

Establishing the case! The facts of dog bite - Victorian public hospital injury surveillance

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ABSTRACT

Aim

To analyse available Victorian data on dog bite injury at three levels of severity — deaths, hospital admissions and emergency department presentations. Exposure data is also considered as is the economic cost of a dog bite.

Method

Victorian data from a number of sources were analysed. These sources were the Australian Bureau of Statistics Death Unit Record File (death data), the Victorian Admitted Episodes Dataset (hospital admissions), the Victorian Emergency Minimum Dataset and Original Victorian Injury Surveillance System Database (emergency department presentations) and the Monash University Accident Research Centre (MUARC) database, established to determine the cost of injury to Victoria.

Results

The highest rate of serious injury from a dog bite is in children aged less than five years. Two-thirds of bites to children occur in a residential location, while 38% of bites to adults occur in a public place. Children were most likely to be bitten to the head and face. In contrast adults were most likely to be bitten on the hands.

All-age hospitalisation rates for Victoria were consistent over time. The total estimated treatment cost for a dog bite requiring hospital treatment was \$1,633,592 for one year alone. Residents of rural Victoria have both higher rates of dog ownership and dog bites, particularly for young children aged less than five years. Dog bites to children relate to the way in which the child interacts with the dog, particularly during play and feeding times.

Conclusions

Limiting exposure for vulnerable community members has the potential to reduce dog bites. Many dog bite prevention strategies have been proposed, but few have been evaluated for effectiveness. Given the over-representation of rural communities, particularly young children in rural settings, prevention campaigns should take into account the special needs of these communities.

INTRODUCTION

A man's best friend, perhaps so, but for all pleasure that dogs bring as companions, it is worth remembering that 284 Victorians are hospitalised each year as the result of a dog bite. The aim of this paper is to analyse available Victorian injury surveillance data on dog bite injury.

METHOD

In Victoria, injury surveillance data is collected at three levels of severity covering deaths, hospital admissions and emergency department (ED) presentations. This data comes from a number of sources:

- the Australian Bureau of Statistics Death Unit Record File (deaths);
- the Victorian Admitted Episodes Dataset (hospital admissions); and
- the Victorian Emergency Minimum Dataset and Original Victorian Injury Surveillance System database (ED presentations).

Data on injury cost is available from the Monash University Accident Research Centre (MUARC) database established to determine the cost of injury to Victoria.

Data sources

The Australian Bureau of Statistics (ABS) Death Unit Record File (DURF), consists of information supplied by State Registrars of Births, Deaths and Marriages. Each death registered in Australia is classified by the ABS according to the World Health Organisation (WHO) International Classification of Diseases (ICD) coding system. The ICD 'External Cause of Injury' code (E-code) 906.0 identifies dog bite. ABS-DURF data is available for the period 1990-1998.

The Victorian Admitted Episodes Dataset (VAED) contains information on admissions to Victorian public hospitals over a 12 year period — July 1987 to June 1999. Detailed information on hospital admissions, from admission to discharge, is collected. VAED data is also coded using the ICD coding system, and dog bites until June 1998, were identified using the E-code 906.0. From July 1998 ICD version 10 has been applied and 'dog bite' has been combined with 'struck by dog' in the new version ICD10 E-code W54.

The Victorian Emergency Minimum Dataset (VEMD) records details of injuries treated at the EDs of 28 major Victorian public hospitals (Appendix 1). VEMD hospitals treat approximately 80% of statewide ED presentations. Data is available for the five year period January 1996 to December 2000. Dog bites were identified by searching for cases with an 'External Injury Cause' code of 21 — dog related *and* a 'Nature of Main Injury' code of 21 — bite. To account for any coding inconsistencies, cases containing the text term 'dog' in the 100-character 'Description of Injury Event' variable were selected and manually reviewed to identify additional dog bites.

