



Suicide registration in eight European countries: A qualitative analysis of procedures and practices

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ABSTRACT

Objective: To compare suicide registration in eight European countries and provide recommendations for quality improvement.

Method: Qualitative data were collected from country experts using a structured questionnaire.

Results: Suicide registration was based on the medico-legal system in six countries and the coronial system in two. Differences not only between, but also within these two systems emerged. Several elements crucial to the consistency of suicide registration were identified.

Conclusion: A precise model for recording suicides should include: an accurate legal inquiry and clarification of suicidal intent; obligatory forensic autopsy for injury deaths; reciprocal communication among authorities; electronic data transmission; final decision-makers' access to information; trained coders.

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1. Introduction

Validity and reliability of suicide statistics have been addressed in a number of studies. Stengel [1] declared that international comparisons of suicide rates are unreliable. Subsequent studies, with less critical and firm conclusions, asserted that errors in the

reporting of suicides are fairly randomized over the years and that official statistics are nonetheless reliable [2–5] although care should be taken in regional comparisons [5–7].

One universal opinion among researchers is that suicides tend to be underreported [3,4,8–12] and that, accordingly, the number of false-positive suicide cases is negligible [2]. The extent of underestimation has been found to be 10–20% [8,13,14]. The most common category for 'hidden suicides' is 'undetermined death' [6,8–11,14–17] but also accidents such as 'poisoning' [8] and 'drowning' [16,18].

Suicides can be underestimated for several reasons. Besides socio-cultural factors, such as criminalization and religiousness [4,15,19], methodological variations in death-registration procedures contribute to differences in suicide rates [6,8,10,15,19–22]. Suicide registration is a complicated, multilevel procedure that includes medical and legal issues, involving several responsible authorities, that vary from one country to another [5,13,21,23–25]. Two distinct approaches are identifiable in different countries: the legal approach, which is applied mainly in coronial systems, and

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the medical approach, applied mainly in medico-legal systems. When legal criteria are used, the decision to classify a death as suicide is expected to be 'beyond reasonable doubt' [10–12,21,24]. In the medical approach, decisions about causes of death are reached in the same way as for any other diagnosis, i.e. on the basis of the 'balance of probabilities' [14,21,24]. The legal approach may result in systematic exclusion of particular types of suicide, since death is classified as suicide only when there is significant evidence indicating suicidal intent [9–11,21].

Some systematic comparative studies of suicide-registration procedures are available [1,10,16,21,23–25] but none of these studies are recent. Exploring suicide registration across the EU with a view to promoting a standardized approach has been proposed [15]. The accuracy of coding and registration of underlying cause of death is important for the quality of mortality statistics [26]. Failing an improvement in the reliability of suicide statistics, any evaluation of the efficacy of suicide-prevention programs is questionable.

The aims of the present study were:

- (1) To describe and compare procedures for suicide registration in eight European countries.
- (2) To pinpoint potential deficiencies in these countries' suicide-registration systems.
- (3) To provide recommendations on how best to improve the quality of suicide registration in the EU.

2. Methods

2.1. Data collection and instrument

The data were collected within the OSPI-Europe (optimized suicide-prevention programs and their implementation in Europe) project under the European Union's Seventh Framework Program [27]. Experts from eight European countries in various regions were involved: Estonia from Northern Europe; Hungary from Eastern Europe; Belgium (Flanders), Ireland and the Netherlands from Western Europe; Austria and Germany from Central Europe; and Portugal from South-West Europe.

A common study instrument (questionnaire) was developed and approved by experts. This qualitative structured questionnaire comprised six sections relevant to procedures for suicide diagnostics and registration: (1) legal inquiry, (2) forensic autopsy, (3) certifier, (4) final decision, (5) burial arrangements, (6) coding and (7) national suicide-mortality statistics. The first draft of the questionnaire was sent to all participants. Based on a consensus, the final questionnaire was developed, piloted in Estonia and sent to each participating country for completion.

