Injury Data Definitions - The Need for Standards

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Abstract

The wide variation in injury mortality rates from one country to another dictates the necessity of analyzing these differences. Potential biases which must be taken into account when considering cross-national injury mortality rates may lie in different coding conventions, variation in recording external causes on death certificates, artifacts in registration of deaths or in grouping causes. A number of local examples of misinterpretation will be presented to illustrate the importance of standard injury data definitions and groupings.

Investigation of the reported finding that Israeli females had among the highest rates in the industrialized world for unintentional injuries other than motor vehicle crashes, led to clarification of classification disparities and to the discovery that almost all the excess mortality came from incorrect inclusion of iatrogenic effects. Corrected inter-country comparison of the mortality rates associated with other types of unintentional injury led to the detection of excessive fatal falls among Israeli women aged 75 and over.

differences in defining and registering the intent of injury can also blur vital information, and were found to contribute to distortion of the national rates for suicide and for unintentional firearm mortality among young Jewish males. Another critical factor is the definition of the population at risk. In Israel, data relating to accidental or intentional injuries among military personnel are included in hospitalization and mortality statistics, while in the US these are excluded from the national samples. Comparison of rates of injuries requiring hospital visits will therefore lead to misleading conclusions about their relative frequency among the military service age-groups.

Internationally accepted guidelines and standards for case and data element definitions, groupings of cause of injury and analytic strategies should be developed. These might be appropriately disseminated as Internet tutorials.

Introduction

The need for world-wide collaborative approaches and data-driven preventive efforts to reduce injuries has been noted by many, as well as the need to improve the quality , reliability and comparability of international injury statistics. The wide variation in injury mortality rates from one country to another suggest that there may be cases for preventive action in individual countries, as well as important new areas of etiologic research. However, differences in injury data definitions and the lack of standards may be a major cause of disparities.

Potential biases which must be taken into account when considering cross-national injury mortality rates include different coding conventions, variation in registration or recording of external causes on death certificates, or artifacts caused by inappropriate grouping of causes. A number of local examples of misinterpretation will be presented to illustrate the importance of standard injury data definitions and groupings.

Inappropriate classification

In 1994, the National Center for Health Statistics published an International Mortality Chartbook (Levels and Trends, 1955-91); a fascinating, well-designed booklet comparing country rankings and trends for selected causes of death and variations in patterns of mortality in the US and 40 industrialized countries. Included among these are data for Israel, which we perused with great interest, in particular for intentional and unintentional injuries (figure 1). To our surprise and chagrin, we found that Israeli females had among the highest rates in the industrialized world for unintentional injuries other than motor vehicle crashes.

Since this collapsed cause group included codes E-800-807 and E826-E949, a grouping which we had never previously used, we spent considerable time trying to figure out what could be causing this huge disparity in rates between Israeli females and those in other countries. We previously had an indication that elderly women had a high rate of fatal

falls, but nothing had suggested that we were so far out of line with the experience of other countries.

We attempted to access the individual E-codes in order to determine where the excess mortality was: whether Israeli females had high rates in all unintentional causes or in one or two specific categories, information which would enable us to proceed with strategic planning for intervention. However, as the grouping had been done early in the analysis, more detailed code groups were unavailable.

We accessed two national mortality data files through the CDC-WONDER network: the NCHS US Compressed Mortality File and the England and Wales Population/ Mortality data set. These data were down-loaded and compared with the locally available Israeli mortality data in order to identify and explain the markedly divergent unintentional injury rates among the countries. The first step was to try to duplicate the Chartbook findings.

In order to facilitate detailed comparison between the three national data sets, a number of arbitrary decisions were made:

1. Due to technical limitations in the England/Wales data set (available on WONDER only through 1989; only 10yr grouping from 25 on), information for 1987-89 was accessed and the English age-distribution was used.

