

# Fall-related deaths in an enlarged European Union

## OBJECTIVE

The objective of this monograph is to provide producers and users of death statistics with a practical tool to help study **deaths related to falls**.

## METHODS

Mortality data produced by health authorities of 33 European countries<sup>1</sup> and compiled yearly by Eurostat<sup>2</sup> were used. Depending on their availability, data were used to describe time trends, geographical distributions and demographical risks.

By reviewing the literature, the international forum for mortality specialists<sup>3</sup>, the revision and update process of the International Classification of Diseases (ICD) and the answers of a questionnaire filled in by death statistics producers of 36 European countries<sup>4</sup> in the framework of the ANAMORT project<sup>5</sup>, it has been possible to:

- describe the limits of the observed differences;
- elaborate recommendations for a better use of available data;
- elaborate recommendations for a better production of future data.

## Definition of deaths related to falls

Death from accidental fall was considered as any death reported to Eurostat with an underlying cause of death coded W00 to W19 (table 1) in the 10<sup>th</sup> revision of ICD (ICD-10).

Death from fall was considered as any death due to fall, whatever the intent was: in addition to death from accidental fall, it included death from suicide by fall, homicide by fall and fall from undetermined intent.

## Definition of indicators used

The number of deaths for each group of underlying causes of death (UCoD) was the one transmitted by the countries' national authorities to Eurostat for a given year. Aggregation of the number of deaths for the European Union (EU) was made by Eurostat, using last available data for a given year. Crude death rate (CDR) was obtained by dividing the number of deaths by the last estimate of the population available in Eurostat (for a given age group if age specific crude death rate was computed). Age-standardised death rate (SDR) was computed by direct standardisation,

using the 1976 European population. The potential years of life lost before 75 years-old (PYLL75) due to a given cause were calculated for each age group by multiplying the number of deaths related to this cause by the difference between age 75 and the mean age at death in each age group. Potential years of life lost were the sum of the products obtained for each age group. Proportions of PYLL75 were calculated by dividing the PYLL75 due to a given cause by the total amount of PYLL75 due to all causes of death. Indicators were produced at country level, for all countries of EU15<sup>6</sup> or EU25<sup>7</sup>. For other groups of countries, estimation of a given indicator was calculated as an average of this indicator at country level weighed by the proportion of its population among the group.

## SITUATION REGARDING DEATHS FROM FALLS IN EUROPE

The number of deaths from accidental fall in EU25 was 46,337 in 2005, which represents 20.2% of deaths due to external causes. SDR for accidental fall was 6.5 for 100,000 inhabitants in 2005, among the 25 countries of the European Union. Variations between 2.0 and 16.0 /100,000/year according to the countries were observed in Europe (Figure 1).

