doi:10.1093/bjc/azl084 BRIT. J. CRIMINOL. (2007) **47**, 455–469
Advance Access publication 18 October 2006

GUN LAWS AND SUDDEN DEATH

Did the Australian Firearms Legislation of 1996 Make a Difference?

JEANINE BAKER and SAMARA MCPHEDRAN*

Mass murders in Dunblane, United Kingdom, and Port Arthur, Australia, provoked rapid responses from the governments of both countries. Major changes to Australian laws resulted in a controversial buy-back of longarms and tighter legislation. The Australian situation enables evaluation of the effect of a national buy-back, accompanied by tightened legislation in a country with relatively secure borders. AutoRegressive Integrated Moving Average (ARIMA) was used to predict future values of the time series for homicide, suicide and accidental death before and after the 1996 National Firearms Agreement (NFA). When compared with observed values, firearm suicide was the only parameter the NFA may have influenced, although societal factors could also have influenced observed changes. The findings have profound implications for future firearm legislation policy direction.

Introduction

Worldwide, the development of legislation aimed at reducing levels of firearm-related death has become a significant issue within the spheres of public health, public safety and criminal justice. However, relatively little research to date has addressed the impacts of significant epochs of regulatory reform upon firearm-related deaths in countries like Australia, where strict firearms regulations were introduced in 1996.

After the 1996 mass killing of 35 people at the Port Arthur historical site, Australia enacted gun controls that are considered among the most stringent in the developed world. Briefly, the National Firearms Agreement (NFA), which was ratified by Federal Parliament in 1996 and implemented across all States and Territories by the end of 1997, prohibited certain types of firearms, in particular semi-automatic rifles and semi-automatic and pump action shotguns. To facilitate the removal of these firearms, a government-funded 'buy-back' scheme was designed, whereby owners were compensated for handing in their firearms. Over 600,000 firearms were subsequently destroyed by police.

The NFA also introduced strict requirements governing the possession of firearms, such as the necessity to have a proven or 'genuine reason' for firearm ownership (self-defence was explicitly excluded), compulsory written safety tests and the stipulation that all privately owned firearms must be registered through a State-controlled firearms licensing body. Additional components such as safe storage of firearms when not in use and 28-day waiting periods for acquisitions of firearms were included in the reforms.

* Correspondence to J. Baker, Research and Policy Unit, Sporting Shooters Association of Australia, PO Box 166, Gumeracha, South Australia 5233, Australia; jb@ssaa.org.au. Samara McPhedran, School of Psychology, University of Sydney, Camperdown, New South Wales 2006, Australia and International Coalition for Women in Shooting and Hunting (WiSH), PO Box 184, Ballarat, Victoria 3353, Australia.

In the late 1990s, research suggested that the NFA may have been successful in reducing firearm suicides, but ineffective for other sudden gun deaths (Carcach *et al.* 2002; Reuter and Mouzos 2003). However, whether the 1996 legislative reforms affected rates of firearm homicide and unintentional firearm death remained unclear (Mouzos 1999). The effects of the reform remain contentious, particularly in regard to the usefulness of the buy-back of 'low risk' firearms (Reuter and Mouzos 2003) and in light of historical trends and notable declines in firearm suicide and homicide since the early 1980s (Figures 1 and 2).

International research and evaluation are of particular relevance when considering preventative measures other than legislative restrictions that may reduce firearm violence. Associated with discussion over effective methods has been substantial debate as to whether specific intervention measures lead to displacement and method substitution. Such debate finds its basis in rational choice theory, which assumes that an individual contemplating a criminal act, or suicide, will respond to a particular set of circumstances by evaluating opportunity, cost and benefit (not necessarily financial) before deciding whether they will consider method substitution or desist from further criminal or suicidal action (e.g. Cornish and Clarke 1986; 1987; Guerette *et al.* 2005).

Much of the existing literature on gun control comes from the United States (e.g., Ludwig & Cook 2000) and may not be applicable to other countries, or even to other parts of the same country (Killias, van Kesteren and Rindlisbacher 2001). One excellent review of the American situation, framed within the context of historical and rational choice theory, covers the various attempts to curb firearm violence in that country and the success of such measures (Cook *et al.* 2001). The differing experiences of different countries following increased firearm legislation are testimony to the need

