Weapons, wealth, and health: the arms industry as a commercial determinant of health

As governments worldwide increase defence spending and arms company revenues climb, we urgently need to examine how the arms industry (and not just its products) influences health, argue **Mark Bellis and colleagues**

Governments often justify investment in weapons in the name of national security, but the use of arms, whether deployed by militaries, paramilitaries, criminals, or civilians, causes loss of life and injury and poses a substantial threat to global health. The large global arms industry comprises state owned enterprises, private firms, and hybrid public-private models, and its profit driven interests have a growing influence on global agendas and on governmental defence and security policies through lobbying, political donations, and close institutional relationships.[1]

According to the Stockholm International Peace Research Institute (SIPRI) global military expenditure was $2.7tn in 2024,[2] with the combined revenues of the top 100 largest defence companies totalling $632bn in 2023 (the most recent year for which data are available).[3] The five largest companies by revenue are Lockheed Martin, RTX, Northrop Grumman, Boeing, and General Dynamics, and the five largest arms exporting nations are the US, France, Russia, China, and Germany, which together supplied 75% of the world's arms exports in 2023.

KEY MESSAGES

- Growing global conflict and political instability are driving nations to rapidly increase arms spending to enhance security capabilities
- As well as direct harms to health and the environment from weapons, the arms industry exerts serious indirect effects on health and health policy
- Indirect effects include disruption of education and health services, food insecurity, and pollution
- A commercial determinants of health framework should be applied to the arms industry to inform how health considerations should feature alongside defence and profit as key aspects of a growing corporate sector

Overlapping interests between governments, militaries, and arms companies have long been recognised. US President Dwight Eisenhower coined the term military-industrial complex in 1961, and more recently researchers have expanded the concept to include a civilian-commercial dimension reflecting the increasingly blurred boundaries between the military and civilian sectors.[4] The arms industry has close ties with domestic governments and militaries, but its growth in international markets has allowed it to increase income and profits and to benefit from economies of scale. Demand for arms fluctuates over time—building up in times of perceived threat, surging during war, and falling after conflicts. However, these declines can be mitigated or even reversed by sustained narratives of high threat, such as after the 9/11 terrorist attacks.[5] Arms companies also offset these down cycles by diversifying their customer base. For governments, arms exports not only offer economic benefits but also a means to project influence and forge strategic alliances.

These practices align closely with the corporate practices of other industries, including tobacco, food, and gambling, which use political, economic, and cultural influence to enable them to promote products that are detrimental to health.[6] These commercial determinants of health have emerged as increasingly important global considerations in the fields of health and policy, and offer an essential lens through which the actions of different industries need to be viewed.

In this, the first of two articles on the arms industry,[7] we lay out the health harms associated with arms and consider how a framework for commercial determinants of health can be applied to the use of arms in conflict and civilian settings. The direct and indirect health harms arising in both contexts are shaped by the commercial practices of different, albeit overlapping, domains of the global arms industry, the types of weapons produced, and the regulatory frameworks which govern them (fig 1).

Arms industry as a commercial determinant of health

To date, research examining the commercial determinants of health has predominantly focused on harmful commodity industries—namely tobacco, alcohol, ultraprocessed food, and fossil fuels, which together account for at least a third of preventable deaths worldwide each year.[8] A commercial determinants of health lens reveals that harm arises not only from the products of these industries but also their corporate practices and the sociopolitical systems in which they operate.[8 9]

The arms industry has so far received limited attention as a commercial determinant of health. Some work has been done on the civilian firearms sector, particularly in the US, where gun violence is a leading cause of death and injury. This has highlighted concerning practices such as marketing to children and the shaping of cultural norms that foster societal acceptance of firearms and violence.[10-12]

The associated health harms of the arms industry extend far beyond the use of firearms alone, and indeed weapons, encompassing their design, manufacture, marketing, financing, distribution, stockpiling, and decommissioning.[7 9 10] Like other major commercial organisations, arms companies wield considerable economic and political power, which they use to shape public policy, science, and regulatory environments. Use of a commercial determinants of health framework captures these dynamics by examining both the proximal determinants of health (eg, injury and death caused by firearms, explosives, and other weapons) and the distal determinants (eg, international controls on arms exports), while recognising how the distal components shape the immediate harms.

