

Statistical Approaches to Developing Indicators of Armed Violence

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Executive Summary

This paper explores the feasibility of developing a meaningful system of indicators of armed violence for use in exploring the relationship between armed violence and attainment of the Millennium Development Goals. Through our explorations, we have determined the following:

1. Many sources of data that can be used for developing indicators of armed violence exist. However, use of the data for that purpose is complicated and requires significant planning and the expectation of the need to relate limitations of the data to the eventual users of the indicators for policy purposes.
2. The potential for development of indicators that measure phenomena that either promulgate and/or propagate armed violence is high, with the same caveats described above for indicators of armed violence.
3. Development of the indicators most likely will rely on the use of data from multiple sources and of multiple types. That is, data from surveys, censuses, administrative sources, and surveillance systems will need to be combined in a rigorous and defensible manner.
4. Data storage and distribution should occur on the most widespread and simple platform possible. Indicators should be distributed with information related to the source of the data and a quality index that indicates an overall measure of the completeness of data documentation, quality of data collection and recording methods, possibility of data misrepresentation by informants, and closeness of concept measured to the concept represented by the indicator.
5. Indicators of armed violence can be analysed both through time series methods and also linear regression methods to explore the relationships between measures of phenomena that either predict or sustain armed violence, and the armed violence itself.
6. Once the indicators described above are developed and made available, experimental and quasi-experimental techniques can be used to test the relationships between armed violence and development, as well as the effectiveness of interventions intended to reduce or end armed violence.

Detailed information on potential sources of data are included as appendices to this manuscript, and a detailed discussion of the feasibility of creating indicators of armed violence is provided in Chapter 5.

Table of Contents

1. Introduction	7
2. Measuring Armed Violence	11
3. Correlates of Armed Violence	17
3.1. Appropriateness and Validity of Selected Statistically Relevant Indicators	17
3.2. Predictors of Armed Violence	17
3.3. Sustainers of Armed Violence.....	23
4. Benchmarking	25
5. Feasibility	27
5.1. Harvesting Preexisting Data	27
5.2. Collecting and Compiling Raw Data	32
5.3. Storage and Distribution Mechanisms	33
5.4. Modelling Error in Indicators of Armed Violence	36
5.5. Developing an Index: Complex Indicators of Armed Violence	36
6. Analysis beyond Indicator Development	39
6.1. Time Series Development and Study	39
6.2. Evaluation Techniques	39
6.3. Predictive Models	40
7. Discussion.....	43
References.....	47
Appendix 1. Data Sources: Indicators of Armed Violence	55
Appendix 2. Data Sources: Predictors and Sustainers of Armed Violence.....	61
Appendix 3. Goals, Targets and Indicators of Armed Violence (Developed at the Expert Workshop on Indicators of Armed Violence)	69

1. Introduction

As an output of the Expert Workshop on Indicators of Armed Violence, held in Geneva on December 14–15, 2009 and sponsored by the United Nations Development Programme and the Geneva Declaration Secretariat, Small Arms Survey commissioned StatAid to prepare a technical paper on statistical approaches related to the measurement of armed violence. This manuscript is the result. Specifically, StatAid was requested to:

1. Critically reflect on statistical methods to address armed violence, taking into account actors, effects, determinants, risk factors, and prevention programs;
2. Research availability of data for the indicators proposed at the Expert Workshop, as well as propose measures of phenomena that either promulgate or perpetuate armed violence, and discuss the appropriateness and validity of all of those indicators;
3. Explore the challenges to collecting those data and to development of a system by which national data sources can be synthesized; and
4. Propose practical steps required to produce common standards to collect data on armed violence.

The next two chapters of this manuscript address the second request described above. Chapter 2 explores existing data sources both for the indicators of armed violence proposed at the Expert Workshop, as well as potential ancillary indicators. Chapter 3 thoroughly explores potential measures of predictors and sustainers of armed violence. Chapters 2 and 3 are supported by tables that map indicators to data sources, and describe the quality of those data. Those tables are provided in Appendices 1 and 2.

Chapter 4 partially addresses the third goal described above, through a short discussion of benchmarking of indicators of armed violence. Chapter 5 addresses the third and fourth goals by thoroughly exploring issues related to the feasibility of creating a set of cross-national indicators of armed violence. Specifically, the chapter proposes methods for harvesting existing data, collecting new population-based data, harmonizing those data into a single set of indicators, and distribution methods for those indicators.

Chapter 6 explores concepts related to the first goal discussed above, and presents specific methods of analysis that utilize the indicators proposed in the previous chapters. Potential methods for evaluating interventions designed to reduce or eliminate armed violence also are explored.

What do we mean by armed violence?

Armed violence assumes many forms, and armed violence outcomes are not restricted exclusively to deaths. They include, for example, assault, sexual assault and gender-based violence, as well as other forms of non-fatal attacks. Nevertheless, deaths from armed conflict draw considerable attention from international actors, although there has been a decline in the

number of those deaths over the past 20 years. Three factors have been cited as the basis for that decline, in addition to the general decline in peacetime mortality during that period. They include a. the change in the characteristics of warfare, whereby wars have been waged with less use of conventional weapons on a large scale, and with smaller armed forces; b. improved global initiatives that have promoted health through efforts such as large-scale vaccinations, which have led to the decline of deaths in peacetime and during war; and c. a greater presence of humanitarian intervention in regions that have experienced armed conflict and war (Human Security Report Project, 2009).

The vast majority of casualties of armed violence occur during non-conflict-based events (Geneva Declaration Secretariat, 2008). Those casualties are the result of gang-related violence, sexual and gender based violence, and violence related to crime. The indicators, predictors, and sustainers chosen to represent armed violence should reflect that fact.

What do we mean by indicators of armed violence?

For the purposes of this manuscript, an indicator is a measurement of the state or level of a phenomenon. Numeric indicators assume two basic forms: *simple* and *complex*. Simple indicators typically are composed of single numeric values or statistics and reflect relatively simple concepts. Complex indicators are comprised of multiple measurements assembled in a form that allows the indicator to measure a complex concept or process. For example, the *Human Development Index* is an overall measurement of human well being that is composed of a weighted average of nation-level statistics on life expectancy at birth, adult literacy rate, school enrolment, and gross domestic product (GDP) per capita (United Nations, 2004).

It is important to note that indicators are not necessarily synonymous with statistics. A useful analogy is to consider an indicator as a “bucket” to be filled with data. The indicator defines the concept, but it does not define how the data are to be collected and does not require that the data be gathered through an identical mechanism for each place and time for which the indicator is developed. For example, rates of homicide might be derived through a random sample survey in one nation, but might be determined through surveillance data in another location. *However, use of data of multiple types and/or from multiple sources requires careful methodology and excellent communication of data limitations to users of the indicators.*

What do we mean by predictors and/or sustainers of armed violence?

For the purposes of this manuscript, “predictors” of armed violence are indicators of phenomena or *risk factors* that are highly correlated with incidence of armed violence. The use of “predictor” as terminology should not be interpreted as a statement of causality, but rather as a phenomenon that we hypothesize might be causal and that appears prior to or during armed conflict. Sustainers are indicators of phenomena that we hypothesize as causing violence to continue once it is present. Predictors and sustainers also are indicators, but are not indicators of armed violence *per se*. However, they might be useful in statistical models that explore the relationships between the various phenomena surrounding armed violence.

Data Sources

Several types of data exist that could be harvested for the development of indicators. *Survey data* are collected from a subset of the population of interest. In the best situations, survey data are collected from a random sample of that population, to ensure that the resulting statistics represent the population well. However, often that is not what occurs, either because a sample frame (list of the population) is not available or is incomplete. *Census data* are similar to survey data, except that an attempt is made to collect the data from every member of the population. Censuses typically are very expensive. Both surveys and censuses can be focused on capturing factual data (e.g. household income), perceptions/opinions (e.g. what the respondent believes is a reasonable wage in his/her community), or both.

Administrative data are data collected by a government or other organization for the purpose of fulfilling its administrative responsibilities. For example, data are collected from citizens when they pay taxes, or when they register for social security or medical benefits. In contrast, *Surveillance data* are data collected to track phenomena that affect several members of society. Such data include crime data collected by police units for the purposes of documenting serial criminal activity, or data collected at hospitals for the purposes of tracking epidemics. Note that police stations and hospitals also might collect administrative data, but whereas administrative data exist for the purpose of providing services to individuals, surveillance data exist for the purpose of providing services to communities or populations.

Other types of data exist, including focus group data and events-based data (e.g. data gathered from media reports), but the data described above represent the four most likely to be used for the purpose of developing the national and regional indicators of armed violence described in the next chapter.

2. Measuring Armed Violence

Measuring armed violence is a challenging task that requires gathering reliable data to effectively gauge its appropriateness and validity in formulating relevant indicators. The Expert Workshop on indicators of Armed Violence established a foundational list of potential indicators of armed violence that create a starting point for the acquisition of pertinent data. This section discusses available sources of data relevant to each indicator, and assesses their quality and timeliness.

Some of the indicators discussed in this paper (including the correlates of armed violence, discussed in Chapter 3) are more statistically and qualitatively robust than others. That essentially is due to the methodological rigor and comprehensiveness of the datasets to which they belong, how current the data are, and how accurate or credible their sources are. Perhaps the greatest challenge to collecting statistically valid indicators is the temporal element. That is, data sources vary in the extent to which they are updated or kept current, although it is possible to make future predictions of armed violence indicators based on past trends. In several instances, highly-relevant variables are readily available, but have not necessarily been updated to reflect the most recent or real-time developments in a country or territory. In addition to the textual citations for the sources associated with each of the indicators discussed in this section, complete URLs or file paths to their online counterparts are included in Table A and Table B of Appendix I.

Intentional homicide (national, local). Intentional homicide is the unlawful death inflicted on one person by another. However, defining “homicide” across countries becomes challenging as differences in legal codes might allow for the justified taking of life. Nevertheless, the capture of data related to unlawful deaths tends to be recorded more accurately than other related data. That is due in large part to the processing of deaths through police and medical examiner records, or through other institutional means used to account for human remains.

The U.N. Office on Drugs and Crime (UNODC) has published a series of *Crime Trends and the Operations of Criminal Justice Systems (CTS)*. The reports are published in “waves,” incorporating statistical data from as early as 1970 (the first and second *CTS*) up to the current tenth edition, which incorporates data from 2005–2006. The eleventh edition is under review and will capture data up to 2008. The report annotates intentional homicides by country and illustrates the rates of intentional homicides per 100,000 persons. Although those data are presented within their respective reports and cannot be exported to a separate file, the United Nations Statistics Division provides online, exportable files using the same UNODC data (UNODC, 2008).

Intentional homicide by firearm. Of all homicides recorded in eight world sub-regions during 2000, nearly 60 per cent were carried out with small arms. The global flow of small arms is perpetuated by ease of access to them, relaxed gun control laws, surplus firearms from prior conflicts, and porous international borders. Global trends in homicide by firearm indicate that young men are most at risk for death by such weapons. That primarily is due to young men’s involvement in criminal activities such as membership in gangs, or their involvement in the sale and use of illicit drugs. Aggregating those social indicators demonstrates the degree to which the illegal use of firearms affects mortality rates among young men and women (UNODC, 2004).

The seventh edition of the United Nations Office on Drugs and Crime's *Survey of Crime Trends and Operations of Criminal Justice Systems, Covering the period of 1998-2000* provides a wide range of criminal, police, and justice data—as well as data on penal systems—for 92 countries. Data relating specifically to intentional homicide by firearm are displayed by incidence per year, and rate per 100,000 persons (UNODC, 2004). For access to those data online, please see Appendix I, Table A of this report.

Direct conflict deaths. Accurately measuring direct conflict deaths frequently is hampered by lack of reporting. In many instances, armed factions intentionally distort the number of fatalities reported, for various strategic and political reasons. In other cases, conflict zones might be too dangerous for humanitarian organizations or media outlets to conduct accurate reporting. Recently, new survey methodologies have made the measurement of conflict related deaths feasible by using existing demographic data to predict the number of conflict related deaths. Technological advances allow for rapid data distribution that in turn facilitates accurate reporting. A response to the need for adequate reporting has been the creation of international conflict datasets that are used to calculate the annual toll of conflict related deaths. One of the most well-recognized datasets has been produced by the International Peace Research Institute, Oslo, which compiles data from multiple sources (e.g. non-governmental organizations, national government agencies) on conflicts, including war, and includes data for countries' internal and external conflict. The dataset captures conflicts from 1946 to 2008 (PRIO, 2009). For access to those data online, please see Appendix I, Table A of this report.

Indirect conflict deaths. In almost all armed conflicts, the number of deaths attributable to causes unrelated to direct conflict far supersedes the number of deaths of direct conflict. Armed conflict has far reaching and often long lasting effects on a community's ability to secure basic human needs. Major contributors to indirect conflict deaths include the inability to access basic healthcare, food, shelter, and clean water. Disruptions in infrastructure make the delivery of basic needs nearly impossible, exacerbating the effects of armed conflict.

