from zero.

(QISU triage categories: resuscitation; emergency; urgent); fairly urgent (QISU: semi-urgent); and not urgent (QISU: non urgent). This equation was estimated for the 80,657 persons, of all ages, whose injuries were the result of accidents or assault (spousal or non-spousal). Table 3 shows the estimation results from estimating an ordered logit model in which the dependent variable took the values: 3, if the injury needed very urgent treatment; 2, if treatment was fairly urgent; 1, if treatment was not urgent.

Shown alongside the estimates are the marginal probabilities of an injury being assessed as requiring "very urgent" treatment.[15] These marginal probabilities show, for example, that: injuries to females were less likely to be very urgent than male injuries by 1.5 (percentage) points; injuries to infants, children, and older persons were more likely be very urgent – by respectively, 11.3, 10.1 and 12.0 points - than injuries to adults; on the other hand injuries to youths were less likely to be very urgent than adult injuries.

The results show that the probability of spousal assault injuries being assessed as needing very urgent treatment was not significantly different from that for accidental injuries: the marginal probability of spousal assault injuries, with accidental injuries as the residual outcome, was not significantly different from zero. Since the marginal probability of non-spousal assault injuries was significantly negative, spousal assault injuries were more likely, by 5.6 points, to be assessed as needing very urgent treatment compared to non-spousal assault injuries.

[15] The marginal probability, associated with a determining variable, of being in a particular triage category, is the change in the probability of being placed in that category, consequent upon a unit change in the determining variable, the values of the other variables remaining unchanged. For ease of presentation, only the marginal probability of an injury being categorized as "very urgent" is shown.

4. Estimating the "True" Number of Assault Injuries to Women

Injuries through spousal assault are but a particular instance of violence against women. The QISU recorded 937 injuries to women which were *intentionally* caused: 31 cases of sexual assault; 38 cases of parental assault; 247 cases of spousal assault; 612 cases of "other assault"; and 9 cases of assault through police intervention or operation. These 937 injuries through assault comprised 3 percent of the total injuries to women (31, 948). The recorded number of assault injuries to women could, however, underestimate the true number of assault injuries to women: even if one focuses on only those injuries recorded by the QISU, and ignores those injuries which are not presented at hospitals, there is the possibility that some of the injuries to women which were recorded as accidental were, in fact, the result of assault.

There are a number of reasons why spousal abuse, in particular, is likely to be under-reported. The first is the *embarrassment* or *shame* factor which is motivated by a desire on the part of the abused person to internalize family issues, to look for ways of minimizing the potential impact of isolated abuse cases on other family members and from self denial (Eisenstat and Bancroft, 1999).[16] Another reason for under-reporting is the *fear* of further retributory abuse. Closely allied to this is the fear is the fear of family disruption if the attention of the police or social services is drawn to the abuse. The final reason is the *guilt* factor, where the abused person feels that the abuse is in some way a just punishment for their failings in the relationship; in such a situation, the victim will often report their injuries as resulting from an accident. (Headey *et. al.*, 1999).

[16] Males are known to be highly susceptible to this factor and are less likely than females to admit to abuse because of issues of self-esteem (Lowenstein, 2005).

In this section we provide an estimate of the "true" number of spousal assault injuries to women. The QISU data report the external cause of the injury: for example, "motor vehicle", "fall", "struck by or collision with a person", "struck by or collision with an object" etc. Let *C* represent the event that an injury was the result of "being struck by or collision with a person" and let *A* represent the event that the injury was the result of a spousal assault. Of the 243 spousal assault injuries to women, older than 15 years, 189 (78 percent) were the result of "being struck by or collision with a *person*" and 43 injuries (18 percent) were the result of "being struck by or collision with an *object*". Consequently, for women, the conditional probability $P(C|A) = 0.78$ where $P(C|A)$ is the probability of injury through "being struck by or collision with a person", given that it was the result of spousal assault. We are, however, interested in the conditional probability $P(A|C)$: the probability of injury through spousal assault, given that it was the result of "being struck by or collision with a person".