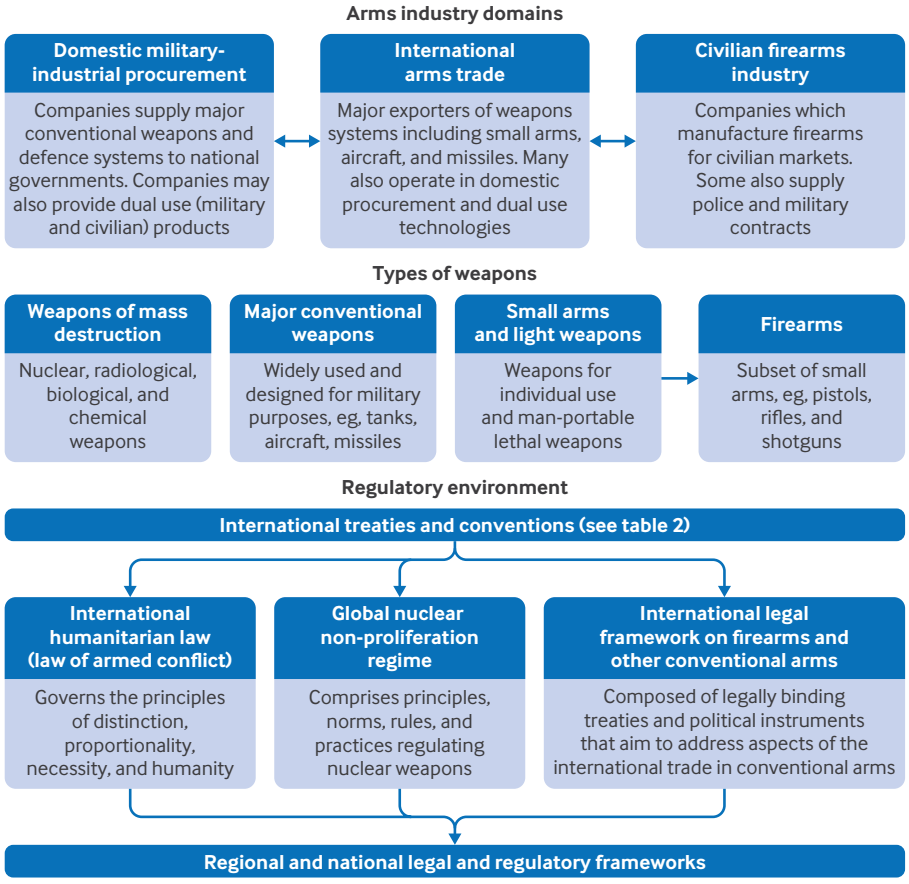

Fig 1 | Systems level overview of the arms industry

Health harms of arms in war and conflict

Although the marketing and design of weapons are closely connected to how they are used and the harms they inflict,[7] the arms industry often seeks to distance itself from the consequences of their products. However, the effect of arms on health is starkly visible in conflicts. Conflict levels have almost doubled since 2020, accompanied by a surge in civilian casualties and a steep increase in numbers of women and children killed (table 1). Substantial evidence from gender analyses show that conflict affects men and women differently, ranging from higher rates of death and injury among men, who are more likely combatants, to the threat of sexual violence, which is greater for women and girls. In addition, gender norms shape different experiences of economic loss, displacement, or other vulnerability resulting from conflict.[24]