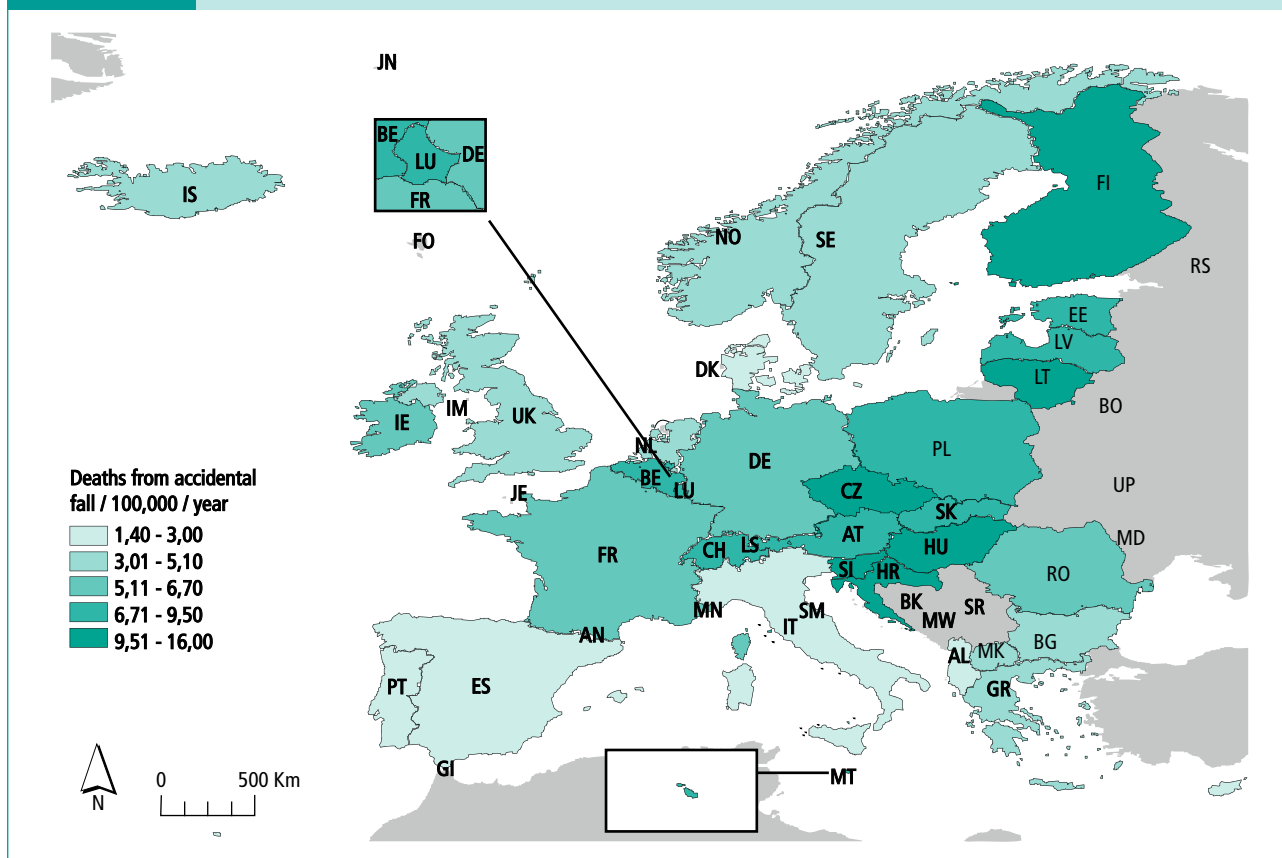
A west-east gradient was observed, with the highest SDR by accidental fall observed in Croatia, Slovenia, Hungary, Lithuania, and Finland.

Regardless of age, the CDR by accidental fall for men were higher than for women (Figure 2). The risk of death by accidental fall was 2.4 times higher among men (average for all countries and year, varying from 0.3 to 26.0 according to country and year; 1<sup>st</sup> quartile 1.6; 3<sup>rd</sup> quartile 2.7). In 2005, among EU25 countries, victims were observed among the elderly (65 years-old and more) in 31% of the cases. CDR by accidental fall increased with age regardless of the gender (Figure 2): compared to 15-24 years-old, the risk of death of the elderly (65 years-old and more) was 60 times higher.

The SDR has decreased by 7% between 2000 and 2005 (from 7.0 to 6.5/100,000/year) in the European Union of 25 countries (Figure 3). This trend was also observed over a longer period in the European Union of 15 countries. In certain countries, sharp decreases in SDR by accidental falls could be observed (Denmark 2000, France 2000, Germany 1998, Italy 2003, Netherlands 1998, Norway 2005, Spain 1999, Sweden 1997, Switzerland 1995). These sharp decreases were associated with the implementation of the 10th revision of ICD in six of these countries.

1. Included the 25 Member States of the European Union before 2007, Albania, Bulgaria, Croatia, Iceland, Macedonia, Norway, Romania and Switzerland.
2. [epp.eurostat.ec.europa.eu](http://epp.eurostat.ec.europa.eu).
3. [www.nordclass.uu.se/index\\_e.htm](http://www.nordclass.uu.se/index_e.htm).
4. 33 above mentioned countries, Bosnia Herzegovina, Serbia and Turkey.
5. [www.invs.sante.fr/surveillance/anamort](http://www.invs.sante.fr/surveillance/anamort).
6. EU15 comprised the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.
7. EU25 comprised EU15 and the following 10 countries: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, and Slovenia.

**FIGURE 1** AGE-STANDARDISED MORTALITY RATE BY ACCIDENTAL FALL IN EUROPE IN 2005\*



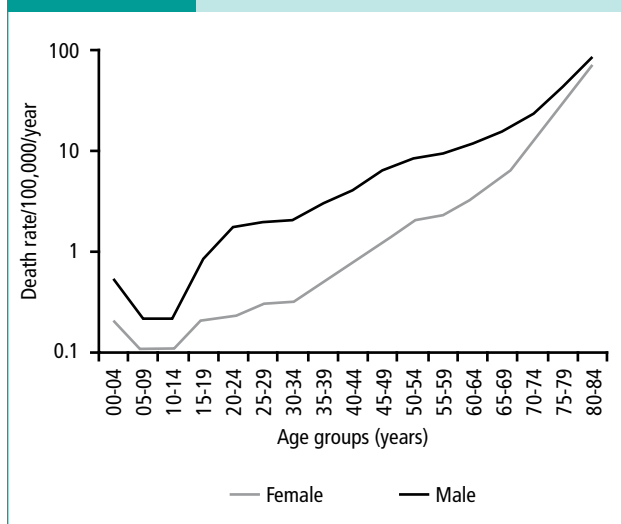
\* Owing to missing data for 2005, the map included data for 2004 for Albania, 1998 for Belgium, 2001 for Denmark and 2003 for Italy.

