Suicide Misclassification in an International Context

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Within the context of international research, data misclassification has been a persistent and contentious topic in the suicide literature.[1-8] Guiding this paper is the central question of whether official national suicide data are sufficiently reliable and valid to scientifically justify their use in international comparative studies. Are real differences and similarities in cross–national suicide rates obscured by artifactual differences? The paper moves from consideration of general potential sources of suicide misclassification to the presentation of techniques and data deemed useful in assessing the severity of the problem.

Manner of Death and Medicolegal Decision–Making

When an individual dies, the primary classification decision concerns whether manner of death can be appropriately attributed to **natural causes, accident, homicide** or **suicide.*** The great preponderance of deaths are attributed to natural causes, whether due to chronic or communicable disease. Natural causes accounted for between 85 and 97 percent of reported deaths in the 28 countries whose 1990 mortality data were accessible to the authors through the *World Health Statistics Annual* published by the World Health Organization (WHO) (Table 1).** With important implications for quality of cause–of–death reporting, this helps explain relatively low autopsy rates in many countries. The mean autopsy rate was 21 percent among 25 countries reporting this information to WHO, with a range of 4 to 49 percent.[9] All other things being equal, a low autopsy rate increases the likelihood that some suicides are misclassified under natural causes.

Results of a 1971 WHO survey provide insight into the process of suicide case ascertainment.[10] Normally, the train of decision–making concerning manner of death begins with a proximate physician. But when a suicide (or other unnatural death) is suspected, police are often the first authorities called to the scene. They play a key role in questioning relatives, nonrelative witnesses, as well as physicians connected to the case, and in locating notes or observing aspects of the scene indicative of suicide. Sometimes police are assisted directly in their interrogations by a coroner, medical examiner or ancillary personnel.

The WHO research indicates that practicing physicians involved in a possible suicide case rarely possess sole responsibility for ruling on manner of death. In fact, this decision is usually in the province of the public authorities: coroner, medical examiner, police or judiciary. A majority of countries responding to the survey possessed a coroner or medical examiner system or equivalent. While medical examiners are medically qualified, coroners may have law degrees, medical degrees or both. The decision to autopsy is usually made by a coroner or other legal representative of the State, but this may rest with police or local physicians. Autopsies are mostly performed by qualified pathologists. Suspected poisonings require a toxicological examination, which is often, but not invariably conducted in a dedicated forensic laboratory. Forensic medical training appears prominently featured in the qualifications of those charged with making a ruling, or contributing directly to a ruling, on possible suicides.

The WHO survey reveals that the level of appointment of persons serving as a coroner or medical examiner varies from the national through the state or provincial level to the local level. Those in the office may be full–time or

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*Injury epidemiologists increasingly prefer to substitute the rubric **unintentional injury** for **accident** in order to nullify connotations of fatalism and implied unavoidability. But since **accident** is routinely used in classifying manner of death, and coding external cause of injury mortality under the *International Classification of Diseases* (ICD), it is retained for use in this paper. It seems noteworthy that the rubric **natural causes** also is routinely used in classifying manner of death, and that this use might well be counterproductive with regard to case ascertainment and prevention of premature mortality.

**For comparative purposes, the United States was added as the twenty-ninth country. The U.S. data pertain to 1989.

part–time, and supervised or unsupervised. In some countries, decisions concerning suicide can be amended on the death certificate in light of subsequent evidence. Some countries also reported probable suicides within their official national suicide statistics, while others did not or might not. This issue has since been resolved in ICD–8 with inclusion of injury codes for undetermined intent.

Determining the correct manner of death harbors important implications with respect to criminal liability, insurance payments, quality of mortality statistics, and the emotional well–being of survivors.[11] Deficient empirical evidence and the burden of proof appear to impel medicolegal authorities towards ruling an equivocal injury death an accident rather than as a suicide or homicide,[10] although the undetermined injury intent category would be the appropriate place for such a death. But burden of proof is more important in shaping the decision–making of coroners than that of medical examiners. The latter are more guided by the balance of probabilities, and hence are likely to be less conservative in their judgments. To illustrate these system differences, the procedure used in many states of the United States is contrasted with that of England. In American states with a medical examiner system, the medical examiner possesses sole authority to rule a death a suicide or not, based on the accessible evidence. In England, a formal judicial coroner's court makes the final determination based on testimony from a variety of sources, including forensic experts.

Impairing generalizability, responses to the WHO survey were received on behalf of only 26 countries. Nevertheless, this research does reveal diversity in medicolegal procedures and decision–making, which could be expected to generate artifactual cross–national variation in suicide reporting.