Conflict traumatises some of society's most vulnerable individuals, with one in six children worldwide living in conflict affected areas.[25] Explosive weapons (eg, missiles, rockets, shells, bombs, and landmines) continue to kill thousands of people, most of whom are civilians (table 1), and small arms and light weapons (SALW) are the second most prevalent cause of conflict related civilian deaths.[26]

The health effects of war and conflict extend far beyond direct violence and result in millions of further deaths and years of increased child mortality worldwide. Use of explosive weapons in conflicts affects aid access, education, and healthcare services, with disruption to healthcare fuelling the resurgence of preventable diseases and disrupting critical prevention programmes. In Gaza, the collapse of healthcare facilities and growing starvation are likely to kill more people than the direct conflict and violence itself. Even when not directly targeted, war and conflict can have long lasting effects on healthcare delivery. Consequently, health recovery may be stifled for years after conflict.[27] For example, in Yemen, decades of political instability and violence have left 40% of health facilities partially or completely non-functional.[28] Conflicts also drive displacement and vulnerability, affecting health directly and resulting in hunger and food insecurity (table 1). The Russia-Ukraine conflict shows how the effects can extend to global food supply chains, creating food shortages and rising prices.[29]

Health harms of arms in civilian violence

The influence of the arms industry extends further into civilian life through both the legal marketing and illicit flow of firearms outside conflict settings. Gun violence is substantial, with intentional homicides outnumbering deaths resulting directly from conflict in 2023 (table 1).[20] In the US, which has high civilian ownership of firearms, non-fatal injuries occur daily[23] and firearms are a leading cause of injury and death among children. The most popular type of rifle in the US is a semi-automatic AR15-style rifle, similar to one used in the military. These rifles increasingly feature in mass shootings, with prevalence rising from 13% of events in 2010-14 to 49% in 2020-24,[30] and their rapid rate of fire makes them more lethal than handguns. Higher calibre weapons are also linked to fatality: analysis of handgun assaults in Boston, Massachusetts, during 2010-14 estimated that nearly 40% of firearm homicides might have been non-fatal if the weapon had been of a lower calibre.[31]

The effects of firearms are not incidental; they reflect systematic commercial influences and behaviour that increase the availability, accessibility, lethal potential, and cultural acceptance of firearms. The aggressive marketing of firearms, including directly at children (such as lower calibre versions of adult rifles)[32] and through their pervasive representation across media consumed by teenagers,[33] expands the number of weapons in circulation and inevitably contributes to increasing health harms from their use. These practices are key drivers of the use of lethal violence in society[7]; the driver is not just individual intent, as is often argued by the industry.

Firearms are also linked to transnational organised crime and are widely used in illicit drug trades and other illegal industries to enforce territorial control and internal discipline. The US is the world's largest firearms exporter.[34] Illicit flows of firearms, originating from legal markets, mostly go into Latin American and Caribbean countries which report the highest proportion of firearm related homicides (table 1). A 2021 lawsuit filed by the Mexican government against seven US firearm manufacturers alleged their actions were aiding and exacerbating the Mexican drug war by supporting bulk

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Table 1 | Health harms from weapons and war

Health harm	Size of impact
War and conflict	
Global deaths from conflict[13]	Estimated 233 000 in 2024,* a 30% increase from 2023
Global conflict related civilian deaths[14]	At least 48 000 in 2024; third consecutive year of steep increases
Global conflict related civilian deaths among women and childr[en]14	Around four times more killed in 2023 and 2024 compared with 2021-22
Deaths and non-fatal injuries from explosive weapons†[13]	Nearly 70 000 across 56 countries in 2024; 89% of casualties were civilians
Indirect effects of conflict on civilians[15]	Estimated 30 million deaths between 1990 and 2017
Indirect impacts of conflict on children[16]	Estimated 15 years for mortality among under 5s to recover to pre-conflict levels
Attacks or obstruction of healthcare in conflict[17]	62% rise between 2022 and 2024; healthcare workers, clinics, and hospitals are often targeted
Conflict related acute food insecuri[iy]18	Conflict was the primary cause of food insecurity for 135 million people in 2023
Global prevalence of forcible displacement due to conflict[19]	Estimated 123 million people at the end of June 2024, an increase of 5.3 million people since the end of 2023
Civilian violence	
Global intentional homicide deaths[20]	Annual average of 440 000 in 2019-21
Share of homicide deaths perpetrated by firearms[20 21]	Ranges from 79% in the US and 65% in Central America to 67% in the Caribbean and 70% in South America in 2021 *v* 17% in Europe
Firearms in civilian ownership[22]	Roughly 857 million at the end of 2017; almost 400 million of which are in the US
Non-fatal firearm related injuries in US[23]	Average 200 people a day

