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Nosology

What is an injury?

J Langley, R Brenner

A clear definition is needed

Paramount to the study of any disease is the clear definition of the subject of interest. The definition of injury is fraught with challenges and complexities. Importantly, injuries unlike most diseases must be defined simultaneously by the causative event and by the resulting pathology. For example, bruising can occur in the absence of a mechanical insult to the body (for example, in the case of sepsis or a bleeding disorder) and thus, taken alone, cannot be considered an injury. Similarly there are many events, such as car crashes, that result in no pathology, even if ''victims'' are bought to an emergency department for observation. Thus, the theoretical definition of injury must incorporate both cause and outcome. Equally challenging is the operational definition of injury, for example, which diagnoses, codes, or combination of codes from the *International Classification of Diseases* (ICD)[1] define injury? In this paper we discuss shortcomings in existing theoretical and operational definitions of injury with a view to advancing injury prevention research and practice.

THEORETICAL DEFINITIONS

The theoretical definition of injury is problematic since there is no basic scientific distinction between disease and injury. In some cases the etiologic agents are identical, for example the result of the brief exposure to toxic gas is often called injury whereas eventual pulmonary effect of chronic exposures to low concentrations of the same gas may be called disease.[2] Many of the public health orientated injury texts consider that the ''energy definition'' best describes the causes and pathologies of interest, namely ''injury'' refers to damage to the body produced by energy exchanges that have relatively sudden discernible effects.[3] In contrast, ''disease'' tends to be used for pathologies such as cancer which manifest themselves over longer periods after first exposure to their causes. While this seems to be a reasonable starting point, a number of issues remain. These issues are perhaps best explored through specific examples. First, what is meant by ''damage to the body''. If damage to the body refers to tissue damage, strict adherence to the theoretical definition would lead to the exclusion of many events that are routinely classified as injuries. For example, ingestion of a foreign body, such as a coin, often results in no tissue damage and foreign bodies can be removed from other orifices such as the nose or ear, without damage to the surrounding tissues. Similarly, a sexual assault which results in no tissue damage but from which the victim experiences severe depression, will only be covered by the theoretical definition if the scope of bodily damage is broadened to include psychological damage. There would seem to be a case for such harm to be included in a theoretical definition given that significant numbers of those in injury research and practice consider this a legitimate area of concern for the field. Moreover, in New Zealand (population 4 million) at least, the agency, Accident Compensation Corporation, which has the primary mandate for injury prevention, rehabilitation, and compensation, compensates victims who suffer such harm. In the 2000/2001 financial year 267 people were compensated for psychological injury at a total cost $NZ2 659 000.

Second, consider also the meaning of ''energy exchange''. Clearly a surgical incision is the result of intentional transfer of mechanical energy and this transfer results in tissue damage, yet, traditionally surgical incisions are not included in counts of intentional injuries. Perhaps, when the benefits of the purposely intended injury are thought to outweigh the costs, the theoretical definition is not applicable. But that approach is inconsistent with our approach for counting injury due to the lawful use of force (for example, police), where presumably the benefits are also thought to outweigh the costs of using such force. In this case, however, provision is made in ICD to code injuries due to this cause (E970–978: legal intervention).

Most injury prevention experts expand the theoretical definition of injury to include not only bodily damage caused by transfers of energy but also damage caused by the absence of energy.[3] While this serves us well by bringing injuries due to a number of causes (for example, drowning, hypothermia, and asphyxia) under the broad umbrella of the theoretical definition, it also obscures the boundaries as it could be argued that the final pathway for death of any etiology is ultimately an absence of energy.

Finally, the notion that an injury must have ''sudden discernable effects'' leads to the exclusion of tissue damage due to chronic low energy exposures (for example, carpal tunnel syndrome) but as Robertson has pointed out some have modified the energy definition to include such cases.[3]

The development of the theoretical ''energy'' definition of injury by Haddon represented a significant advance in our thinking and provided a useful basis on which to consider injury control measures.[4] One of its major strengths is the inclusion of both cause and outcome in the definition. However, as the field of injury prevention has advanced it is clear that there is now a need to refine the concepts outlined in this theoretical definition.

OPERATIONAL DEFINITIONS

Arguably the most common operational definitions of injury, although rarely directly stated as such by most authors, are all those pathologies included in the ''Injury and Poisoning'' chapter (XVII) of the ninth revision of the ICD or all those events coded to ICD

Supplementary External Causes of Injury and Poisoning (commonly referred to as E codes).[1] The former chapter includes all those pathologies most scientists and members of the public would describe as injury (for example, fracture, dislocation, open wound). The latter includes all those mechanisms or events which ''cause'' injury (for example, motor vehicle traffic crash, fall, sharp objects).