For data collection, the Delphi method was used. This permits collection and synthesis of informed opinions from a group of experts with specialist knowledge in an area of interest. Expert responses to the questionnaire were sent electronically and reviewed by the leading institution of the current study (ERSI). After a critical review of the responses, gaps and contradictions in the data were communicated back to the experts for clarification. There were four clarification rounds before the data were considered reliable.

The WHO European Mortality Database [28] was used to obtain age-adjusted data for intentional self-harm (ICD-10 X60–X84), hereinafter 'suicides', and events of undetermined intent (ICD-10 Y10–Y34), hereinafter 'undetermined deaths'. For the Flanders part of Belgium, the country experts provided data with reference to the national mortality statistics. The period investigated comprised the latest 5 years for which data were available.

2.2. Data analyses

The experts' answers were entered on an Excel spreadsheet. The data were analysed from the initial stage (confirmation of injury death) to the last stage (registration of death in national mortality statistics) of suicide registration. A full account of critical stages of the suicide registration procedure for each participating country was compiled.

Total age-adjusted, 5-year mean suicide and undetermined death rates per 100,000 inhabitants were calculated for each country to stabilize the data. Ratios were calculated by dividing undetermined-death rates by suicide rates.

2.3. Definitions

'Injury death' includes accidents, suicides, homicides and undetermined deaths ('external causes of death' in ICD-10, Chapter XX).

The 'legal inquiry' is the compulsory procedure in cases of injury death, culminating in a legal decision. This inquiry is conducted by legal authorities or, in

some countries, coroners. The term 'legal authorities' includes the police, public prosecutors, judicial investigators and/or courts.

The 'certifier' is a legally authorized official who ascertains the medical cause of a death (with differential diagnoses of accident, suicide or homicide in cases of injury death) and issues a medical death certificate. This official can be either a coroner or a medical doctor (physician, public-health doctor, forensic medical doctor or pathologist).

The 'final decision' is the conclusion that the death was due to suicide, whereupon it is registered as a suicide in the national statistics. This decision is based on the medical and/or legal evidence obtained from such procedures as external inspection and/or post-mortem examination of the body, investigation of the scene of the event, questioning of witnesses and forensic autopsy.

The 'final decision-maker' is the official with access to all the information: medical data, results from the forensic autopsy (if any) and legal inquiry, other police evidence (such as a suicide note) and statements from relatives or other people involved.

The 'coder' is the official who applies the ICD code for national statistics.

3. Results

The process of suicide registration starts after the fact of death has been established by a medical doctor and suspicion of injury death has been raised. It ends with registration of the death in the national mortality statistics. On the basis of the registration practices described, the eight countries surveyed were divided into two groups: those applying the medico-legal system and those with the coronial system. Procedures for registering suicides are presented for each participating country.

Table 1 summarizes the stages of suicide registration, the authorities involved in all these stages and other data relevant to suicide registration.

4. Description of suicide-registration procedures

4.1. Countries with a medico-legal system

4.1.1. Austria

A legal inquiry is initiated, in every case, once a body is found if there is any suspicion of injury death. The inquiry is performed by the legal authority (the police). The certifier and final decision-maker is a medical doctor (public-health doctor), who issues the death certificate following the examination (external inspection) and receives the results of the legal inquiry (and vice versa). In the event of uncertainty a forensic autopsy, ordered by the certifier or the legal authority (court) and performed by a forensic medical doctor, follows. The results of the forensic autopsy are transmitted to the certifier and the legal authority. The time limit for the final decision on the cause of death is 1 month, but this may be changed during the current year. The certifier sends the death certificate to be registered at the local civil registration office, from where it is sent to the office of national statistics. Annual statistics on causes of death are publicly available within 3 months.