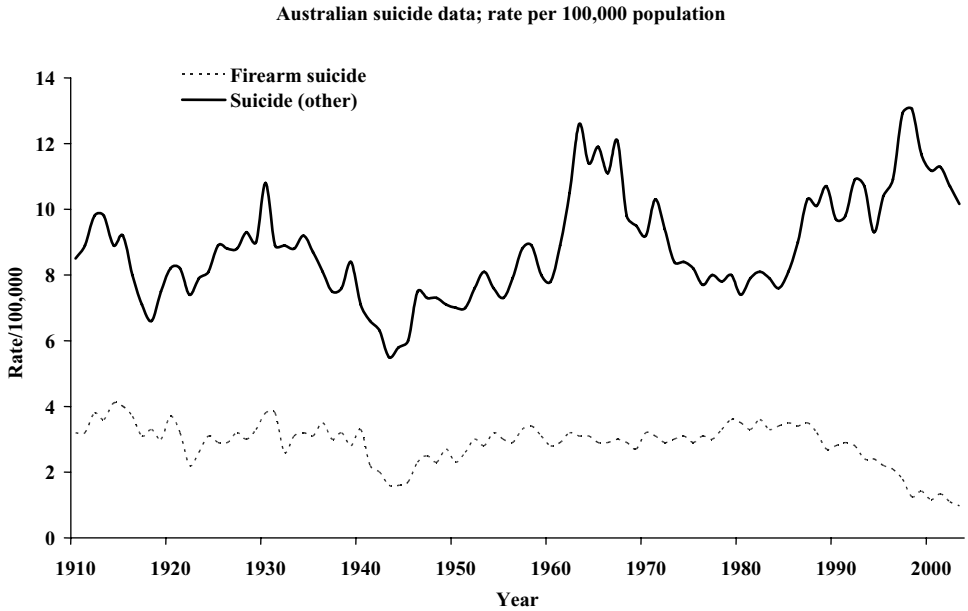

FIG. 1 Historical trends for suicide in Australia, 1910–2003

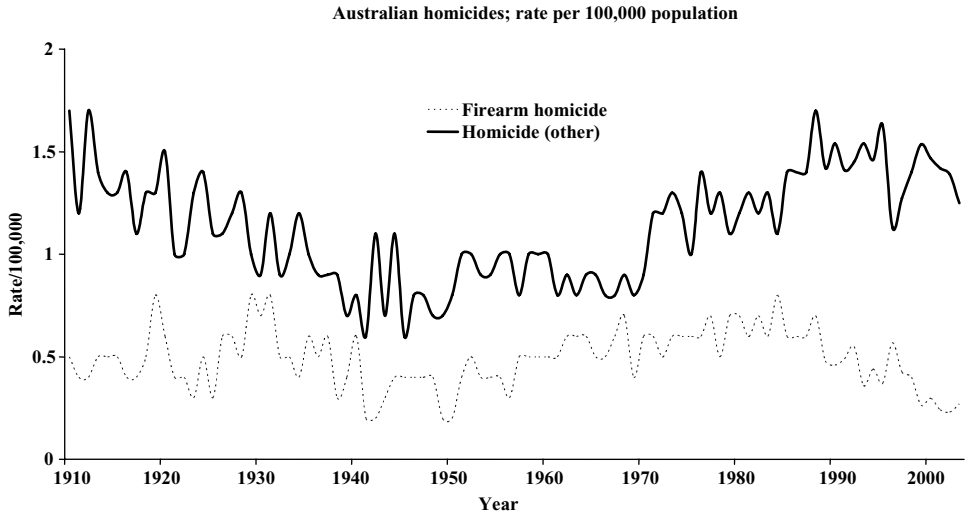

FIG. 2 Historical trends for homicide in Australia, 1910–2003

for greater international research into the efficacy of different models of firearms legislation in reducing sudden death by firearm. The introduction of legislation across a nation where organized crime in trafficking of firearms is currently perceived to be a low risk (Mouzos 2000a) provided the opportunity, as more data post-NFA became available, to examine the impact of restrictive firearm legislation by setting 1996 as a pivot point within the time series.

Along with the primary objective of this study, which was to evaluate the benefits of buying back legally held firearms and increasing restrictions on firearm owners, the data permitted us to assess changes in the trends for firearm and non-firearm homicide or suicide and give consideration to the possibility of displacement. The inclusion of suicide and homicide by methods other than firearm provided a control against which the political, social and economic culture into which additional legislative requirements for civilian firearm ownership occurred could be evaluated, as well as determining the level of method substitution within homicide and suicide.

It is important, given the contentious and often emotive nature of firearms control, to objectively determine whether the intervention of the 1996 NFA and its accompanying investment of public funds achieved the early predictions of a reduction in all 'types' of firearm-related deaths using available data. It must be clearly demonstrated that the desired outcomes of the legislative interventions occurred if we are to ensure significant objectives could not be achieved by means other than legislation and buybacks, in order to reduce firearm abuse and sudden death by firearm. Therefore, the aim of this review was to assess the contribution of firearms legislation to reducing rates of firearm-related death in Australia, with specific emphasis on suicide and homicide.

Methods

The implementation of the NFA across Australia provided a natural experimental design allowing comparisons of trends in sudden death over time. Publicly available

data spanning the period 1979–2004 were obtained from the Australian Bureau of Statistics, Australian Institute of Criminology and National Injury Surveillance Unit. Figures were standardized to rates per 100,000 population. Although the emphasis was upon firearm homicides, suicide and accidental death, trends in homicide (non-firearm) and suicide (non-firearm) were also examined to address questions relating to method substitution and confounding factors such as societal changes affecting sudden death in the community. Accidental death (non-firearm) was not examined because of the large number of parameters falling into the category of accidental death, including vehicular and medical deaths (see Kreisfeld, Newson and Harrison 2004).

