

**A Comment on the Small Arms Survey 2007 Methods for Estimating
National Civilian Firearm Totals**

Gary Kleck

College of Criminology and Criminal Justice

Florida State University

Tallahassee, Florida 32306-1127

March 5, 2015

Researchers doing cross-national research on the associations between gun ownership rates and violence rates have begun to use the Small Arms Survey (SAS) to measure national rates of gun ownership. The main problem with the SAS is that it counts apples for some nations, oranges for others. That is, even though its developers clearly believe it generates estimates that are at least roughly comparable across nations, they are actually not comparable at all, because the methods measures different quantities for different nations.

The 2007 SAS generated estimates of national civilian firearm totals for 178 nations as of 2006. No estimates were created for nations with a population under 250,000. The most extensive available description of the methods used is confusing, often vague, incoherent, inconsistent, and extremely incomplete (see *Small Arms Survey_2007*, Chapter 2 “Completing the Count: Civilian Firearms” [pp. 55-59] and *Small Arms Survey 2011*). The following is the best that can be inferred about the estimation methods from these rambling descriptions.

The authors used three radically different methods for estimating the number of civilian guns in a given nation, one for each of three subsets of the 178 nations.

1. For 77 nations for which national governmental counts of registered guns were available, estimates were based on a large upward adjustment for unregistered guns, which the authors called “extrapolation from registration data.” The authors claim that the number of unregistered guns is typically 2.6 times the number of registered guns (p. 55), implying that the total number (registered and unregistered) is 3.6 times the number registered. This claim was apparently based on a bivariate regression analysis in which the dependent variable was a “comprehensive” independent estimate of unregistered guns and the sole predictor was the number of officially registered guns, using data from the 52 nations for which both kinds of information were available (pp. 55-56). The estimated

parameters of this regression equation (constant and coefficient) were not reported – only its R^2 .

The authors report that this method does not work equally well for all of the nations to which it was applied (p. 55), but do not seem to recognize that this implies that resulting estimates are not comparable across nations because the degree to which registered gun counts understate the total civilian guns differs from country to country. Perhaps in response to this problem, the authors report that estimates for some nations “have been adjusted,” but do not report how this was done (p. 55).

The “comprehensive” independent estimates of unregistered guns were in turn an average of estimates generated by a variety of supposedly “expert” sources. By the authors’ own admission, some of these “independent estimates” were little more than guesses (p. 53). Further, the kinds of sources of these estimates varied from nation to nation and thus were not comparable. Since the adjustment ratio was based on different “comprehensive” measures of firearms for different nations, the ratio is not consistent across nations, so registration counts will be adjusted upward too little for some nations and too much for others.

The authors also arbitrarily dropped some registration figures based on the subjective judgment that they “appeared suspiciously low” (p. 67, fn. 3). Since the authors concede that registration figures in general are wildly low as counts of total civilian firearms (p. 55), it is unclear by what standard the rejected figures in particular were considered *especially* inadequate while other registration figures were used.

2. For 76 nations for which neither registration data nor “credible” (in the authors’ subjective opinion) independent estimates were available, the authors apparently estimated total guns per 100 persons based on a bivariate regression equation in which the sole predictor was gross domestic product (GDP) per capita. Even this detail is unclear because the appendices (called “annexes” by the authors) that accompanied the report refer to something called GNI (Gross National Income?), an abbreviation that is never explained. The authors call this method “Correlating civilian gun ownership from basic national indicators” (sic). The plural word “indicators is misleading because the method actually used just one purported correlate of civilian gun ownership, GDP (or GNI, whatever that is).

The regression equation used for these GDP-based predictions was apparently estimated using 76 nations for which both registration data and “comprehensive” independent estimates of total gun ownership were available, then the resulting equation was applied to a *different* set of 76 nations for which neither kind of data was available (p. 57).

The estimated parameters of this prediction equation (its constant and regression coefficient) were not reported. The authors did, however, report that the R^2 for this equation was only 0.287, indicating that it was a very poor method for estimating/predicting guns per capita.

This method was not applied to all 76 nations in the same way. For some nations, the authors used a prediction equation estimated on a “global” set of nations for which the requisite data were available, while for other nations the prediction equation was based only on sets of nations located in the same region as the target nation (p. 57). The

authors report that these regional prediction models were not equally good at predicting civilian guns per capita (p. 57), implying that estimates based on this method are not comparable for nations in different regions. None of the parameters for any of these regional regression equations were reported, nor were those for the globally-based equation, either in the text or in any of the “annexes.”

3. Finally, for the remaining 25 nations for which there were no registration data but there were some kinds of “comprehensive” independent estimates, the authors apparently just averaged these estimates, or at least those that the authors subjectively assessed to be “credible” (p. 53). Recall that some of these “estimates” were, by the authors’ own admission, little more than guesses. Further, since different kinds of “expert” estimates, with differing levels of quality, were used for different nations, the resulting averaged estimates are not comparable across nations.

At no point do the authors ever caution readers that their estimates of civilian gun totals are not comparable across nations. Quite the contrary, they convey exactly the opposite impression, using their estimates to rank nations by their rates of guns per capita (see especially Annexe 4). Nevertheless, it is clear that these estimates cannot be legitimately used to compare gun levels across nations, either when the estimates were created using different methods among their three broad methodologies, or even when the estimates were all created by the same one of these three methodologies.

All of the methods are grossly simplistic, even taking account of the limitations of available international data, and none of them are empirically validated. That is, the authors did

not demonstrate any strong correlation between their estimates and other previously accepted measures of national gun levels used for cross-national comparisons, such as direct survey measures of household gun prevalence (available for at least 21 of the nations studied by the authors) or the percent of suicides committed with guns (PSG) (available for at least 55 of the nations studied by the authors). Thus, it would have been easy for the authors to have conducted validity checks, but they did not, for reasons they do not explain. In sum, in addition to the estimates being based on crude and incompletely documented methods, and noncomparable across nations, they are also completely unvalidated.

The easy availability of these data, and their extensive coverage of 178 nations, is likely to tempt unwary researchers into using them. Indeed, at least one set of researchers has already done so (Konty and Schaefer (2012)). Nevertheless, these estimates should not under any circumstance be used for cross-national research on the relationship between gun levels and homicide or suicide rates. Since there is no basis for believing that the SAS estimates are either valid or comparable across nations, any findings based on their use would be meaningless. Instead, either direct survey measures or PSG should be used. These measures are currently available only for far fewer nations, but there is no point to studying a larger set of nations if one's measure of gun levels is noncomparable junk.

References

- Konty, Mark, and Brian Schaefer. 2012. "Small Arms Mortality: Access to Firearms and Lethal Violence." Sociological Spectrum 32:475-490.
- Small Arms Survey. 2007. The Small Arms Survey – 2007: Guns and the City. "Chapter 2, Completing the count: civilian firearms." Available online at <http://www.smallarmssurvey.org/publications/by-type/yearbook/small-arms-survey-2007.html>.
- Small Arms Survey. 2011. Estimating Civilian Owned Firearms. Available online at http://www.smallarmssurvey.org/fileadmin/docs/H-Research_Notes/SAS-Research-Note-9.pdf.