4.1.2. Belgium (Flanders)

The certifier is the medical doctor, who issues the death certificate with a professional opinion regarding the cause of death. This is sent to the municipal administration, from where it is forwarded to the office of national statistics for registration. In the event of an unnatural death (injury death) or doubt, the certifier must indicate on the death certificate that there is a 'legal medical objection against burial or cremation'. An inquiry by a legal authority invariably follows this objection. The legal authority decides whether a forensic autopsy is necessary and, if so, orders it. An autopsy is performed by a forensic medical doctor. The conclusion on the cause of death following the inquiry is then reached by a physician or the forensic medical doctor and legal authorities (the police and/or a judicial investigator). The conclusions of the inquiry are not routinely communicated to the office of statistics. In the event of doubt, the coder systematically questions the legal

Table 1
Summary of suicide registration procedures and authorities involved.

		Austria	Belgium (Flanders)	Estonia	Germany	Hungary	Portugal	Ireland	The Netherlands
Initial stage	Authority responsible for legal inquiry	Police	Police and judicial investigator	Prosecutor and police	Office of Public Prosecutor	Police	Police and prosecutor	Coroner, involving the police	Police
Intermediate stage	Authority receiving/ having legal inquiry results	Police and certifier (public-health doctor)	Police and judicial investigator	Prosecutor and police	Office of Public Prosecutor	Police	Physician or forensic medical doctor	Coroner	Public prosecutor
	Authority ordering forensic autopsy	Court	Judicial investigator	Police	Police, Court of Law, Office of Public Prosecutor	Police	Prosecutor	Coroner	Police
	Authority performing forensic autopsy	Forensic medical doctor	Forensic medical doctor	Forensic medical doctor	Forensic medical doctor	Forensic medical doctor	Forensic medical doctor	Forensic medical doctor	Forensic medical doctor
	Authority receiving forensic autopsy results	Police and certifier (public-health doctor)	Judicial investigator	Police	Police, Court of Law, Office of Public Prosecutor	Police	Prosecutor and police	Coroner	Public prosecutor
	Certifier and institution	Public-health doctor at public-health service	Physician or forensic medical doctor, no specific institution	Forensic medical doctor at Estonian Forensic Science Institute	Forensic medical doctor at Forensic Institute	Forensic medical doctor at Forensic State Office	Physician at hospital/health centre or forensic medical doctor at Legal Medical Institute	Coroner, independent office holder	Municipal coroner at Municipal Health Service or Dutch Forensic Institute
Final stage	Final decision-maker	Public-health doctor	Physician or less often forensic medical doctor	Forensic medical doctor	Forensic medical doctor	Forensic medical doctor	Physician or forensic medical doctor	Coroner after inquiry; vital statistics officer for national statistics after consulting police	Municipal coroner or Public prosecutor (in case of forensic autopsy)
	Coder and institution	National Statistics Office (Statistics Austria)	Specially qualified coder (medical doctor) in Flemish Agency for Care and Health	Medical doctor in National Institute for Health Development	Medical doctor in local public-health authority	Forensic medical doctor	Non-medical trained coders within the Directorate-General of Health	Vital statistics officer in Central Statistic Office	Municipal coroner or Dutch Forensic Institute (in case of forensic autopsy)
	ICD-10 since	2002	1998	1997	1998	1996	2002	2007	1996
	Institution registering death	Local Civil Registration Office; Aggregate Data in National Statistics Office (Statistics Austria)	Flemish Agency for Care and Health	National Institute for Health Development	Local Public Health Authority; Aggregate Data in National Statistical Office	Statistics Office	Local agency of civil registry (Conservatórias do Registo Civil); aggregate data in the Instituto Nacional de Estatística (INE)	Central Statistics Office	Statistics Netherlands (CBS)
Central registry system	Electronic	Electronic	Electronic	Paper based	Electronic	Electronic	Electronic	Electronic	

authorities and the certifier. Data collection for any given year closes in September of the following year (the median delay between death and coding being 4 months). Annual mortality data are published and made publicly available within 18 months.