The data for selected sudden death categories were analysed as a time series for the period 1979–96 (Jmp 4.0.4, SAS Institute). As the only predictor considered against sudden death was time, the AutoRegressive Integrated Moving Average (ARIMA) model was used to predict selected sudden death categories. The principles of the ARIMA model (frequently referred to as the Box-Jenkins model) were applied to the data to avoid assumptions of linearity with time and to establish a more realistic pattern with which to predict future events.[1] The ARIMA model allows the future values of the time series to be estimated by a linear combination of past values and a series of errors and uses a maximum likelihood fit of the specified ARIMA model to the time series. This provided the opportunity to describe and predict the evolution of the time series to the year 2004. For all sudden death categories, the confidence intervals were set at 95 per cent, with the autoregressive order (p) set at 1, the differencing order (d) set at 1 and the moving average order set at 1.[2] The stability of ARIMA models was evaluated based on the partial autocorrelation charts, residual values and the R^2 values.

A methodological caution is necessary. In 1996, the firearm homicide rate was high due to the murder of 35 people in one shooting event. As a consequence, mistakenly using 1996, rather than 1997, as a start point for evaluating changes in the rate of firearm deaths post-NFA would alter the conclusions drawn. Likewise, the retention of the 1996-elevated figure, along with outliers identified in firearm homicide, artificially elevates the change in rates for the pre-NFA time series. This has important implications for future investigations and it is recommended that subsequent research into the impacts of firearms legislation take into account the importance of screening for outliers and using appropriate, consistent grouping methods.

Outliers in this study were identified using the ARIMA residual values calculated from examining the data from 1979 to 2004 for each sudden death category. Years in which the residual values differed from the mean residual value by more than twice the standard deviation were assumed to be outliers (Table 1). However, given the polarization that can occur in the debate about firearm legislation, outliers in this study were

[1] Where the data show stable behaviour over the entire period of the study (outside of the period due to the intervention), ARIMA models can be fitted directly to the data series. The modelling process predicts the short-term behaviour of the time series after the event and answers the primary question 'Did the event cause a permanent change?'. A first-order autoregressive model (p) uses past observations to predict each future value and the moving average (q) defines the number of past error terms to be used in determining the weighted average of the present observation. One limitation of the ARIMA model is that the model is stationary and including differencing passes transforms the data to meet this assumption. The combination of autoregressive and moving average models after a defined number of differencing passes allows the short-term forecasting of future observations. This versatility of ARIMA modelling is preferable to linear models, which provide less flexibility for modelling the intervention. A brief, applications-oriented (non-mathematical) introduction to ARIMA methods can be found in McDowall *et al.* (1980).

[2] ARIMA (1,1,1).

TABLE 1 *Total numbers of sudden deaths in each category indicating outliers based on ARIMA residuals*

Year	Population	Firearm suicide	Suicide (non-firearm)	Firearm homicide	Homicide (non-firearm)	Accidental
1979	14,515,729	523	1,161	102	160	65
1980	14,695,356	514	1,087	103	176	62
1981	14,923,260	492	1,179	90	194	36
1982	15,184,247	547	1,230	106	182	49
1983	15,393,472	508	1,216	92	200	40
1984	15,579,391	530	1,184	125	171	33
1985	15,788,312	553	1,279	95	221	35
1986	16,018,350	545	1,442	96	224	27
1987	16,263,874	569	1,675	98	228	28
1988	16,532,164	529	1,670	116	281*	30
1989	16,814,416	454	1,799	84	235	18
1990	17,065,128	478	1,655	85	256	31
1991	17,284,036	501	1,694	86	242	29
1992	17,494,664	490	1,907	105	245	24
1993	17,667,093	424	1,890	59	237	18
1994	17,854,738	429	1,660	49	239	20
1995	18,071,758	398	1,879	58	268	14
1996	18,310,714	385	1,996	99	213	29
1997	18,517,564	333	2,389*	75	246	19
1998	18,711,271	225	2,451	54	231	21
1999	18,925,855	265	2,214	62	281	28
2000	19,153,380	230	2,126	60	256	44
2001	19,413,240	252	2,194	50	260	17
2002	19,640,979	216	2,102	42	276	31
2003	19,872,646	199	2,007	37	265	40*
2004	20,111,300	168	1,927	32	231	54

* Indicates outlier based on ARIMA residual results.

not eliminated lest such actions be construed as being used in order to make the argument that the NFA failed to influence sudden death by firearm even more compelling.

Following identification of outliers, ARIMA analysis, as described above, was undertaken on a subset of the data (1979–96) and used to extrapolate rates per annum for selected sudden death categories for the years 1997–2004 and estimate 95 per cent confidence interval (CI) limits around the predicted values. Matched pairs (JMP 4.0.4) were used to compare the observed and predicted values for the time period 1997–2004.