*Armed Conflict Location and Event Data note that this is a conservative estimate.
†Defined by Action on Armed Violence as "weapons that share common characteristics causing deaths, injuries and damage by projecting explosive blast, heat and often fragmentation around the point of detonation."

weapon sales to cartels.[35] The US Supreme Court dismissed the case in June 2025 citing insufficient evidence.[36]

Spending on arms at the expense of health

Although governments ultimately decide on military budgets, they do so within a broader context shaped by arms industry lobbying and the strategic influence of the military industrial complex, particularly in relation to procurement decisions.[7] The relation between arms and health expenditure is complex and often contested, but a global analysis suggests a 1% rise in military expenditure could result in a 0.6% fall in publicly financed health expenditure.[37] As noted, global military spending reached $2.7tn in 2024.[2] For context, an additional annual investment of around $371bn in low and middle income countries to support sustainable development goal 3 (good health and wellbeing) could save 97 million lives by 2030.[38]

Many countries are facing difficult funding choices in the context of greater healthcare demand and increasing pressure to build military capabilities, all against a challenging economic backdrop in which the arms industry has a significant role in shaping national defence agendas. For example, in June 2025 the UK prime minister announced a commitment to spend 3.5% of the country's gross domestic product on core defence by 2035, a substantial increase from current spending of 2.3%.[39] This is likely to take money from health, humanitarian, and social spending.

The consequences of such choices in the context of global volatility are particularly evident in low and middle income countries, where increases in military spending can further constrain already limited budgets for health and social welfare.[40] A stark example is South Africa's decision in 1999 to purchase fighter jets and other expensive arms from European manufacturers despite millions of its citizens needing HIV medication.[41] In recent decades, high income countries have reduced foreign aid in favour of increased domestic defence spending.[42] This shift can exacerbate growing health financing crises in low and middle income countries, where health resourcing is already strained through competition with defence and other political priorities.

Wider harms of arms to environmental and planetary health

The production, stockpiling, and use of arms makes a sizable contribution to the environmental degradation that threatens the health of people and the planet—from the extraction of raw materials through to the deployment of arms in conflict. Military activity is estimated to currently account for 3-7% of global greenhouse gas emissions.[43] The US military is the world's largest institutional consumer of fossil fuels,[44] and in 2017-18, the UK arms industry alone is estimated to have emitted around 1.46 million tonnes of carbon dioxide equivalent, similar to the total emissions from all UK domestic flights.[45]

The European Network Against Arms Trade, an informal network of peace groups, suggests that the arms industry's influence has led to a shift towards a war economy mode in the European Union, diverting funds away from peace building and climate action.[46] This redirection represents a double blow for environmental efforts, when environmental targets are delayed or axed to free up resources for arms procurement. Climate change has serious health effects and is expected to cause an estimated 14.5 million additional deaths between 2023 and 2050.[47] By increasing food scarcity and displacing populations, climate change also heightens the risk of future armed conflicts.[7]

