Chapter 2
Epidemiology of Polytrauma

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Epidemiology is the study of health and disease in populations, the scientific approach typifying public health medicine. The paradigms are somewhat different from the reductionist approach of much clinical science, which seeks to understand disease processes at an “omic” level. The rationale that underpins epidemiology suggests that effective disease control must begin and end by understanding the impact of a disease (and its prevention/management strategies) at a population level – globally, nationally, and locally – including the identification of vulnerable groups, etiological factors, and societal costs.

An epidemiological perspective on polytrauma – significant injuries affecting more than one body region – and its management must draw from the significant “injury control” literature. The latter often does not distinguish between polytrauma and major injury to a single body system. However, it sets an important context for more detailed descriptions of polytrauma found in trauma registries. This chapter will therefore first describe the global injury burden prior to a polytrauma focus.

2.1 Global Burden of Injury

Trauma fulfills the disease classification criteria for a global pandemic, this being a recurrent and significant cause of morbidity and mortality over time and across continents despite efforts to control its impact. Worldwide, about 16,000 people die every day as a result of an injury (5.8 million deaths per year), and the projections for 2020 show that 8.4 million deaths per year are expected [1, 2]. Consequently, injury will be the second most common cause of disability adjusted years of life lost.

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within the next 13 years (second only to HIV/AIDS). Undoubtedly, the major burden of injury is increasingly occurring in the developing world as it industrializes, adopts motorized transportation, and remains the major center for armed conflict [2]. Despite a lower population incidence, injury remains the most common cause of death and disability in children and young adults in the developed world [2].

Incidence and trends vary across the developed world. National statistics are quoted as showing crude annual rates of approximately 1,095/100,000 injury deaths and hospitalizations in England and Wales [3, 4]. These data are obtained from national statistics that use International Classification of Disease codes, a taxonomy with limited descriptions of injury severity. The abbreviated injury scale (AIS) dictionary has a greater level of detail (over 2,000 injury codes) and allocates to every injury a severity score between 1 (mild) and 6 (maximal) [5]. These can be summed into the injury severity score (ISS) [6] as a global reflection of the anatomical severity of injury suffered by each individual patient. Severe injury is defined as ISS >15. Within Europe, most hospital admissions with injury have much lower ISS values (range 4–9), due to single isolated limb fractures in children or the elderly (falls), and isolated mild head injury (blunt assault) in young adults.

This latter AIS/ISS taxonomy has been utilized to describe injury incidence in continental Europe and the US; consequently, rates appear considerably lower than in England and Wales. Across continental Europe, the annual rates of death and severe injury (ISS >15) varies from 25 per 100,000 in Germany to 52.2 [7] in one region of Italy [8]. In Canada, the annual rate of death and severe injury (with ISS >12) is estimated at 71.5 per 100,000 [9]; a lower ISS is utilized here, but, in fact, the occurrence of ISS scores 13–15 is low, so this probably reflects a truly higher incidence of injury morbidity in Canada compared to continental Western Europe.

The incidence in most of continental Europe has declined in recent years (Figs. 2.1 and 2.2). There is limited literature available on the economics of injury, but they are an important source of direct medical costs as well as indirect costs resulting from economic production losses; in the Netherlands, for example, the direct costs of injury represents 5% of the health care budget, whereas in Spain, the total costs associated with traffic injuries alone account for 1.35% of the gross national product [10, 11]. In both countries, injury has been shown to be a more expensive disease than cancer or cardiovascular disease once societal costs are accounted for.

### 2.2 Etiology and Vulnerable Groups

Etiology and vulnerable groups are inextricably linked and reflect the nature of the disease. Injury results from a transfer of energy – most commonly kinetic, but, within armed conflict, thermal, chemical, blast, and radiation become important – to the patient. The nature/severity of the injuries sustained depends on the type and magnitude of impacting energy and vulnerability of the host.

Clearly, risk-taking behavior involving transportation ± alcohol, more prevalent in younger males, conveys a higher likelihood of injury. Indeed, statistics