

ORIGINAL PAPER

# Child mortality due to suffocation in Europe (1980-1995): a review of official data

## *La mortalità infantile per soffocamento in Europa (1980-1995): revisione dei dati ufficiali*

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### Key words

Suffocation • Children • Mortality • Standardized mortality rates

### Parole chiave

Soffocamento • Età pediatrica • Mortalità • Indice standardizzato di mortalità

### Summary

This report outlines the current status of the official statistical data available concerning mortality rates for suffocation in children < 15 years of age, stratified according to sex and country in Europe, in the years 1980-1995. The data source is the WHO Mortality Database, which comprises deaths registered in national vital registration systems, with underlying cause of death as coded by the relevant national authority. To assess the impact of the problem of suffocation, the total potential years of life lost have been calculated. In addition, for Italy, and for the years 1999-2000, data related to deaths and hospitalizations for foreign body in the pharynx and larynx are presented. In Italy, in the years 1999-2000, the ratio between the number of hospitalizations and the mortality rates is approximately one death every 10 hospitalizations (x 100,000). The European mortality rate exceeds nearly one death per 100,000 persons. No evidence of any geographical pattern or cyclic trend emerged from the analysis of this official data.

### Riassunto

*Nel seguente lavoro si delinea lo stato attuale delle banche dati statistiche ufficiali disponibili. Le banche dati considerate si riferiscono ai casi di mortalità per soffocamento tra i bambini minori di 15 anni, stratificati in base alle variabili sesso e nazione, che si sono verificati tra il 1980 e il 1995. I dati provengono dal database sulla mortalità dell'OMS che riporta i casi di morte così come inseriti nei sistemi di registrazione di natalità e mortalità e la causa di morte così come codificata dall'autorità nazionale rilevante. Per valutare l'ordine di grandezza del problema del soffocamento sono state calcolate le previsioni degli anni di vita totali persi. Inoltre, per l'Italia, sono stati presentati i dati di morte e di ospedalizzazione per soffocamento prodotto da corpi estranei ingeriti nella faringe e nella laringe negli anni 1999-2000. In Italia, negli anni 1999-2000, il rapporto tra numero di ospedalizzazioni e tassi di mortalità è approssimativamente di 1 morto ogni 10 bambini ospedalizzati (per 100.000). Lo stesso rapporto a livello europeo è di circa 1 morto per 100.000 persone. Non ci sono evidenze di pattern geografici o di cicli temporali che emergono dall'analisi dei dati ufficiali.*

## Introduction

Among the causes of death, accidents are one of the most important factors, in each country, for the youngest age groups. Indeed, if accidents associated with specific age groups, which present characteristic behaviours, are taken into consideration, it emerges that choking is not a negligible phenomenon<sup>1,2</sup>. Choking is the interruption of respiration due to internal obstruction of the airways, suffocation is obstruction of the airways due to an external object that blocks the nose and mouth, and strangulation results from external compression of the airway by the object<sup>3</sup>.

Airways obstruction is the principal determinant of fatal suffocation in children < 4 years old. In the USA, choking on food is the sixth most common cause of accidental deaths; during 2000, 160 children between 1-14 years died from obstruction of the respiratory tract associated with inhaled or ingested foreign bodies (W79-W80 ICD-X revision)<sup>4</sup>; many of these episodes were associated with candy/gum (19%) and coins (12.7%). This is due to the lack of a complete set of teeth, the inability to masticate the food well before swallowing (for example, sweets, popcorn, potato chips, grapes, pieces of meat, etc.)<sup>5</sup> and to the tendency to put objects in the mouth (for

example coins, jewelry, balloons, small toys, buttons, small balls, etc.)<sup>6</sup>.

All objects that, on account of the particular form, dimensions and surface, can be easily introduced into the mouth are dangerous, particularly objects of spherical form with a smooth surface, because these are difficult to remove.

The mechanism, which determines penetration into the respiratory tract, is generally caused by sudden and violent inhalation or aspiration of the foreign body in the mouth or pharynx. Fits of weeping, hiccoughs,

sudden and not coordinated movements of the child could facilitate this dramatic event.

