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The Weapons That Kill Civilians — Deaths of Children and Noncombatants in Iraq, 2003–2008

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Armed violence, such as that in the ongoing conflict in Iraq, is a threat to global health.[1] It causes serious injuries and deaths of civilians, makes orphans of children, traumatizes populations, and undermines the ability of communities to provide adequate medical care even as it dramatically increases health care needs. Moreover, indiscriminate or intentional harm to civilians violates humanitarian principles and basic human rights. Believing that a careful assessment of the effects of different kinds of weapons on civilians in Iraq was needed, we used the database of the Iraq Body Count (IBC), a nongovernmental organization that documents civilian violent deaths in Iraq,[2] to determine the nature and effects of various weapons on civilians in Iraq. The patterns we found convince us that documenting the particular causes of violent civilian deaths during armed conflict is essential, both to prevent civilian harm and to monitor compliance with international humanitarian law.

Unlike surveys that do not distinguish between Iraqi combatants and noncombatants among the dead,[3] the large-scale IBC database attempts to specifically identify civilians, whose deaths are of particular concern from a public health and humanitarian standpoint.[1,4] Recent findings from the Iraq Family Health Survey support the validity of the IBC database by showing similar regional trends and distributions of violent deaths.[3] The IBC has monitored direct civilian deaths daily since the Iraq war began on March 20, 2003, with the invasion by U.S.-led coalition forces. IBC sources are primarily reports in the professional media, including reports translated from Arabic, supplemented by reports from hospitals and morgues. Deaths are added to the database when sources report the number of civilians killed, with time and location described adequately to avoid double counting. Also recorded are the perpetrator, the target, the weapons used, the primary sources, and whenever possible, each victim's age, sex, occupation, and name. Although the IBC records injuries as well as deaths, we limited our analysis to deaths, which are more consistently reported by the media.[2] "Civilian" deaths include those of most women, children under 18 years of age, noncombatants, and police officers killed during regular, but not paramilitary, activities, since police are considered part of normal civil society.

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Numbers of Iraqi Civilians, Female Civilians, and Children Killed by Particular Weapons in Short-Duration Events of Armed Violence, March 20, 2003, through March 19, 2008.*

Method	Total No. (%) of Civilians Killed (N=60,481)	No. of Events	Mean No. of Civilians Killed per Event	No. (%) of Female Civilians Killed (N=2396)	No. of Female Civilians/No. of Civilians of Known Sex Killed (% female)	No. (%) of Children Killed (N=2146)	No. of Children/ No. of Civilians of Known Age Killed (% children)
Execution							
Any	19,706 (33)	2,844	7±0.2	300 (13)	300/6,592 (5)	124 (6)	124/6,687 (2)
With torture	5,760 (10)	714	8±0.4	49 (2)	49/1,906 (3)	16 (1)	16/1,882 (1)
Small-arms gunfire	11,877 (20)	5,943	2±0.03	660 (28)	660/7,220 (9)	416 (19)	416/7,963 (5)
Suicide bomb							
Any	8,708 (14)	725	12±1.0	266 (11)	266/2,535 (11)	340 (16)	340/2,734 (12)
Bomber in vehicle	5,401 (9)	514	11±1.2	142 (6)	142/1,440 (10)	234 (11)	234/1,607 (15)
Bomber on foot	3,293 (5)	210	16±1.5	124 (5)	124/1,086 (11)	106 (5)	106/1,118 (9)
Vehicle bomb	5,360 (9)	866	6±0.4	244 (10)	244/859 (28)	216 (10)	216/1,053 (21)
Roadside bomb	2,854 (5)	1,404	2±0.1	126 (5)	126/1,230 (10)	149 (7)	149/1,409 (11)
Mortar fire	2,079 (3)	786	3±0.1	170 (7)	170/386 (44)	231 (11)	231/556 (42)
Air attack without ground fire							
Any	2,363 (4)	253	9±0.9	258 (11)	258/564 (46)	277 (13)	277/703 (39)
Bomb only	479 (1)	28	17±3.6	28 (1)	28/67 (42)	34 (2)	34/88 (39)
Missile only	357 (1)	45	8±2.3	36 (2)	36/115 (31)	35 (2)	35/118 (30)
Air attack with ground fire	687 (1)	41	17±6.5	63 (3)	63/177 (36)	66 (3)	66/234 (28)
Total for all methods	60,481 (100)	14,196	4±0.1	2396 (100)	2,396/21,448 (11)	2146 (100)	2146/23,581 (9)

