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Supporting Information

Supplementary methods and results

This appendix was part of the submitted manuscript and has been peer reviewed.
It is posted as supplied by the authors.

Appendix to: Negin J, Bell J, Ivancic L, et al. Gun violence in Australia, 2002–2016: a cohort study. *Med J Aust* 2021; doi: 10.5694/mja2.51251.

Supplementary methods

Study design and data sources

We conducted a population-based record-linkage cohort study of individuals identified with firearm injury in New South Wales (NSW) Australia, from 2002-2016. Data sources included the NSW Admitted Patient Data Collection, death registrations from the NSW Register of Births Deaths and Marriages, and Mental Health-Ambulatory Data Collection. The NSW Admitted Patient Data Collection is a census of all in-patient admissions in all NSW hospitals, both public and private, and includes individual demographic and clinical information, including up to 51 diagnoses relevant to the admission, coded according to the International Classification of Diseases-Australian Modification (ICD10-AM). Death registrations include information on the date of death, and the underlying and contributing causes of death, also coded using the ICD-10-AM for all deaths in NSW. The Mental Health-Ambulatory Data Collection (MHAMB) records mental health contacts between clinicians and non-admitted patients in publicly funded settings including outpatient and outreach care, care to admitted patients in non-psychiatric and hospital emergency information on number of settings, care to clients in community residential settings and mental health promotion and prevention services. Data on firearm licences were ascertained from the NSW Police Force Firearms Registry 2019 annual report which presents information on firearms licensing and ownership, including number of firearm licence holders by postcode across the state.[1]

Study population

We identified a cohort of individuals with a recorded diagnosis of a firearm injury in the NSW Admitted Patient Data Collection or cause of death fields in death registrations during the study period, 2002-2016 (ICD-10-AM codes: W32-W34, X72-X74, X93-X95, Y22-Y24, Y35.0, Y36.4). Records with specific codes indicating injuries due to air rifles (W34.1, X95.1, Y24.1, Y35.02, Y36.42, X74.1) were excluded. After identifying the cohort, the health records for these individuals were identified and linked to all their hospital admissions, mental health ambulatory records or death registration from 2002-2016. The NSW Centre for Health Record Linkage identified the cohort, then probabilistically linked their records to their hospital, death and mental health ambulatory records, and provided de-identified data to researchers.

Study factors

Based on ICD-10-AM codes, we classified firearm injuries by intent as assault, intentional self-harm, accidental, and undetermined or other (including legal intervention or war operations). Year of firearm injury was based on year of admission to hospital or year of death. We categorised age at injury occurrence as 0-18, 19-29, 30-39, 40-49, 50-59 and ≥60 years. We used the Index of Relative Socioeconomic Disadvantage as a measure of socio-economic status for each individual. This Index scores residential areas, including postcodes on their relative socioeconomic disadvantage from information collected at each Census.[2] We identified socioeconomic index scores for each individual in our cohort based on their recorded postcode of residence and scores were then categorised into quintiles from most to least disadvantaged. Postcode of residence was also used to classify area of residence at the time of injury as major city, regional or remote using the Accessibility/Remoteness Index of Australia.[3] We abstracted the type of firearm used as smaller (handgun) or larger (rifle, shotgun), and the body region injured, based on ICD10-AM codes. Admission records with mental and behavioural disorders recorded were identified using ICD10-AM codes F00–F99. Any record in the Mental Health Ambulatory Data Collection indicated contact with this service.

Analyses

For all analyses, we assessed firearm injuries by intent and for all firearm injuries combined. Injuries classified as undetermined intent or other (legal intervention or war operations) were included in the combined analyses. For individuals with more than one firearm injury during the study period, we included their first injury by intent, and for those with two or more injuries classified by different intent, each injury was included in each intent category. We described the frequency, proportion and rate of firearm injuries by intent and socio-demographic characteristics. Rates of firearm injury by socio-demographic characteristics were determined by calculating the mean annual number of individuals affected over the 15-year period and dividing by the relevant Australian Bureau of Statistics estimated population at the midpoint of the study period[4] as the denominator. We calculated the average annual percent change in firearm injury rate using negative binomial regression. The dependent variable (the number of firearm injuries) was regressed against year, offset by the log of the corresponding population denominator and with a log-link function. We also calculated the number and proportion of individuals who died as a result of their injury and the type of firearm involved.

Using hospital admission records at the time of firearm injury, we identified the number of individuals admitted to hospital, the body region injured, and admission characteristics (length of stay and intensive care admission). In the two years prior to injury, we determined the number and proportion of individuals admitted to hospital, the number of admissions, and proportion of those with a mental health or behavioural condition recorded. We also calculated the number and proportion of those who had contact with mental health ambulatory services. For individuals alive two years after injury, we investigated hospital use and contact with mental health ambulatory services post-injury in a similar way. For analyses using hospital admissions records, consecutive records indicating hospital transfers or a change in the type of admission, were merged into one admission.

The number of firearm license holders with a registered firearm by postcode reported in the NSW Firearm registry report was used to determine the proportion and rate of license holders by geographic area. Number of firearm holders, intentional self-harm and assaults were then aggregated by statistical area level 4 (SA4) regions which comprise populations of 300-500,000 persons in metropolitan areas and 100-300,000 in regional areas.[5] Population rates of each of these measures were then determined by SA4 geographical area and the strength of the association between rates of firearm injuries and firearm ownership was then assessed using Pearson's correlation coefficient.

References

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5. Australian Bureau of Statistics. Australian Statistical Geography Standard (ASGS): Correspondences, July 2011. Canberra, ABS, 2012. (ABS Cat. No. 1270.0.55.006). https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.006July%202011?OpenDocument (accessed Sep 2019).

Table. Annual number and rate of firearm injuries per 100 000 persons per year, by injury intent category, New South Wales, 2002–2016

	Assault		Intentional self-harm		Accidental		Undetermined/ other		Total	
Year	Number	Rate*	Number	Rate*	Number	Rate*	Number	Rate*	Number	Rate*
Total	851		798		506		238		2393	
2002	97	1.5	67	1.0	59	0.9	4	0.1	227	3.4
2003	69	1.0	63	1.0	50	0.8	4	0.1	186	2.8
2004	52	0.8	52	0.8	49	0.7	6	0.1	159	2.4
2005	46	0.7	47	0.7	50	0.7	5	0.1	148	2.2
2006	58	0.9	51	0.8	27	0.4	21	0.3	157	2.3
2007	45	0.7	49	0.7	28	0.4	15	0.2	137	2.0
2008	50	0.7	53	0.8	35	0.5	25	0.4	163	2.3
2009	54	0.8	39	0.6	29	0.4	24	0.3	146	2.1
2010	48	0.7	41	0.6	19	0.3	23	0.3	131	1.8
2011	57	0.8	47	0.7	20	0.3	19	0.3	143	2.0
2012	65	0.9	55	0.8	30	0.4	18	0.2	168	2.3
2013	68	0.9	55	0.7	33	0.4	22	0.3	178	2.4
2014	51	0.7	58	0.8	26	0.3	22	0.3	157	2.1
2015	43	0.6	69	0.9	27	0.4	18	0.2	157	2.1
2016	48	0.6	52	0.7	24	0.3	12	0.2	136	1.8
MAPC (95% CI)	–3.4% (–5.5% to –1.2%)		–1.3% (–3.0% to 0.5%)		–7.0% (–9.3% to –4.7%)		—		–2.6% (–4.0% to –1.3%)	

* Rate per 100,000 population.

MAPC = mean annual percentage change, 2002–2016; CI = confidence interval.