The original VISS database collected detailed injury data from the EDs of seven campuses of five Victorian public hospitals between 1988 and 1996. Data is based on information provided by the injured person (or proxy) and the attending doctor. Dog bites are identified by combining the 'Mechanism of Injury' code 15 — bitten, with the 'Factor Code' 6201 — dog.

The MUARC cost of injury database considers injury incidence and average treatment costs to determine specific allocation of direct costs to various injury cause and age categories for hospitalised injuries in Victoria, including dog bite (Watson and Ozanne-Smith, 1997).

RESULTS

Incidence

Deaths

The ABS-DURF reported two deaths from dog bites in Victoria, and another 7 in other Australian states, in the years 1991-1998. The Australian annual average death rate from dog bites was 0.004 per 100,000 population between 1979 and 1996, with a steady frequency of 0-2 cases per year (Ozanne-Smith et al., 2001). There was no clear gender pattern among the small number of Australian and Victorian deaths. Of the two Victorian deaths in this period one involved a child, the other an adult.

Hospital admissions

Victorian data for the 12 years 1987-1999 reported 3,412 hospitalisations for dog bites (final year includes 'struck by dog' also). Young children (aged less than five) were the most likely victims with an annual average frequency over the 12 years of 96 bites requiring hospitalisation, compared to 66 pa for older children and 122 pa for adults. Young children account for a third of hospitalised dog bites and age specific rates of a dog bite show that the highest risk is clearly for persons aged 1-4 years, followed by 5-9 year olds (Figure 1). Figure 1 shows the rate trends for hospitalised dog bites by age group for the financial years 1987-88 to 1998-98. The final year of data, 1998-99, isn't included as the new ICD version E-code – W54, includes being struck by a dog, as well as a dog bite. For the eleven years 1987-88 to 1997-98 there has been no overall reduction in the rate of serious dog bite injury. The rate for young children shows a statistically significant downward trend since 1993-94 ($p=0.019$; Ozanne-Smith et al., 2001).

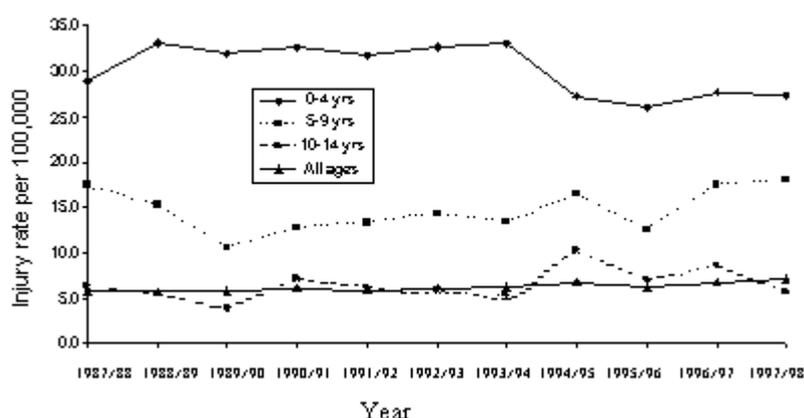
The average annual length of stay in hospital increased with age, the majority of young children admitted being for < 2 days and after 35 years, the majority, and an increasing proportion with age, were admitted for longer periods.

Eighty-nine percent of young children were hospitalised for bites to the head and face compared with 68% of older children and 19% of adults. Almost half of adult bites requiring hospitalisation (46%) were to the upper limbs. Only one complete year (July 1995 to June 1996) of hospital admission data is available nationally.

For this year the Australian all-age rate for dog bites was 7.7 per 100,000 population while the Victorian rate was lower at 6.3 per 100,000 population (Ozanne-Smith et al., 2001).

Recent Victorian analyses considered injuries by broad geographic region (Ashby et al., 2001). Three regional groupings were considered based on the population size of statistical local areas (SLA). The metropolitan grouping includes SLAs of 100,000 or more persons and includes Geelong. There are two rural categories — rural centres and rural/remote areas. The former includes SLAs of 10,000-100,000 population, the latter includes SLAs with populations less than 10,000.