4.1.3. Estonia

A legal inquiry and a forensic autopsy are obligatory in all cases of injury death. The legal inquiry is performed and the forensic autopsy ordered by the legal authority (the police). The forensic medical doctor performs forensic autopsy and can consult the legal authority for additional information. The certifier and final decision-maker regarding the medical cause of death is a forensic medical doctor. The final decision must be reached within 1 month, but changes are allowed during the current year. The death certificate is issued by the certifier (forensic medical doctor) and sent to the national death registry, where a medical doctor is responsible for assigning ICD code. The national death registry forwards the electronic data to the state statistics office. Annual statistics on causes of death are publicly available within 9 months.

4.1.4. Germany

A legal inquiry follows every injury death. The Office of Public Prosecutor is responsible for the legal inquiry, and the forensic autopsy is ordered by the legal authorities (in different states these may be the police, public prosecutor or a court of law) and performed by a pathologist at a forensic institute. The results of the forensic autopsy are sent to the legal authority. The certifier and final decision-maker is a pathologist, who acts independently from the legal authorities. The regulations set no time limit on the final decision and diagnoses can be changed in response to additional information. The certifier (forensic pathologist) issues the death certificate and sends it for registration to the local public-health authority. The office of national statistics stores aggregated data and registration of causes of deaths is paper-based. Annual mortality statistics are publicly available within approximately 1 year.

4.1.5. Hungary

A legal inquiry follows every injury death. The legal authority (police) orders forensic autopsies in all suicide cases, and they are performed by forensic medical doctor. The certifier and the final decision-maker is the forensic medical doctor. The certifier issues, the death certificate and sends it to the office of statistics. In the event of uncertainty, the legal authority can order a repeat autopsy conducted by a different forensic expert. On concluding the legal inquiry, if the cause of death has been reclassified, the forensic expert issues a supplementary certificate specifying the new cause of death and sends it to the office of statistics. Annual figures on causes of death are available within 4–5 months.

4.1.6. Portugal

A legal inquiry is conducted for every injury death. The legal authority (Public Prosecutor's Office) performs the inquiry, decides whether a forensic autopsy is necessary and, if so, orders it. A forensic medical doctor conducts the forensic autopsy. The certifier and final decision-maker is a medical doctor: physician, if the forensic autopsy is dismissed, or a forensic medical doctor, if the forensic autopsy is performed. The results of the legal inquiry are sent to the final decision-maker, who can reclassify the cause of death. This can be modified only if the current year is still open from the statistical administrative standpoint. The deadline for the final decision is 9 months after the death. The certifier issues the death certificate and sends it to the local agency of civil registration, which sends digitized data to the Directorate-General of Health (DGS), which forwards it to the National Statistical Institute (INE). Annual statistics on the causes of death are available within 1–2 years.

4.2. Countries with a coronial system

4.2.1. Ireland

The legal authority (the police) refers every case of injury death to the coroner, who is an independent officeholder with either a medical or a legal professional background. The coroner conducts a legal inquiry involving the police and witnesses. A forensic autopsy is ordered by the coroner following every injury death, and performed by a forensic medical expert. The certifier is the coroner, who sends the certificate to the Registrar. The registrar transcribes the information from the coroner's certificate onto the death registration form and forwards both to the Central Statistics Office. After receiving this information, the vital statistics officer sends a confidential form to the police, who return the form along with an opinion as to whether the death was accidental or undetermined or caused by suicide or homicide. The final decision-maker and coder is the statistician. The time limit for the final decision is 2 years. Two sets of figures for mortality statistics are released. One set, based on deaths registered in a particular year, is published within 6 months after year-end. The second set, based on the incidence of deaths in a calendar year, is published within 24 months after year-end. Since 1993, suicide has been decriminalized in Ireland.

4.2.2. The Netherlands

When an injury death takes place the coroner, a medical doctor who works in the municipal health service, is first notified. A legal inquiry follows every injury death. The coroner notifies the legal authorities (police) in the event of any suspicion. The legal authority decides whether a forensic autopsy is necessary and, if so, orders it. The autopsy is performed by the Dutch Forensic Institute. The results of the legal inquiry and forensic autopsy are sent to the legal authority (public prosecutor), which checks both sources. If a forensic autopsy is ordered, the certifier is the Dutch Forensic Institute and the final decision-maker is the legal authority (the public prosecutor). If no forensic autopsy is ordered, the certifier and final decision-maker is the coroner. The certifier assigns the ICD code and the final decision-maker sends the death certificate to the Central Statistics Office. Statistics for the preceding year can be revised within 2 months after year-end. Annual statistics on causes of death are available to the public within 6 months.