* Plus–minus values are means ±SE. Short-duration events are defined as those ascribable to no more than two calendar dates and causing at least one reported civilian death; deaths from prolonged events and aggregate reports are excluded. Unless noted, results are for single methods only. The methods listed were included because they caused more than 0.5% of the total reported civilian deaths and because data on their effects, with the necessary level of detail, were available. Included in the "Total for all methods" are 1334 events involving other, unknown, or combined methods that killed 6847 civilians, 309 female civilians, and 327 children. "Execution" denotes the killing of any captured person by any method; this category includes combatants who were executed after being captured, since once they were captured they became noncombatants, who are protected under international humanitarian law.[4] For executions, the mean number per event is the mean number of executed persons reported found (e.g., "seven bodies found tortured and shot"), since the event of killing is usually hidden. "Small-arms gunfire" refers only to open gunfire and does not include executions of captured persons by gunfire. "Air attack with ground fire" involves any combination of air-fired weaponry (e.g., bombs or missiles) and ground-fired weaponry (e.g., mortars or gunfire).



An interactive table is available at NEJM.org

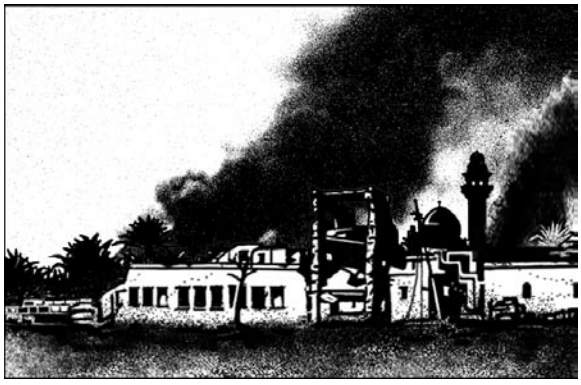
Database entries are systematically error-checked by three IBC volunteers before publication on the IBC Web site (www.iraqbodycount.org).[2]

We based our data set on the number of Iraqi civilian deaths recorded as of June 13, 2008, for the 5-year period of analysis, March 20, 2003, through March 19, 2008. Of the total of 91,358 Iraqi civilian deaths from armed violence recorded for this period, we excluded 10,027 deaths from prolonged violence (e.g., the two sieges of Fallujah and prolonged episodes of violence during the invasion of March 20, 2003, through April 30, 2003), and 20,850 deaths recorded only in aggregate reports from morgues and hospitals, since these deaths were not reliably linked to specific events of a weapon's use. As our table shows, we focused on the remaining 60,481 deaths of Iraqi civilians and the causative weapons in 14,196 armed-violence events considered to be of short duration (lasting up to two calendar dates), occurring in an identifiable location, and directly causing one or more reported civilian deaths. Each death included in the table is of an individual non-

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combatant and is linked to a type of weapon used in a specific time and place; these are not estimates extrapolated from a sample.

The greatest proportion of victims — 19,706 of 60,481, or 33% — were killed by execution after abduction or capture. Of the bodies of those who were executed, 5760, or 29%, showed marks of torture, such as bruises, drill holes, or burns. (A typical media report about this particularly appalling form of violent death reads: "The bullet-riddled bodies bore signs of torture and their hands were tied behind their backs.") Iraqi civilians also suffered heavy tolls from small-arms gunfire in open shootings and firefights (20% of deaths), apart from executions involving gunfire, and from suicide bombs (14% of deaths).



In events with at least one Iraqi civilian victim, the methods that killed the most civilians per event were aerial bombings (17 per event), combined use of aerial and ground weapons (17 per event), and suicide bombers on foot (16 per event). Aerial bombs killed, on average, 9 more civilians per event than aerial missiles (17 vs. 8 per event). Indeed, if an aerial bomb killed civilians at all, it tended to kill many. It seems clear from these findings that to protect civilians from indiscriminate harm, as required by international humanitarian law (including the Geneva Conventions),[4] military and civilian policies should prohibit aerial bombing in civilian areas unless it can be demonstrated — by monitoring of civilian casualties, for example — that civilians are being protected.