By Bayes' Theorem, $P(A|C) = [P(C|A) \times P(A)]/P(C)$. Of the 10,125 injuries to women older than 15 years, resulting from accidents or assault (spousal or non-spousal), 935 (9.2 percent) were due to "being struck by or collision with a person", $P(C) = 0.092$. Establishing the value of $P(A)$ – the probability that a woman, 15 years or older, will be injured through spousal assault – is more problematic. As Matthews (2000) points out "in those cases where there is a complete absence of any previous results or insights, the prior probability of the correctness of the hypothesis will be based largely on opinion" (p. 264). In establishing a value of $P(A)$ we were guided by the data: since 243 of the 10,125 injuries to women above the age of 15 were due to spousal assault, $P(A) = 243/10125 = 0.024$.

We assume that a fraction of the injuries to women which were the result of "being struck by or collision with a person", and which were reported as accidents, were, in fact, the result of spousal assault. Then by Bayes' theorem, $P(A|C) = (0.78 \times 0.024)/0.092 = 0.20$ implying that 20 percent of the 341 "accidental" injuries to women, above the age of 15, *which were due to "being struck by or collision with a person"*, were the result of spousal assault. Thus, the "true" number of injuries to women, above the age of 15, due to spousal assault was 243 (the reported figure) *plus* 20 percent of the 341 "accidental" injuries to women, above the age of 15, which were due to "being struck by or collision with a person", i.e. 243 + 68 = 311. Thus, on the above calculation, the reported number of injuries due to spousal assault understates the "true" number by 22 percent.

We can evaluate the above "test" for spousal assault - which would correctly predict spousal assault in 20 percent of injuries resulting from "being struck by or collision with a person"- with another "test". Let *D* represent the event that an injury was the result of "being struck by or collision with a *person or an object*" and, as before, let *A* represent the event that the injury was the result of a spousal assault. Of the 243 spousal assault injuries to women, older than 15 years, 232 (96 percent) were the result of "being struck by or collision with a person or an object" Consequently, for women, the conditional probability $P(D|A) = 0.96$; we are, however, interested in the conditional probability $P(A|D)$: the probability of injury through spousal assault, given that it was the result of "being struck by or collision with a person or an object".

Of the 10,125 injuries to women older than 15 years, resulting from accidents or assault (spousal or non-spousal), 2,048 (20.2 percent) were due to "being struck by or

collision with a person or an object", $P(D) = 0.202$. If, as before, $P(A) = 0.024$, then, applying Bayes' theorem, $P(A|D) = 0.114$. This second test (was the injury the result of "being struck by or collision with a person or an object"?) is less successful (11.4 percent success rate) at predicting spousal assault than the first test (was the injury the result of "being struck by or collision with a person"?). Even though 96 percent of spousal assault injuries involve a person or an object – compared to 78 percent involving only a person – the ratio of the number of spousal assault injuries to injuries due to being "struck by or collision with persons *and* objects" is much smaller ratio of the number of spousal assault injuries to injuries due to being "struck by or collision with person "

5. Conclusions

This study, which differs from other studies in this area by its application of econometric methodology to injuries data, analyzed the nature of spousal assault injuries comparing such injuries to non-spousal assault injuries and accidental injuries. Those most likely to suffer abuse were females, indigenous persons, those not in market employment and those aged less than 45 years of age.

Our finding that spousal abuse and indigenous status are highly correlated is consistent with results found for indigenous populations in other countries. While age, gender and indigenous status are personal characteristics beyond the sphere of social policy, labour market status is not. Our results show that increasing the empowerment of women through greater labour market participation would noticeably reduce the probability of being injured through spousal assault.

That injuries from spousal assault are significantly are likely to be more severe than non-spousal assault injuries is an important finding. There is a tendency to underplay

the severity of spousal assault in particular and of injuries which occur in the home in general. Our study showed that this complacency was unjustified. Of equal concern was the fact that those suffering spousal injuries were more likely to refuse further attention, through medically-advised hospital admission, than persons with other injuries.

Lastly, we suggested using Bayes' theorem to estimate the "true" number of injuries due to spousal assault. Using this methodology, we found that the reported level of spousal assaults against all women understated the true level of spousal assaults by nearly one-fourth.