Inhalation into the airways occurs if the dimensions of the foreign body are such that they allow passage through the diameter of the glottis. If the foreign body, which occupies the hypopharynx, is not passed through the glottis, then it is generally expelled with reflex coughs. If the particular dimensions and irregularities of the foreign body cause a block at glottis level, death due to asphyxia occurs very rapidly. In cases in which the glottis is crossed, the progression

**Table I.** E521: suffocation due to drowning and submersion in children under 12 months old (IX revision ICD) referring to a population of 100,000 stratified by sex and country.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Austria		2.1		0	0	0	0	0	0	0	2.2	2.1	0	0		0
Belgium			1.6	1.7	1.7		0				0	1.5	0			
Greece	0	0		0	0	0	0	1.8	1.8	0	0	0	0			0
Finland								0	0	0	0	0	2.9	0		0
NL		0		0	0	0	0		0	0	0	0	2			2.1
Spain	0.8	1.5	1.5	1.2	1.2	0.8	0.4	0.9	1.8	0.5	0.5	0		0.5	1	
RFT		0.3		0.7	0	0		0	0.3	0.6	0.3					
RDT			0.8	0	0.9	1.7	0	0.9	0	0	0					
Germany												0.7	0.2	2		0.5
M France	1.2		1.2	1.3	0.8	0.5	1	0.5	0.8	1.3	0.8	1.3	1		0.3	
Portugal	4.9	2.6	0	0	0	0	0	0	0	0	0	0	0	0		0
Italy		0	0.3	0	0.3	0	0.3	0	0.3	0	0.3	0.3		0.6		
Engl. & Wales		1.5		0	1.2	0.6	0	0.9	0.3	0.9	0.3	1.7	0.8			1.5
Scotland			0		0	0	0	0	0		0	2.9	0			0
UK								0.8	0.2	1	0.2	1.7	0.7			1.3
Northern Ireland	0			0	0	0	0	0	0	7.4	0	0	0			0
Ireland		0	0	0	0	0	0	0	0	0	0	0	0	0		
Sweden								0	1.7	1.7	0	0	0		0	0
Russian Fed.	1.7			2.5	2.5				2.4	2.6	2.6	2.8	2.3	3		2.4
Austria		0		0	0	2.4	0	0	0	0	0	0	0	2.2		2.3
Belgium			0	0	0		1.8				1.7	0	0			
Greece	0	1.5		0	0	3.6	0	0	0	0	0	0	0	0		0
Finland								0	0	0	0	3.1	0	0		3.2
NL		0		0	0	0	0	0	0	0	0	0	0			0
Spain	1.5	0	0	0	1.3	0.5	0.5	1	0	1	1.5	1		0.5	0	
RFT		0.7		0.3	0	0.3		0.3	0.6	0.6	0.3					
RDT			0	0.9	0	0.9	0.7	0.9	1	0	2.3					
Germany												0	1.3	0.5		0
F France	0.5		1	1.1	0.8	1.1	0.5	1.1	1.3	1.1	1.1	0.8	2.2		0.9	
Portugal	2.6	1.4	0	1.4	0	3.2	1.6	17	0	0	0	0	0	0		0
Italy		0	0.3	0.3	0.4	0.4	0.4	0	0	0.4	0	0		0		
Engl. & Wales		0		1.3	0.6	0	0.9	0	0.9	0.6	0.6	0.6	0.3			0.9
Scotland			0		0	0	0	3.1	0		0	0	0			3.4
UK								0.3	0.8	0.5	0.5	0.5	0.3			1.1
Northern Ireland	0			0	0	0	0	0	0	0	0	0	0			0
Ireland		0	0	3.1	0	0	0	0	0	0	0	0	0			4.2
Sweden								0	0	0	0	0	0		1.8	0
Russian Fed.	1.7			1.5	1.4				2.1	1.4	1.8	2.5	1.3	2.1		2.1

of the foreign body is subject to a different destiny, depending on several intrinsic and extrinsic factors. Among the intrinsic factors, it is worthwhile mentioning the volume, consistency, dimensions and shape; the latter is more dangerous if globe-shaped as the smooth surface allows fast ingestion, filling the entire hollow; instead, an irregular or sharp shape could guarantee a minute passage of the air flow. The extrinsic factors include inhalation intensity and the child's position, although this factor is marginal,

as foreign bodies tend to occupy the right bronchus, on account of its larger calibre and smaller angle with respect to the trachea<sup>7</sup>.