Figure 1: Trends in dog bite hospitalisation rates per 100,000 by age group, Victoria 1987–1998 *



Source: Victorian Admitted Episodes Dataset, July 1987-June 1998, * Excludes private hospitals

Analyses based on these regional classifications indicate a higher all-age rate of dog bite amongst residents of non-metropolitan Victoria, 7.1-7.8 per 100,000 compared to residents of metropolitan Victoria, 6.7 per 100,000 (Table 1). For young children hospitalised dog bite rates were lowest for young child residents of metropolitan areas (23.1/100,000) and highest for those residing in rural centres (37.9/100,000). In contrast, the rate for older children (5-14 years) was highest amongst children living in metropolitan areas. For adults the hospitalised rates were fairly stable across regional groupings (Table 1).

Table 1: Average annual frequency and rate per 100,000 population of hospitalised dog bite injury by broad age group and regional classification, Victoria July 1996-June 1998

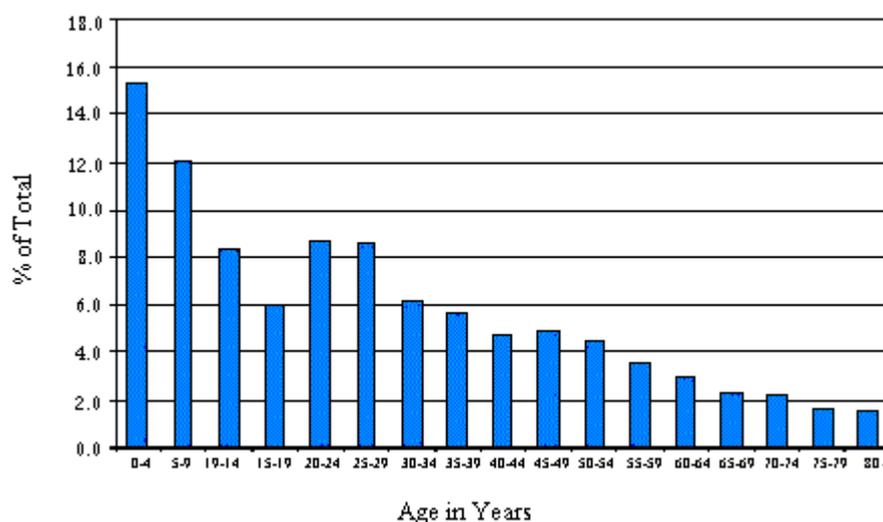
	0-4 years (young child)			5-14 years			15+ years (adult)			All-age
	Population	N	Rate/ 100,000	Population	N	Rate/100,000	Population	N	Rate/100,000	Rate/100,000
Metropolitan (SLA 100,000+ persons)	229,084	53	23.1	467,417	62	13.3	2,776,072	117	4.2	6.7
Rural Centres (SLA 10,000-24,999 persons)	36,966	14	37.9	76,099	7	9.2	391,869	15	3.8	7.1
Rural/remote (SLA <10,000 persons)	46,446	17	36.6	107,288	7	6.5	501,773	27	5.4	7.8
Total	312,495	84	26.9	650,804	76	11.7	3,669,713	159	4.3	6.9

Source: Victorian Admitted Episodes Dataset, July 1996 – June 1998, Australian Bureau of Statistics Estimated Resident Population 1997 and 1998.

Emergency department presentations

The VEMD reported 6,465 ED presentations to 28 Victorian public hospitals for a five year period, January 1996 to December 2000, as the result of dog bite. Most (58.6%) were male and followed a similar pattern as hospitalised cases in that most were among children aged 0-4 and 5-9 years. ED cases also showed a second peak amongst adults 20-29 years of age (Figure 2).