The ICD-10 code X59 (coding for "Exposure to unspecified factor") which could correspond to elderly found dead with a fracture, represented more than 50% of accidental falls in four of these countries. The increase of SDR in 2004 was not confirmed in 2005. The 10 Member States, mostly in Eastern Europe, explained the increase in death rates by accidental fall in the European Union (EU25 versus EU15) was due to higher incidence rates

in these countries (Figure 3). In 22 countries<sup>8</sup>, it was possible to obtain statistics on "all falls" (whatever the intent was, see table 1) in 2005. Non accidental falls represented 0 to 31% of all falls (12% on average for all these countries). In 5 countries<sup>9</sup>, the proportion of "accidental falls" decreased among "all falls" after the introduction of the 10<sup>th</sup> revision of the ICD.

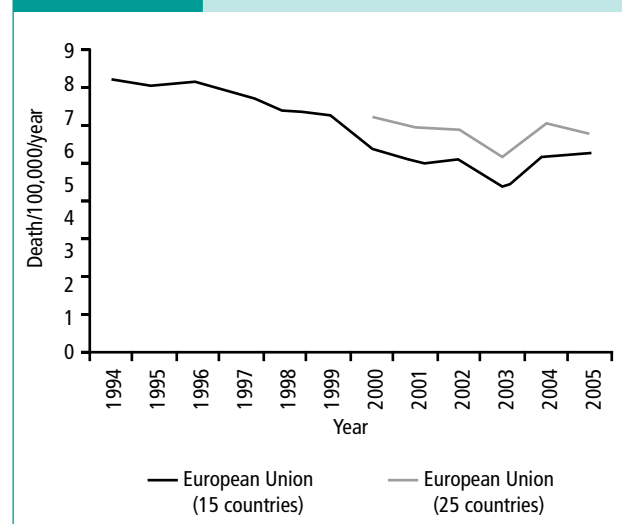
**FIGURE 2**

CRUDE RATES OF MORTALITY BY ACCIDENTAL FALL BY GENDER AND AGE GROUP IN THE EUROPEAN UNION (25 COUNTRIES) IN 2005 – LOGARITHMIC SCALE



**FIGURE 3**

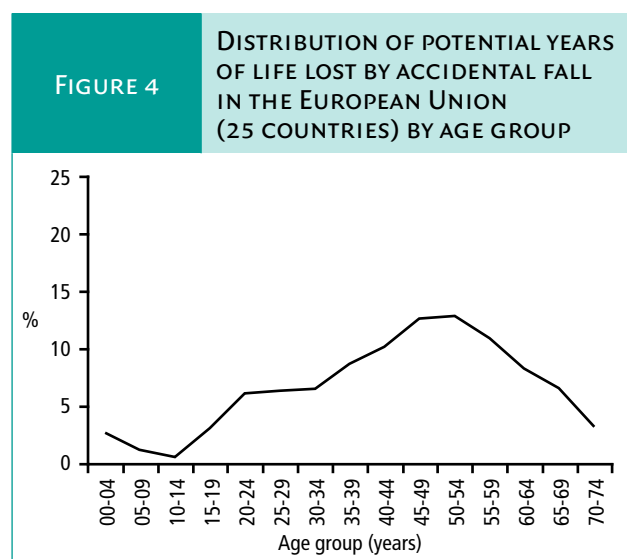
TRENDS IN AGE STANDARDISED DEATHS BY ACCIDENTAL FALL IN THE EUROPEAN UNION (15 AND 25 COUNTRIES)



8. Austria, Croatia, Cyprus, Czech Republic, Estonia, Metropolitan France, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Macedonia (the former Republic of Yugoslavia) Malta, Norway, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, and Switzerland.

9. Austria, Metropolitan France, Portugal, Spain, and Sweden.

In EU25, deaths from accidental fall were responsible for 6% of the PYLL by external causes of death. The highest impact was among people between 40 and 59 years-old (Figure 4).