2. Since we were not concerned with motor vehicle crashes, or in fact with other transport injuries, E800-849 was grouped into one category - transport injuries. After the event, we realized that we were also constructing an unconventional grouping, particularly since some water-transport codes (E830,832) are often included in an analysis of drowning mortality.

3. The WHO world population was used as the standard population (as had been used in the International Mortality chartbook).

As can be seen in figure 2, the overall picture is essentially the same, with the rate for Israeli females more than twice the rate for US females and 2.6 times the rate for England and Wales. After disaggregation and inspecting separate categories among the three populations (figure 3), the large excess mortality rates for transport-associated fatalities among US females was observed. We also observe extremely high rates among Israeli women for iatrogenic conditions (surgical and medical complications and adverse effects), with more than a 10-fold difference between Israeli and US women, and an Israeli rate 36 times greater than the rate in England and Wales. When inspecting the combined rate for other unintentional injury fatalities, there is no real difference between the Israeli and US age-adjusted rates, while the English have slightly lower mortality in this group.

If we plot the mortality rates for complications/adverse effects jointly with that of the other unintentional injuries (figure 4), it can clearly be seen that almost all the excess mortality came from inclusion of complications and adverse effects together with other non-transport unintentional injuries. We believe that the inclusion of iatrogenic causes together with unintentional injuries is incorrect, although we in Israel must seriously evaluate the causes for and implications of the differences in the lethal complication rate. However, this is a different story altogether and leads to a different type of investigation, including the relative effect of anticipated malpractice/negligence suits on reporting practices.

Inter-country comparison of the mortality rates associated with other types of unintentional injury (figure 5) bring the problems of Israeli females back into proportion: there is a clear excess of fatal falls which is firmly associated with women aged 75 and over (figure 6). It remains to be seen whether registration or coding artifacts are affecting the results or whether different etiologic factors or fall hazards are present among elderly Israeli women.

Intent

This is one example of how inappropriate grouping of cause of death codes can hamper understanding of injury differences between countries. An additional

example of potential error in classification is that of incorrect or inconsistent recording or interpretation of the intent of injury or 'manner of death'. The method of recording intent may vary in different countries, as can be seen by this comparison of the US and Israeli death certificate (figure 7).

The U.S. death certificate, clearly delineates the manner of death: natural causes, accident, suicide, homicide, pending investigation or could not be determined. The Israeli death certificate, however, is ambiguous, and leaves no room for stating that the manner of death is pending investigation or could not be determined. Since autopsied medical examiner cases are rare in Israel, and police often waive their option for autopsy when there are no external signs of violence, the manner of death is often left blank altogether.

These factors contributed to distortion of the national rates for suicide and for unintentional firearm deaths among young Jewish males. Reported mortality from unintentional firearm wounds (ICD-9 922) among 18-19 year old Jewish males was considerably higher than the comparable rate among white US males (12.4 per 100,000 in Israel as compared to 2.1 in the United States). This differential, of paramount importance if substantiated, indicated either substantial bias in registration or in coding of deaths or a significant public health problem. After receiving appropriate clearance from official sources, we attempted to identify the nature of the differential.

We found (table 1) that more than half of the death certificates among Jewish males 18-21 for whom the coded cause of death had been unintentional firearm wound were, in fact, suicides on the basis of internal investigation. Furthermore, it turned out that more than half (23 out of 41) of the death certificates coded to 'firearms, intent undetermined' were also suicides.

These clarifications change the suicide and unintentional firearm mortality rates accordingly. The corrected suicide rate in this specific population group (19.8 per 100,000) is more than double the officially reported rate. The unintentional firearm mortality rate decreases from 13.4 to 5.6 per 100,000, a 58% reduction. It must be

stated, however, that this corrected rate is still more than two and a half times greater than the reported US rate for white males in the same age group, and is probably related to the high availability of firearms in Israel and near-universal active and reserve military service.

Clearly, not only methods of recording intent should be standard, but, in addition, methods should also be promoted for updating death or other injury certificates after civilian or military police investigation.