Results

The firearm suicide rates for 1979–96 were predicted well by the ARIMA model (R^2 = 0.85). Suicide rates by firearm pre- and post-NFA both showed decline, but the observed suicide rates post-NFA were consistently lower than the predicted values and fell outside the 95 per cent CI limits for the predicted rates (Figure 1A). The paired *t*-test comparing predicted suicide by firearm values with the observed values for the years 1997–2004 indicated that the predicted mean suicide rate was significantly higher than the observed mean suicide rate (μ_{pred} = 1.85, μ_{obs} = 1.22, std error = 0.06, $P(T \leq t)$ $t_{\text{one tailed}} < 0.001$) (Figure 3A). If considered in isolation, this result would suggest that the introduction of the NFA decreased the rate of firearm suicide in Australia, as suggested by the earlier studies of Carcach *et al.* (2002) and Reuter and Mouzos (2003).

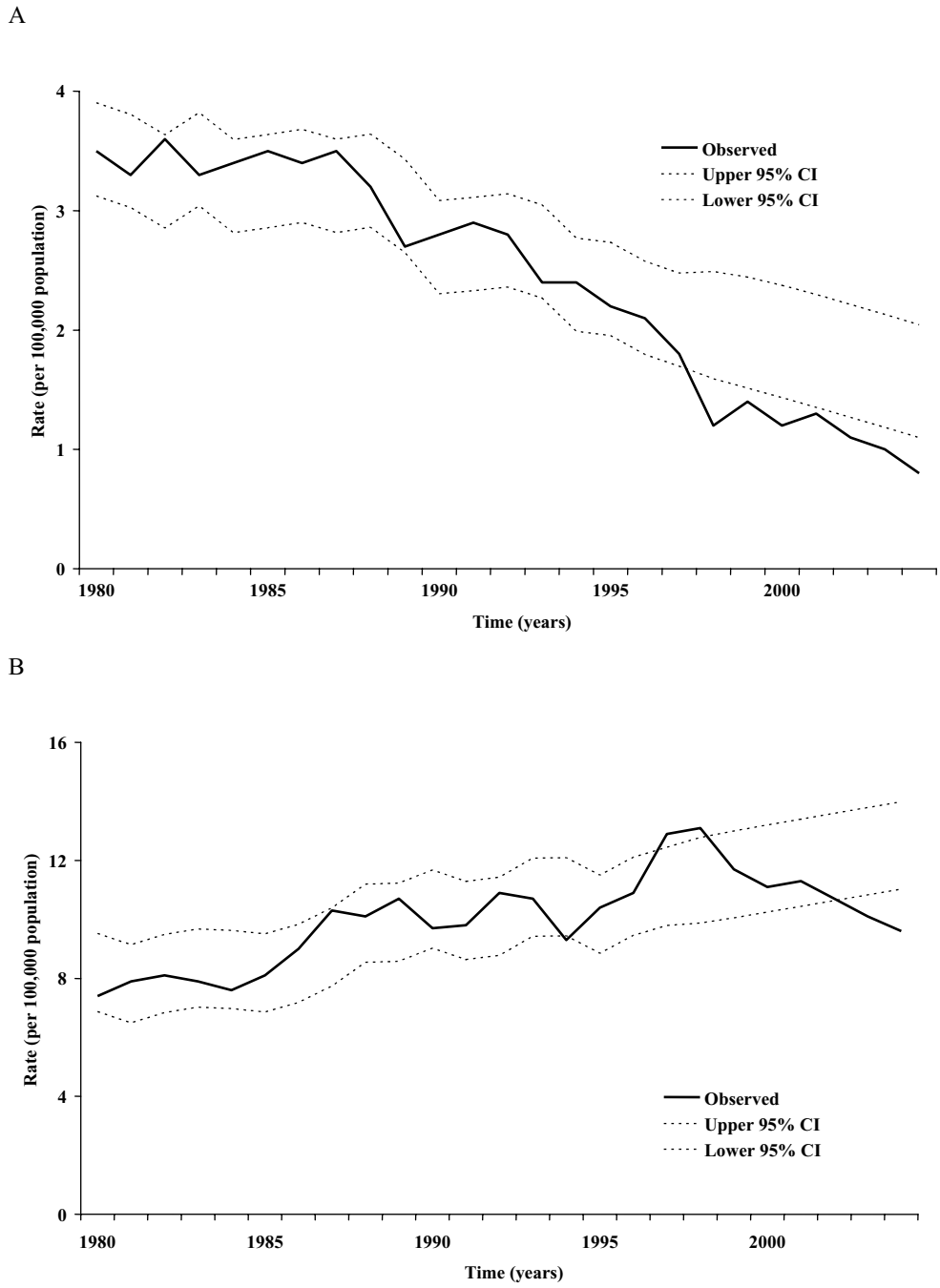

FIG. 3 Firearm suicide (A) and suicide (non-firearm) (B) with observed suicide rates per 100,000 population for the time period 1980–2004, showing 95% CI for the predicted ARIMA values based on the time period 1979–96 and forecast to 2004.