The impact, at the level of the tracheal-bronchial tree, causes three different types of phenomena: reflex, inflammatory and mechanical.

The reflex action causes violent cough, serious dyspnoea due to glottis spasm and syncope. The inflammatory phenomena are caused by the material of the foreign body especially if it is of an organic nature.

**Table II.** E521: suffocation due to drowning and submersion in children between 1-4 years old (IX revision ICD) referring to a population of 100,000 stratified by sex and country.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Austria		4		6	8.6	5.9	4.9	3.3	1.7	5.6	6.6	3.8	1.6	4.6		1.5
Belgium			3.2	6	6		0.8				4.1	1.6	2.4			
Greece	3.1	5.4		2	1.4	2.2	0.8	0.8	3.7	1.6	2.2	1.4	0.9	0.5		0.9
Finland								2.3	2.3	2.4	3.2	3.9	1.5	3.8		1.5
NL		10.5		7.2	6.4	5.9	6.5	6.1	5.7	4.3	5	4.7	4.8			3.7
Spain	4	6.4	5.3	4.6	4.2	3.2	3.5	3.6	4	3.8	3.1	2.8		3	3.3	
RFT		6.4		6.9	4.9	3.8		4.6	4.7	3.2	5.1					
RDT			6.6	6.9	6.9	6.9	4	6.7	3.9	3.5	8.2					
Germany												3.8	3.1	3.4		3.1
M France	6		4.8	5	4	2.8	3.1	3	3.1	2.5	2.5	2.8	2		2.3	
Portugal	12.6	10	10.9	8.8	10.4	8.3	6.3	3.5	3.3	5.4	2.5	3.7	1.8	5.3		0.9
Italy		2.1	1.9	2.4	1.4	0.9	0.8	1.2	1	12.3	10	0.5		0.6		
England & Wales		1.7		1.4	1.8	2.4	1.6	1.3	1.7	1.5	1.6	1.1	1.4			0.6
Scotland			2.3		1.5	3	1.5	0.8	2.3		0.7	1.5	0			0
UK								1.2	1.8	1.3	1.5	1.1	1.2			0.7
Northern Ireland	5.8			5.5	1.8	1.8	0	0	3.6	0	1.8	0	0			5.7
Ireland		2.8	3.4	3.4	3.4	5.8	4.4	2.3	2.4	3.2	2.6	3.6	3.6	0		
Sweden								0.5	3.4	1.4	3.2	0.9	2.1		0.4	0.8
Russian Fed.	10.4		11.1	10.5				10.3	9.7	10.5	11.2	11.8	9.7		9.6	
Austria		5.4		3.4	2.8	2.8	3.4	2.9	3.5	3.5	2.9	4	4.5	1.6		2.2
Belgium			1.7	1.7	2.5		0.9				0.4	0.8	0.4			
Greece	1.1	0.7		1.1	0.4	0.4	0.4	1.7	0.4	0.9	0.5	0	0	0.5		0
Finland								1.6	0.8	0.9	1.7	3.3	0.8	0.8		0.8
NL		5.5		4	3.5	2.3	1.5	2	2.3	1.7	3.3	2.2	1.3			1.3
Spain	2	1.3	2.4	1.8	2	2	1.1	2	1.4	1	2.2	1.3		1.3	1.2	
RFT		3.4		2.7	2.2	2.1		2.2	2.9	1.9	1.9					
RDT			3.1	2	2.8	1.5	2.7	3.9	5.3	1.2	1.7					
Germany												1.9	1.8	1.5		1.1
F France	2		1.9	2.6	1.9	1.5	1.5	1.4	1.5	0.5	1.6	0.9	0.7		0.8	
Portugal	8.2	8.6	5.1	6.2	5.7	3.9	2.9	3	2.4	2	1.7	2.2	1.4	2.3		1.8
Italy		1.1	0.8	0.6	0.7	0.3	0.3	0.3	0.1	0.4	0.3	0.5		0.3		
England & Wales		0.5		0.7	0.6	0.6	0.6	0.8	0.6	0.6	0.8	0.3	0.7			0.4
Scotland			0.8		1.6	0.8	2.4	0.6	0		0	1.6	0			0
UK								0.8	0.5	0.5	0.7	0.4	0.7			0.3
Northern Ireland	0			0	0	0	1.9	0	0	0	0	0	4			0
Ireland		0.7	1.4	0.7	0	0	0	0.8	0	3.3	2.7	1.9	1.9	1.9		
Sweden								1.6	0.5	1	0.9	0	1.7		0.8	0.4
Russian Fed.	4.6			5.2	4.7				3.9	4.5	4.5	4.8	5.4	4.9		4.4