Another example of ambiguity due to differential registration of intent lies in the following comparison of drowning mortality in the US, England/Wales and Israel (figure 8). The US has the highest age-adjusted unintentional drowning mortality rate (1.7/100,000) and England the lowest (0.5 per 100,000). While the overall drowning mortality rate is similar in Israel and in England/Wales (1.45 per 100,000), the internal distribution of intent varies considerably. In England, unintentional drowning accounts for only about a third of all deaths, whereas in Israel they are over 90 % . In Israel, the bias appears to be in the direction of calling all drownings accidents, while in England/Wales, judgment is withheld . How should these data be compared?

For this purpose, a mechanism/intent matrix for presenting E-coded data similar to that proposed by McLoughlin, Fingerhut et al seems most appropriate (figure 9), with one major exception: In our view, 'other intentional' should be separated out and should include military operations occurring after the cessation of hostilities. Although deaths occurring during wartime are excluded from the mortality rate (numerators) and subsequently from the population, all other deaths and hospitalizations occurring to soldiers, or associated with military operations, are included in the injury statistics. Thus, deaths occurring to soldiers or citizens during the Intifada, or as a result of terrorist attacks are all included in national morbidity and mortality statistics. A special extension of the 6th digit of E-code 998 has been assigned in Israel for injury incurred during terrorist attacks.

Data relating to accidental or intentional injuries among military personnel represent an extension of the same problem. In Israel, these are all included in hospitalization and mortality statistics. In the United States, to the best of our understanding, military personnel are by and large treated in federal, military or VA hospitals and these are excluded from the national samples on hospitalization and emergency room visits. Comparison of rates of injuries requiring hospital visits will therefore lead to misleading conclusions about the relative frequency of injuries among the military service age-groups.

Additional questions arise of which countries have mandatory military service and at what age; where injuries among those serving are treated (military hospitals?) and whether these are reported together with national data. We are not suggesting standardization of these reporting procedures among the military in different countries; there are, of course, widely differing needs. But systematic information on whether these are included or excluded in the relevant age groups would be valuable for international comparisons.

Summary

A number of local misinterpretations of injury data have been presented. On the basis of these, we suggest the following:

Develop internationally accepted guidelines and standards for case and data element definitions.

Standardize, or at least suggest, groupings of codes for particular analytic purposes. Everyone seems to come up with their own grouping making it extremely difficult to interpret cross-national data.

Teach clinicians documentation skills, questions to ask and what information to collect (who, what, when, where, why and how).

Make coding and cause grouping clinics, or tutorials, internationally available, perhaps on Internet, backed jointly by WHO, NCHS and CDC.

Develop grouping and analysis methodologies which promote preventive actions and reduce artifactual biases in cross-national evaluation of injury patterns.

FIGURE 1

Unintentional Injuries: Females (without motor vehicle crashes)

Rate/100,000
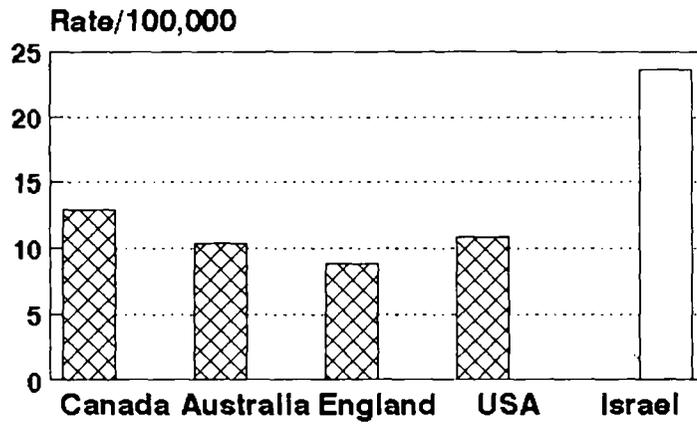
1985-89 Age-adjusted (E800-E807, E826-E949)
International Mortality Chartbook