Although treaties and conventions now restrict the production, sale, and use of weapons of mass destruction, not all countries are signatories, and the historical and potential future impacts of the use of such weapons remain a major concern for planetary health. Development of nuclear weapons has resulted in increased cancer rates in populations living close to test areas,[48] health harms from the mining of raw materials,[49] and widespread pollution because of radioactive leakage from storage sites.[50] The term weapons of mass destruction underlines the acute existential threat these weapons pose. A regional nuclear war between India and Pakistan, for example, could cause over

Table 2 | Examples of major treaties and conventions relating to arms

Treaty/convention	Description	Signatories	Oversight and implementation
International humanitarian law			
Biological Weapons Convention* (BWC)	Bans the development, production, and stockpiling of biological and toxin weapons	193 states signed, 189 ratified. Chad, Eritrea, Israel, and Djibouti are non-signatories	Lacks a formal verification mechanism. Implementation supported by the BWC implementation support unit within UNODA
Chemical Weapons Convention*	Prohibits the development, production, acquisition, stockpiling, retention, transfer, or use of chemical weapons	194 states signed, 193 ratified (all except Israel). Egypt, North Korea, and South Sudan are non-signatories	Implemented by the Organisation for Prohibition of Chemical Weapons
Convention on Cluster Munitions	Prohibits the use, production, transfer, and stockpiling of cluster munitions	123 states signed, 111 ratified. Major producers of cluster munitions (including US, Russia, China, and India) have not joined	Implementation supported by UNODA
Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction (Ottawa Treaty)	Prohibits the development, production, stockpiling, transfer, and use of anti-personnel mines	165 states agreed to be bound by the convention. Countries that have not formally agreed include US, Russia, China, India, Israel, and Saudi Arabia	Overseen by the implementation support unit of the treaty; supported by UN Mine Action Service
Global nuclear proliferation regime			
Treaty on the Non-Proliferation of Nuclear Weapons*	Aims to prevent the spread of nuclear weapons, promote peaceful uses of nuclear energy, and further the goal of nuclear disarmament	191 states ratified. India, Israel, Pakistan, and South Sudan have not joined. North Korea withdrew in 2003	Overseen by the International Atomic Energy Agency
Comprehensive Nuclear Test Ban Treaty* (CTBT)	Prohibits all nuclear explosions for military or civilian purposes and to stop development of new or upgrades of nuclear weapons	187 states signed, 178 ratified. Not ratified by states including China, US, and Israel. Russia revoked ratification in 2023	Overseen by the CTBT Organization, which operates the International Monitoring System
Treaty on the Prohibition of Nuclear Weapons*	First legally binding international agreement to comprehensively prohibit nuclear weapons, aiming for total elimination	94 states signed, 73 ratified. None of the nine nuclear armed states (US, Russia, China, France, UK, India, Pakistan, Israel, and North Korea) have joined	Implementation overseen by UNODA
International legal framework on firearms and other conventional arms			
UN programme of action to prevent, combat, and eradicate the illicit trade in small arms and light weapons (SALW) in all its aspects (UNPoA)	Targets illicit SALW, through strengthening regulations, ensuring better management of arms transfers, and safeguarding and monitoring weapon stockpiles. This also includes the International Tracing Instrument*	Adopted by all UN member states in 2001	Coordinated by UNODA
Protocol against the illicit manufacturing of and trafficking in firearms, their parts and components and ammunition (UN Firearms Protocol)	Aims to prevent, combat, and eradicate the illicit manufacturing and trafficking of firearms by promoting effective control and traceability mechanisms	126 states ratified. Countries that have signed but not ratified include Australia, Canada, Iceland, Japan, and UK. Countries that have not joined include US and Russia	Oversight by UNODC; implementation through national legislation and international cooperation mechanisms
Arms Trade Treaty (ATT)	Aims to regulate the international trade of conventional weapons. Parties must assess the extent to which export of conventional arms might contribute to serious violations of human rights and international humanitarian law	142 states signed, 116 ratified. Not ratified by countries including US and Israel; not signed by countries including Russia, India, and Saudi Arabia	Overseen by the ATT secretariat, implementation supported by UNODA

UNODA=UN Office for Disarmament Affairs; UNODC=UN Office on Drugs and Crime.
*Major international agreements addressing weapons of mass destruction.