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Table 1
Salient Features of Injuries Due to Different Intentions:
Emergency Departments of Queensland Hospitals, 2003-2005

	Spousal Assault	Other Assault	Accident
Number of Cases	**313**	**2,493**	**78,639**
Gender			
Male (%)	21	74	62
Female (%)	79	26	37
Total (%)	100	100	100
Average Age (years)	32	28	18
Bodily Location of Injury			
Head (%)	46	50	23
Trunk (%)	9	5	4
Upper limbs (%)	14	16	34
Lower limbs (%)	4	3	21
Unspecified location (%)	27	26	18
Total (%)	100	100	100
Place of Injury Occurrence			
Home (%)	77	27	49
School/public institution (%)	0	7	10
Recreation/sports area (%)	3	6	13
Street (%)	4	15	8
Workplace (%)	2	18	9
Other Place (%)	14	27	11
Total (%)	100	100	100
Nature of Injury			
Superficial (%)	29	24	13
Open Wound (%)	27	28	23
Fracture/dislocation (%)	14	19	33
Foreign body (%)	1	0	7
Other injury (%)	29	29	24
Total (%)	100	100	100
Ethnicity of Injured Person			
White (%)	44	67	88
ATSI (%)	51	26	4
Other (%)	5	7	8
Total (%)	100	100	100
Triage Category			
Very urgent (%)	22	22	30
Fairly urgent (%)	61	63	59
Not urgent (%)	17	15	11
Total (%)	100	100	100

Source: QISU data

Table 2
Logit Estimates of the Likelihood of Spousal Assault Injury

Sex (residual: male)	Coefficient (z-value)	Marginal Probability
Female	2.012***	.0062***
	(13.42)	
Ethnicity (residual: other)		
White	0.298	.0008
	(1.09)	
ATSI	2.399***	.0257***
	(8.39)	
Country of Birth (residual: foreign born)		
Australian born	-0.150	-.0004
	(0.79)	
Age Category (residual: +65 years)		
Youth: 15-21 years	1.864***	.0112*
	(3.09)	
Young adult: 22-30 years	2.126***	.0136**
	(3.59)	
Mature adult: 31-45 years	2.114***	.0120**
	(3.59)	
Older Adult: 46-65 years	1.206**	.0058
	(1.98)	
Labour Market Status: (residual: other employment)		
Student	-0.886**	-.0019***
	(2.16)	
Unemployed	0.884***	.0040***
	(5.75)	
Employed	-0.120	-.0003
	(0.27)	
Home Duties	0.630***	.0026**
	(3.30)	
Constant	-10.612***	
	(15.43)	
Observations	31339	

Notes to Table 2:
The equation was estimated for injured persons whose age was greater than 15 years.
Dependent variable = 1, if an injury in the QISU data was the result of spousal assault; =0 if it was not such an injury.
Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Ordered Logit Estimates of Triage Equation

	Coefficient (z-value)	Marginal Probability: Very Urgent
Female	-0.072***	-.015***
	(4.86)	
Bodily Location of Injury		
Head	-0.434***	-.084***
	(18.17)	
Trunk	-0.235***	-.045***
	(5.97)	
Upper limbs	-0.743***	-.142***
	(29.72)	
Lower limbs	-1.177***	-.201***
	(43.80)	
Nature of Injury		
Superficial	-0.827***	-.145***
	(33.20)	
Open wound	-0.818***	-.149***
	(38.39)	
Fracture/dislocation	0.074***	.015***
	(3.38)	
Foreign body	-0.967***	-.158***
	(28.45)	
Intention		
Spousal Assault	-0.139	-.027
	(1.17)	
Non-spousal assault	-0.291***	-.056***
	(6.64)	
Place Where Injury Occurred		
Home	0.080***	.016***
	(3.28)	
School or other public institution	0.130***	.027***
	(4.01)	
Street	0.545***	.120***
	(16.24)	
Recreation/sports area	0.070**	.014**
	(2.33)	
Workplace	0.058*	.012*
	(1.82)	
Ethnicity		
White	0.147***	.029***
	(5.47)	
ATSI	-0.094**	-.018**
	(2.26)	
Australian born	-0.148***	-.029***
	(7.28)	
Age group		
Infant: <6 years	0.529***	.113***
	(23.93)	
Child: 6-15	0.481***	.101***
	(23.24)	
Youth: 16-21	-0.086***	-.017**
	(2.95)	
Old: 65+	0.540***	.120***
	(11.87)	
Observations	80657	

Notes to Table 3

1. The dependent variable takes the values: 3, if the injury needs very urgent attention; 2, if the injury needs fairly urgent attention; 1, if the injury does not need urgent attention.
2. The residual categories are - sex: male; bodily location: unspecified bodily location; nature of injury: other injury; intention: accident; place: other places; ethnicity: other.