FIGURE 2

Unintentional Injuries: Females (without transport injuries)

Rate/100,000
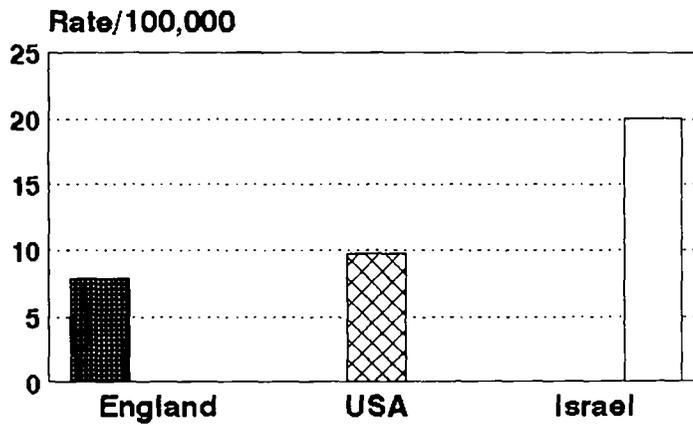
1987-89 Age-adjusted (E850-E949)
WONDER; Israel mortality data

FIGURE 3

Unintentional Injuries: Females

Rate/100,000

■ England ⊠ USA ☐ Israel
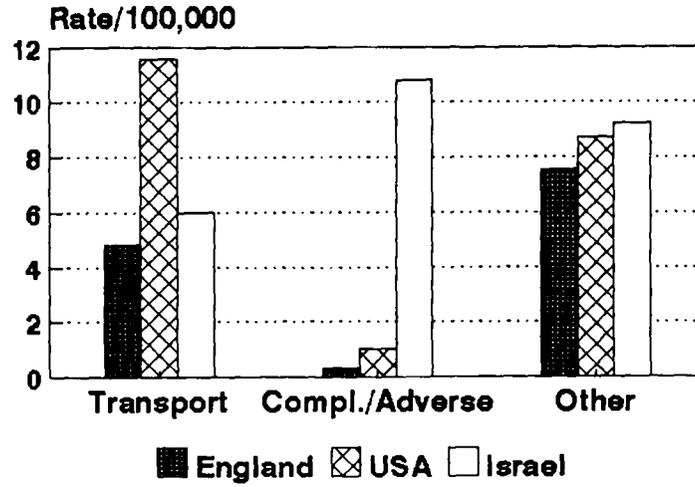
1987-89 AGE-ADJUSTED
WONDER; Israel mortality data

FIGURE 4

Unintentional Injuries: Females
(without transport injuries)

Rate/100,000

■ Other Unintent. ▧ Compl./Adverse
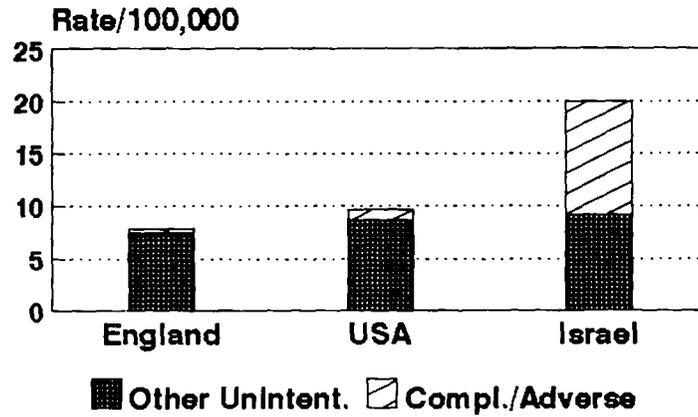
(E870-879; E930-949)