Figure 2: Dog bite ED presentations by age group, 1996-2000, Victoria

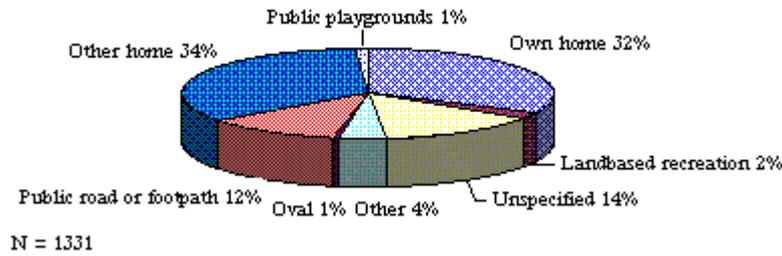


Source: Victorian Emergency Minimum Dataset, 1996-2000

Of the cases treated in VEMD participating EDs 13.3% were subsequently admitted to a hospital ward for further treatment. Admissions were highest among young children with more than a quarter requiring hospitalisation. Sixteen percent of older children and 9.2% of adults required hospital admission.

Detailed Victorian emergency department data were collected at seven hospital campuses for various full year periods, from 1988 to 1996 as part of the Original Victorian Injury Surveillance System database (Ashby, 1996). These VISS data provide detailed patterns for the location of the injury event and the body part injured as well as the circumstances of the injury and are generally more specific than VEMD data for these variables. For children less than 15 years of age, their own home or homes at which they were visitors made up 66% of locations where bites occurred (Figure 3). While public places contributed only 20% of child cases, they accounted for 38% of adult cases (Ashby, 1996). VEMD data also shows that two-thirds of dog bite to children occur in a residential location.

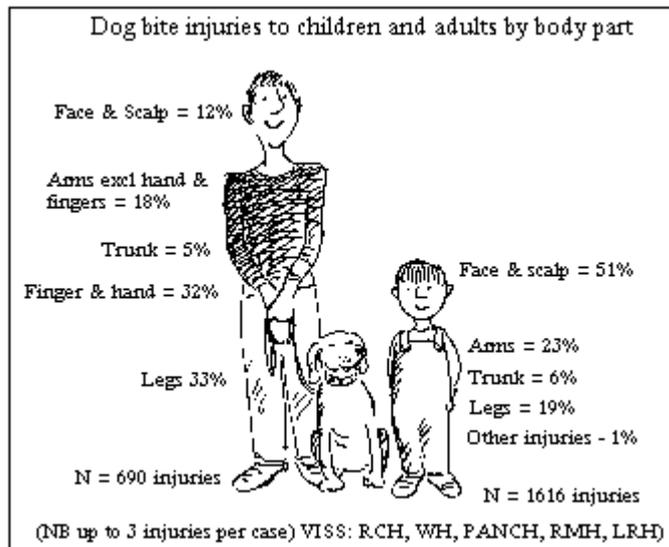
Figure 3: Location where dog bite occurred, children < 15 years, ED presentations, Victoria



Source: Original VISS database, 1989-1996 as appearing in Ashby, K. (1996) Reprinted with permission from the Victorian Injury Surveillance and Applied Research System

The body region affected shows quite different patterns for children and adults (Figure 4). More than half of bites to children in both the VISS and VEMD datasets were to the head, face and scalp. This rate is higher among those cases subsequently admitted to hospital (82%). In contrast, half of the bites to adults, in both datasets, were to the upper limbs, particularly the hands.

Figure 4: Dog bite by body region injured, ED presentations, Victoria



Source: Original VISS database, 1989-1996 as appearing in Ashby, K. (1996) Reprinted with permission from the Victorian Injury Surveillance and Applied Research System. Art work, Jocelyn C Bell.