Unlike measurements of armed conflict deaths, the measurement of indirect conflict deaths is not supported by datasets specifically developed to monitor and predict the occurrence of deaths. The collection of data on indirect conflict deaths is in its infancy. However, methodological approaches do exist and are being implemented. Information regarding all aspects of armed conflict is being produced by various sources, but no single dataset exists that incorporates indirect conflict deaths comprehensively. The Small Arms Survey has produced a series of annual reports that seek to capture much of the data necessary to fulfil that mandate. For detailed reference to the Small Arms Survey list of reports—particularly the 2005 edition focusing on *Weapons at War*—please see Appendix I, Table A of this report.

Number of conflict-related injuries per year per 100,000. As with direct conflict related deaths and indirect conflict deaths, the accurate measurement of all conflict related deaths is elusive. Existing data are not readily accessible in a format that makes quantifying conflict related deaths at an international level. Efforts along this line of inquiry will necessarily involve sharing publicly available data at the country level. Survey methodologies already in existence—particularly epidemiological and other health-related data—will establish the groundwork for the

creation of a dataset that is useful for accurately measuring and predicting the total number of conflict related injuries.

Violent victimization. Criminal victimization is not endemic to situations of armed conflict. However, it is during and after periods of armed conflict that violent victimization takes on its most egregious forms. Sexual and gender based violence is perhaps the most prevalent of such violent victimizations. The general environment of lawlessness and impunity during armed conflict leads to victimization of women and children through acts of rape, torture, forced labour, and other acts. In urban settings, deteriorating social conditions and economic exclusion of sectors of the population lead to increased marginalization and substandard living conditions. The association between young men and youths experiencing high unemployment rates and the increase in gang and drug related violence has been established. Additionally, violent victimization also includes violence against intimate partners who suffer disproportionately against other population sectors (Tilburg University, 2006).

Data on international violent victimization has been produced by the United Nations Office on Drugs and Crime. Specific data relating to criminal victimization is available through its *International Crime Victims Survey: Criminal Victimization in International Perspective, ICVS 2004-2005*. For detailed information concerning that survey, please see Appendix I, Table A. Additionally, the United Nations Interregional Crime and Justice Research Institute's *Correspondence on Data on Crime Victims* provides data on a wide range of international criminal activity (2000 is the most recent year for which data are available; UNICRI, 2010).

Displacement/resettlement. The threat of death is a central motivator for relocation. Persons dislocated from their communities face a higher risk of indirect death, caused by deteriorated infrastructure and lack of access to basic needs. In recent conflicts, images of displaced persons living in makeshift towns have reached international media, focusing attention on the humanitarian need to address this problem. As such, the issue of internally displaced persons has received greater scrutiny by humanitarian organizations. The interest on this subject matter is reflected in the data publicly available that measures the numbers and effects of displaced and resettled populations Appendix I, Table A.

The Internal Displacement Monitoring Centre publishes statistics by country from multiple sources, including independent monitors, government agencies, and the United Nations. Further, the U.N. Development Programme (UNDP) has included several searchable datasets in its *Human Development Report* that are specific to statistics gathered on refugees. The UNDP database is highly interactive, and allows users to define query parameters in producing targeted statistical tables in a downloadable file format (please see Appendix I, Table A).

Number of child soldiers/children involved in armed conflict. Although there is an abundance of sources about child soldiers that is publicly available—all of them noteworthy—no single source exists that aggregates regional data in existence into a comprehensive database for comparative purposes. Coalition to Stop the Use of Child Soldiers has published *Child Soldiers: Global Report 2008*, which details information regarding population under the age of 18, number of government forces, conscription, recruitment age, and voting age by country, along with other qualitative information for countries in conflict and with known child soldier combatants, which

includes progress toward achieving disarmament, demobilization, and reintegration (please see Appendix I, Table A).

Rate of intimate partner violence. A World Health Organization report finds that upwards of 40 per cent—and up to 70 per cent—of all female homicides are the result of intimate partner violence. Those disturbing figures have not gone unnoticed by several organizations whose mission is to eradicate that form of violence (WHO, 2005).

As mentioned, the WHO has published several reports that address intimate partner violence. Its *Multi-country Study on Women's Health and Domestic Violence against Women* report (WHO, 2005) documents intimate partner violence and its effect on women's health. Chapter 4 of its *World Report on Violence and Health* focuses on the direct effects of intimate partner violence on women's health. Additionally, the U.N.'s High Commissioner for Refugees has made public its *In-depth Study on All Forms of Violence Against Women*. To access those reports, please see Appendix I, Table A.

Conflict related sexual and gender-based violence. The amount of data available for research on gender-based violence is robust. As discussed elsewhere in this report, the incidence of gender-based violence is most prevalent in areas of armed conflict. Heightened public awareness of violence against women and children has spurred interest in gathering data related to gender-based violence. In addition to the publicly available resources cited in elsewhere in this report, the U.N. High Commissioner for Refugees has published *Sexual and Gender-Based Violence against Refugees, Returnees and Internally Displaced Persons: Guidelines for Prevention and Response*. Another valuable resource is the United Nations Development Fund for Women, *Progress of the World's Women 2000*, which provides a statistical approach to tracking the progress of women (UNIFEM, 2000).

Perceptions of safety. Perceptions of safety or lack thereof can lead to further violence if populations experiencing fear arm themselves for protection. The proliferation of arms—particularly during times of crisis—has the potential to lead to more violence. This social phenomenon is true in most social settings, irrespective of the existence of armed conflict. Thus, the measurement of perceptions of safety is crucial to understanding and predicting the repercussions of societal fears.

The United Nations Office on Drugs and Crime publishes yearly updates to its *Nations Survey of Crime Trends and Operations of Criminal Justice Systems*. Its eighth edition (for 2001–2002) provides statistics on perceptions of safety in addition to statistics on crime, police, courts, and penal systems by country per year and per 100,000 inhabitants. Additionally, the Interuniversity Consortium for Political and Social Research has made publically available its *International Crime Victim Survey (ICVS), 1989-1997*. Although the information contained within this report is dated, it serves as a basis for historical comparison (see Appendix I, Table A).

Access to justice/conviction rates. Access to government and societal institutions or lack thereof is a central component of social discontent. Through time, marginalized populations who feel that government institutions are not responding to their needs can develop into armed opposition.

Similarly, by responding to requests for redresses manifested by elevated conviction rates, governments might placate populations, thereby controlling dissent.

Statistical data relevant to policing, justice, and penal systems all are integral to measuring levels of societal discontent, and to predicting adverse outcomes of inaction. To that end, the U.N. Office on Drugs and Crime's *Survey of Crime Trends and Operations of Criminal Justice Systems* provides pertinent data regarding issues related to justice, police, and penal systems. In addition, the United Nations Office on Drugs and Crime also has published its *Criminal Justice Assessment Toolkit*, which provides guidelines in assessing indicators relevant to justice. URL addresses to these resources are available in Appendix 1, table 1A of this volume (see Appendix I, Table A).

Reporting rate for armed violence/crimes against persons. Fear of retribution prevents many from reporting crimes to appropriate authorities. Unreported crimes have the additional disadvantage of concealing actual crimes while permitting—and in some cases—emboldening, the perpetrators to continue such activities with impunity. The value of accurate statistical data regarding rates of crime is invaluable to law enforcement efforts in allocating appropriate resources to address those crimes. The U.N. Office on Drugs and Crime's *International Crime Victims' Survey* database captures international statistical data relevant to criminal activity globally (see Appendix I, Table A).

Reduced number of gang/militia/armed groups. Accurate measurement of gang membership—whether it is through paramilitary militia or other armed groups—is crucial to determining the effectiveness of programs enacted to demobilize and reintegrate former combatants. Although information exists for regional numbers of gang, militia, and armed groups, very few if any of that information contains statistical measurements of reduced or increased activity. That poses a significant problem in assessing the effectiveness of Disarmament, Demobilization, and Reintegration (DDR) programs. No single dataset exists that effectively quantifies on an international level the extent to which gang members, militia, or armed groups are reintegrated. Future research should focus on the creation of such a dataset in the effort to ascertain the extent of gang membership, its social underpinnings, and its effects at a regional level. To that end, the U.N. Disarmament, Demobilization, and Reintegration Resource Centre has published its *Monitoring and Evaluation of DDR Programmes*, however, this manual falls short of the statistical research necessary to implement a strategic plan on accurately assessing the overall number of gang, militia, and armed groups. Information on accessing data from that manual can be viewed in Appendix I, Table A.

Percentage of (ex-) combatants in DDR programmes or gang member/at risk groups in violence reduction initiatives. As discussed above, data reflecting actual numbers of combatants is particularly insufficient to measure any attribute of combatants or ex-combatants. However, the assessment of human development indicators might provide insight into the numbers of combatants and ex-combatants in DDR programs. For example, labour statistics might reveal an increase or decrease in a demographic group that correlates to the known age group of combatants. The International Labour Organization's LABORSTA Internet Database provides downloadable, interactive labour statistics for over 200 countries or territories, including unemployment levels by age group (ILO, 2010).

Reduced income inequality. Income inequality is perhaps one of the most oft-cited indicators of social discontent. Much has been written about disparities in income and the perceptions of populations that are unjustly marginalized by others' pursuit of wealth. One need only look at international social movements of the late 19th and 20th centuries to gain insight into how income inequality has been a factor in the incidence of violence.

The World Bank makes available a database that captures many of the indicators associated with income inequality by country. Its *Measuring Income Inequality Database* displays statistical data by country and U.N. country code, year, Gini coefficient, and cumulative quintile shares. The data distribute unevenly for 138 countries over the period of 1890 to 1996, and are useful for historic analyses of income inequality. Alternatively, the World Bank also has produced the *World Development Indicators 2002*, which provides more recent statistics. Information on accessing those data can be viewed in Appendix I, Table A.

Reduced unemployment among young men. As discussed above, prolonged unemployment foments social instability as members of populations engage in illegal activities to provide for themselves. Young men experiencing prolonged unemployment have been shown to engage in acts of violence (See "Youth Bulge" in Section 3.2, "Predictors of Violence"). The International Labour Organisation's *LABORSTA Internet Database* (discussed above) provides a downloadable database of labour statistics for over 200 countries or territories, including unemployment levels by age group (ILO, 2010).

Although the list of indicators outlined in this section covers a wide range of potential research on armed violence, it does not exhaust all avenues of inquiry. As research proceeds and more information is gathered, the search for alternative sources of potential indicators might be useful in correlating different facets of the existing data. Included in Appendix Table 1B is a list of potential "alternate" indicators of armed violence.

3. Correlates of Armed Violence

3.1. Appropriateness and Validity of Selected Statistically Relevant Indicators

Several variables are closely associated with the conditions that promote the onset of armed violence. Individually, those correlates vary with respect to their level of appropriateness and validity for predicting the likelihood of an armed violence outcome. Collectively, these predictors are a powerful means by which to determine whether a country or territory is at risk for a state of armed violence. Some of the correlates of armed violence described in this paper are more statistically and qualitatively robust than others. That essentially is due to the methodological rigor and comprehensiveness of the datasets to which they belong, how current the data are, and how accurate or credible their sources are. Perhaps the greatest challenge to collecting statistically valid predictors is the temporal element. That is, data sources vary in the extent to which they are updated or kept current, although it is possible to make predictions of future armed violence outcomes based on past trends. In several instances, highly-relevant variables are readily available, but have not necessarily been updated to reflect the most recent or real-time developments in a country or territory. In addition to the textual citations for the sources associated with each of the correlates discussed in this section, complete URLs or file paths to their online counterparts are included in Table A of Appendix II.

3.2. Predictors of Armed Violence

Meta-indices. Few comprehensive indices exist to evaluate the tendency of a nation-state or its government to become unstable or volatile. However, the *State Fragility Index and Matrix*—produced by the Center for Systemic Peace and the Center for Global Policy—is a methodologically rich resource. Although 2008 is the year of the most recent *Index*, it was “based on real-time monitoring of security and political conditions in each of the 162 countries under examination,” and “[e]ach of the measures has been carefully selected on the basis of extensive research that has validated the fundamental association between the measure and the key conditions of fragility and instability” (Marshall and Cole, 2009, p.24). Each country’s Fragility Index is based on scores derived from eight indicator variables, of which armed conflict is one.

Although it is not the exclusive form of armed violence, civil war is a major form of such conflict. Dixon has compiled a list of “consensus determinants of civil war,” based on seven categories of variables that were subject to statistical testing of their strength as predictors (Dixon, 2009). Those variables are discussed here because they serve as potentially important predictors for the broader category of armed violence. The categories include demographics (e.g. population density, ethnic group dominance), geography (whether land area is non-contiguous, whether a neighbouring state is at war), environment (presence of drought, land degradation), resource wealth (diamond and oil exports/trade), economy (level of prosperity and growth), history and insecurity (number of years for which peace has been maintained, presence of refugees), and regime and policy (whether democratic governance prevails, whether the ruling regime is politically stable; Dixon, 2009, p. 720).

Political corruption. As Le Billon notes, when competition increases between corrupt factions in powerful government positions, the potential for armed conflict to occur also increases (Le

Billon, 2003, pp. 413–414). To measure corruption among government/public and other political officials, the non-governmental network *Transparency International* compiles an annual report to assess perceived levels of corruption in a country or territory (Transparency International, 2009). That report is based on multiple sources (e.g. surveys of members of civil society and the private sector) and calculates confidence levels as to the accuracy of each country's score. Data are available from 2001–2009. Somewhat similarly, the World Bank Group maintains a database that includes numeric indicators of a country's ability to control corruption (Kaufmann, Kraay, and Mastruzzi, 2009). The most recent data are for 2008. Sources are drawn from surveys of several individual respondents and organizations.