Complications of Method and Duration

Ability to detect suicide varies with the method used, and there is considerable international variation in terms of the distribution of methods among reported suicides.[12–14] In the absence of other evidence, violent methods of the order of hanging, shooting and stabbing make detection easier for medicolegal authorities than so–called nonviolent methods like drowning, poisoning and gassing.[7,15–18] These last three methods have been labeled equivocal, along with some others such as jumping from a height, lone driver vehicular crashes, and one form of shooting, Russian roulette.

Among suicides in which a rapidly lethal method was used, those by drowning seem most difficult to correctly discern, especially without witnesses. Toxicological evidence of a lethal overdose in an adult is suggestive of a suicidal poisoning, especially when the substances involved are not associated with abuse. This suggestion is based on the notion that an adult who overdoses, does so wittingly. However, the co–presence of alcohol and/or some other highly addictive psychoactive drug, when not the lethal agent, can cast doubts about intent. For drugs of abuse, it is especially difficult to determine intent because of the unknown and variable strength of many "street" drugs. Some adults also may truly be ignorant about the demarcation line between a safe dose and an overdose.

Slow suicides, those whose duration extends over several months or even years, seem rarely likely to be registered as suicides in any country.[19] Whether common or not, a suicidal decision by some individuals may lead to a protracted, tortuous and lethal trail of excessive use of alcohol and/or other psychoactive drugs, malnutrition or undernutrition, or some combination of wilful destructive behaviors. A more obvious, but probably still grossly underreported kind of slow suicide, is one that commences with an attempt, and ends months later in death from medical complications.

Individual Sociodemographic Characteristics

Heterogeneity across populations could have implications for artifactual differences in international suicide rates. Sociodemographic characteristics of suicide victims, for example, all possess potential for differential misclassification. This issue is illustrated here by reference to three such characteristics: age, sex and race.

With respect to age, elderly deaths are less thoroughly investigated than deaths in younger people. Older people are more likely to die from natural causes than younger people, which helps account for their lower autopsy rates.[9] Also, they are believed to be more prone to choose nonviolent methods of suicide, and slow methods like starvation or

deliberate neglect of necessary personal medical attention and treatment.[19,20] In concert, these factors promote the expectation that the accuracy and completeness of suicide certification is less for the elderly than for their younger counterparts.

Recent data confirm the frequently reported finding that male suicide rates exceed corresponding female rates (Table 2). While this situation may well accurately portray the direction of observed national sex differences in suicide rates, differential misclassification may ensue from females being more inclined to choose nonviolent methods than are males.[12,13]

Warranting more intensive and extensive investigation is the relationship between race, ethnicity and differential suicide misclassification. Predictably, research conducted in the United States provides evidence of their connection.[21–23] In one example, a New York study, which focused on race and misclassification, published Health Department records of suicides were compared with the suicide records of the Medical Examiner (ME).[22] The ME records on suicides, serving as the gold standard in this study, included in addition to cases signed out to the Health Department, cases medically considered suicide, but not attaining the legal status, and cases overlooked by the Health Department because final disposition was not requested. Following the introduction of the injury with undetermined intent codes under ICD–8, black suicide cases were almost twice as likely to be underenumerated in Health Department records as white cases. One major explanation was the relatively high use by blacks of an equivocal suicide method, jumping. But in addition, case histories for blacks were less complete than those for whites. Unknown is whether racism and racial socioeconomic differences influenced the history taking.

While sociodemographic characteristics differentially relate to suicide underenumeration within a country, it seems probable that these differentials are less pronounced in some countries than others. Thus, adjusting international suicide rates for population composition may or may not ease problems with their use.

Sociocultural Milieu

The search for the meaning of suicides must extend beyond purely individual characteristics and circumstances to the sociocultural milieu in which these events occur. But like sociodemographic heterogeneity, sociocultural heterogeneity can be a source of artifactual differences in international suicide rates.

Religion is a sociocultural variable, which has received serious attention from suicidologists dating back to the work of the French sociologist, Emile Durkheim, in the nineteenth century.[24] A famous Durkheimian hypothesis is that adherents of religions or religious denominations, which foster a high degree of social integration, are less prone to suicide than counterparts whose religious affiliation encourages or is permissive towards individualism or the pursuit of free inquiry. The social integration argument was used by Durkheim to explain a lower reported suicide rate in Roman Catholic countries than in Protestant countries.