Consider first the chapter on injury and poisoning. The title of the chapter alone raises interesting issues. Many injury researchers and practitioners would consider poisoning to be one of a range of pathologies which operationally define injury. That being the case why is the chapter named in this manner?

The chapter makes provision for ''Effects of foreign bodies entering through orifice'' (930–939) yet these classifications do not directly describe pathology and as we have already mentioned many such events do not result in discernable damage to the body (for example, young child sticks a small toy up his nose). In other words there is no injury. Even allowing for the possibility that injury may have occurred, this range of codes is anomalous as it is inconsistent with ICD's approach to other injuries. For example ICD does not have a grouping of codes for ''effects of motor vehicle crashes''. Rather ICD require the actual pathology to be coded.

The chapter also includes: ''Certain adverse effects not elsewhere classified'' (995) and ''Complications of surgical and medical care, not classified elsewhere'' (996–999). Some have argued that these are ''medical injuries'' and should be excluded from the operational definition of injury. The justification given is that the aetiology is different than other injuries and that these types of injuries require different means of prevention.[5] As has been argued elsewhere,[6] neither argument is sufficient grounds for exclusion. Rather the decision should be based on whether the injuries meet an accepted theoretical definition of injury. While some would in fact appear not to meet the theoretical ''energy'' definition, such as 996.0 ''Mechanical complication of cardiac device, implant and graft'' others almost certainly do, for example 998.2: ''Accidental puncture or laceration during a procedure''. Importantly, the inclusion or exclusion of ''medical'' injuries has dramatic effects on estimates of incidence. For example, in New Zealand in 1998 there were 67 428 public hospital discharges which had injury (800–999) as the primary diagnosis,[6] and 17% of these were in the range 995–999.

It should be noted that there are conditions which fall outside the 800–999 range but which some would classify as injury. These include musculoskeletal conditions related to the knee and back (717, 718, 724) and certain conditions of the eye (366.2). Some have argued that most of these conditions are chronic and should thus be excluded from an operational definition of injury, presumably on the basis that the theoretical definition of injury should be confined to pathologies that occur suddenly. Assuming one accepts this argument, it raises an interesting question. Are we to assume, for example, that all strains and sprains coded in the range 840–848 have occurred acutely? Given that there are no guidelines in this respect we feel such an assumption would be unwise. In 1999 at the International Collaborative Effort on Injury Statistics meeting in Washington, Pickett sought to identify all injury codes outside chapter XVII.[7] Various recommendations for dealing with these were discussed at the meeting but no consensus was reached.

The ICD injury and poisoning codes do not include psychological injury. Such harm presumably could be covered by the ICD codes for over mental health outcomes (mental disorders 290–319). In New Zealand cases with psychological injury could potentially be identified by ascertaining injury events using external cause codes and then searching for accompanying codes indicative of a relevant mental disorder. This is possible in New Zealand because hospital discharges for injury events are routinely assigned external cause of injury codes, even if there is no apparent tissue damage. However, external cause codes are not routinely assigned in many other countries and, even when they are assigned, it is not clear that coders routinely document psychological consequences of injury.

The US Injury Surveillance Workgroup of the State and Territorial Injury Prevention Directors Association (STIPDA) have grappled with the above problems and have recently produced the inclusion/exclusion criteria for identification of injuries from hospital discharge data.[8] A number of issues are worthy of note. First, no explanation is given for the exclusions/inclusions. For example, late effects of injuries, poisonings, toxic effects, and other external causes (905–909) are included. This contrasts with the coding practice in New Zealand where the following explanation is given: ''Late effects of injury and poisoning (ICD codes 905–909) are no longer entered as principal diagnosis; preference is given to the residual conditions, with the late effects entered as a secondary diagnosis'' (P8).[9] The approach adopted in New Zealand would appear consistent with the instructions in ICD-9 (P501), although it must be said that those instructions are difficult to interpret.[1] Second, with the exception child maltreatment syndrome (995.5), most ''medical injuries'' have been excluded. Third, the working group acknowledges that there may be codes outside the 800–999 range which qualify as injury but until such stage as a consensus can be reached on these codes, they recommend exclusion of these pathologies from injury counts.