Pre-NFA suicide (non-firearm) rates were increasing. The ARIMA analysis predicted the 1979–96 suicide (non-firearm) well (R^2 = 0.73). Predicted and observed suicide (non-firearm) rates post-NFA showed no average change, with the results of the paired *t*-test showing that the means of both the predicted and observed values were not significantly different (μ_{pred} = 11.82, μ_{obs} = 11.31, std error = 0.60, $P(T \leq t)_{one\ tailed}$ = 0.21). However, it appeared there was an initial increase in suicide (non-firearm) immediately following the introduction of the NFA, with the years 1997 and 1998 being higher than the upper ARIMA 95 per cent CI. This was followed by a decrease, with rates observed in three (2002–04) of the eight predicted years falling outside the ARIMA 95 per cent CI (Figure 3B). When considered in conjunction with the suicide (firearm) rates, these findings may suggest a case for an initial occurrence of method substitution, followed by a decrease in suicide (non-firearm), which mirrored, but was larger than, falls in observed suicide (firearm).

The pre-existing downward trend observed for firearm homicide continued post-NFA (Figure 4A). The ARIMA model did not predict firearm homicide as well as it did for firearm suicide (R^2 = 0.52). The paired *t*-test comparing rates of predicted homicide by firearm with the observed rates for the years 1997–2004 indicated no significant difference between the two (μ_{pred} = 0.28, μ_{obs} = 0.27, std error = 0.01, $P(T \leq t)t_{one\text{-}tailed}$ = 0.14). Based on these tests, it can be concluded that the NFA had no effect on firearm homicide in Australia.

ARIMA modelling was an extremely poor predictor for homicide (non-firearm) (R^2 = 0.04), suggesting that an alternative model should be sought. However, based on the ARIMA model, predicted homicide (non-firearm) rates post-NFA were similar to the observed rates (Figure 4B) and the results of the paired *t*-test were not significant (μ_{pred} = 1.39, μ_{obs} = 1.30; std error = 0.04, $P(T \leq t)_{one\text{-}tailed}$ = 0.08). The results do not support the possibility of displacement to the use of other weapons in relation to homicide (non-firearm) post-NFA. If such displacement had occurred, we would have expected the observed levels of non-firearm homicide to increase relative to predicted levels. The theoretical possibility that displacement from firearm homicide to other methods may have occurred at an increasing rate throughout the entire time series, potentially contributing to the relatively stable rate of non-firearm homicide over time, was not assessed in the current study.

The ARIMA model predicted the accidental firearm death rate between 1979 and 1996 relatively well (R^2 = 0.57). Extrapolating the model to 2004 indicated that the pre-NFA decline in accidental firearm death reversed during the 1997–2004 time period (Figure 5). This observation was confirmed by the results of the paired *t*-test, with a negative correlation resulting from a comparison of the observed and predicted values. The predicted accidental firearm death was significantly lower than the observed mean accidental firearm death rate (μ_{pred} = 0.06, μ_{obs} = 0.15, std error = 0.03, $P(T \leq t)_{one\text{-}tailed}$ = 0.02). The conclusion that accidental firearm death began to increase post-NFA could be inferred from these findings. However, the actual number of incidences per annum across Australia for all years varied substantially, and small changes in the number of accidental deaths per annum can significantly influence rates per annum. Thus, any inference that the NFA 'caused' an increase in accidental firearm death would be extremely tenuous.

Conclusions

Examination of the long-term trends indicated that the only category of sudden death that may have been influenced by the introduction of the NFA was firearm suicide.