Freedom of the press. Suppression of journalists (including threats of violence and direct violence against them) is common as regimes or factions mobilize toward militant activity (Deutsch Karlekar, 2009, pp. 1–3). The international non-governmental organization, Reporters Without Borders, and the non-governmental organization Freedom House, both publish indices of journalist and press freedom for 175 and 195 countries, respectively (Reporters Without Borders, 2009; Freedom House, 2009). Data are available for each index for 2009 and 2008, respectively. Both organizations base their indices on complex surveys administered to members either of partner organizations or to individuals.

Level of democratization. Although there is disagreement as to whether the absence of democratic participation in a society is correlated with a government's increased likelihood to engage in armed conflict with other governments, there is increasing evidence that a society with a well-established, mature democracy is less likely than others to foster a culture of violence (Gleditsch and Hegre, 1997; Mansfield and Snyder, 2002). One of the most recognized sources of data on countries' level of democratization is Vanhanen's *Measures of Democracy*, consisting of three variables for 192 countries: political competition, political participation, and an index of democratization (Vanhanen, 2009). The most recent year for which data are available is 2008.

Political stability. Governance is a critical category of predictors for a country's tendency to engage in armed violence—and the political stability of a regime is one such predictor. The World Bank Group's *Worldwide Governance Indicators* database contains numeric indicators of a country's level of political stability, and the most recent year for which data are available is 2008 (Kaufmann, Kraay, and Mastruzzi, 2009). Sources are drawn from surveys of several individual respondents and organizations.

Freedom of movement. Restricted freedom of movement is a potential indication that a government regime is attempting to consolidate power, which, in turn, can be associated with the conditions that promote armed violence. Presently, data sources for measuring the freedom of movement within several countries are not well developed or tend to be more qualitative than quantitative (Human Rights Education Associates, 2003).

Rule of law. As with correlates of governance such as political stability and freedom of movement, the extent of the rule of law within a country can serve as a predictor of its propensity toward armed violence. For example, failure to enforce laws that address crime can promote criminal activity and associated violence. The World Bank Group's *Worldwide Governance Indicators* database includes numeric indicators of the extent to which the rule of law prevails in a country, and the most recent year for which data are available is 2008 (Kaufmann, Kraay, and

Mastruzzi, 2009). Sources are drawn from surveys of several individual respondents and organizations.

Inflation rates. Economic conditions are important indicators of a country's or territory's tendency to experience armed violence, as lack of prosperity or other economic hardships suggest that tensions among populations, non-state actors, and/or political factions might escalate to the point of conflict or violent crime. An analysis of several studies of civil war found that economic distress is "a significant predictor of civil war onset: the probability of civil war onset is substantially higher among nations with lower indicators of economic well-being" (Quinn, Mason, and Gurses, 2007, p. 168). Inflation rates (consumer price index) are one potentially strong predictor. Data for inflation rates are available for 227 countries and territories for 2009, through the World Bank Group's *World Development Indicators Database* (World Bank Group, 2009). Those data are based on multiple country-level surveys of entities such as government agencies/statistical agencies. Inflation rates for 227 countries and territories also are available through the U.S. Central Intelligence Agency's *World Factbook*, which draws data from multiple public- and private-sector sources such as national government agencies and statistical annexes (CIA, 2009b).

Gross domestic product (GDP). As with inflation rates, GDP serves as a potential predictor of a country's or territory's propensity to experience armed violence. *GDP per capita* illustrates the "opportunity costs for participation in rebellion" (Quinn, Mason, and Gurses, 2007, p. 169). GDP and *GDP per capita* can be obtained from the U.S. Central Intelligence Agency's *World Factbook* and from the United Nations (U.N.) Statistics Division, respectively (CIA, 2009a; U.N. Statistics Division, 2009). CIA data are available for 225 countries for 2009, and U.N. data are available for 215 countries for 2008. Data for the U.N. Statistics Division is compiled from national statistical agencies as well as international statistical organizations or organizational repositories.

Economic inequality/poverty. Similarly, vast income inequality between population groups suggests that the conditions for armed violence might arise. Statistical tables (of economic data)—including per cent of population beneath the international poverty line—are available from the U.N. International Children's Emergency Fund, albeit dating back to 2005 (UNICEF, 2009b). Data from UNICEF generally are gathered from complex surveys administered at the national or sub-national level by the organization, from World Health Organization surveys and other statistical compilations, and from other national or international organizations. Additionally, the CIA *World Factbook* includes data on the per cent of population living beneath the poverty line, as defined within each country. The availability of those data, however, varies by year. Thus, there is no complete dataset for a single year (2008 is the most recent year for which data for some countries have been obtained; CIA, 2009d).

"Youth bulge;" youth unemployment. When a demographic group becomes large relative to the population in a society, it can become restive if it suffers from widespread unemployment. The "youth bulge" is defined as an usually high proportion of individuals under the age of 30 in a society. Youth bulge is described as "young adults (15–29) as a percentage of the working-age population (Cincotta, 2008, p. 60). The International Labour Organization's LABORSTA Internet Database provides downloadable labour statistics for over 200 countries and territories, including unemployment levels by age group. The most recent year for which data are available

is 2008 (ILO, 2010). Data for LABORSTA typically are compiled from national statistical agencies and other national government agencies.

Prison population. Prison population size can be a correlate of armed violence if a regime attempts to consolidate its power by imprisoning large numbers of dissidents or other opponents. The International Centre for Prison Studies' *World Prison Population List* includes data on prison populations/number of prisoners in 218 countries and territories. The most recent year for which data are available is 2008 (Walmsley, 2008). Although those data do not distinguish the general prison population from political prisoners, one could compare prison population size over multiple years to determine whether there has been an unusual increase in recent years. Data from the *World Prison Population List* are compiled from multiple sources, such as national and international non-governmental organizations, national government agencies and ministries, and select media outlets.

Military personnel. Increases in or elevated numbers of military personnel could suggest that a regime intends to engage in armed violence within or across its borders. The World Bank Group's *World Development Indicators Database* contains data on military personnel *per capita* and military personnel as a percentage of the total workforce, for 169 countries. The most recent year for which data are available is 2005 (World Bank Group, 2008).

Military expenditures. Similarly, military expenditures might increase as a government gravitates toward armed conflict. The World Bank Group's *World Development Indicators Database* contains downloadable data on military expenditures as a percentage of GDP, for 227 countries and territories. The most recent year for which data are available is 2005 (World Bank Group, 2008).

Police (per capita). As with military presence, an increase in police forces might signal a government's movement toward a state of suppression, and, potentially, the use of armed violence. Conversely, inadequate police protection might allow acts of violent crime to increase. The United Nation's Office on Drugs and Crime publishes data on its member states' police presence. Data from its most recent *Survey of Crime Trends and Operations of Criminal Justice Operations* are available freely and online, including for number of police per 1,000 people, although the most recent year for which data on police presence are available is 2004 (data for 2005 and 2006 are forthcoming; UNODC, 2007).

Presence of armed militias/factions. As armed non-state actors mobilize, the propensity for armed conflict to arise increases. The Graduate Institute of Geneva maintains data for 50 active national and regional armed groups around the world, including characteristics and structure of those groups (Graduate Institute of Geneva, 2008). Data are compiled from multiple sources obtained by the Institute's research staff.

Arms transfers (acquisitions). The acquisition of conventional weapons also is a potential correlate of armed violence. The Stockholm International Peace Research Institute's *Arms Transfers Database* includes downloadable data on acquisitions of "seven categories of major conventional weapons" from 1950–2008, by country or armed faction (SIPRI, 2008). Those data are gathered from sources such as national government publications, scholarly publications, technical registers, and media outlets.

Illegal trade: Minerals. Much research has been done with respect to the role of natural resource wealth in armed conflict. Governments or non-state actors or factions might compete for a country's resource wealth by attempting to appropriate it to fund their operations, or might attempt to use it as leverage against internal or external opponents—among other reasons (Dixon, 2009; Le Billon, 2001). Minerals are one such example. Presently, quantitative data sources at or below the country level for the illegal trade of minerals are not well developed. However, the Global Policy Forum has compiled a rather extensive list of documents on the relationship between the exploitation of mineral resources (e.g. diamonds) and armed violence (Global Policy Forum, 2010).

Political violence. If state-sponsored acts of violence against members or leaders of opposition groups increases, it is possible that a country is gravitating toward a more grave condition of armed violence. The *Non-State Conflict Dataset* of the Uppsala Conflict Data Program, Uppsala University, includes data for number of state-sponsored, “political” deaths for 50 countries, from 2002–2005 (UCDP, 2007). Sources for those data include the proprietary online database *Factiva*, as well as non-governmental organizations and individual experts.

Illicit drug trade/prevalence of drug trafficking. The “strongest case against drug control is the violence and corruption associated with the [global] black market” (United Nations Office on Drugs and Crime, 2009, p.163). As with the appropriation of mineral resources to leverage power against opponents, a regime or non-state actor might engage in the trade of illicit drugs to finance its operations. The United Nations Office on Drugs and Crime's (UNODC) *World Drug Report* publishes drug-related crimes for the most recent year (2009) by country and by drug, including prevalence of drug-trafficking crime. Data for that report are based primarily on survey questionnaires administered by UNODC to U.N. member countries.

International sanctions. Regimes or national governments that have come under international scrutiny for specific actions oftentimes become the subject of international sanctions (e.g. economic) as they approach a state of interstate war or internal armed conflict. The U.N. Security Council Sanctions Committees execute mandatory economic or other sanctions (not including the use of armed force/military presence) against national governments. Countries against which sanctions have been implemented are listed online (United Nations Security Council Sanctions Committees, 2009).

Forced evictions/displacement. Forced evictions from homes or mass displacement suggest that a regime or faction is targeting specific population groups or forcing them to resettle as part of a plan to appropriate land while increasing power. The Internal Displacement Monitoring Centre of the Norwegian Refugee Council publishes country-level data on internally displaced persons (IDPs) as of 2008, including the number of IDPs, the year in which the current displacement began, and the number of refugees who returned to their homes in 2008 (Internal Displacement Monitoring Centre, 2009). Data are compiled from multiple sources, including national and international non-governmental organizations, as well as national government agencies or ministries. The Geneva-based Centre on Housing Rights and Evictions publishes a *Global Survey on Forced Evictions*, which includes data (from multiple sources) on forced evictions of populations that have been implemented, threatened, or planned by government entities for countries and territories around the world, including Africa, the Americas, Asia and the Pacific, and Europe. The most recent year for which data are available is 2008 (COHRE, 2009).

Additionally, the U.N. Refugee Agency provides a database of reports and news alerts (from multiple sources) regarding forced evictions and relocation within countries and territories, albeit for varying years (UNHCR, 2010).

Discrimination against ethnic groups. As with forced displacement, discrimination against population groups based on their ethnic composition can signal a regime's movement toward increasing its power through violent means. For the countries in its dataset, the *State Fragility Index and Matrix* (discussed above) includes a complex indicator for "minorities at risk" (Marshall and Cole, 2009, p. 32).

Water and food scarcity. When a country or territory is experiencing shortages in or lacking adequate amounts of certain natural resources, competition between rival factions or other non-state actors can promote a tendency toward armed conflict. Freshwater resources and food are no exception. Downloadable data on water scarcity are available for 140 countries, although 2004 is the most recent year for which data are available (Hoekstra and Chapagain, 2008). Macro-level data on water scarcity are available through the Stockholm International Water Institute and the U.N.'s Water Programme (SIWI, 2010; U.N. Water, 2010; those data are based on country-level surveys from previous U.N. *World Water Development Reports*). With respect to food scarcity, the Statistics Division of the Food and Agriculture Organization of the United Nations provides downloadable country-level data for prevalence of undernourishment and the intensity of hunger for 177 countries. The most recent year for which data are available is 2006 (FAO, 2009).

Literacy and education level. Low levels of literacy (and, by association, level of education) among a population are another social and political predictor of a state's or territory's propensity to experience armed violence, such as violent crime and domestic violence. Literacy rates for 204 countries are published in the CIA's *World Factbook*, with varying years for which the most recent data are available, depending on the country (2008 is the most recent year; CIA, 2009c).

Prevalence of religious extremism/extremist groups. It has been posited that there is an association between the rise of religious extremism and the onset of armed violence (although, as Iannaccone and Berman [2006] suggest, militant theology often is a response to societal inequalities or policies that marginalize peoples of certain religious sects or faiths). Presently, data sources for documenting the incidence of religious extremist activity around the world are not well developed, largely are qualitative, or are not current enough to provide useful predictors.

Religious persecution. In addition to religious extremism, the prevalence of religious persecution within a country or territory is among the predictors of whether armed conflict might arise. In its report, *Global Restrictions on Religion*, the Pew Forum on Religion and Public Life includes several variables associated with restrictions on religious freedom/expression by country, such as intimidation of religious groups by national governments. Its data generally refer to 2009 (Pew Forum on Religion and Public Life, 2009), and were derived from multiple sources, such as reports from non-governmental organizations, U.N. reports, U.S. State Department reports, and national government agencies.