A plausible alternative explanation to that of Durkheim in accounting for international suicide rate differences, such as those still frequently reported between predominantly Roman Catholic and Protestant countries, is that these differences really reflect variation in the social condemnation of suicide and the reluctance of physicians to certify a death a suicide.[25] Proponents argue that suicide rates are actually socially constructed, and that the greater the social condemnation of suicide the more deficient the reporting. Whether the source is related to religion and/or other factors, social condemnation may induce suicide victims to disguise the intent of their acts. Moreover, it may similarly function to encourage family and friends, and sometimes even medicolegal authorities themselves, to withhold or suppress crucial evidence like a suicide note, or knowledge of behavior or conversation consistent with suicide ideation.

Assessing Reliability

Three empirical approaches are identified here, which have been employed by epidemiologists, to assess the reliability or precision of international suicide statistics. The first, labeled the experimental approach, is aimed at determining whether medicolegal officials differ in assigning manner of death in a common set of cases. In a blinded study, in which Danish and English officials made such assignments for a sample of each other's cases, differentials in reported suicide rates were attributed to variation in ascertainment procedures.[26] However, this finding was contradicted in a second study involving English and Scottish officials.[27] The discrepant results might be explained by the fact that in the latter study, cases being reviewed were not restricted to equivocal ones.

A second approach to the reliability question compares rankings of suicide rates of immigrants in a particular country with rate rankings in the countries of origin. Two studies, conducted in Australia (n=17)[28] (see, for example, Table 3) and the United States (n=11),[29] respectively, demonstrated a high degree of consistency between rankings. Rank–order correlation coefficients ranged between 0.8 and 0.9. Their findings induced the authors of both studies to conclude that cross–national differences in reported suicide rates were real, and not artifacts of variable case ascertainment procedures. These procedures were assumed to be consistent within countries; a weak assumption. All Australian states and territories possess a coroner system, but national reporting of suicide does not invariably depend upon it.[30] The medicolegal system in the United States is diverse and highly decentralized.[10] Immigrants in neither country are uniformly distributed geographically by ethnicity. In addition, there are examples of inconsistency in the rankings in the two studies, and the magnitude of rate differences may be affected by ascertainment procedures. These concerns have generated a third approach for addressing the reliability issue, known as rate reformulation.

With rate reformulation, cross–national comparisons are conducted using reported suicide rates, and rates combining suicide with other mortality categories thought prone to contain hidden suicides. A 22 nation mortality study, which involved a comparison of suicide rates with combined rates for suicide and injury of undetermined intent, produced a rank–order correlation coefficient of 0.89 ($p < .001$).[31] This coefficient rose to 0.95 with the removal of a single outlier, Chile. A second study, based on 19 European countries, adopted the same technique, excepting that accidental poisonings also were added to suicides and injury deaths of undetermined intent (Table 4).[6] The correlation coefficient of 0.96 ($p < 0.001$) reflected highly congruent rankings. Thus, expanding the suicide category to allow for possible misclassification under other injury categories did not appreciably alter the rankings reported for the suicide rates alone.

Besides epidemiologists, sociologists are the other main utilizers of international suicide statistics for research purposes. Sociological interest is driven primarily by the quest for understanding social causation; by the search for macro–explanations of cross–national rate variation, such as the roles of industrialization, urbanization, and religion.[32] The groundwork for a fourth approach for assessing the reliability of international suicide data is evident in an innovative sociological study.[33] Taking official county–level suicide rates as the dependent variable, its authors performed a two–step multivariate analysis using both putative social causation factors, and a set of social construction factors as predictors. The latter variables are explicitly incorporated into their model in order to determine if systematic misreporting renders official suicide data useless for testing social causation theories. These variables are the type of system charged with classifying manner of death, procedures for selecting medicolegal officials, and nature of facilities accessible to these officials over the course of an investigation. The authors conclude that while systematic misreporting occurs, it exerts a minor impact on the "explanatory" power of social construction predictors of suicide rates. Their study was limited to a single country, albeit an extremely diverse one, the United States. It has been criticized for a number of deficiencies, including the omission of age as a covariate, and the failure to examine differences between suicide certifications made by coroners and medical examiners, respectively.[17] But despite deficiencies, there is a need to apply its research question and methodology to the international arena.

On balance, to the extent that they are representative, the findings reported from the preceding studies give reason for confidence that international suicide data are adequate for scientific purposes from the standpoint of spatial reliability. Temporal reliability does not appear problematic either. The introduction of the undetermined injury intent category under ICD–8 had potentially important implications for allocating equivocal injury deaths. But research conducted in the United States and Australia suggests that any associated artifactual suicide rate changes at the national level are small.[34,35] However, as the ensuing sections demonstrate, the validity of international suicide data is much more difficult to dismiss as a scientific concern.