Suicide bombers in Iraq are mainly used strategically by sectarian or insurgent forces, with deployment at targets after apparently coordinated planning.[5] Although the bomb's blast is undiscriminating, the individual bomber is not. A suicide bomber on foot acts as a precision weapon — a close-quarters "smart bomb" whose pattern of killing many civilians at a time can result only from either disregard for civilians when targeting opposition forces or direct targeting of civilians. When combatant forces intentionally target civilians, they commit a war crime and violate international humanitarian law pertaining to both international and civil armed conflicts.[4]

Among victims of known sex — that is, those identified as male or female, regardless of age — the proportion of female civilians killed varied according to the weapon used, as did the proportion of children killed among victims of known age. Because the media may tend to specifically identify female and young victims more readily than male adults among the dead, which could inflate our findings for the percentages of female civilians and children killed, these findings should not be considered absolute proportions; they are, however, relatively robust indicators of the varying demographic characteristics of civilians killed by different weapons. Female Iraqis and Iraqi children constituted the highest proportions of civilian victims when the methods of violence involved indiscriminate weapons fired from a distance: air attacks and mortars. That air attacks, whether involving bombs or missiles, killed relatively high proportions of female civilians and children is additional evidence in support of the argument that these weapons, like mortars, should not be directed at civilian areas because of their indiscriminate nature.

By contrast, the methods that resulted in the highest proportions of male civilians among victims of known sex were the relatively close-quarter, precise methods of gunfire (91% male civilians), execution (95% male civilians), and execution with torture (97% male civilians). Execution with torture, the most intimate, brutal method of killing, was used the most selectively against male (rather than female) civilians and against adults (rather than children). By nature, execution is precise and deliberate — the highly controlled, usually planned killing of a captured person. The character of this form of killing, combined with our findings that a great many civilians were killed by execution, in many events, with strong selection according to the sex and age

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of potential victims, supports the assessment that executions have been applied systematically and strategically to civilians in Iraq.[5]

Certainly, different perpetrators can use similar weapons in different ways, with different effects on civilians. Nevertheless, our findings regarding the rates of Iraqi civilian death resulting from different types of weapons reveal stark differences in the effects of various weapons on civilians, in terms of both the numbers and the demographic characteristics of those killed. Weapons that kill relatively high proportions of Iraqi civilians, female civilians, or children are particularly hazardous to public health. Such indiscriminate or intentional effects from armed conflict must be radically curtailed to comply with international humanitarian law.[4] We believe that all combatant forces and governments should implement policies of routine and transparent collection and release of verifiable data on the civilian casualties of military actions. Such monitoring would facilitate timely reparative action and must inform planning if armed combat is to be prevented — as much as possible — from harming noncombatants. Policymakers, war strategists of all persuasions, and the groups and societies that support them bear moral and legal responsibility for the effects that particular combat tactics have on civilians, including the weapons used near and among them.

No potential conflict of interest relevant to this article was reported.

Dr. Hicks is an honorary lecturer in the Department of Health Service and Population Research, Institute of Psychiatry, King's College London, London, and is an unpaid nonexecutive board member of Conflict Casualties Monitor, the nonprofit organization that manages the IBC. Mr. Dardagan is a cofounder and principal analyst, Mr. Bagnall a software architect and developer, and Dr. Sloboda a cofounder and analyst at the IBC. Dr. Sloboda is also a professor at the Department of Politics and International Relations, Royal Holloway College, University of London, London. Ms. Guerrero Serdán is a Ph.D. candidate and Dr. Spagat a professor in the Department of Economics, Royal Holloway College, University of London, London.

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Care of War Veterans with Mild Traumatic Brain Injury — Flawed Perspectives

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Researchers estimate that more than 300,000 U.S. veterans of the wars in Iraq and Afghanistan (20% of the 1.6 million) have sustained a mild traumatic brain injury (TBI), also known as concussion, with the majority going untreated.[1] In response, the Department of Defense and the Department of Veterans Affairs (VA) have implemented new postdeployment health initiatives, including screening, communication strategies, disability regulations, and specialty care services.

Unfortunately, the clinical definition of "concussion/mild TBI" adopted by the Department of Defense and the VA — a blow or jolt to the head resulting in brief alteration in consciousness, loss of consciousness (lasting less than 30 minutes), or post-traumatic amnesia — is inadequate for achieving the objectives of these well-intentioned initiatives. The case definition lacks three essential criteria for use months after injury: symptoms, time course, and impairment. It pertains only to physiological disruption of brain function at the time of injury. Health initiatives crafted through consensus processes using this definition are likely to be causing unintended consequences.

To identify those who sustained a concussion/mild TBI during deployment, the postdeployment screening form asks service members and veterans to recall whether they were "dazed" or "confused" at the time of an injury or blast "experience." Positive responses to this single unvalidated question have accounted for two-thirds of all reported cases of concussion/mild TBI. The remaining cases are clinically similar to sports concussions, involving brief loss of consciousness (usually lasting seconds to a few minutes) or post-traumatic amnesia.[2,3] Arguments that cli-

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