3.3. Sustainers of Armed Violence

Many of the predictors of armed violence overlap with those that perpetuate such conflict. This section discusses several indicators that sustain armed violence. Many of the data for the following indicators are based on the sources discussed in Section 3.2. If a data source for an indicator is missing, it likely is because of an absence or paucity of current or quality data.

Political legitimacy. A low degree of political legitimacy—and, more broadly, a high level of state fragility (discussed above)—increases the likelihood that armed conflict will resume or continue. For example, the time in office of a government’s current leadership and the number of attempted coups after a period of armed internal conflict has ended both are indicative of whether armed violence might continue. Those variables are included in the *State Fragility Index and Matrix*—produced by the Center for Systemic Peace and the Center for Global Policy (discussed above; Marshall and Cole, 2009).

Economic viability. As with predictors of armed violence, lack of economic viability can sustain a condition of armed violence. That includes most of the variables discussed above, such as GDP/GDP *per capita*, inflation rates, and general economic inequality. The *State Fragility Index and Matrix* includes complex indicators for state economic effectiveness and economic legitimacy for the countries in its dataset (discussed above; Marshall and Cole, 2009).

Police and military capacity. If state actors such as police and military forces lack the size or capability to be effective in maintaining peace and security, a condition of armed violence is likely to continue. That is especially applicable to post-civil war societies, but not limited to them (Quinn, Mason, and Gurses, 2007, p. 170). See the discussion in Section 3.2 on data sources for police and military capacity.

Outcome of previous conflict. A society that has experienced armed violence—such as civil war—is more likely to experience continued violence based on the outcome of that conflict. That includes, for example, which faction or actors prevailed (e.g. opposition groups/rebels; the government in power), and whether the previous conflict was concluded with a “negotiated settlement” or a definitive victory by one of the sides in that conflict. Conflict (specifically, civil war) is likely to continue if competing forces believe that they still have the legitimacy to rule—what is referred to by Quinn, Mason, and Gurses as the concept of dual sovereignty: “Our model predicts that the persistence of dual sovereignty into the post-conflict environment is the primary structural precondition for the resumption of civil war” (Quinn, Mason, and Gurses, 2007, p.176). Data for countries’ internal and external conflicts (including war) for the period 1946–2008 can be downloaded from the *Armed Conflict Dataset* (discussed in Section 2) of the Centre for the Study of War at the International Peace Research Institute, Oslo (PRIO, 2009).

Duration of past conflict. As the duration of a conflict becomes longer, the likelihood of the continuation of conflict increases. That is especially so with respect to civil war, although it is not limited to such conflict (DeRouen, Jr. and Sobek, 2004). Data on the duration of armed conflicts (including war) for the period 1946–2008 can be downloaded from the *Armed Conflict Dataset* of the Centre for the Study of War at the International Peace Research Institute, Oslo (PRIO, 2009).

Disarmament, Demobilization, and Reintegration (DDR) programs. Lack of programs to reintegrate former combatants into society also increases the likelihood of continued conflict, as those individuals are prone to return to their former armed groups in the absence of effective support programs (Walter, 1999). A list of countries in which DDR programs are in effect under the auspices of the United Nations is available through its *Disarmament, Demobilization, and Reintegration Resource Centre* (UNDDRRC, 2009).

4. Benchmarking

Benchmarking consists of techniques used when more than one source of data exists for the same variable, and entails efforts to adjust for or correct discrepancies in the frequency of publication for the values of that variable. For example, one dataset might be produced annually and have a high level of accuracy and statistical validity, whereas another might be published monthly but have a lower level of accuracy and validity (OECD, 2005). With respect to indicators of armed violence, the specific concern is with creating benchmarks against which indicators can be assessed, given the multitude of sources for which data exist.

In searching for the highest-quality sources of data for indicators of armed violence, the strongest likely will be those whose data are as complete as possible for the most recent year, provided that the data were gathered through sound methodologies and valid collection techniques. Data from international entities such as the U.N. Statistics Division and other agencies, non-governmental organizations or research centres that publish indices on highly-specific variables, and data gathered from representative random samples and censuses are of particular import. Data from national statistical agencies should be considered, albeit with caution.

Few comprehensive sources of data on armed violence indicators exist that would enable researchers to establish a reference point by which new sources of data could be compared for the purpose of benchmarking. Perhaps the most comprehensive at present—discussed in Section 3.2—is the *State Fragility Index and Matrix* (Marshall and Cole, 2009). We recommend that source as a potential reference index to which new indices (based on complex indicators) could be compared. Thus, although the *State Fragility Index* is not a dataset *per se*, we emphasize its use as a potential means for making comparisons when developing new sets of armed violence indicators.

5. Feasibility

The feasibility of creating high-quality indicators of armed violence rests on the quality and scope of the data available for that purpose. Creating indicators of armed violence can be done in two ways: to use data collected by another organization or government agency, or to collect data directly on the phenomenon of interest. Most researchers creating indicators and indices compile data collected by another subgroup of their organization or another organization. For that reason, we focus the majority of the following discussion on the use of data collected by others, although we briefly will discuss requirements for direct data collection.

5.1. Harvesting Preexisting Data

Extracting data from existing databases, multiple data files, or statistical registers can be difficult and time consuming for several reasons, including:

Data quality issues. Even if data have been collected for all nations or territories of interest, the quality and scope of the data might vary greatly. Missing or incomplete data, data that do not reflect real-time developments, and questions of data validity all pose challenges to data harvesting processes. For example, using data from official state statistical sources requires great care—particularly with respect to data related to armed violence or human rights abuses—as governments are hesitant to expose their malfeasance (UNDP, 2000, p. 93).

Cost considerations. As with gathering data on general human rights abuses, data harvesting for the purpose of generating indicators can be costly (PARIS21, 2007c): databases that are not freely/publicly available might require a subscription or fee for access, developing new databases might require new software or staff/researchers' time to develop electronic interfaces, and missing or incomplete data might require an investment of time or funds in gathering (or building statistical models to account for the absence of) that information. However, there exist several reasonably affordable means for extracting and compiling such data, although considerations such as whether or not to use or construct a relational database management system should be made. In general, much of the existing data of interest to researchers or policy-makers is publicly available through the Internet from national and international non-governmental organizations, as well as national governments. In Chapters 2 and 3 of this manuscript, we outline a number of those data sources.

There is an added complication related to gathering indicators of armed violence: using data that initially is collected in qualitative format, such as newspaper reports of events of armed violence and/or human rights violations data. Developing a specific indicator of armed violence might require a systematic means of compiling data that are not necessarily in a format conducive to analysis, such as qualitative data that first must be coded using a protocol that enables quantitative applications. If multiple datasets are to be used to gather information about one aspect of armed violence, one must develop a means by which to determine how comparable the data are to each other—and how to compile them (PARIS21, 2007b).

Data timeliness. When using preexisting data of any form, it is critical to identify and use sources that are as current as possible (provided that they are from valid, credible sources), as

many indicators used to assess armed violence do not represent the most recent year: for many countries or territories, data for certain indicators have not been updated in several years due to factors such as inadequate data collection capacity in resource-poor countries—or due to closed regimes that have not allowed external entities to conduct data-gathering projects (see Section 3: “Correlates of Armed Violence”).

Data replicability. Before state-level sources of data can be gathered and organized into databases or other statistical compilations, one must ensure that the data are suitable for present and future use. Thus, an important criterion is that they are based on variables that can be measured repeatedly over time, to determine whether a particular condition has improved or worsened (UNDP, 2000, p. 90). Nevertheless, there are many advantages to using preexisting data, such as their utility for comparative analyses, their importance to understanding changes and developments over time, and their near-immediate availability (van Deth, 2003).

Multi-source data. In many instances, data for indicators of armed violence must be collected and compiled from multiple sources. At a high level of aggregation, the same type of data is not necessarily available for every country; thus, when indicators are created, they often are comprised of data from multiple sources. For example, the *Human Development Index* of each *Human Development Report* is a composite of data from several sources such as the World Bank, internationally-recognized non-governmental organizations, national governments, and other sources (UNDP, 2009).

In the case of surveillance or administrative records systems, micro-level data might need to be combined from several sources. In that event, it is important to ensure that those data are integrated into a single system so that duplicate values or entries are identified and removed. A prime example of an existing database that allows significantly large numbers of records and data from multiple sources to be managed that way is the Statistical Administrative Records System (StARS) of the U.S. Bureau of the Census. At its inception, StARS was implemented to handle an estimated 800 million records from multiple U.S. federal government agencies (Farber and Leggieri, 2001).

Aggregation level. Data are collected for various units of analysis (e.g. among individuals, villages, provinces, states). Before compiling those data, it is important to consider the level at which the data can and should be aggregated. Similarly, it is important to ask *whether* the data can be aggregated or disaggregated without losing any metrics. For example, if gathering data on intentional homicide rates in a specific region of a continent (e.g. in northern Africa), do the available data lend themselves to aggregation at the regional level if they exist for individual countries? If data exist at a regional level, can they be disaggregated to reflect intentional homicide rates at the national level?

Principles for Data Harvesting

All of the factors discussed above can make the creation of indicators of armed violence less feasible. However, we believe the solution is not to give up, but rather to develop indicators in a transparent manner that communicates the limitations of the data and works to improve data quality over time. For that reason, we propose that creators of indicators of armed violence adhere to a set of data quality practices based on the work of the Metagora project (see PARIS21,

2007b). These data quality practices are applicable for all types of data utilized (e.g. survey, census, administrative, and surveillance data), and are outlined below.

- *Ensure that data to be used for the creation of indicators will represent the population of interest adequately.*

Representation of the population of interest for survey data depends on the type of sampling used. Random sample surveys are by definition representative if the sample size is large enough and the sample frame representing the population is complete. However, it rarely is the case that a sample frame is perfect. If random sampling is not used, then the likelihood of the data not representing the population of interest is very high. In either case—the use of non-random sampling or the use of an incomplete sampling frame—deficiencies of the data should be described to the user of the indicators derived from them.

Representation of the population is similar for census, administrative, and surveillance data: in all of those cases, the data are intended to capture the full universe of events or measures for the full population of interest. It often is the case, however, that certain segments of the population are not included. For example, the U.S. Census Bureau develops national-level statistics based on data collected from vital statistics offices for each of the 50 states, the seven outlying territories, and the District of Columbia. Frequently, however, data from an entire state or territory are missing, or data from particular counties in certain states are not included. It might be the case that the data still are the best available to measure the phenomenon of interest. However, in those cases, limitations of the data should be made clear to the user.

In the United States, for example, there are at least two potential sources of data about violent crime: the National Crime Victimization Survey and administrative records from police stations (police surveillance data). In the case of the former data source, we know that certain types of crimes—such as sexual violence—are underreported and therefore not adequately represented. However, in the latter case, the data might be missing for particular counties or states, and some crimes are never reported to the police. The two data sources can be used together to understand crime reporting patterns and to adjust estimates, but an outstanding limitation of the statistics created is the bias against reporting certain types of crimes either to the police or the survey.

- *Determine that the data adheres to the cross-country concept being measured.*

Whether data are being compiled from existing sources or collected in the field, a means for standardizing conceptual definitions must be considered. Oftentimes, variables gathered on a particular topic have different meanings based on their source(s) or how they were collected. For example, data on GDP (a potential predictor of armed violence) is available for most countries, but some data sources report GDP based on the exchange rate in relation to the U.S. dollar. Thus, any data collection or compilation process relying upon multiple sources for a single variable must ensure that the definition of that variable is harmonized prior to analysis.

As another example, in the case of sexual and gender-based violence, it is possible that different national surveys or even the same cross-national survey will be collecting slightly different data due to cultural differences. For example, although the international standard for gender-based violence includes forced early marriage, in certain countries the prevailing attitudes make it extremely unlikely that such events will be reported as a crime.

If there are differences in the concepts being measured by the variables from different data sources, creators of indicators of armed violence have at least two choices. The first is to adjust—or harmonize—the data, as described in the first example above. The second is to accept the differences in definitions as one of the limitations of the data used and to report that limitation appropriately when the indicators are distributed to end users. In the latter case, it might be possible to work with national statistical offices and/or other collectors of data to improve the conceptual equivalence across nations.

- *Ensure that the characteristics and sources of the data are well documented and understandable to the user.*

As we describe below in our proposal to release indicators with an index of quality, documentation of data is essential to understanding how data are to be interpreted. For example, data collected from a random sample are prone to nonresponse. Therefore, a nonresponse rate should be available to the data user. Producers of such data should explore the data for interviewer effects—that is, an interviewer whose results are significantly different than those of other interviewers. Such a situation might indicate shirking or even data falsification. Data from a census, administrative data, and surveillance data should be accompanied by documentation as to their completeness, how the data were collected, and for what timeframe the data are valid. Whenever possible, the questionnaire or data collection tool should be available to end users for their review.

Whereas some data collection efforts are very well documented, others are not. Producers of indicators of armed violence should be prepared to encounter data that might have no documentation. In the quality index we propose below, quality is considered very low for such data.