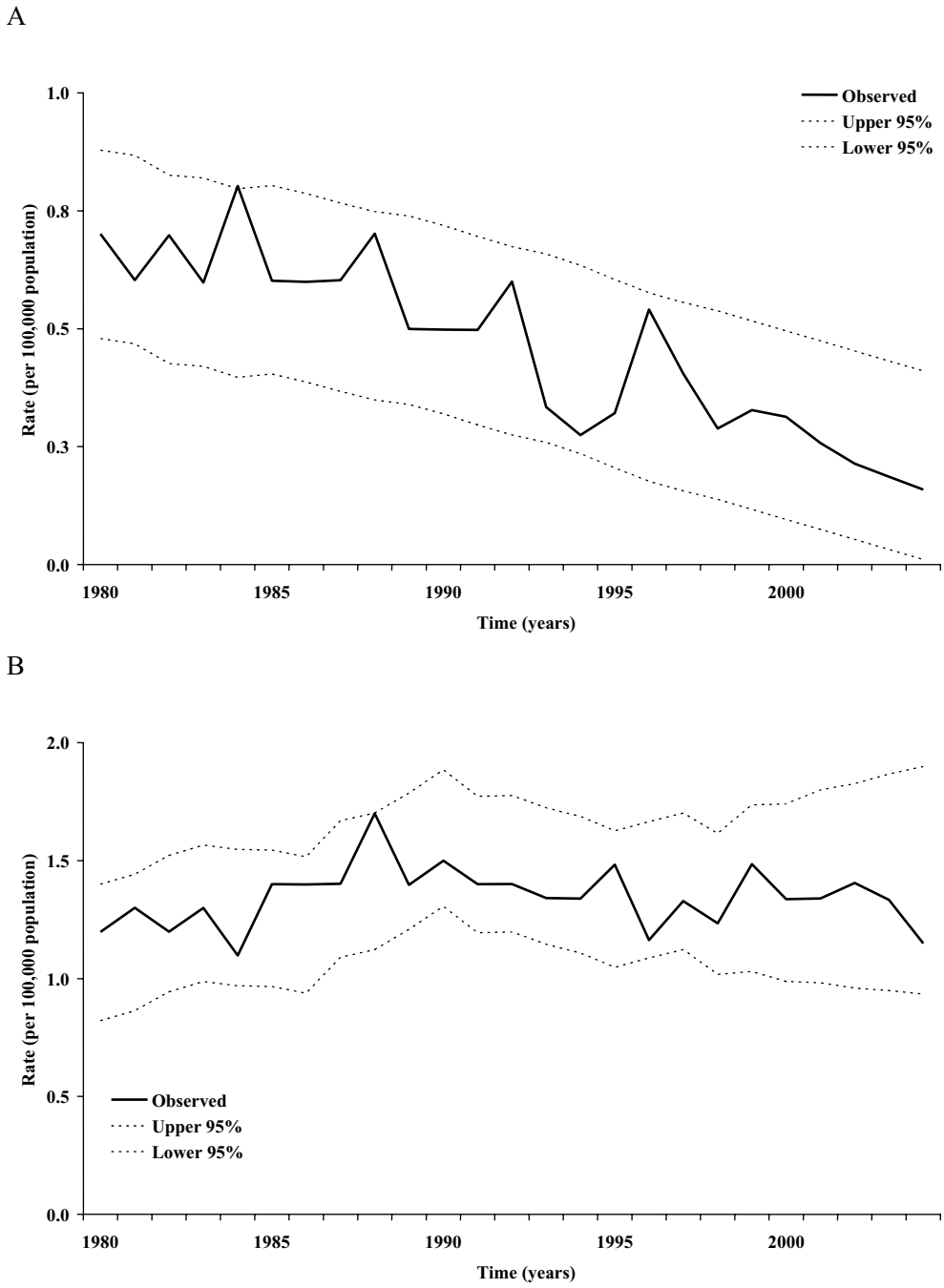

FIG. 4 Firearm homicide (A) and homicide (non-firearm) (B) with observed homicide rates per 100,000 population for the time period 1980–2004, showing 95% CI for the predicted ARIMA values based on the time period 1979–96 and forecast to 2004.

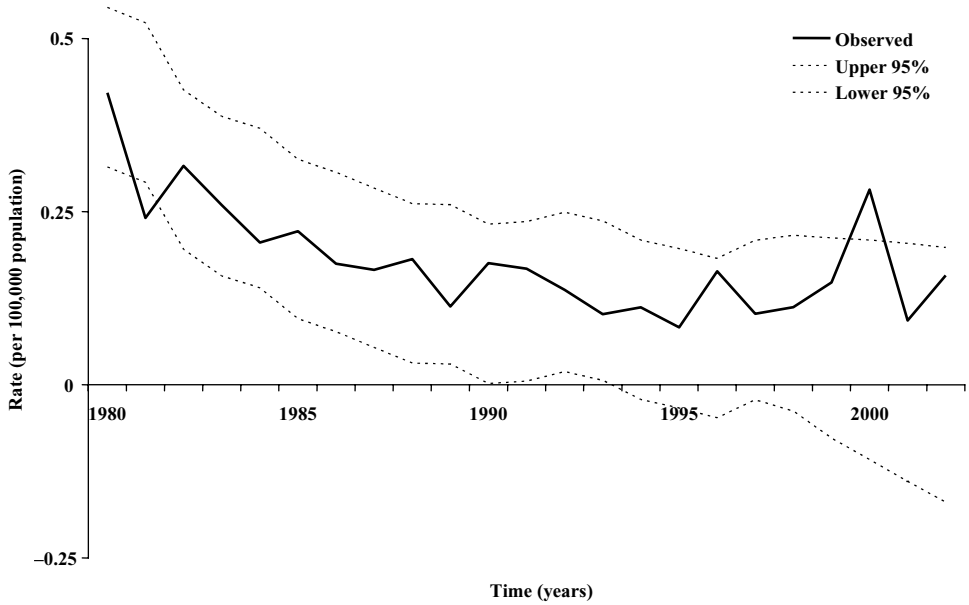

FIG. 5 Accidental firearm death rates with observed accidental death rates per 100,000 population for the time period 1980–2004, showing 95% CI for the predicted ARIMA values based on the time period 1979–96 and forecast to 2004.

However, this effect must be considered in light of the findings for suicide (non-firearm). Homicide patterns (firearm and non-firearm) were not influenced by the NFA, the conclusion being that the gun buy-back and restrictive legislative changes had no influence on firearm homicide in Australia. The introduction of the NFA appeared to have a negative effect on accidental firearm death. However, over the time period investigated, there was a relatively small number of accidental deaths per annum, with substantial variability. Any conclusions regarding the effect of the NFA on accidental firearm death should be approached with caution.