A review of the case narrative data from the VISS dataset allows for identification of patterns of injury associated with dog bite. Where specified, child injury commonly occurred when the bitten child was playing with the dog (17% of bites to children), patting the dog (10%) or feeding the dog or attempting to play with the dog whilst it was eating (5%), eg. *'trying to grab dog's food whilst dog was eating, dog bit child'*. Pedestrians (5%) and bicyclists (3%) were bitten whilst walking or riding on the street, and a further 5% of children were bitten when they climbed the fence into a neighbours yard to retrieve a ball or simply when they were climbing on a fence, eg. *'Playing on a fence, dog on the other side of the fence grabbed arm and pulled child over fence'*. Three percent of children were bitten after teasing or hurting the dog including pulling its tail or hitting it, eg. *'pulling dog by tail and the dog bit him'* and 11 children were bitten when hugging or cuddling the dog.

Cost of dog bite injury

The treatment costs of hospitalised cases of dog bite and those treated in the emergency department of hospitals, but not admitted, have been estimated for Victoria using the database established for a cost of injury study (Watson and Ozanne-Smith, 1997). The costs by body region injured and nature of injury for hospitalised cases in the year 1993-94 are shown in Table 2 (over page). The total estimated treatment cost for hospitalised dog bite cases was \$1,343,250. Treatment costs for emergency department treated cases were estimated at an additional \$290,342 for the same year. Insufficient data were available to estimate the indirect costs.

Table 2: Treatment costs for hospitalised dog bite cases by body region and nature of injury, Victoria July 1993-June 1994(n = 280 cases)

	Head	Eyes	Face excl. eyes	Neck	Abdo-pelvis	Spine-back	Upper extremity	Lower extremity	Multiple	Other—unspecified	Total
Fractures	\$0	\$0	\$6,290	\$0	\$0	\$0	\$65,310	\$0	\$0	\$0	\$71,600
Intracranial (not skull fracture)	\$9,078	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$9,078
Open wound	\$69,021	\$50,989	\$692,746	\$846	\$11,606	\$2,015	\$105,570	\$157,185	\$6,395	\$0	\$1,096,372
Superficial Injury	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,895	\$0	\$0	\$2,895
Bruises-Haematoma	\$0	\$0	\$0	\$0	\$0	\$0	\$12,484	\$0	\$0	\$0	\$12,484
Other	\$0	\$0	\$0	\$0	\$826	\$0	\$0	\$0	\$0	\$91,398	\$92,224
Missing code	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$58,597	\$58,597
Total	\$78,099	\$50,989	\$699,036	\$846	\$12,432	\$2,015	\$183,364	\$160,080	\$6,395	\$149,995	\$1,343,250

Source: Watson and Ozanne-Smith, 1997. Reprinted with permission

Exposure

Dog ownership by household is identified by many studies in the peer-reviewed literature as a risk factor. Hence, information on dog ownership supplied by household surveys are of interest. In 1992, the Australian Bureau of Statistics (ABS) in association with the Victorian Department of Human Services and the Monash University Accident Research Centre, surveyed a representative sample of 4000 Melbourne households on household safety issues, including dog ownership (ABS, 1992). It was found that: 33.5% of households had a dog. A repeat survey in 1998 found similar total household ownership of dogs (34.6%; ABS, 1998). In addition, a 1998 Victorian study (Ashby et al) which surveyed 78 Victorian municipalities reported that the average rate of registered dogs per 100 dwellings was significantly higher in rural municipalities (49.2 per 100 dwellings, 95% CI=43.4,55.0) than for metropolitan municipalities (30.1 per 100 dwellings, 95% CI=20.7,39.5) ($t=2.1$, $p<0.01$). Rural municipalities also recorded a significantly greater number of bites, rushes, worries and dogs destroyed per 1000 than metropolitan areas (10.5-1000, 95% CI=3.6, 17.4, 1.9-1000, 95% CI=0.8,3, $t=-2.6$, $P<0.05$; 2.8-1000, 95% CI=0.3,5.3, 0.05-1000, 95% CI=-0.02,0.12, $t=-2.25$, $p<0.05$ respectively; Ashby et al., 1998).