Assessing Validity

Borrowing from the language of disease screening, the validity of suicide data can be examined from the complementary perspectives of sensitivity and specificity. Sensitivity measures the degree to which suicides are correctly certified. Specificity is the equivalent measure for nonsuicides. Since suicide tends not to be overenumerated, the specificity of suicide certification should not be problematic for international research. Specificity is inferred to reach or approach 100 percent.[36]

With considerable cross–national variation, the sensitivity of suicide certification falls well short of the high standard established for specificity. This is due to the interplay of forces already identified, such as sociodemographic characteristics of suicide victims, choice of method and duration of event, prevailing sociocultural milieu, and nature and training of medicolegal decision–makers and auxiliary staff. A range for sensitivity estimates has been reported of 26 percent and 83 percent, with estimates concentrating between 56 percent and 71 percent.[36] However, these figures are probably inflated due to the difficulty in obtaining a suitable gold standard, such as ME/coroner records which incorporate psychological autopsies. Moreover, the more developed countries predominate among countries upon whose data these estimates derive. Primarily due to a lack of economic resources and appropriately trained personnel, sensitivity estimates for the less developed countries should be closer to the lower end of the specified sensitivity range than to the upper limit.

Three external cause categories are considered prime contenders for containing misclassified suicides. They are accidental poisoning (ICD–9 E850–869), accidental drowning (E910), and injury of undetermined intent (E980–989). The mortality ratio of the combined death rate for these combined categories to the suicide rate is a guide in estimating theoretical upper limits for various national suicide rates. Figure 1 draws attention to this potential in 29 countries whose mortality data were accessed for this paper. The degree of potential suicide misclassification varies directly with the magnitude of the ratio. Other violence (E980–999), which includes war–related injury, is used for computing the ratio in lieu of being able to extricate injury of undetermined intent. However, the former is generally believed to have been of no or minor consequence for mortality in the reporting countries in the observation year.

The ratio of the rates for the selected combined injury categories to suicide reveal a range extending from 0.1 for Austria to 4.1 for Mexico. Thus, in the implausible scenario that all of the combined injury deaths are misclassified suicides, reclassification would only increase the Austrian suicide rate by 10 percent. At the other extreme, the Mexican rate would increase more than four–fold. Other nations exhibiting potential for a high degree of suicide misclassification include Malta, Portugal and a number of Eastern European countries. Examining potential misclassification by suicide method for these countries would be interesting, but is not possible on the basis of the published WHO mortality data.

Figure 2 displays a second set of ratios, which provide for highly liberal upper limits for suicide rates. These ratios incorporate another possible source of misclassified suicides, the residual natural cause mortality category of symptoms, signs and ill–defined conditions (ICD–9 780–799).[37] In this instance, the range extends from 0.2 for Austria and Hungary to 16.8 for Greece.

Computing and examining ratios of the type presented above would be useful in selecting countries for an international suicide study, in a way which would minimize concerns with validity and be consistent with the need for fair comparisons. Artifactual differences in cross–national suicide rates will not necessarily invalidate conclusions based on observed trends. But the selection process should make allowance for major differentials in potential suicide misclassification.

Drowning and Elderly Japanese Females*

Through reference to routinely published WHO mortality data, the preceding section illustrates the potential, in gross terms, for undercounting suicide in 29 selected countries. As previously stated, WHO does not report suicide data disaggregated by method. Yet the distribution of suicide methods varies cross–nationally, and this has important implications for differential misclassification. A case for this being a viable issue is proposed by means of a hypothesis concerning one nonviolent and equivocal method of suicide in one sub–population, elderly Japanese females. The method is drowning, which like **harikari** or self–disembowelment, has attained major symbolic importance in Japan.[38] Elderly are operationalized here as persons 65 years and older, and the observation period is the 1979–81 triennium.
Elderly Japanese of both sexes register comparatively high suicide rates within and across populations, and the male rates exceed those of females.[39] In a comparison involving the populations of Japan and seven other countries, all known for ease of water access, elderly Japanese also manifested a clear excess risk of accidental drowning (Table 5). Whereas only one in 24 Japanese male suicides was attributed to drowning, the proportion among female suicides was one in eight (Table 6). In the adjacent age groups, 65–74 years and 75 and older, female drowning suicide rates were two–and–a–half times those of corresponding male rates (Figure 3).