- *Ensure that the data are in an easily accessible/retrievable format.*

We are operating under the assumption that if indicators of armed violence are developed, they are intended to be distributed to a wide audience. In order to facilitate that process, we recommend using a *comma delimited file (.csv)* combined with a *text data dictionary file*—both of which are widely accepted formats for information storage and distribution. We strongly recommend against using a commercial relational and/or object-oriented databases for this purpose, due to the high costs of obtaining the platform. For the distribution of indicators, which are comprised of macro-level data, a simple two-dimensional structure will suffice.

However, it might be that micro-level data must be collected directly by the creator of indicators of armed violence. There are several options for more complicated data structures than can be housed comfortably in a table format. Open-source or freely-licensed software programs offer great potential. For example, the Human Rights Data Analysis Group of the Benetech Initiative offers a software platform at no charge to interested parties, known as *Analyzer*. That program, which stores data in a structure based on a “Who did what to whom?” model (first introduced in Ball, 1996), can be used to compile human rights violations data. The data can be gathered either by means of several qualitative “data collection projects” that subsequently are coded to create quantitative information, or by questionnaires designed to collect quantitative data. It also can be used to generate new statistics, as well as to conduct forms of analysis such as Multiple Systems Estimation (HRDAG, 2010).

Still another application that is freely available to human rights practitioners and interested parties is the *Martus* software, also developed by the Benetech Initiative. *Martus* is “an information and document management system” based on end-user software and an Internet-driven interface. It allows human rights violations information to be entered, disseminated, and shared among users across countries (Martus, 2009). Additionally, new technologies exist that allow users to gather and compile data on potential human rights violations in real time, such as the *Ushahidi* online platform, which has included web-based tools comprised of reports generated by users for tracking “reports of incidents of violence,” as in the case of post-election Kenya from 2007 to 2008 (Ushahidi, 2010).

Finally, OpenOffice—an open-source productivity suite—includes a database that is reasonably equivalent to the Microsoft Access platform distributed with the Microsoft Office suite. The advantage of using OpenOffice is that it is freely available, and its database platform can handle complicated data structures that do not fit neatly into the “Who did what to whom?” framework.

- *Ensure that any ethical considerations associated with using data are addressed prior to data collection.*

The practices described above often are not followed. For that reason, development of indicators of armed violence must involve communication with national statistics offices and other data providers in order to improve communication concerning data limitations, and to reduce those limitations when possible. It is an ethical obligation of the creators of armed violence indicators to release information about the quality of the data sources used—if only to report that information simply is unavailable.

If creators of indicators of armed violence arrange for direct data collection activities, then the ethical considerations are wider. Care must be taken to ensure not only that the data collection procedure does not expose respondents to potential harm, but also that the sum benefit to the population of interest is higher than the sum cost to that population. For example, Swiss and Jennings describe a situation in which they recommend against collecting data on sexual violence against Sri Lankan women due to the potential harm to

the respondents associated with the stigma of being a sexual violence survivor (Swiss and Jennings, 2006).

Finally, please note that the United Nations has published guidelines for data collection and organization for use in compiling statistics at the international level. Additionally, several U.N. agencies have published guidelines and “best practices” for the collection of topic-specific data. Although those guidelines are intended for use by national statistical agencies, the U.N. Statistics Division recommends—among its best practices—the use of “strictly professional considerations for decisions on methodology, terminology and data presentation; putting measures in place to prevent the direct or indirect disclosure of data on persons, households, businesses and other individual respondents; [and] developing a framework describing methods and procedures to provide sets of anonymous micro-data for further analysis by bona fide researchers, maintaining the requirements of confidentiality” (U.N. Statistics Division, 2008). With respect to its international household survey program, the U.N. International Children’s Emergency Relief Fund works with countries to collect data using its *Multiple Indicator Cluster Surveys*, which represent a system designed to produce data (from the local level) on the status and condition of women and children. Those data are compiled for comparative purposes at the international level, as well as for country-level decision making (UNICEF, 2009a).

5.2. Collecting and Compiling Raw Data

Collecting new data begins with identifying the information that one wishes to capture, measure, understand, and apply. Research goals should be established prior to data gathering, and a means by which to collect the data must be agreed upon. In the context of data gathering for indicators of armed violence, the most efficacious approach likely is that of a random sample survey using a face-to-face data collection mode, or, in some instances, a paper-and-pencil questionnaire. The choice of mode is governed largely by considerations such as cost, location of the respondents within the sample frame, and customs of the society of which the respondents are a part. For example, surveys of survivors of gender-based violence living in remote villages of a poor country most likely would be administered a face-to-face interview, or, depending on the level of stigma associated with being a sexual violence survivor, a paper-and-pencil interview—provided that literacy rates are sufficient and that a culturally appropriate survey questionnaire can be designed (Harkness, Van de Vijver, and Johnson, 2003).

Collecting and compiling new data also requires the standardization of definitions for any fundamental constructs measured by the survey instrument. Failure to create a clear, harmonized definition of critical concepts might invalidate some or all of the data. Of particular import are cross-cultural considerations with respect to definitions of violence. That is, certain acts or behaviours considered “violent” in one culture might not be sanctioned as such in another. For example, if administering a survey on domestic violence to individuals whose culture deems the striking of a spouse to be permissible and acceptable, survey designers must be cognizant of that, and must create a questionnaire that captures spousal abuse through appropriate questions that are understandable to the respondent and still recordable by the interviewers (Harkness, Van de Vijver, and Mohler, 2003). Thus, underlying concepts must be recognized from two perspectives: their conceptual equivalence and their functional equivalence.

For gathering data on indicators of armed violence, the challenge is twofold: standardized survey questionnaires and forms must be developed, but those questionnaires must account for cross-

cultural differences. Similarly, differences in language and societal structure must be taken into account to ensure that survey responses and their associated measurements remain valid when a survey is administered across regions within and across countries. To accomplish that, several techniques exist, such as the use of multiple indicators for measuring the same construct in a survey (Smith, 2003).

An equally important part of the process for administering surveys at the field level is the proper training of interviewers. Before interviewers are deployed, they must be trained to fully understand the survey instrument and how to interface with it. Ultimately, interviewers must be prepared in such a way that they do not directly influence the outcome of the survey administration. That includes emphasizing to them the importance of adhering to the survey questionnaire, and not interacting with respondents in a way that might discourage them from answering questions as transparently as possible. Finally, with respect to administering surveys on the topic of armed violence measures, it must be noted that interviewers should be as prepared as possible to interact with respondents who might be experiencing trauma from the effects of such violence. In those instances, interviewers must be especially sensitive to the needs and personal context of the respondents (PARIS21, 2007a).

Once data from a survey have been collected, it is necessary to ensure that proper data entry is conducted. Database considerations and structures are discussed elsewhere in this paper. However, one should note that the process of data entry is no less important than any other aspect of survey administration. Sound practices for data entry are addressed at length by the Metagora project, of which one worthy of mention here is the use of form data entry by at least two separate individuals (i.e. “double” data entry), as a quality control mechanism (PARIS21, 2007c).

Ultimately, data should be processed such that they are capable of being “re-used” or “recycled” by other individuals. Processing should entail the creation of standardized, universally readable data file formats, with documentation (e.g. data keys) that can be interpreted by a multitude of users. Wherever possible, paradata (information or data about the collected data, including, for example, separate records related to the data, such as those containing interviewers’ observations of respondent behaviour during the administration of a survey questionnaire) should be collected and stored in a separate file for the purpose of monitoring the quality of the data. Decisions also should be made as to how the collected data should be organized. That includes, for example, the level at which the data should be aggregated or disaggregated.

5.3. Storage and Distribution Mechanisms

As described above, in order to make data on indicators of armed violence available to as wide an audience as possible, we recommend that a format be developed that enables the data to be distributed as a “flat file” (e.g. in comma delimited, “.csv” format). Specifically, we propose that, at the least, the following variables (in columnar form) be included:

1. A *unique identification number* for each row. The identification number should contain keys that describe:

- a. the specific indicator and/or covariate (e.g. intentional homicide rate per 10,000 population, police personnel per 10,000 population). Because there are relatively few

indicators, covariates, and sustainers proposed, we suggest a three-character identifier: the first being “I,” “C,” or “S,” depending on the classification of the statistic (i.e. indicator, covariate, or sustainer), and the remaining two characters being numeric codes for the specific variable within the category;

b. the reference country: in this case, the existing three-digit numeric codes for nations developed by the U.N. Statistics Division can be used (e.g. 004 for Afghanistan; United Nations Statistics Division, 2009);

c. the level of aggregation (i.e. national, sub-national);

d. the year (four digits); and

e. a counter of two or three digits (set to a different value for each of the indicators/statistics that falls in the same set of categories given by a–d).

The purpose of the unique identification code is to facilitate communication about the data between developers and users, so as to provide adequate paradata. In turn, that paradata can be used to better understand the nature and scope of the data, as well to address problems such as missing or incomplete data and survey nonresponse.

2. An *identification number* that corresponds to the type of data source. That would include, for example, values designated for administrative records, surveys, censuses, surveillance apparatuses such as data collected through geospatial imaging and geographic information systems, and combinations of sources from those categories.

3. *Country name*. Name of the country, with names arranged alphabetically or by another characteristic, such as *Human Development Index* score.

4. *Region and/or sub-region*. Region and sub-region of the world can be important fields to include, for the purpose of comparing data/indicators based on characteristics associated with geography, history, and socioeconomic conditions. The U.N. Statistics Division publishes a list of country regions and sub-regions, available online (United Nations Statistics Division, 2009).

5. *Indicator variable name*. Indicators can be arranged in two ways: as the basis of a single file (e.g. one indicator per file), or as multiple indicator variables in a single file. The decision to use either of those methods depends on the conceptual closeness of the indicators. For example, if recording indicators of intentional homicide by multiple measures (e.g. by firearm, by victim age, victim gender), it likely would be best to include those variables in one file, with accompanying documentation that describes each variable name. We suggest that variable names be kept simple but clear enough to be understood without frequently having to refer to a data codebook.

6. The *year* to which the indicator variable(s) corresponds.

7. *Quality index*. A longstanding problem with indices and indicators developed to date by the United Nations and other governmental and non-governmental entities is the inability to express levels of uncertainty associated with the statistics provided. Uncertainty encompasses several

forms of error. For random sample survey data, there is sampling error, but there also is measurement error related to survey nonresponse, communication errors between interviewer and respondent, and deliberately incorrect responses by respondents. For example, it is known that, during interviews, respondents suffer both from acquiescence bias and also social desirability bias over sensitive issues (Pearson et al 1991). In many cultures, experiences of violence are considered shameful and/or stigmatizing—especially in the case of sexual violence. For that reason, data collected through random sample surveys might underreport incidences of violence. Quantifying that underreporting has been the subject of several research efforts, including, for example, those of the *Iraq Family Health Survey Study Group* (2008).

Similarly, census data are prone to the same types of measurement error as survey data, as well as coverage error (i.e. incompleteness of or duplications within the sample frame). Administrative records also are prone to certain types of error, including intentional misleading of government entities. Similarly, data from surveillance systems can be subject to discrepancies, as when, for example, data from geospatial imagery (e.g. satellites) is entered incorrectly into databases that underpin geographic information systems.

As described above, the same type of data is not necessarily available for every country; thus, when indicators are created, they often are comprised of data from multiple sources. To allow some level of expression concerning the certainty of the data despite the multitude of sources from which the data are derived, we propose a simple, five-number index to be used for each row of the data. We do not expect this index to be implemented precisely as described, as a great deal of discussion and development would be required to create a “quality index” for future indicators produced by large international organizations such as the United Nations. However, we present our ideas as a starting point.

The index could reflect the quality of the statistics as follows:

- *Documentation of data collection method.* The quality of the documentation could be determined by (1) description of coverage and coverage problems (for random sample surveys, that would include sampling error and descriptions of nonresponse), (2) description of the data collection methodology (e.g. process for conducting interviews or for compiling administrative records or surveillance data), (3) process for data entry/recording (e.g. Are the data entered directly into a computer system by the respondent? By an interviewer? By a third party after data collection has taken place? By “double” data entry?), (4) description of quality checking procedures (e.g. supervision of survey/census field operations, supervision of administrative/surveillance recordkeeping), and (5) training provided to relevant staff. To begin developing this index, for each of those five points, a simple 0/1 indicator could be used to express whether the process is sufficiently documented, and an average could be taken for the total value for that category:
 - Quality of data collection methods: set to 0 if no information is available; otherwise range from 0 to 1;
 - Quality of data recording methods: set to 0 if no information is available; otherwise range from 0 to 1;

- Likelihood of misrepresentation of data by respondents: to be determined by appropriate experts. This variable can range from 0 to 1 and should be based—whenever possible—on evidence-based research (e.g. given that something is known about the underreporting of sexual violence in different cultural settings, that information can be used to inform this category); and
- Closeness of concept being measured during original data collection to the concept represented by the indicator/covariate/sustainer (i.e. a function of measurement error): 0 to 1.

Summing the categories would generate a score between 0 and 5. The index then would be set to the number closest to the score (between 1 and 5).