4.3. Rates of suicide and undetermined death

Data on suicides and undetermined deaths are presented in Fig. 1. Rates of both suicide and undetermined death vary by country. A high numerical value of the ratio of undetermined deaths to suicides reflects a relatively high level of the former. This ratio was highest in Portugal (0.78), followed by Estonia (0.32) and Germany (0.21). The lowest ratio was found in Hungary (0.05), followed by the Netherlands (0.06) and Austria (0.07).

5. Discussion

5.1. Principal findings and comparison with other studies

5.1.1. Medico-legal and coronial systems

The present study revealed that suicide registration was based on the medico-legal system in six of the countries studied and on the coronial system in two countries. Although there should be basic differences between these two systems [10,24] the findings showed that there are not only differences between the medico-legal and the coronial system as such, but also key differences within the two systems. For example, a coroner is involved in suicide registration in both Ireland and the Netherlands, but a coroner's professional background, main responsibilities and

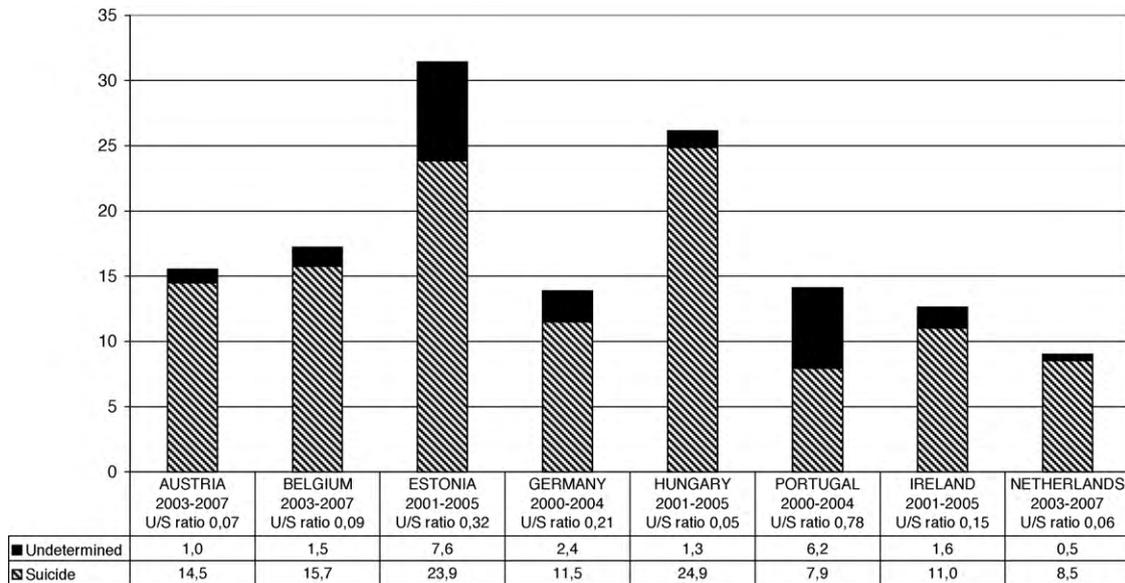


Fig. 1. Age-adjusted total rates of suicides (S) and events of undetermined intent (U) per 100,000, average of the last 5 years available and rate ratios of events of undetermined intent to suicides (U/S).

position in the chain of suicide registration differ between the two countries. In Ireland the coroner is an independent official, a certifier with a legal and/or medical background who is responsible for several steps in the chain. In the Netherlands the coroner has a medical background, works for the municipal health service, has far less responsibility and acts as the certifier only when no forensic autopsy is performed.