It is hypothesized that suicide of elderly females is relatively underenumerated due to misclassification of suicidal drowning as accidental drowning. At the core of this hypothesis is the finding that between ages 25–34 and 75 and older, the ratio of drowning suicides to accidental drownings declined by 81 percent for females as compared with only 49 percent for males (Figure 4). Moreover, the ratio was 5:1 at ages 25–34, while always below parity for males. The differential ratio decline might simply result from age–sex variation in exposure to, and proficiency in water. This does not seem particularly plausible, and has not been demonstrated. A Japanese national study found that less than 10 percent of elderly accidental drownings had witnesses.[40] By contrast, one–third of those in the 15–64 age group was witnessed.

Two arguments are proposed, in addition to the nature of the ratio shift, which reinforce the drowning suicide misclassification hypothesis. First, Japanese females hold a six year advantage over males in life expectancy at birth, and are at much greater risk of being widowed, and living alone.[41] These differences reduce the likelihood that older female victims of suicide, irrespective of method, will have survivors well situated to assist medicolegal authorities in their investigation and deliberations. In 1985, for example, 70 percent of 75–79 year old females were widowed as compared with 20 percent of corresponding males. Furthermore, between 1970 and 1985 the percentage of females from the 1900–04 birth cohort, living separately from their families, rose from 9.6 to 19.3. Further emphasizing this trend of increasing isolation are results from surveys of wives of childbearing age conducted by the *Mainichi Shimbun*, a leading Japanese newspaper.[41] In 1950, 55 percent of responders planned to be dependent upon their children in old age. This percentage decreased to 18 in 1988. With similar implications for the living arrangements of the elderly, 75 percent of responders in 1963 regarded personal care of aged parents as normal, compared with 63 percent in 1988.

The second argument for suspecting relative underenumeration of elderly female suicide in Japan revolves around persisting sex roles and changing attitudes to suicide in the social, cultural, political and economic metamorphosis characterizing the post–World War II era. Traditionally an acceptable, and even honorable manner of death,[2,24] suicide is much less so in contemporary Japan.[42] But the formative years of Japanese, designated elderly in the period 1979–81, preceded both the United States' occupation and the revolution in global communications. Therefore, this sub–population might well have retained a traditional view of suicide being an appropriate means for terminating life. However, since Japan has remained a male–dominated society,[41,43,44] elderly females may be more inclined than elderly males to disguise their suicides in order to protect their families against social stigmatization.

***The material presented in this section is drawn from a previously published source: Rockett IRH, Smith GS. Covert suicide among elderly Japanese females: questioning unintentional drownings. *Social Science and Medicine* 36(11); 1993: 1467-1472.

Japan has the longest population life expectancy at birth in the world, among the highest living standards, historically positive attitudes towards suicide, and a relatively ethnically and racially homogeneous population. These factors are all conducive to comprehensive and accurate suicide registration. But the evidence presented here, as a rationale for the drowning suicide hypothesis, suggests that Japan is not immune to problems with the sensitivity of suicide certification; at least among the group at highest reported risk of suicide, the elderly. The drowning suicide misclassification hypothesis needs testing at the level of prefectures, the local level. If substantiated, it further underscores the caution that researchers should exercise, if tempted to uncritically accept as valid the magnitude, and even the existence and direction, of observed age– and sex–specific differentials in cross–national suicide rates.

Conclusion

Unless specifically addressing issues of data quality, international suicide studies typically use underlying cause–of–death data emanating from national death certificates. For the more developed countries, the evidence presented here indicates that such national data achieve acceptable standards of reliability. The validity of suicide certification, or more precisely the sensitivity, poses greater problems for scientific users.

Epidemiologists, who are interested in official international suicide data for comparative descriptive purposes, should exercise restraint in selecting countries and drawing conclusions. Whether these data are suitable for what sociologists refer to as social causation studies, and epidemiologists call correlational or ecological studies, requires further investigation. Generally, the quality of suicide data for the less developed countries is likely to be grossly deficient. Without adjustment, the use of such data is highly questionable.

Suicide is widely acknowledged as a public–health problem, although an underenumerated one. Identifying high–risk groups, understanding etiology, and designing and implementing effective prevention programs are ultimately contingent upon obtaining an accurate and detailed description of its magnitude. There is a serious need to improve the sensitivity of suicide certification in most countries. To this end, and to enhance data comparability, there would be great value in WHO creating a global working group to standardize criteria for defining suicide and ascertaining cases, along the lines of a recent collaborative multi–disciplinary and multi–organizational effort in the United States coordinated by the Centers for Disease Control and Prevention (CDC). A comprehensive update of the 1971 WHO survey, too, would aid in the formation of the group, and in specifying its responsibilities.