1987-89 Age-adjusted
WONDER; Israel mortality data

FIGURE 5

Other unintentional Injuries: Females

Rate/100,000

■ England ⊠ USA ☐ Israel

1987-89 Age-adjusted
WONDER; Israel mortality data
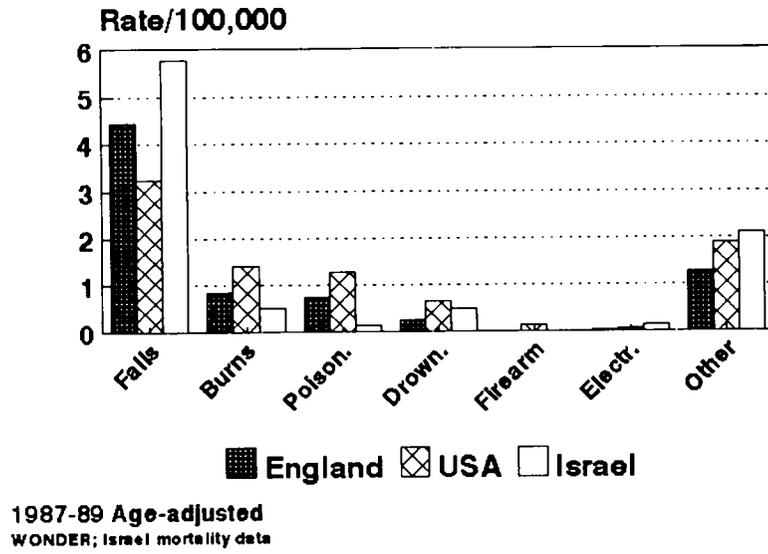
FIGURE 6

Mortality from Falls: Females

Rate/100,000

Age Group

·□· England ◇ USA △ Israel

1987-89
WONDER; Israel mortality data

FIGURE 7

MANNER OF DEATH

() NATURAL   () PENDING INVESTIGATION

() ACCIDENT   () COULD NOT BE DETERMINED

() SUICIDE

() HOMICIDE

FROM U.S DEATH CERTIFICATE

MANNER OF DEATH

() SUSPECTED HOMICIDE   () WORK ACCIDENT

() SUSPECTED SUICIDE   () MOTOR VEHICLE ACCIDENT

() OTHER ACCIDENT
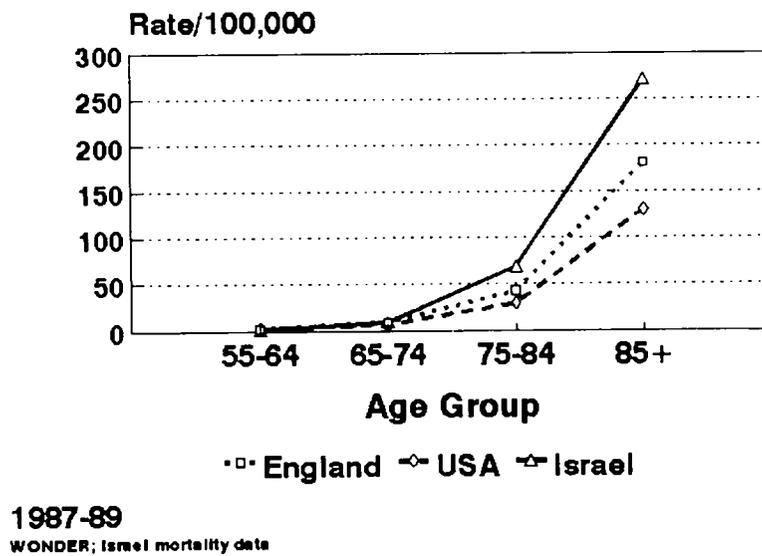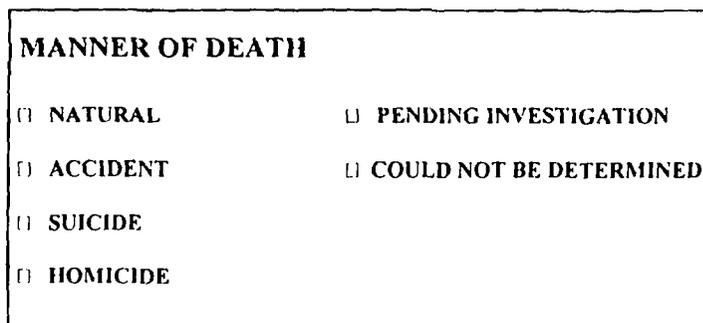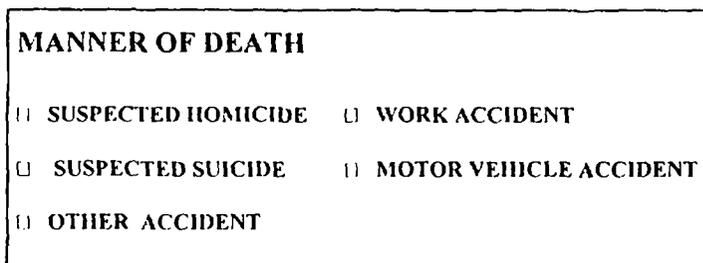
FROM ISRAELI DEATH CERTIFICATE