## INTERPRETATIONS AND LIMITS OF OBSERVED DIFFERENCES IN DEATHS BY FALL IN EUROPE

Misclassifications of deaths from accidental fall due to inappropriate selection of underlying causes of death were described by 26 out of the 36 countries questioned during the Anamort project. Combined effects of these misclassifications were considered as conducting to underestimation of the magnitude of the deaths due to accidental falls in most of these countries.

Increasing age was considered as a risk factor for under declaration of deaths from accidental fall. This might be explained by the priority given by the certifiers to complex medical history among elderly.

Changes in codification rules between the 9<sup>th</sup> and 10<sup>th</sup> revision of the ICD classification for selecting UCoD might also explain sharp decreases in death rates observed in some countries (a person found dead with a femur fracture might have been coded in the group of accidental falls with the ICD-9 and not in the ICD-10).

Less frequently, overestimation of deaths by accidental fall might be observed in case of non application of codification rules giving priority to osteoporosis or epilepsy seizure when associated to accidental fall.

## ANALYTICAL RECOMMENDATIONS TO IMPROVE COMPARABILITY OF TIME TRENDS (FOR STATISTICS USERS)

The potential impact on falls estimates due to the coding of death with X59 (Exposure to unspecified factor; causing fracture if X59.0) should be estimated in order to identify national correcting factors to better estimate trends according to the application of ICD coding rules.

A strategy on multiple cause of death analysis should be developed to describe deaths related to fall. This would allow balancing the changes in the ICD version by identifying the cases of fracture of the femur (coded S72) without identified external cause or associated to:

- a pathological fracture (e.g. M84.4, M90.7)
- an exposure to an unspecified force causing fracture (X59.0)
- or osteoporosis (M80).

The introduction of the automated coding system might help to eliminate the biases due to different applications of coding rules by coders. It could also contribute to take into account, with homogeneity and rapidly, the regular updates of the ICD classification.

Indicators describing fall-related deaths, whatever the intent was, could be interesting to follow as prevention measures on accidental falls should have an impact on intentional falls also (homicide or suicide and undetermined intent).

## RECOMMENDATIONS TO IMPROVE COMPARABILITY OF FUTURE DATA COLLECTED (FOR DATA PRODUCERS)

Circumstances of the fall should be described in detail in the death certificate (place, location and mechanism).

Various alternative or associated diagnoses should be envisioned by certifiers when a death appears to be related to a fall: suicide, homicide or family violence, epilepsy seizure, bone density disorders, alcohol intoxication.

Search of fall in the medical history of a patient who died in a surgical unit (orthopaedic ward) should be systematic.

Certifiers should be encouraged to write information on conditions contributing/initiating death if an "external cause of injury and poisoning" occurred in the past (e.g. falls, traffic accidents, etc.), and mention the time lag between the elements of the causal chain.

Development of an ICD code and indicator to identify low-velocity falls should be necessary to better describe a potential increasing health problem related to population ageing.

Before using the place of injury code (4<sup>th</sup> digit) in the chapter of falls (W00-W19) for analysis, the appropriate use of this digit should be validated.

Additional and more detailed recommendations may be found on [www.invs.sante.fr/surveillance/anamort](http://www.invs.sante.fr/surveillance/anamort).

## BIBLIOGRAPHIC REFERENCES

- Fatalities and injuries from falls among older adults - United States, 1993-2003 and 2001-2005. *MMWR Morb Mortal.Wkly Rep.* 2006;55:1221-4.
- Agran PF *et al.* Rates of pediatric and adolescent injuries by year of age. *Pediatrics.* 2001;108:E45.
- Alamgir H *et al.* An evaluation of hospital discharge records as a tool for serious work related injury surveillance. *Occup Environ Med.* 2006;63:290-6.
- Ballesteros MF *et al.* Differential ranking of causes of fatal versus non-fatal injuries among US children. *Inj Prev.* 2003;9:173-6.
- BEH. [Numéro thématique - Épidémiologie et prévention des chutes chez les personnes âgées] [[Special issue - Epidemiology and prevention of falls among the elderly]]. *Bull Epidemiol Hebd* [n° 37-38], 1-16. 2-10-2007.
- Bergeron E *et al.* A simple fall in the elderly: not so simple. *J Trauma.* 2006;60:268-73.
- Calder SJ, Anderson GH, Gregg PJ. Certification of cause of death in patients dying soon after proximal femoral fracture. *BMJ.* 1996;312:1515.
- Drumond M, Jr. *et al.* [Evaluation of the quality of mortality information by unspecified accidents and events of undetermined intent]. *Rev Saude Publica.* 1999;33:273-80.
- EUNES. Fact sheet: Prevention of Falls among Elderly - Elderly Safety - Focus on Accidental Injuries. 2007. Center for Research and Prevention of Injuries-CEREPI

Griffiths C, Rooney C. The effect of the introduction of ICD-10 on trends in mortality from injury and poisoning in England and Wales. *Health Statistics Quarterly*. 2003;19:10-21.