5.4 Modelling Error in Indicators of Armed Violence

As we describe above, all random sample surveys are subject to error, including measurement error, processing error, coverage error, sampling error, nonresponse error, and adjustment error. Additionally, other forms of data compilations such as administrative records are subject to problems, including incomplete data or obsolete information. Here, we discuss a proposed means of addressing error that arises in collecting and compiling data on armed violence (or for indicators of armed violence).

First, there are processes by which indicators can be *adjusted* to account for biases in the data. As survey datasets become larger and more complex, it is likely—particularly with respect to data gathered on the topic of armed violence—that certain elements or members of a target population will be underrepresented or missing. Thus, such elements typically must be *weighted* to account for underrepresentation. For elements that are missing, the process of *imputation* (using estimated values to replace missing values) can be used, albeit with great care. For an in-depth treatment of survey error, weighting, and imputation, see Groves et al (2004).

Second, although the quality index proposed above would be a first step toward describing the error associated with the indicators developed, it is a very rough guide to the certainty of the value given for the indicator. We propose the eventual development of a model to describe error produced from the compilation of data based on multiple sources. That model would be used to account for incomplete data, the timeliness of the data (i.e. how recent the data are), and the comparability of different types of data, such as data derived from random samples versus data from administrative records or censuses. Specifically, we propose an error model using a methodology similar to the U.S. Bureau of the Census' Total Error Model, which draws upon data from multiple sources to estimate error elements that are then used to estimate variability and bias in the total census counts (Petroni, 2001; Spencer, 2002). The error model that would be created for indicators of armed violence would consider measurement and sampling error, allowing comparisons between survey data and other types of data.

5.5. Developing an Index: Complex Indicators of Armed Violence

As discussed throughout this paper, there are many potential sources of data on indicators, predictors, and sustainers of armed violence. However, despite sharing common themes, most sources exist independently of others. For example, economic indicators and predictors draw

upon several aspects of economic strength, such as GDP, GDP *per capita*, and inflation rates. To that end, we propose the creation of a set of complex indicator variables derived from a subset of the different types of indicators, predictors, and sustainers discussed and referenced in this paper. Based on those complex indicators, we further propose the creation of a single, unified complex indicator similar to the *Human Development Index* score that is determined for each country. We recommend that the complex indicators used to generate an index of “propensity to experience armed violence” be arranged in a manner somewhat similar to the *State Fragility Index and Matrix* discussed above. Our recommendation is based on the methodology for the following calculations used to compile the *Index* (Marshall and Cole, 2009, p. 31):

$$\begin{aligned}\text{State Fragility Index} &= \text{Effectiveness Score} + \text{Legitimacy Score} \text{ (25 points possible)} \\ \text{Effectiveness Score} &= \text{Security Effectiveness} + \text{Political Effectiveness} + \text{Economic} \\ &\quad \text{Effectiveness} + \text{Social Effectiveness} \text{ (13 points possible)} \\ \text{Legitimacy Score} &= \text{Security Legitimacy} + \text{Political Legitimacy} + \text{Economic Legitimacy} \\ &\quad + \text{Social Legitimacy} \text{ (12 points possible)}\end{aligned}$$

Specific details as to how each “score” was assembled can be viewed in Marshall and Cole (2009, p. 31). We note that, as with the *State Fragility Index*, a set of complex indicators for the purpose of creating an armed violence index “value” should include variables that reflect economic, social, and political conditions in a country or territory. Specifically, to capture a state’s propensity to experience armed violence, one could assemble many of the variables discussed in Section 3 of this paper (“Correlates of Armed Violence”), and arrange them according to category (i.e. economic, social, political), calculate a separate “score” for each category, and then add up each score to create a single index value for a given country.

6. Analysis beyond Indicator Development

The preceding chapters have outlined the sources of data on armed violence that already exist, the gaps in those data, and a series of steps by which indicators could be developed not only for armed violence but also predictors and sustainers of armed violence. The question remains as to whether statistical techniques—including variations of experimental design—can be used to determine how likely armed violence is to occur in the future or whether a particular violence prevention program is effective. Here, we discuss several potential methods for exploring relationships between indicators.

6.1. Time Series Development and Study

Indicators typically are provided for particular years; therefore, a set of indicators of the same definition (e.g. intentional homicides per 10,000 capita per year) can be treated as a time series. Looking across nations provides a set of time series that can be compared and contrasted, albeit with caution due to the data issues described in the previous chapter.

Specific methods exist for analyzing time series data. For a single time series, specialized models such as autoregressive moving average (ARMA) models and autoregressive integrated moving average (ARIMA) models can help elucidate the relationship between indicators for different years. For example, an AMRA model estimates parameters that indicate the correlation between two years diminishes as the two years are further apart in time; in that case, the rate at which the correlation diminishes is of interest (Brockwell and Davis, 1991).

When time series are to be analysed together, an area of statistical practice called *functional data analysis* can be utilized either to determine a “trend line” that describes all of the time series in tandem, or to apply linear models, using covariate data available for each of the time series (Ramsay and Silverman, 1997). A specific technique called *generalized estimating equations* has been developed to allow linear models for which a set of time series forms the dependent variable to be estimated with appropriate assumptions related to the correlation between values within a single time series (Lynn 2009, p. 252, 352). Using those techniques, the relationship between predictors/sustainers and indicators of armed violence can be measured and explored.

6.2. Evaluation Techniques

The “gold standard” for determining whether a particular treatment (or, in this case, a particular intervention, such as a DDR program) is effective in preventing, reducing, or ending armed violence is a fully randomized design. To accomplish that design, one would have to randomly assign geographic areas either to receive the intervention (the treatment group) or not to receive the intervention (control group). After a fixed amount of time, we use indicators of the phenomenon that we hope the intervention will mitigate to test whether the areas that received the treatment are statistically significantly different than the areas that did not.

There are some situations in which a truly randomized design might be the best choice. If an intervention is expected to be successful but is expensive to implement, it might be that it is not feasible to apply it to all areas of armed violence due to funding constraints. In that situation,

randomly choosing some areas to receive the treatment—so that strong proof of the effectiveness of the intervention can be obtained—might lead to increased funding for the intervention.

In other cases, it either is infeasible or unethical to implement a truly randomized design. For example, if the intention is to determine the effect of armed violence on development, the treatment/intervention of interest is armed violence and it would be unethical to purposely incite armed violence to determine its effects on development. In such a case, a *quasi-experimental design* might be the most reasonable approach. In a quasi-experimental design, the effect of a treatment is determined by using a comparison group that is similar to the group receiving the treatment on several important characteristics. For example, a group receiving development aid might be compared to a group with a very similar socioeconomic profile for which development aid is not available. Because the groups are not randomly assigned to treatment and/or control, the process is only “quasi-” experimental (Bingham and Felbinger, 2002).

One variation of a quasi-experimental design that we propose for measuring the relationship between armed violence and development is a *paired cohorts* study. In this case, we propose that when a nation begins to experience a particular form of armed violence, such as armed conflict, it is paired with a nation *not* experiencing the armed violence that most closely represents its socioeconomic profile. The development level of the two nations can be cross-compared over time, and the difference between their levels of development attributed—at least in part—to the effects of the armed violence. If this process is repeated for multiple pairs of nations, then stronger evidence is built as to the nature of the effect of armed violence on development, even if a truly randomized design cannot be implemented. In that way, indicators of development and indicators of armed violence can be compared to elucidate the relationships between them.

6.3. Predictive Models

Although we discussed predictive models during our discussion of time series methods, there are predictive models that can be applied to data that are not provided in a time series. In this case, we envision one of several possibilities.

Linear models with predictors and/or sustainers as independent variables and indicators of armed violence as dependent variables. Within a single year, a cross-national set of indicators can serve as a dependent variable in a model that relies on predictors and/or sustainers as the independent variables. In this way, the relationships between the indicator and the predictor/sustainer variables can be elucidated: predictors/sustainers that are most highly correlated with armed violence can be determined, with the intention of developing interventions that target the predictors/sustainers and, hopefully—by extension—reduce the likelihood of armed violence. Although causality cannot be proven through such modelling, if there is suspected causality due to other sources of evidence (e.g. narrative testimonies), then the linear models provide significant evidence as to the strength of the relationship.

Linear models with dependent variables in time series form. Alternatively, complex linear models can be built that explore the relationships between predictors/sustainers and indicators of armed violence, over nations and over time simultaneously. Such models would rely on functional data analysis techniques such as generalized estimating equations.

In both of those cases, statistical specialists should be utilized both to create and also to interpret the models. However, these proposed models could be highly informative in developing policy related to armed violence.

7. Discussion

Beginning with the list of indicators of armed violence developed through the December 2009 Expert Workshop, we have attempted to thoroughly explore what research and systems are necessary for creating a robust methodology by which those indicators can be created and distributed. There are many challenges, but we believe that such a system of indicators is attainable.

In this discussion, we focus on six main points, described below in italics.

Many sources of data that can be used for developing indicators of armed violence exist. However, use of the data for that purpose is complicated and requires significant planning and the expectation of the need to relate limitations of the data to the eventual users of the indicators for policy purposes.

Although there are many data sources available for the armed violence indicators proposed, not every indicator is as feasible as the other. In the cases where there are many data sources available to measure the same phenomenon, decisions will need to be made as to how to choose among or combine those data to allow the highest quality indicators to be developed. As described below, there can be serious limitations to the indicators developed that will not be apparent to users of those indicators. For that reason it is not enough to have, somewhere, a statement about the quality of the data. A measure of data quality must be directly connected to the indicators through presentation in a single file, so that every user is aware of data limitations.

The potential for development of indicators that measure phenomena that either promulgate and/or propagate armed violence is high, with the same caveats described above for indicators of armed violence.

We were able to research many potential indicators that could be used as predictors and sustainers, but the caveats discussed above about the complexity of combining data from different sources, measuring data quality, and communicating data quality to users apply here as well.

Development of the indicators most likely will rely on the use of data from multiple sources and of multiple types. That is, data from surveys, censuses, administrative sources, and surveillance systems will need to be combined in a rigorous and defensible manner.

Development of the indicators likely most will rely on the use of data from multiple sources and of multiple types. That is, data from surveys, censuses, administrative sources, and surveillance systems will need to be combined in a rigorous and defensible manner. That is not easy, primarily due to the fact that the error associated with each of those types of data is different for different data sources and even for the same type of data but from different countries. Therefore, creating a meaningful indicator without some awareness of the error associated with the numbers is extremely difficult.

Let us take the example of data from administrative records being compared to survey data. Imagine that we have measured rates of homicide in Country A at 80 per 10,000 through administrative records, and in Country B as 200 per 10,000 through survey data. In order to compare those numbers, we first must determine what the definition of homicide is in each case. If the administrative records are gathered from police stations, do they include incidences of police brutality? What about honour killings? If the definitions of homicide do not match in the two data sources, we either must determine an adjustment factor for one data source using auxiliary data or make the difference in definition clear to any user of the data.

If the definitions basically are the same (or one number is adjusted), then there is the issue of our certainty about the data. As described above, there are sources of measurement error that apply to all types of data, and the survey data additionally will suffer from sampling error. For the administrative records data, has it been collected from every police station in the country, or are some police stations not included? Do the police accurately record information each time an incident occurs? Are persons whose names are unknown included? For the survey data, we must ask about the quality of the sampling frame. Did it include the entire population of interest? What is the sampling error? Is there a measure of or adjustment for nonresponse? Then, for both types of data, we must examine whether the form for recording the data (whether by computer, paper, telephone contact, or other means) is well or poorly designed, whether the questions asked during data collection are validated, and so forth.

Perhaps after our analysis of the data quality and data error sources, we determine that the administrative records data are of poor quality (e.g., missing police stations, missing data, bad data entry practices, and so forth) but the survey data are of high quality. Without direct explanation of the differences in quality, the user of the homicide indicator is likely to assume that the survey data will contain more error than the administrative records data. Worse, a naïve user might just assume that Country B has more homicides than Country A, despite the many reasons that Country A's number is downwardly biased. It is for that reason that we propose a quality index in Chapter 5.

Data storage and distribution should occur on the most widespread and simple platform possible. Indicators should be distributed with information related to the source of the data and a quality index that indicates an overall measure of the completeness of data documentation, quality of data collection and recording methods, possibility of data misrepresentation by informants, and closeness of concept measured to the concept represented by the indicator.

A simple .csv format for data has several benefits. First, it is not platform specific, so users of personal computers of any type will not be limited in access. Second, it is not specific to a commercial package. Whereas Microsoft Excel files presuppose that the user has access to Microsoft Office, a .csv file can be read by virtually any spreadsheet or statistical software package.

As a corollary, documentation about the data—definitions of variables, descriptions of paradata, and descriptions of how the index was created—should be made available in a simple text file for the same reasons: universality of access regardless of what type of (or how old a) personal computer is used, and universality across software packages, again of any age.

To be clear, the information distributed to describe the data is as important as the data themselves. Although descriptions of data collection methodology and error sources often are omitted in files of indicators, we strongly recommend that the standard be to distribute the variable definitions, paradata information, and quality/error information in a *single text file*, so as to force the user to at least briefly consider the potential error associated with the numbers. Furthermore, the inclusion of a quality index as a variable in the dataset itself will communicate to the user the importance of understanding quality when analyzing data.