5.1.2. Legal inquiry and forensic autopsy

A study by Jouglé et al. [29] reported considerable variations among countries in terms of medico-legal inquiries, the proportions of autopsies and the certifiers' professional backgrounds. According to the results of the current study, a legal inquiry is compulsory for every injury death in all participating countries, and is most commonly performed by legal authorities. Registration of suicide does not differ from registration of other causes of injury deaths in participating countries. Nevertheless, Ireland's legal-inquiry process is notably different. There, although overall responsibility for legal inquiry rests with the coroner, confidential police reports, which are sent to the vital statistics officer in parallel with the medical death certificate issued by the coroner, are consulted in the process of suicide registration [30].

Legal evidence and procedures include elements that the countries have in common, such as routine external inspection of the body and investigation of the scene of the event. Execution of the forensic autopsy and the recipient of these results are critical elements in the process. In the event of injury death a forensic autopsy is ordered by legal authorities, and it is obligatory in half the participating countries (Ireland, Germany, Estonia and Hungary). In the others (Austria, Belgium, the Netherlands and Portugal) it is not compulsory and the legal authorities decide whether a forensic autopsy is necessary. The results of a forensic autopsy are typically communicated back to the legal authorities. Reliable data about the percentages of autopsies performed and toxicological post-mortem analysis of suicides were not available in most of the countries. Only Hungary reported that autopsies are performed in all cases of injury death, and in 80–90% of the forensic autopsies toxicological post-mortem analysis is also performed, resulting in a relatively low level of undetermined deaths. Given that intention is an important element in determining suicide [9,11,14,20,21], psychological autopsy revealing the suicide

process, psychological and psychiatric issues, risk and precipitating factors is essential. Currently, legal inquiry routinely does not include a psychological autopsy in investigation procedures.

5.1.3. Certifier and final decision-maker

Previous studies have investigated the trustworthiness of the certifier in the suicide registration procedure [20,24]. In most of the countries studied the certifier is a forensic medical doctor, but in some countries (Austria, Belgium and Portugal), a physician at a hospital or health centre may also decide that suicide is the cause of death, if a forensic autopsy is not ordered. In countries with a coronial system, the coroner is usually the certifier. However, in the Netherlands the coroner is the certifier only if no forensic autopsy is ordered.

The accuracy of suicide statistics depends on the comprehensiveness of the information on which the final decision is based. Many researchers have commented on the different approaches adopted by either medical or legal final decision-makers [10–12,14,21,24]. In the current study, the final decision-maker concerning the medical cause of death was most commonly the certifier, who does not always have access to all pertinent information.

In some countries (Estonia, Germany and the Netherlands) a lack of communication between the certifier as the final decision-maker and the legal authorities conducting the legal inquiry occurs. The certifier provides the data on the causes of death for the national statistics, but if the legal inquiry finally reaches a different decision, this is not communicated back to the certifier and no corrections in national statistics are made. Although the final decision-maker in Portugal receives all the requisite data, the relative level of undetermined deaths is higher than in the other countries surveyed, presumably because of the low percentage of autopsies performed. It is noteworthy that Belgium is the only country where the medical doctor and legal authorities have joint responsibility for final decisions on causes of death.

5.1.4. Coder and registry system

The coding and registry system applied in a specific country may also affect the quality of the death-registration process. Central or local systems of coding may influence standardization. Moreover, the coders vary in their professional background, experience and ways of interpreting the rules [23]. In most of

the countries studied, ICD codes are applied to the causes of death at central level (in the offices of national statistics or its public-health counterparts) by specially qualified coders. The exception is the Netherlands, where the certifier applies ICD codes. In addition, coders' and/or statisticians' access to supplementary information has been identified as particularly important [13,23]. In the current study it was reported that coders in doubt can, in principle, contact the certifier or the legal authority for clarification, but it is not known how often this clarification is sought or how responsive the certifiers and legal authorities are, in view of the confidentiality of the data.