Griffiths C, Wright O, Rooney C. Trends in injury and poisoning mortality using the ICE on injury statistics matrix, England and Wales, 1979-2004. *Health Stat Q*. 2006;5:18.

Hansen KS *et al*. Epidemiology of severely and fatally injured patients in western part of Norway. *Scand.J.Surg*. 2004;93:198-203.

Kannus P *et al*. Fall-induced injuries and deaths among older adults. *JAMA*. 1999;281:1895-9.

Koehler SA *et al*. Accurately assessing elderly fall deaths using hospital discharge and vital statistics data. *Am.J Forensic Med Pathol*. 2006;27:30-5.

Langlois JA *et al*. International comparisons of injury mortality in the elderly: issues and differences between New Zealand and the United States. *Int J Epidemiol*. 1995;24:136-43.

Ohmann C *et al*. [A new model of comprehensive data linkage-evaluation of its application in femoral neck fracture] [[Ein neues Modell der sektorübergreifenden Datenzusammenführung und Evaluation am Beispiel der Schenkelhalsfraktur]]. *Z.Arztl.Fortbild.Qualitatssich*. 2005;99:547-54.

Preuss J *et al*. Injuries in fatal cases of falls downstairs. *Forensic Sci Int*. 2004;141:121-6.

Roberts SE, Goldacre MJ. Time trends and demography of mortality after fractured neck of femur in an English population, 1968-98: database study. *BMJ*. 2003;327:771-5.

Thélot B *et al*. [International classification of disease for the analysis of the causes of death by injury in France: reference lists] [[Classification internationale des maladies : liste de référence pour l'analyse des causes de décès par traumatisme en France]]. *Bull Epidemiol Hebd*. 2006;323-8.

Tomson T *et al*. Medical risks in epilepsy: a review with focus on physical injuries, mortality, traffic accidents and their prevention. *Epilepsy Res*. 2004;60:1-16.

TABLE 1		CORRESPONDENCE TABLE DEFINING THE GROUP OF FALLS AND ACCIDENTAL FALLS ACCORDING TO REVISION NUMBER OF INTERNATIONAL CLASSIFICATION OF DISEASES (ICD)			
		ICD-10	Label	ICD-9	ICD-8
All falls	Accidental falls	W00	Fall on same level involving ice and snow	E885	E885
		W01	Fall on same level from slipping, tripping and stumbling	E885	E885
		W02	Fall involving ice-skates, skis, roller-skates or skateboards	E885	E885
		W03	Other fall on same level due to collision with, or pushing by, another person	E886	E886
		W04	Fall while being carried or supported by other persons	E885	E885
		W05	Fall involving wheelchair	E884	E884
		W06	Fall involving bed	E884	E884
		W07	Fall involving chair	E884	E884
		W08	Fall involving other furniture	E884	E884
		W09	Fall involving playground equipment	E884	E884
		W10	Fall on and from stairs and steps	E880	E880
		W11	Fall on and from ladder	E881	E881
		W12	Fall on and from scaffolding	E881	E881
		W13	Fall from, out of or through building or structure	E882	E882
		W14	Fall from tree	E884	E884
		W15	Fall from cliff	E884	E884
		W16	Diving or jumping into water causing injury other than drowning or submersion	E883	E883
		W17	Other fall from one level to another	E884	E884
		W18	Other fall on same level	E888	E887
		W19	Unspecified fall	E888	E887
		///////	Fracture, cause unspecified	E887	///////
		Y01	Assault by pushing from high place	E968.1	E967
		X80	Intentional self-harm by jumping from a high place	E957	E957
		Y30	Falling, jumping or pushed from a high place, undetermined intent	E987	E987
		///////	Late effects of accidental fall	E929.3	E943

## ACKNOWLEDGEMENTS

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### **Support:**

European Commission, DG Sanco (partial financial support) and Eurostat (technical support).

Citation :

F. Belanger, A-B Ung *et al*. Fall-related deaths in an enlarged European Union - Institut de veille sanitaire - Saint-Maurice, 2008, 4p. Disponible sur [www.invs.sante.fr](http://www.invs.sante.fr)