The quality index that we propose in Chapter 5 is meant to spark discussion and encourage others to begin to consider effective methods of communicating uncertainty about the indicators they produce—not to serve as the definitive model for a quality index. However, we strongly believe that such an index should be the standard for any indicators produced and made available to the public in general, and specifically to policy-makers.

Indicators of armed violence can be analysed both through time series methods and also linear regression methods to explore the relationships between measures of phenomena that either predict or sustain armed violence and the armed violence itself.

Linear models and time series analyses are not able to prove causality—that is, finding a correlation between a predictor or sustainer and an armed violence indicator does not prove that the armed violence is a result of the phenomenon being measured by the predictor or sustainer. However, the strength of the relationship can be elucidated. Further, there might be qualitative data available that confirm a causal relationship; in that case, it is the combination of the data sources that demonstrate the effect of the predictor on the armed violence.

If causality must be proved using quantitative data, then an experimental or quasi-experimental design must be applied. That is not possible or ethical in some cases: for example, randomly selecting communities to flood with small arms in order to test whether the presence of small arms causes greater homicide rates is not an acceptable experimental design. In some cases, however, it is possible to use such a design to prove causality; this concept is discussed more below.

Once the indicators described above are developed and made available, experimental and quasi-experimental techniques can be used to test the relationships between armed violence and development, as well as the effectiveness of interventions intended to reduce or end armed violence.

Fully experimental designs are the gold standard for proving causality. An example of a situation in which it might be ethical to use a fully randomized design is when there is limited funding for a preventive program (e.g. DDR, microfinance) and a random selection of communities is chosen to pilot the program.

In the case of armed violence and development, we describe a potential quasi-experimental design for measuring their relationship in Chapter 6. Elucidating the relationship between armed violence and development will be a significant step toward understanding what needs to be done to meet the Millennium Development Goals.

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Appendix 1. Data Sources: Indicators of Armed Violence

Table 1A. Indicators of Armed Violence and Associated Sources.

Indicator	Source	Notes
Intentional Homicide locally and nationally	United Nations Office on Drugs and Crime; UNdata	<i>Tenth United Nations Survey of Crime Trends and Operations of Criminal Justice Systems, covering the period 2005 – 2006</i> : the International Homicide Statistics (HIS) dataset provides intentional homicide data for 198 countries or territories < www.unodc.org/documents/data-and-analysis/CTS10%20homicide.pdf >; <i>UNdata</i> : Intentional homicide, rate per 100,000 population: < http://data.un.org/Data.aspx?q=homicide&d=UNODC&f=tableCode:1#UNODC >.
Intentional Homicide by use of Firearms	United Nations Office on Drugs and Crime	<i>Seventh United Nations Survey of Crime Trends and Operations of Criminal Justice Systems, covering the period 1998 - 2000</i> (United Nations Office on Drugs and Crime, Centre for International Crime Prevention); Data available publicly at < www.unodc.org/pdf/crime/seventh_survey/7sv.pdf >; data also available at < www.nationmaster.com/graph/crime/crime-murders-firearms-per-capita >.
Direct conflict deaths	International Peace Research Institute, Oslo	<i>Armed Conflict Dataset: Armed Conflicts Version 4-2009</i> includes data for countries' internal and external conflict (including war) for the period 1946–2008: < www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO/Armed-Conflicts-Version-X-2009/ >.
Indirect conflict deaths	Small Arms Survey/CERAC	<i>Behind the Numbers: Small Arms and Conflict Deaths in Small Arms Survey 2005: Weapons at War</i> . < www.smallarmssurvey.org/files/sas/publications/yearb2005.html >.
Number of conflict-related injuries per year per 100,000	Unavailable	No data available

Indicator	Source	Notes
Violent victimization	United Nations Office on Drugs and Crime	International Crime Victims Survey: <i>Criminal Victimization in International Perspective</i> , ICVS 2004-2005. Report is available for download at < http://rechten.uvt.nl/ICVS/news.htm >.
Displacement/resettlement	Internal Displacement Monitoring Centre; United Nations Development Programme	<i>IDP Database</i> : provides detailed information by country on current IDP statistics from independent, government and United Nations sources; accessible at < www.internal-displacement.org/8025708F004CE90B/%28httpPages%29/22FB1D4E2B196DAA802570BB005E787C?OpenDocument&count=1000 >; <i>Human Development Reports</i> : interactive database allows for extractable, user defined tables on a wide range of development indicators by country or region, including several categories specifically relating to refugees, publically available at < http://hdr.undp.org/en/statistics/data/ >.
Number of child soldiers/ children involved in armed conflict	Coalition to Stop the Use of Child Soldiers	No comprehensive international statistical data could be found that annotated the number of child soldiers involved in armed conflict by country. <i>Child Soldiers: Global Report 2008</i> lists population under the age of 18, number of government forces, conscription, recruitment age, and voting age by country along with qualitative information for countries in conflict and with known child soldier combatants, which includes progress toward achieving disarmament, demobilization, and reintegration. Report is publically available at < www.childsoldiersglobalreport.org/content/facts-and-figures-child-soldiers >.

Indicator	Source	Notes
Rate of Intimate Partner Violence	World Health Organization; United Nations High Commissioner for Refugees	<p>World Health Organization: <i>WHO Multi-country Study on Women's Health and Domestic Violence against Women</i>: Report documents intimate partner violence and its effect on women's health: <www.who.int/gender/violence/who_multicountry_study/en/>;</p> <p>World Health Organization: <i>World Report on Violence and Health</i>: Chapter 4 of this report focuses on intimate partner violence: <www.who.int/violence_injury_prevention/violence/world_report/en/>;</p> <p>United Nations High Commissioner for Refugees: <i>UN General Assembly, In-depth study on all forms of violence against women: report of the Secretary-General, 6 July 2006, A/61/122/Add.1</i>; available at <www.unhcr.org/refworld/docid/484e58702.html>.</p>
Conflict related – Sexual and gender related violence	United Nations High Commissioner for Refugees; United Nations Development Fund for Women	<p>United Nations High Commissioner for Refugees: <i>Sexual and Gender-Based Violence against Refugees, Returnees and Internally Displaced Persons. Guidelines for Prevention and Response, UNHCR (SGBV Guidelines)</i>: available at <www.unhcr.org/3f696bcc4.html>;</p> <p>United Nations Development Fund for Women <i>Progress of the World's Women 2000</i>: statistical emphasis on tracking the progress of women; available at <www.unifem.org/materials/item_detail.php?ProductID=9>.</p>
Perceptions of safety and security	United Nations Office on Drugs and Crime; Interuniversity Consortium for Political and Social Research	<p>United Nations Office on Drugs and Crime: <i>Eighth United Nations Survey of Crime Trends and Operations of Criminal Justice Systems, covering the period 2001 – 2002</i>: Statistics on crime, police, courts and penal systems by country per year and rate per 100,000 inhabitants: data available publicly at <www.unodc.org/pdf/crime/eighthsurvey/8sv.pdf>; data also available through at <www.nationmaster.com/graph/crime/crime-total-crimes>;</p> <p><i>International Crime Victim Survey (ICVS), 1989-1997</i>: <www.icpsr.umich.edu/icpsrweb/ICPSR/studies/2973>.</p>

Indicator	Source	Notes
Access to justice/conviction rates	United Nations Office on Drugs and Crime	United Nations Office on Drugs and Crime: <i>Eighth United Nations Survey of Crime Trends and Operations of Criminal Justice Systems, covering the period 2001 – 2002</i> : < www.unodc.org/pdf/crime/eighthsurvey/8sv.pdf >; Data also available at < www.nationmaster.com/graph/crime_tot_cri-crime-total-crimes >; <i>Criminal Justice Assessment Toolkit</i> ; available at < www.unodc.org/documents/justice-and-prison-reform/cjat_eng/CJAT_Toolkit_full_version.pdf >.
Reporting rate for armed violence/crimes against persons	United Nations Office on Crime and Drugs	United Nations Office for Crime and Drugs: <i>International Crime Victims' Survey (ICVS)</i> : Data available at < www.nationmaster.com/graph/crime_rep_to_pol-crime-reporting-to-police >.
Reduced number of gang/militia/armed group members	UNDDR Resource Centre	Monitoring and Evaluation of DDR Programmes: available at < www.unddr.org/iddrs/03/download/IDDRS_350.pdf >.
Percentage of (ex-) combatants in DDR programmes or gang member/at risk groups in violence reduction initiatives	International Labour Organization	Manual on training and employment options for ex-combatants; available at < www.ilo.org/employment/Whatwedo/Publications/lang-en/docName--WCMS_116729/index.htm >; comprehensive manual detailing localized methods for reintegrating ex-combatants through employment initiatives; LABORSTA Internet Database: downloadable, interactive database of labor statistics for over 200 countries or territories, including unemployment levels by age group; accessible at < http://laborsta.ilo.org >.

Indicator	Source	Notes
Reduced Income inequality	World Bank Group	<i>Measuring Income Inequality Database</i> : available at: < http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20699070~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html >; country and country code, year, Gini coefficient, cumulative quintile shares. The data distribute unevenly for 138 countries over the period of 1890 to 1996, useful for historic analysis of income inequality; <i>World Development Indicators 2002, Volume 1</i> : downloadable in PDF format at < http://econ.worldbank.org/external/default/main?pagePK=64165259&theSitePK=469372&piPK=64165421&menuPK=64166093&entityID=000094946_0210120412542 >; data also available at < www.nationmaster.com/graph/eco_inc_dis_poo_10-economy-income-distribution-poorest-10 >.
Reduce unemployment rate among young men	International Labour Organisation, Department of Statistics	<i>LABORSTA Internet Database</i> : downloadable, interactive database of labor statistics for over 200 countries or territories, including unemployment levels by age group; accessible at < http://laborsta.ilo.org >.

Table B. Potential Indicators of Armed Violence and Associated Sources.

Potential indicator	Source	Notes
Human trafficking	United Nations Educational Scientific and Cultural Organization	United Nations Educational Scientific and Cultural Organization: <i>Trafficking Project</i> ; provides a database for user-defined queries by subject, including keyword, statistic type, population demographic, form of exploitation (e.g. forced marriage, prostitution, forced labor), country of origin and country of destination; available at < www3.unesco.org/culture/WebTraffickingV2/Search.aspx >.

Potential indicator	Source	Notes
Weapons sales/Transfers (illicit and legal)	<p>Global Policy Forum</p> <p>The Ujima project</p> <p>Federation of American Scientists</p> <p>Norwegian Institute of Small Arms Trade</p>	<p>Stevenson, Chris. 2008. <i>Many Weapons. Few Global Rules: The Path to Arms Transfer Control</i>. New York: Global Policy Forum: <http://globalpolicy.org/component/content/article/204-small-arms/42625.html></p> <p>Weapons Sales by Country: available at <http://ujima-project.org/arms/country/>: downloadable database of legal arms sales for countries in the continent of Africa</p> <p><i>U.S. Small Arms Shipments Database</i>: “The Arms Sales Monitoring Project seeks to increase transparency, accountability and restraint in U.S. arms exports; broaden the coalition of citizens working to reform arms export policy...;” available at <www.fas.org/asmp/profiles/smallarmship_db.htm></p> <p><i>Small Arms Trade Database</i>: comprehensive database of small arms trade delineated by exports to or exports from, uses Peace Research Institute, Oslo arms classifications, from 1962 to 2008, vender type (e.g. government, private sector); available at <http://balder.prio.no:8080/PublicQuery_SQL.aspx>.</p>

Appendix 2. Data Sources: Predictors and Sustainers of Armed Violence

Table A. Predictors of Armed Violence and Associated Sources.

Indicator	Source	Notes
Degree of political corruption	Transparency International; The World Bank Group	Transparency International, <i>Corruption Perceptions Index 2009</i> : annual report (since 2001) used to assess perceived level of public sector corruption in a country or territory; based on multiple sources (surveys) and calculates confidence levels as to the accuracy of each “score:” < www.transparency.org/policy_research/surveys_indices/cpi/2009/cpi_2009_table >; underlying data sources and methodology available at < www.transparency.org/policy_research/surveys_indices/cpi/2009/methodology >; World Bank <i>Worldwide Governance Indicators: 1996–2008</i> database contains numeric indicators of a country’s ability to control corruption; data are available for download: < http://info.worldbank.org/governance/wgi/mc_chart.asp >.
Freedom of the press	Reporters Without Borders for Press Freedom; Freedom House	<i>Press Freedom Index</i> : a ranking of the “degree of freedom” for journalists and media outlets, representing 175 countries: < www.rsf.org/en-classement1003-2009.html >; methodology available at < www.rsf.org/IMG/pdf/note_methodo_en.pdf >; Freedom House <i>Freedom of the Press 2009</i> includes a ranking of the degree of press freedom for 195 countries and territories: < www.freedomhouse.org/template.cfm?page=470 >; < www.freedomhouse.org/uploads/fop/2009/FreedomofthePress2009_tables.pdf >.
Level of democratization	Vanhanen’s <i>Measures of Democracy, 1810–2008</i>	Widely-recognized dataset compiled by T. Vanhanen of the University of Tampere, consisting of three variables for 192 countries: political competition, political participation, and an index of democratization; downloadable data and supporting information are maintained by the Finish Social Science Data Archive at < www.fsd.uta.fi/english/data/catalogue/FSD1289 >.
Political stability	The World Bank Group	<i>Worldwide Governance Indicators: 1996–2008</i> database contains numeric indicators of a country’s level of political stability; data are available for download: < http://info.worldbank.org/governance/wgi/mc_countries.asp >.