Finally, while not necessarily the panacea for suicide data problems, greater international use should be made of the psychological autopsy.[46–49] This approach involves followback interviews with family, friends and acquaintances of a decedent to specifically look for possible antecedents of his or her possible suicide. If psychological autopsies were implemented in all or a random sample of equivocal fatal injury cases, this would assist in computing correction factors to refine estimates of true suicide rates. Benefits would also accrue with regard to etiologic understanding and to prevention.

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Table 1. Percentage of Deaths Attributed to Natural Causes* by Country, 1990

Country	%	Country	%
Austria	97.4	Mauritius	92.8
Bulgaria	94.9	Mexico	85.5
Canada	93.2	Netherlands	95.9
Czechoslovakia	92.9	Norway	94.2
Denmark	93.3	Poland	92.3
Germany	95.0	Portugal	93.5
Finland	90.6	Romania	92.8
France	90.8	Singapore	92.7
Greece	97.4	Switzerland	91.2
Hungary	90.9	United Kingdom	96.7
Iceland	92.6	United States**	93.0
Ireland	95.3	Uruguay	93.7
Japan	93.2	USSR	89.1
Luxembourg	94.0	Yugoslavia	93.4
Malta	96.3		

*Chronic or communicable diseases.
**Data for 1989.

Sources: Adapted from World Health Organization, *World Health Statistics Annual*, 1991 and 1992. Geneva: WHO, 1992 and 1993.

Table 2. Suicide Rates by Sex and Country, 1990

Country	Rate*		Ratio
	Male	Female	M:F
Austria	34.8	13.4	2.6
Bulgaria	20.7	8.8	2.4
Canada	20.4	5.2	3.9
Czechoslovakia	27.3	8.9	3.1
Denmark**	32.2	16.3	2.0
Germany	24.9	10.7	2.3
Finland	49.3	12.4	4.0
France	29.6	11.1	2.7
Greece	5.5	1.5	3.7
Hungary	59.9	21.4	2.8
Iceland	27.4	3.9	7.0
Japan	20.4	12.4	1.6
Ireland	14.4	4.7	3.1
Luxembourg	25.2	10.8	2.3
Malta	4.6	0	***
Mauritius	17.6	10.8	1.6
Mexico	3.9	0.7	5.6
Netherlands	12.3	7.2	1.7
Norway	23.3	8	2.9
Poland	22	4.5	4.9
Portugal	13.5	4.5	3.0
Romania	13.3	4.7	2.8
Singapore	14.7	11.5	1.3
Switzerland**	31.5	12.7	2.5
United Kingdom	12.6	3.9	3.5
United States†	19.9	4.8	4.1
Uruguay	16.6	4.2	3.9
USSR	37.4	9.1	4.1
Yugoslavia	21.6	9.2	2.3

*Suicide coded according to ICD–9, except for Denmark and Switzerland (ICD–8).
**Rates per 100,000 population.
***Ratio not calculated due to zero cell.
†Data for 1989.

Sources: World Health Organization. *World Health Statistics Annual*, 1991 and 1992. Geneva: WHO, 1992 and 1993.

Table 3. Suicide Rates per 100,000: Australian Immigrants and Countries of Birth

	Male Suicide Rates				Female Suicide Rates			
Hungary	57.7	40.3	1	1	34.6	17.3	3	1
Poland	56.6	14.3	2	7	28.8	3.3	4	11
Yugoslavia	38.6	17.8	3	5	16.2	7.7	7	6
Czechoslovakia	38.5	30.4	4	3	45.7	12.3	1	4
New Zealand	33.1	11.4	5	9	19.0	6.4	5	8
Austria	33.0	32.4	6	2	44.6	13.9	2	2
Germany	32.8	26.7	7	4	14.5	13.6	9	3
Ireland	30.5	5.3	8	14	10.8	2.3	11	14
Scotland	30.3	10.0	9	10	17.7	6.6	6	7
USA	29.5	16.3	10	6	13.8	5.8	10	9
England and Wales	25.3	13.7	11	8	15.3	9.6	8	5
Spain	15.9	7.6	12	12	7.1	2.5	12	13
Netherlands	12.7	8.2	13	11	6.8	4.9	13	10
Malta	10.7	1.4	14	16	1.4	0.2	16	16
Italy	10.4	7.6	15	12	3.4	3.2	14	12
Greece	6.8	4.7	16	15	3.0	2.2	15	15
Australia	16.1				10.0			
			$r_s = 0.78$*				$r_s = 0.79$*	

*Spearman's rank correlation coefficient.