One of the most publicized and passionately debated areas of the NFA was the buy-back of legally held semi-automatic longarms and pump action shotguns. Consequently, it is pertinent to consider whether any category of sudden death was subsequently associated with changing proportions of firearm type (longarm versus handgun) involved. Following the introduction of the National Homicide Monitoring Program, data on the proportion of firearms category used in suicide and homicide were available from the Australian Institute of Criminology for the years 1991–2001 (Mouzos and Rushforth 2003). These data revealed that the number of suicides in which the category of firearm was not recorded was approximately three times higher than that recorded for handguns and approximately one-third that of longarms, with the proportion of firearm not being identified remaining relatively consistent over the time period examined in the study. Likewise, the number of homicides in which the category of firearm was not recorded was approximately three times higher than that recorded for handguns and on par with that of longarms. Again, these proportions remained relatively constant over the time period studied.

Given this shortfall of data, it was impossible to elucidate whether the category of firearm involved in homicide and suicide changed post-NFA. The National Homicide Monitoring Program, administered by the Australian Institute of Criminology, has identified this lack of data as a problem limiting effective policy recommendations and has indicated that it may take special efforts to collate more accurate data (Mouzos and Rushforth 2003). As the available post-NFA data increase and data requirements become better defined, it will be important to replicate and extend the current analyses, and include changing patterns of use for specific categories of firearm.

However, the NFA was not only directed at buying back semi-automatic longarms and pump action shotguns, despite 643,726 firearms being handed in for destruction. Additional legislation introduced concurrently across Australia as part of the NFA related to tightening the criteria for 'genuine need' and purpose of use, enforcing safe storage of firearms and ammunition, and mandatory training and reporting. Thus, the efficacy of these additional restrictions should also be considered in light of policies designed to reduce overall firearm deaths in one or more of the sudden death categories. Examination of the sudden death categories presented here indicates that evidence for such overall reductions is tenuous at best, with only firearm suicide rates post-NFA being significantly different from those predicted from the observed rates.

However, suicide rates by firearm pre- and post-NFA both showed decline. Without considering the general trends in suicide within Australia for this time period, the conclusion would have been that the 1996 NFA had succeeded in lowering firearm suicide rates. However, immediately following the NFA, suicide (non-firearm) increased. This would suggest that there may have been an initial period during which method substitution occurred, although it seems improbable that a buy-back focusing on semi-automatic longarms and pump action shotguns would prevent access to firearms for anyone intent on suicide. It is possible that the increased scrutiny of licence applicants and the necessity for safe storage would cause those considering acquiring a firearm to attempt suicide to evaluate other methods and may subsequently have led some individuals to seek alternative methods of suicide recognized as approximately as lethal as firearms (particularly, hanging).

Despite the increase observed in 1997 and 1998, suicide (non-firearm) rates also began to decline post-NFA after more than a decade of increases. This suggests that suicide rates in Australia were highly influenced by other societal changes, confounding the ability to discern any effect on firearm suicides that may have resulted from the NFA. The supposition that societal factors such as employment levels, financial prosperity and stresses, and the availability of support networks have a marked influence on both firearm and non-firearm suicide is supported by other authors (Duggan 2003; Beautrais *et al.* 2006; Kates 1990; Kellerman *et al.* 1993). It is probable that other factors affecting suicide, such as increased funding for suicide prevention programmes in various jurisdictions, would have contributed to the social factors that influence suicide by all methods, given that such programmes focus on general intervention techniques rather than specific suicide methods.

Duggan (2003) reported that a decline in gun ownership in the United States was not the driving force in suicide rates. This study suggested that the relationship between firearm ownership and suicide was driven by individual risk factors and age-related preferences rather than by firearm legislation. This hypothesis must be considered when assessing the observed trends in Australian suicides. An emerging issue

worldwide is that of youth suicide. Australia is no exception to this trend, having seen an increase in suicide among youths and young men in particular (see, e.g. Cantor and Neulinger 2000). The use of firearms to enact suicide in Australia has traditionally been associated with older men, whereas younger men appear more likely than other demographic groups to engage in method substitution (DeLeo *et al.* 2002). The trend towards young men's propensity for engaging in method substitution has also been encountered in New Zealand (Beautrais 2000).

Importantly, the assumption that generalized suicide prevention strategies would impact upon suicide rates independently of method selection issues (i.e. exert an equal effect on reducing suicides within each 'method' grouping) may account for the observed change in the rate of decline in firearm suicides post-1996. Differentiating between the potential impacts of the NFA versus the impacts of other factors represents a significant experimental difficulty. This potential confound, in turn, demonstrates the need for a cautious approach towards any conclusions regarding the impacts of the NFA on firearm suicide and will be considered in detail in a future study.