Indicator	Source	Notes
Rule of law	The World Bank Group	World Bank <i>Worldwide Governance Indicators: 1996–2008</i> database contains numeric indicators of the extent to which the rule of law prevails in a country; data are available for download: < http://info.worldbank.org/governance/wgi/mc_chart.asp >.
Freedom of movement (within country)	Data sources not well developed	For further information regarding the relationship between government restrictions on movement and armed violence, see Human Rights Education Associates' discussion and list of documentation on this subject: < www.hrea.org/index.php?base_id=148 >.
Inflation rates (consumer price index)	The World Bank Group; Central Intelligence Agency	World Bank, <i>World Development Indicators Database</i> : downloadable data for inflation rates for 227 countries and territories; < http://ddp-ext.worldbank.org/ext/DDPQQ/member.do?method=getMembers&userid=1&queryId=135 >; CIA, <i>The World Factbook</i> , data include inflation rates for 205 countries and territories: < https://www.cia.gov/library/publications/the-world-factbook/fields/2092.html >.
Per capita gross domestic product (GDP)	United Nations Statistics Division; Central Intelligence Agency	United Nations Statistics Division, Social Indicators, < http://unstats.un.org/unsd/demographic/products/socind/inc-eco.htm >; derived from the National Accounts Statistics Database of the UN Economic Statistics Branch: < http://unstats.un.org/unsd/snaama/Introduction.asp >; CIA, <i>The World Factbook</i> , data include GDP (at official exchange rates, based on the U.S. dollar) for 225 countries and territories: < https://www.cia.gov/library/publications/the-world-factbook/fields/2195.html >.
Economic inequality/poverty	United Nations International Children's Emergency Fund; U.S. Central Intelligence Agency	Statistical tables (economic indicators) from <i>The State of the World's Children 2009</i> , including per cent of population beneath the international poverty line, available for download at < www.unicef.org/sowc09/statistics/tables.php >; CIA <i>World Factbook</i> also includes data on per cent of population beneath poverty line: < https://www.cia.gov/library/publications/the-world-factbook/index.html >.

Indicator	Source	Notes
“Youth bulge;” youth unemployment (annually)	International Labour Organisation, Department of Statistics	LABORSTA Internet Database: downloadable, interactive database of labor statistics for over 200 countries or territories, including unemployment levels by age group; accessible at < http://laborsta.ilo.org >; youth bulge determined by “young adults (15–29) as a percentage of the working-age population (15–64); see Cincotta (2008), quoted in Geneva Declaration Secretariat (2008). <i>Global Burden of Armed Violence</i> . (Geneva: Geneva Declaration Secretariat, pp. 60–61).
Prison population size	International Centre for Prison Studies	<i>World Prison Population List</i> includes data on prison populations/number of prisoners in 218 countries and territories; prepared (annually) by Roy Walmsley: < www.kcl.ac.uk/depsta/law/research/icps/downloads/wppl-8th_41.pdf >; supplemented by the International Centre for Prison Studies <i>World Prison Brief</i> : < www.kcl.ac.uk/depsta/law/research/icps/worldbrief/ >.
Military personnel (per capita)	The World Bank Group	<i>World Development Indicators Database</i> : data for 171 countries, including military personnel per 1,000 population: < http://publications.worldbank.org/WDI > publicly available at < www.nationmaster.com/graph/mil_per_percap-military-personnel-per-capita >.
Military personnel (% of total labor force)	The World Bank Group	<i>World Development Indicators Database</i> : data for 169 countries, including military personnel as a percentage of total workforce: < http://publications.worldbank.org/WDI >; publicly available at < www.nationmaster.com/red/graph/mil_per_of_tot_lab_for-military-personnel-total-labor-force&int=-1 >.
Military expenditures (% of GDP)	The World Bank Group	<i>World Development Indicators Database</i> : data for 227 countries and territories, including military expenditures as a percentage of GDP: < http://ddp-ext.worldbank.org/ext/DDPQQ/member.do?method=getMembers&userid=1&queryId=135 >.
Police per capita	United Nations Office on Drugs and Crime	<i>Ninth United Nations Survey of Crime Trends and Operations of Criminal Justice Systems, covering the period 2003 – 2004</i> : Data for U.N. member states, including number of police per 1,000 people: < www.unodc.org/documents/data-and-analysis/CTS9_by_country.pdf >.

Indicator	Source	Notes
Presence of armed militias/factions	Transnational and Non-State Armed Groups of The Graduate Institute, Geneva	Data for active national and regional armed groups, including characteristics and structure of those groups: < www.armed-groups.org/home/about_database.aspx >.
Arms transfers (acquisitions)	Stockholm International Peace Research Institute	<i>Arms Transfers Database</i> includes downloadable data on acquisitions of “seven categories of major conventional weapons” since 1950, by country or armed faction: < http://armstrade.sipri.org/armstrade/page/trade_register.php >.
Political violence	Uppsala University, Uppsala Conflict Data Program	<i>Non-State Conflict Dataset</i> includes data for number of state-sponsored, “political” deaths for 50 countries, from 2002–2005: < www.hsrgroup.org/index.php?option=content&task=view&id=114 >.
Illegal trade: minerals	Data sources not well developed	For further information regarding the relationship between the exploitation of mineral resources and armed violence, see the Global Policy Forum’s list of documentation on this subject: < www.globalpolicy.org/the-dark-side-of-natural-resources/minerals-in-conflict.html >.
Illicit drug trade/prevalence of drug trafficking	United Nations Office on Drugs and Crime	<i>UN World Drug Report</i> : Drug-related crime available for most recent year (2009) by country; prevalence of drug-trafficking crime by country: < www.unodc.org/documents/wdr/WDR_2009/WDR2009_eng_web.pdf >.
International sanctions	United Nations Security Council Sanctions Committees	Mandatory economic or other sanctions (not including the use of armed force/military presence) against a national government; current countries against which sanctions have been implemented available at < www.un.org/sc/committees >.

Indicator	Source	Notes
Forced evictions	Internal Displacement Monitoring Centre (IDMC) of the Norwegian Refugee Council; Centre on Housing Rights and Evictions; United Nations Refugee Agency	IDMC publishes country-level data on internally displaced persons (IDPs) as of 2008, including the number of IDPs, the year in which the current displacement began, and the number of refugees who returned to their homes in 2008 (Internal Displacement Monitoring Centre, 2009): < www.internal-displacement.org/8025708F004BE3B1/%28httpInfoFiles%29/82DA6A2DE4C7BA41C12575A90041E6A8/\$file/IDMC_Internal_Displacement_Global_Overview_2008.pdf#page=16 >; <i>Global Survey on Forced Evictions</i> includes data on forced evictions of populations that have been implemented, threatened, or planned by government entities for countries and territories around the world, including Africa, the Americas, Asia and the Pacific, and Europe: < www.cohre.org/store/attachments/Global%20Survey%2011%20-%20no%20pictures.pdf >; U.N. Refugee Agency provides a database of reports and news alerts (from multiple sources) regarding forced evictions/relocation within countries and territories: < www.unhcr.org/refworld/topic/4565c22535/459bb2cb21.html >.
Literacy	U.S. Central Intelligence Agency	<i>World Factbook</i> contains data on literacy rates for 204 countries: < https://www.cia.gov/library/publications/the-world-factbook/fields/2103.html >.
Water scarcity	Hoekstra and Chapagain	Hoekstra, A.Y. and Chapagain, A.K. (2008). <i>Globalization of Water: Sharing the Planet's Freshwater Resources</i> . (Oxford: Blackwell Publishing): data on water scarcity for 140 countries, downloadable at < www.waterfootprint.org/?page=files/NationalStatistics >; for macro-level data and additional sources with respect to water scarcity, also see the Stockholm International Water Institute, and the UN's Water Programme statistics: < www.siwi.org/statistics > and < www.unwater.org/statistics_sec.html >.
Food scarcity/hunger	United Nations Food and Agriculture Organization (FAO)	FAO's Statistics Division provides downloadable country-level indicators for prevalence of undernourishment and the intensity of hunger for 177 countries (as of 2006): < www.fao.org/economic/ess/food-security-statistics/en >.

Indicator	Source	Notes
Discrimination against ethnic groups	Center for Systemic Peace	<i>State Fragility Index and Matrix</i> includes a complex indicator for “minorities at risk.” Marshall, Monty G., and Benjamin R. Cole. 2009. <i>Global Report 2009: Conflict, Governance, and State Fragility</i> . Severn, MD: Center for Systemic Peace.
Prevalence of religious extremism/extremist groups	Data sources not well developed	For further information regarding the relationship between religious extremism and armed violence, see Iannaccone, Laurence R. and Eli. Berman. 2006. ‘Religious Extremism: The Good, the Bad, and the Deadly.’ <i>Public Choice</i> , Vol. 128, pp. 109–129.
Religious persecution	Pew Forum on Religion and Public Life	<i>Global Restrictions on Religion</i> (2009) report includes several indicators of restrictions on religious freedom/expression by country, such as intimidation of religious groups by national governments: < http://pewforum.org/newassets/images/reports/restrictions/restrictionsfullreport.pdf >; < http://pewforum.org/docs/?DocID=503 >.

Table B. Sustainers of Armed Violence and Associated Sources.

Indicator	Source	Notes
Political legitimacy	<i>State Fragility Index and Matrix</i>	<i>State Fragility Index and Matrix</i> includes a complex indicator for political legitimacy: Marshall, Monty G., and Benjamin R. Cole. 2009. <i>Global Report 2009: Conflict, Governance, and State Fragility</i> . Severn, MD: Center for Systemic Peace.
Economic viability	<i>State Fragility Index and Matrix</i>	<i>State Fragility Index and Matrix</i> includes complex indicators for state economic effectiveness and economic legitimacy for the countries in its dataset: Marshall, Monty G., and Benjamin R. Cole. 2009. <i>Global Report 2009: Conflict, Governance, and State Fragility</i> . Severn, MD: Center for Systemic Peace. < www.systemicpeace.org/Global%20Report%202009.pdf >.

Indicator	Source	Notes
Police and military capacity	United Nations Office on Drugs and Crime	<i>Ninth United Nations Survey of Crime Trends and Operations of Criminal Justice Systems, covering the period 2003 – 2004</i> : Data for U.N. member states, including number of police per 1,000 people: < www.unodc.org/documents/data-and-analysis/CTS9_by_country.pdf >; for background information, see Quinn, J. Michael, T. David Mason, and Mehmet Gurses. 2007. ‘Sustaining the Peace: Determinants of Civil War Recurrence.’ <i>International Interactions</i> , Vol. 33, pp. 167–193.
Outcome and duration of previous conflict	International Peace Research Institute, Oslo	<i>Armed Conflict Dataset: Armed Conflicts Version 4-2009</i> includes data for countries’ internal and external conflict (including war) for the period 1946–2008: < www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO/Armed-Conflicts-Version-X-2009/ >.
Disarmament, Demobilization, and Reintegration (DDR) programs	United Nation’s Disarmament, Demobilization, and Reintegration Resource Centre	<i>Country Programmes</i> (online) contains a list of countries in which DDR programs are in effect under the auspices of the United Nations: < www.unddr.org/countryprogrammes.php >.

Appendix 3. Goals, Targets and Indicators of Armed Violence (Developed at the Expert Workshop on Indicators of Armed Violence)

Goals	Targets	Indicators
1. Reduce human toll from armed and other physical violence	<ul style="list-style-type: none"> a) Reduce annual conflict-related deaths and injuries b) Reduce non-conflict deaths and injuries 	<ul style="list-style-type: none"> i. Intentional homicide nationally and locally (police recorded, public health, survey based) ii. Intentional homicide by firearm (police recorded, public health, survey based) iii. Direct conflict deaths (incident databases) iv. Indirect conflict deaths (survey and surveillance based) v. Number of conflict-related injuries per year per 100,000 vi. Violent victimization (public health or survey-based)
2. Reduce burden of armed and other physical violence on at risk groups	<ul style="list-style-type: none"> a) Increase support to vulnerable and at-risk groups b) Prevent and reduce non-fatal sexual and gender based violence 	<ul style="list-style-type: none"> i. Displacement/resettlement ii. Number of child soldiers/children involved in armed conflict iii. Rate of intimate partner violence iv. Conflict-related sexual and gender-related violence
3. Develop and implement effective armed violence reduction and prevention programmes	<ul style="list-style-type: none"> a) Strengthen security and justice sector capacity b) Level of trust in security services c) Reduce inequalities and improve opportunities d) Prevent and reduce children/youth involved in organized armed violence e) Reduce access to/availability of illicit weapons 	<ul style="list-style-type: none"> i. Perceptions of safety/security (Barometers and/or victimization survey) ii. Access to Justice, Conviction Rate iii. Reporting rate for armed violence/crimes against persons iv. Reduced number of gang/militia/armed group members v. Percentage of (ex-) combatants in DDR programmes or gang members/at-risk groups in violence reduction initiatives vi. Reduced income inequality vii. Reduce unemployment rate among young man