50 million deaths and severe disruption to the climate and natural ecosystems.[51] Even without full scale deployment, the risks of leakage from manufacturing sites or unsanctioned and illegal use of these weapons are substantial. This is exemplified by how a small amount of the novichok nerve agent caused death and contamination in the UK in 2018.[52]

Countries at all income levels produce basic weapons and ammunition such as small arms, armoured vehicles, and more basic drones. Their widespread production carries important environmental risks, especially in regions where health, safety, and environmental controls are weak. High explosives (those that detonate with high velocity), heavy metals, and propellants contaminate soil and groundwater at military sites. Common explosives have left a toxic legacy of pollution around munitions plants,[53] affecting wildlife and biodiversity but also contributing to human health conditions such as birth defects, respiratory illnesses, and cancer.[54 55] The environmental and health impacts of thousands of tonnes of explosives and chemical weapons dumped into oceans and seas after the two world wars are still being explored but can be expected to be substantial.[56]

The production of arms relies on globally dispersed manufacturing processes, and major arms companies operate production facilities and partnerships across multiple countries. This globalised structure may therefore shift some environmental and health burdens to low and middle income countries that are less equipped or resilient to absorb such harms.[57 58] Moreover, modern weaponry increasingly depends on computerised components, and the mining and distribution of their necessary rare metals is linked to conflict, slavery, and other severe human rights violations.[59]

Regulating the health harms of arms

Various international mechanisms and legal frameworks exist to limit the use and proliferation of weapons (table 2). International humanitarian law seeks to limit the effects of armed conflict on humanitarian grounds by regulating conduct during conflict. It is composed of treaties, customary international law, and general legal principles.[60] In addition, a broader legal

framework, the international legal framework on firearms and other conventional arms,[61] regulates the manufacture, transfer, and tracing of conventional arms, particularly small arms and light weapons. Arms treaties and international conventions therefore play a critical role in shaping humanitarian law, protecting health, and preventing arms being deployed for human rights abuses, terrorism, and crime.

However, these legal instruments are not immune to commercial influences. The final text of the Arms Trade Treaty, for example, included key concessions to the strategic and commercial interests of major arms exporting states, including the recognition of "legitimate commercial interests" and the dilution of risk thresholds from "substantial" to "overriding" in relation to arms transfers when there is a risk of humanitarian law violations.[62] These features align closely with the interests of the arms industry.

The uneven ratification and withdrawal from treaties further highlights the global inequities in power and influence. Many of the world's largest arm producing states, including France, the UK, and the US, have not ratified key treaties—for instance, on the prohibition of nuclear weapons (table 2)—and reporting requirements may be weak or inconsistently applied. Recent calls to withdraw from humanitarian led treaties covering landmines (Ottawa Treaty) and cluster munitions[63] further risk undermining these important global protections. A commercial determinants of health lens helps draw attention to how the health harms of arms are embedded in global systems of trade, power, and profit.

Call to action

The behaviour and practices of arms companies, operating as corporate political actors, have direct implications for human and planetary health. These behaviours have been given insufficient attention for too long.

Defence and strategic policy experts, some government ministers, and certainly military chiefs, as well as industry aligned analysts,[7] would argue that arms remain a necessary and potentially escalating part of national security. However, against a background of rising global military expenditure, considering the arms industry as a commercial actor with substantial influence on governments that commission its products, is essential to understanding how its products, practices, and corporate strategies contribute to health harms beyond the battlefield. Recognising the industry as a commercial determinant of health is a conceptual shift. It is also a call to action for health professionals including researchers, policy makers, and civil society to advocate for a reorientation away from design, distribution, and deployment for profit and towards global priorities of health, human rights, and peace. These themes will be explored in greater detail in our second article.[7]

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