Consider now, the supplementary classification of external causes of injury and poisoning. Reliance on external cause of injury codes to operationally define injuries, has led to other problems. Most importantly, these codes can be used to describe events that result in little or no injury. This occurs most often when a person seeks medical care following an event (for example, a car crash or a fall), but when the event resulted in no injury. Recent work in New Zealand has shown that 26% of all persons discharged from a public hospital, and whose record was assigned an E code, did not have a diagnostic code within the injury and poisoning range (800–999).[7] In ICD-10 the equivalent chapter is now titled ''Injury and poisoning and certain other consequences of external causes''.[10] This is more descriptive of what has always been included in the chapter.

Consider the case of drowning as an example of the definitional confusion which arises from the failure to distinguish the pathology of interest from external causes which may result in that pathology. Typically the term drowning is used to refer to deaths due to asphyxia in liquid. Non-fatal injury outcomes arising from similar processes are often referred to as near drownings. The difficulty here is that the concept of near drownings includes everything from losing your footing in the surf and temporarily losing control of the situation with no detectable pathology right through to major neurological damage as a result of asphyxia. In the latter case should we not be coding the actual pathology—the injury to the brain? In the former case why are we counting these cases if there is no damage namely we do not after all code ''near lacerations or near burns''.

CONCLUSIONS

Some have suggested that discussions about what is and what is not an injury is an esoteric exercise of interest only to nosologists and theorists. Using the New Zealand experience, however, this paper has demonstrated that estimates

of the incidence of injury can vary substantially depending on one's operational definition of injury. This has important implications for determining priorities, developing indicators for monitoring trends, and undertaking international comparisons. Commonly accepted theoretical and operational definitions of what is an injury are in need of revision. Ideally this should take place in an international context and by consensus. The International Collaborative effort on Injury Statistics represents an excellent international forum through which to progress this.

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Safety

Making sense of safety

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Beyond injury prevention

The concept of "safety" can have many different meanings. The *Concise Oxford Dictionary* defines it as "freedom from danger and risks", while the *Merriam-Webster Dictionary* describes safety as "the condition of being safe from undergoing or causing hurt, injury, or loss". According to etymologist Douglas Harper, the word safe first came into use in the English language around 1280, derived from the Old French *sauf*, which in turn stemmed from the Latin *salvus*, meaning "uninjured, healthy, safe". The Latin word is related to the concepts of *salus* ("good health"), *saluber* ("healthful"), and *solidus* ("solid"), all derived from the Proto-Indo-European base word *solwos*, meaning "whole".[1] Thus, at its root, the concept of safety revolves around wholeness and health.

Injury prevention researchers have defined safety as "a state or situation characterised by adequate control of physical, material, or moral threats", which "contributes to a perception of being sheltered from danger" (Andersson and Svanström, as quoted in Welander *et al*, page 12[2]). Safety is commonly viewed through the lens of specific injury domains: for some researchers in the injury prevention field, safety has come to mean the prevention of crime and violence; for others, a reduction in motor vehicle deaths or a feeling of being out of danger rather than being in a positive state of human growth and development.[3]

Due to the multitude of views on the definition of safety, a collaborative effort was launched in 1996 by two World Health Organisation (WHO) Collaborating Centers on Safety Promotion and Injury Prevention, sponsored by the Ministry of Health, Quebec, Canada, and Karolinska Institute, Stockholm, Sweden, to develop international consensus on the conceptual and operational aspects of safety and safety promotion.[2] A document was published in 1998 entitled *Safety and Safety Promotion: Conceptual and Operational Aspects*. The authors of the document stated that a shared definition of safety would result in improved cooperation between researchers and community program workers within the safety promotion discipline, stimulating the development of initiatives that would improve the wellbeing of the population.[3]

TWO DIMENSIONS OF SAFETY

A key point of the WHO's definition of safety is that it has two dimensions: an objective dimension, which can be seen as behavioural and environmental factors measured against *external* criteria, and a subjective dimension, which can be variously defined as the individual's *internal* feelings or perceptions of being safe (which can be aggregated to the macrolevel, to represent the community's subjective safety perception). Hence, for the researchers who contributed to the WHO report, safety is more than merely "non-injury".

In the injury prevention domain, safety is rarely, if ever, operationalised in a manner that is consistent with WHO's broad definition of the concept. Indeed, most injury prevention interventions and programs are designed and implemented with the overall objective to reduce injury rates; injury incidence is seen as the primary focus of program interest and success is overwhelmingly defined as a reduction in injuries.[4–6] Thus, safety is typically defined and measured more by its absence than its presence.