It may originally have been hoped that increasing restrictions on access to firearms and criteria for obtaining a licence would have led to a significant drop in firearm homicide. However, two hypotheses underlie this prediction. First, it must be established whether or not persons legally obtaining firearms are likely to commit homicide. The subsequent assumption that increasing legislative requirements surrounding the legal acquisition of firearms would generate a drop in firearm homicide rests on the premise that tighter legislative stipulations would 'choke off' the supply of firearms to would-be criminals, and that this, in turn, may produce a corresponding decrease in homicides. This concern was presumably addressed by additional tightened requirements on civilian firearm owners within the NFA. A ground-breaking Australian study examined the licensing and registration status of firearms used in homicide between 1997 and 1999 (Mouzos 2000b). This study found that over 90 per cent of firearms used to commit homicide were not registered and the perpetrators not licensed. This trend continues to be found (see Crime Facts Info. No. 54, 2003, Australian Institute of Criminology and National Homicide Monitoring Program Annual Reports, e.g. Mouzos 2005).

While firearms do continue to be stolen from private owners, albeit at a rapidly decreasing rate, thefts also occur from dealers, the military and the police (Mouzos 2002; Mouzos and Sakurai 2006). Based on information provided as to whether the stolen firearms had been used in a subsequent criminal offence, there were five incidents (3 per cent) in which a stolen firearm was identified as being used in subsequent crimes (note, however, that the definition of 'crime' included suicide). It was not specified whether these firearms had been stolen from private owners, businesses or otherwise. However, given that firearms have a long shelf life, there is no guarantee that stolen firearms diverted into the black market will not be used in future crimes. In addition to theft, there are several alternative sources through which criminals can obtain unregistered firearms. Illegal firearm trafficking into Australia is currently regarded to be unorganized and opportunistic (Mouzos 2000a), although smuggling has been recognized as a source for illicit firearms (Johns 2004; Walker 1999, cited in Mouzos 2000a).

The above findings, in conjunction with the current study, partially accord with predictions based upon rational choice theory. From rational choice theory, it would be expected that although legislation may alter the rate of use of a particular method

through changing cost/benefit calculations at the level of method selection, this would not impact upon generalized behaviours. However, given that the NFA did not lead to a change in the rate of decline in firearm homicides, it can be assumed not to have impacted on cost/benefit models of choice-making among offenders. It should also be noted that from an empirical perspective, the NFA regulated mechanisms of legal firearms possession whereas evidence demonstrates that offenders are bypassing legal methods of acquisition. This, in turn, suggests that changing cost/benefit calculations at the level of method selection through the application of restrictive firearms legislation directed at the licit user does not alter the patterns of criminal behaviour.

Just as more general intervention strategies appear to be producing results for suicide, pinpointing and addressing so-called 'high-risk' factors in homicide would be predicted to provide a reduction in homicide across all categories. For instance, strategies focused on the prevention of male-perpetrated homicide could include the role of alcohol and the drinking environment, effective anger management, breaking the 'cycle of abuse' and the role of family breakdown (Chang *et al.* 2005; Gawryszewski *et al.* 2005; Kellerman *et al.* 1993; Rae-Grant *et al.* 1999). Likewise, strategies for preventing females becoming homicide victims would address the means for enabling women to escape domestic violence, the role of deteriorating mental health and the importance of providing improved support for young mothers, particularly those who are not financially independent.

There is limited published information available on firearm morbidity in Australia following the introduction of firearm legislation (Mouzos 2001). The need for such information has become increasingly important, especially since the introduction of firearms regulations limiting access to firearms appears to have little effect on sudden death. The one study undertaken in Australia provides some indication that firearm morbidity was also decreasing pre-NFA, but the time series is limited to 1994–99 and does not clarify whether the decrease in morbidities post-NFA are accelerated. Nor does it provide clarification on annual fluctuation over an extended time period (Table 2) (Mouzos 2001).

The lack of effect of a massive buy-back and associated legislative changes in the requirements for obtaining a firearm licence or legally possessing a firearm has significant implications for public and justice policy, not only in Australia, but internationally. It is tempting to equate strict firearm legislation with effective firearm legislation. If policy is to be truly effective, it must have clearly defined outcomes and it must be able

TABLE 2 *Australia, 1994–95 to 1998–99 firearm-related hospital separations as rates per 100,000 population*

Type of firearm injury	1994–95	1995–96	1996–97	1997–98	1998–99
Accident	1.77	1.59	1.50	1.47	1.20
Self-inflicted	0.57	0.53	0.56	0.47	0.53
Assault	0.56	0.73	0.73	0.71	0.60
Legal intervention	0.04	0.04	0.07	0.06	0.03
Undetermined	0.50	0.39	0.22	0.23	0.14
Total	3.40	3.28	3.09	2.93	2.51

Source of data: Mouzos 2001.

to bring about those outcomes. The desired, and implied, outcome of firearms legislation is to achieve an improvement in overall public health and safety by minimizing firearms abuse and misuse. Such aims may be difficult to achieve when legislation is drafted in the political arena. Consequently, we recommend that firearms policy development should be based on empirical data, careful evaluation of that empirical data, and community understanding and acceptance of proposed legislation (Baker and McPhedran 2004). There is insufficient evidence to support the simple premise that reducing the stockpile of licitly held civilian firearms will result in a reduction in either firearm or overall sudden death rates.

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