The lack of available additional information is reflected in the particular case of Portugal between 2001 and 2003, when coders had specific instructions to make inquiries to ascertain all undetermined causes of death. Here, a rapid rise in suicide rates associated with a marked fall in the rate of undetermined deaths was observed in this period, with a reversal in subsequent years. In Ireland, in contrast to other countries, before a final decision is reached the coder (vital statistics officer) must handle information derived from two different sources: the coroner's report and a confidential police report. Nevertheless, a high level of agreement (91%) between police officers' opinions and coroners' reports was found, and eventually the coder often gives priority to the police report [30,31].

Although death certificates are paper-based in every participating country, the aggregate-level registry system is electronic in all the participating countries except Germany. Paper-based documentation, in contrast to electronic, often tends to facilitate incomplete data collection, which may lead to underestimation of suicide rates. In Portugal, the European country with a relatively high level of undetermined deaths, the death certificate is transcribed to afford digital support at local level where, presumably, errors may occur.

5.2. Implications for policy

The following deficiencies in suicide registration were identified in the countries with relatively high levels of undetermined deaths: poor and one-sided communication between the medical and legal authorities involved in the suicide-registration process (Estonia, Germany and Portugal); potential errors in the transcription of handwritten information from documents (Germany and Portugal); a small number of forensic autopsies (Portugal); an absence of centralized coding (Germany); and coders who lack medical training (Portugal). In the countries with relatively low levels of undetermined deaths, the following aspects of suicide registration may be highlighted as representing best practice: good and reciprocal communication between medical and legal authorities (Austria), autopsy in all suicide cases, repeat autopsies and modification of the cause of death by the forensic medical doctor following an inquiry (Hungary), and both inquiry and forensic autopsy results available to the final decision-maker (the Netherlands).

To improve the quality of suicide registration in the EU, it may be concluded that a model affording the greatest accuracy in recording of suicides should include the following elements: (1) a comprehensive, accurate and time-limited legal inquiry, including clarification of suicidal intent (psychological autopsy); (2) an obligatory forensic autopsy and toxicological analysis in all cases of injury death; (3) reciprocal and accurate communication among the various authorities involved in the registration process; (4) electronic data transmission, with paper-based death certificates for archiving purposes and burial arrangements only; (5) the final decision-maker's access to all information available about a case; (6) coders specially trained and entitled to obtain additional information from the legal authorities and the certifier.

5.3. Strengths and weaknesses of the study

The present study involved devising a structured questionnaire to collect data to describe the process and system of suicide registration. This questionnaire was created and methodically filled in using personal contacts in numerous countries throughout Europe, where groups of appropriate specialists were formed for the task. Based on analysis of the data provided, the various systems and procedures of suicide registration were described and compared, and their potential deficiencies pinpointed and discussed. An attempt was made to provide recommendations on how best to improve the quality of suicide registration in the EU.

One weakness of the study was that, rather than being performed at individual level through investigation of death certificates, it describes the process of suicide registration at country level. The relative level of undetermined deaths, chosen in this study as the quantitative criterion to assess the validity of suicide statistics, is neither the only possible indicator nor comprehensive. Both underestimation and overestimation of suicide rates may occur, owing to misclassification between accidents and homicides. Generalizing the results for some countries has biases. Differences in suicide-registration procedures and practices can occur even within countries, for example in Germany (western and eastern parts) and Belgium (the Flemish and Walloon regions), or between different areas (rural and urban).

5.4. Unanswered questions and future research

The magnitude of underestimation or overestimation of suicides is outside the framework of this study. Investigation at aggregate and individual level is needed to estimate the reliability of diagnostics and registration of causes of death in the 'external causes of death' category: suicides, accidents, homicides and failed diagnoses (i.e. undetermined deaths/open verdicts). The outcomes of this study clearly underline the need to undertake more systematic research on cases with the verdict of undetermined death, in terms of socio-demographic, psychosocial and psychiatric profiles, preferably at individual level.

Conflict of interest

All authors declare that they have no conflict of interest.

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