Source: Whitlock FA. Migration and suicide. *Medical Journal of Australia* II; 1971:840–848.

Table 4. Comparison of the Rank Orders of Suicide Rates and Suicide, Undetermined and Accidental Poisoning Death Rates in 19 Countries in 1970–73

Country	Suicide and self–inflicted injury	Rank order	Suicide and self–inflicted injury and injury undetermined whether purposely or accidentally inflicted and accidental poisoning	Rank order
Austria	30.4	4	33.0	6
Bulgaria	15.1	11	19.0	11
Czechoslovakia	31.0	2	39.8	3
Denmark	30.6	3	36.4	4
Finland	29.7	5	40.8	2
France	20.4	9	25.1	9
Germany	26.8	6	29.6	7
Greece	4.1	19	7.1	18
Hungary	45.2	1	48.5	1
Italy	7.6	16	9.2	17
Netherlands	11.3	13	12.9	15
Norway	11.4	12	14.2	14
Poland	15.5	10	23.1	10
Spain	5.9	17	6.8	19
Switzerland	24.6	8	27.2	8
England and Wales	10.3	15	15.5	13
Northern Ireland	5.4	18	11.0	16
Scotland	10.6	14	17.6	12
Sweden	26.4	7	36.0	5

Spearman's rank correlation coefficient = 0.9596 $n = 19$ $p < 0.001$

Source: Sainsbury P and Jenkins JS. The accuracy of officially reported suicide statistics for purposes of epidemiologic research. *Journal of Epidemiology and Community Health* 36; 1982:43–48.

Table 5. Annualized Accidental Drowning Rates by Age, Sex and Country, 1979–81*

	Age (years)											
	15–24		25–34		35–44		45–54		55–64		65–74	
	M	F	M	F	M	F	M	F	M	F	M	F
Japan	2.9	0.2	2.5	0.3	2.5	0.3	3.5	0.6	4.5	1.1	7.9	3.8
Australia	3.3	0.4	3.1	0.3	3.2	0.4	3.9	0.8	3.6	0.6	3.2	1.0
France	3.5	0.4	3.2	0.4	3.2	0.6	3.3	0.6	3.7	0.9	4.2	1.6
New Zealand	4.8	0.6	3.4	0.3	1.8	1.1	2.8	1.3	2.8	1.2	1.9	1.9
Norway	3.5	0.3	4.2	0.3	4.3	0.1	5.3	0.6	4.5	0.5	4.2	1.7
Sweden	1.5	0.2	2.6	0.3	2.3	0.7	2.4	0.6	3.1	0.7	4.3	1.0
United	1.5	0.2	1.2	0.2	1.0	0.2	0.9	0.4	1.1	0.4	1.1	0.6
Kingdom**	7.2	0.8	4.2	0.6	2.9	0.5	2.4	0.5	2.3	0.5	2.5	0.7
United States												

*Rates expressed per 100,000 population.
**Accidental drowning deaths for Northern Ireland in 1981 were not reported by WHO. For these calculations, they are estimated as the annual average for 1979 and 1980.

Source: Rockett IRH, Smith GS. Covert suicide among elderly Japanese females: questioning unintentional drownings. *Social Science and Medicine* 36(11); 1993:1467–1472.

Table 6. Percentage Drowning as Method of Suicide by Age and Sex, Japan: 1979–81

Age (years)	Male	Female	Both Sexes
15–24	3.3	5.8	4.1
25–34	4.4	10.1	6.2
35–44	3.9	11.1	6.1
45–54	3.4	12.0	6.1
55–64	4.3	13.1	8.0
65–74	4.8	14.5	9.8
75+	5.7	17.4	12.2
Total	4.1	12.5	7.3

Source: Rockett IRH, Smith GS. Covert suicide among elderly Japanese females: questioning unintentional drownings. *Social Science and Medicine* 36(11); 1993:1467–1472.

The authors wish to thank Billy M. Thomas for his assistance with data compilation.