DOG BREED

Dog breed information is not reliably available. The 1992 ABS survey attempted to collect dog breed information. However, identification by specific breed proved unreliable because of the complicated issue of cross breeds and the assignment of breed by owners and interviewers. Of households with dogs, 41.2% had pure breed and 58.8% cross breed dogs (154.7-100,000 and 220.7-100,000 households, respectively).

Only the ED datasets have the potential to identify breed through the inclusion of a one line descriptive case narrative. However, only 12% of child and 9% of adult cases on VISS and a lesser proportion of VEMD cases report breed, making it difficult to draw conclusions based on breed from these data.

DISCUSSION

While it is fortunate that death from a dog bite is infrequent, the continuing incidence of serious non-fatal dog bites is concerning. In eleven years in Victoria there has been no overall reduction in the all-age rate of dog bite injuries requiring hospital admission.

Young children, despite some reduction in hospitalisation rate, remain most at risk for a serious dog bite. Children are most likely to be bitten either in their own home, or at the home of a family member or friend. Case narrative data indicates that many dog bites to children are related to the way in which the child interacts with the dog.

The financial burden of dog bite is considerable. The total estimated treatment cost for a dog bite receiving hospital treatment was \$1,633,592 for one year only. This estimate excludes additional indirect costs such as time lost from work.

Both rates of dog ownership and dog bites are highest in rural Victoria, particularly for young children. Dog bite prevention strategies should consider the particular needs of these groups. While a number of risk factors have been identified for dog bite, there is very little evidence for the effective prevention measures. A systematic research program is required to determine whether some breeds are over-represented in attacks and whether training of dogs and owners is effective.

Consistent advice from dog experts however is that dog temperament is an important factor in choosing a pet, with dogs bred for aggression to be avoided.

It is clear that separation of dogs from the youngest children would also be effective, particularly in the home environment. It is particularly important in rural settings to physically separate young children from dogs kept for work, rather than as pets.

REFERENCES

- Ashby K, Routley V, Stathakis V. *Enforcing Legislative and Regulatory Injury Prevention Strategies*. Hazard, Victorian Injury Surveillance and Applied Research System, 1998; (34); 2-5.
- Ashby K, Stathakis V, Day L. *A profile of injuries to Victorian residents by broad geographic region*. Hazard, Victorian Injury Surveillance and Applied Research System, 2001; (46); 1-17.
- Ashby K. *Dog Bites*. Hazard, Victorian Injury Surveillance and Applied Research System, 1996; (26); 7-13.
- Australian Bureau of Statistics (ABS) *'Safety in the Home' Survey*, Melbourne, October 1998.
- Australian Bureau of Statistics (ABS) *'Safety in the Home' Survey*, Melbourne, November 1992.
- Arbour A, *International Classification of Diseases. Commission on Professional and Hospital Activities*. Annotated International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM); Michigan; 1986; Fourth Printing.
- Ozanne-Smith J, Ashby K, Stathakis V. *Dog bite and injury prevention — analysis, critical review and research agenda*. Injury Prevention, (September 2001).
- Watson W, Ozanne-Smith J. *The Cost of Injury to Victoria*. Monash University Accident Research Report. 1997; (124).

APPENDIX ONE

VICTORIAN PUBLIC HOSPITALS PARTICIPATING IN THE VICTORIAN EMERGENCY MINIMUM DATASET INJURY COLLECTION

From October 1995	
Austin and Repatriation Medical Centre	Ballarat Base Hospital

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Karen Ashby has been with Monash University Accident Research Centre as a Research Assistant since 1994 and assumed the role of co-ordinator of the Victorian Injury Surveillance and Applied Research System in 2000. Her role with VISAR involves regular contribution to the *Hazard* publication, media liaison, development of the VISAR web page and provision of data as part of the VISAR information service. Karen has qualifications in health promotion and is currently undertaking a Masters of Public Health. Karen has a particular interest in the prevention of dog bites and injuries associated with Do-It-Yourself maintenance injuries.

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