FIGURE 8

Drowning

Rate/100,000

■ Unintentional □ Undeterm. ⊠ Suicide ⊠ Homicide

1987-89 Age-adjusted
WONDER; Israel mortality data
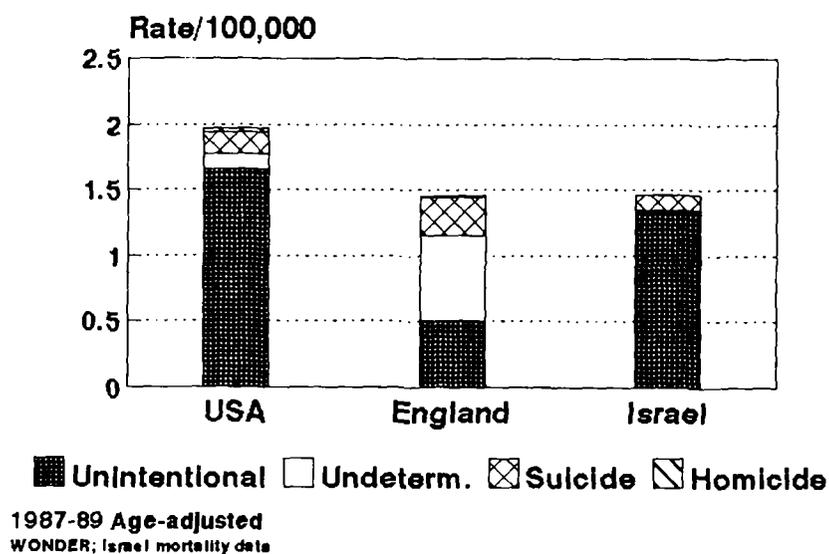
FIGURE 9

MECHANISM	TOTAL	INTENT				
		UNINTENT.	SUICIDE	HOMICIDE	OTHER INTENT.	UNDETERM.
MV-TRAFFIC						
OTHER TRANSPORT						
FIREARMS						
POISON						
FALLS						
SUFFOCATION						
SUBMERSION						
FIRE						
CUT/PIERCE						
STRUCK BY,AGAINST						
OTHER						

based on Intent/Mechanism Matrix

TABLE 1

OFFICIAL AND CORRECTED MORTALITY JEWISH MALES 18-24

1987-1989

CAUSE OF DEATH by age group	RATE/100,000 OFFICIAL	CORRECTED
SUICIDE 18-21	9.5	19.8
22-24	10.4	11.6
FIREARMS:		
UNINTENTIONAL		
18-21	13.4	5.6
22-24	1.5	0.4
UNDETERMINED		
18-21	5.3	2.8
22-24	4.6	4.6

HSRU,MOH