Figure 1 Ratio of Combined Deaths from Accidental Drowning, Accidental Poisoning, and Other Violence to Suicides by Country, 1990

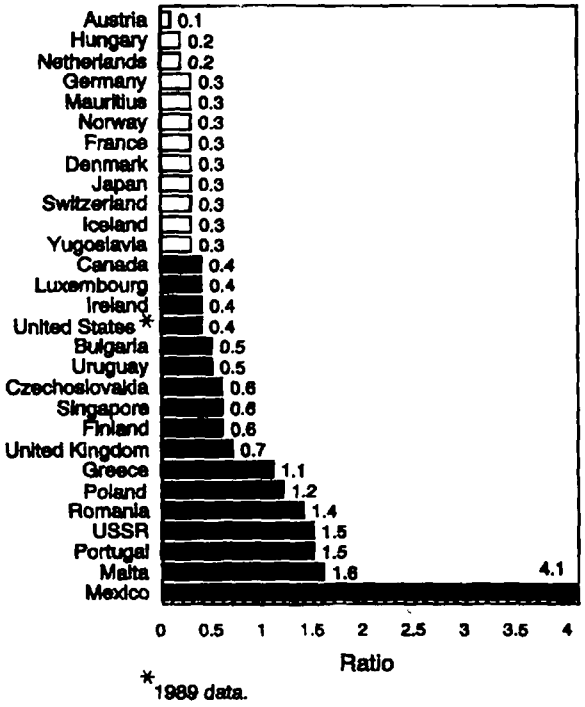


Figure 2 Ratio of Combined Deaths from Accidental Drowning, Accidental Poisoning, Other Violence, and Symptoms, Signs, and Ill-Defined Conditions to Suicides by Country, 1990

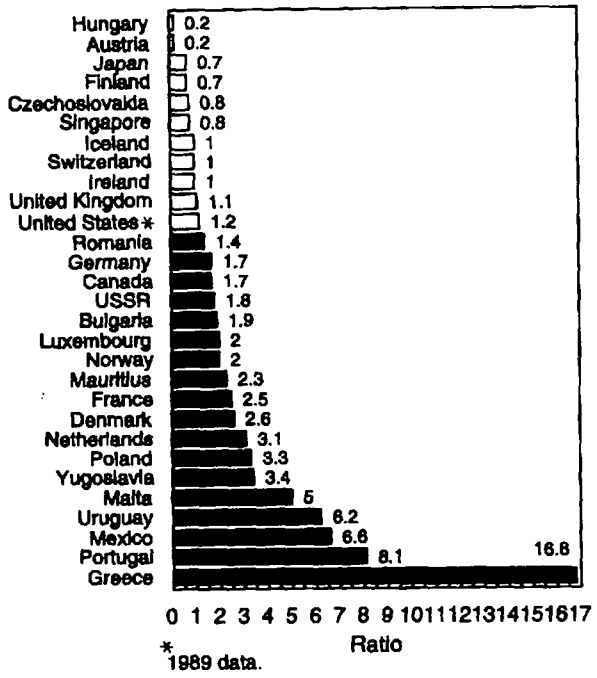
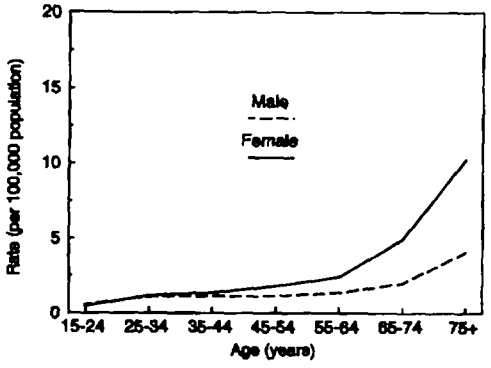
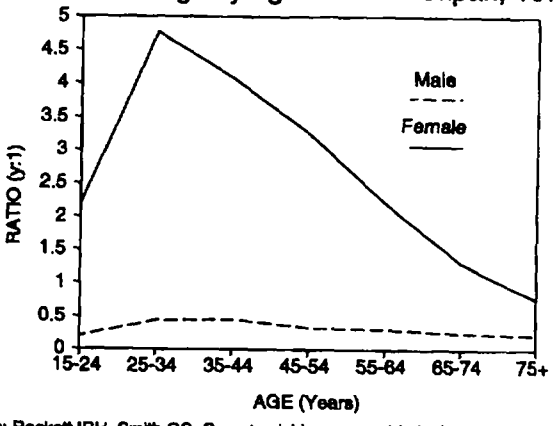


Figure 3 Annual average drowning suicide rates by age and sex: Japan, 1979-81



Source: Rockett IRH, Smith GS. Covert suicide among elderly Japanese females: questioning unintentional drownings. **Social Science and Medicine** 36(11);1993:1467-1472.

Figure 4 Ratio of drowning suicides to unintentional drownings by age and sex: Japan, 1979-81



Source: Rockett IRH, Smith GS. Covert suicide among elderly Japanese females: questioning unintentional drownings. **Social Science and Medicine** 36(11);1993:1467-1472.