**Table III.** E521: suffocation due to drowning and submersion in children aged between 5-14 years old (IX revision ICD) referring to a population of 100,000 stratified according to sex and country.

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Austria		4		1.2	1.2	1.7	2.2	1.5	1.3	0.4	1.1	1.5	1.1	1.3		0.4
Belgium			1.3	2.7	1.2		3.2				1.3	1	0.2			
Greece	3.4	1.3		1.4	1.1	1.5	1.5	2.2	1.4	1	1.8	1.3	0.4	0.7		0.9
Finland								2.2	1.5	2.6	1.2	2.1	0.6	2.4		1.2
NL		1.4		1.2	1.1	1.8	1.6	1	0.5	0.8	1.6	1.2	0.5			0.9
Spain	3.4	2.6	2.1	2.7	2.3	2.2	2.1	2.1	1.8	1.9	1.3	1.6		1.1	0.9	
RFT		2.1		1.6	0.9		1.4		1.3	1.8	1.6	0.9				
RDT			4.8	3.2	2.9	2.8	1.4	2.7	3.7	2.9	2.1					
Germany												1.8	1.2	1.2		0.8
M France	2.3		1.7	2.5	1.2	1.4	0.9	1.2	0.9	1.2	0.8	1	0.7		0.6	
Portugal	2.8	4.9	4.3	4.7	4.5	4	3	3.1	1.8	2.2	2	2.8	0.7	0.6		1.5
Italy		1.9	1.7	1.6	1.4	1.2	1.2	1	1.1	0.9	0.7	0.9		0.7		
England & Wales		1.4		1.1	0.7	0.7	0.8	0.4	0.4	1.2	0.4	0.3	0.3			0.3
Scotland			2.9		0.8	2	3	1.5	1.2		0.6	1.2	0.9			0.9
UK								0.6	0.5	1.1	0.4	0.4	0.4			0.4
Northern Ireland	0.7			1.4	0.7	0	1.5	1.5	0	0	0	0	1.5			0
Ireland		2.3	1.4	2.8	2.8	1.9	1.9	1.4	1.1	2.1	0.9	0.9	0.9	1.8		
Sweden								1	0.8	2	0.4	0.6	1		0.9	0.5
Russian Fed.	12.7			14.5	14.1				14.4	12.3	11.8	16.2	13	12.7		2.1
Austria		0.6		0.6	0.4	0.4	0	0.2	0.5	0.5	0.7	0.5	0	0.4		0.2
Belgium			0.6	0.6	1		0.2				1	0	0.2			
Greece	0.6	0.8		0.1	0.1	0.4	0.6	0.4	0.4	0.1	0.8	0.3	0.5	0.6		0.2
Finland								0	0.3	0	0	0.6	0	0.6		0
NL		0.5		0.5	0.3	0.2	0.1	0.4	0.7	0.2	0.2	0.3	0			0
Spain	0.7	0.9	0.5	0.5	0.5	0.5	0.6	0.5	0.3	0.5	0.7	0.3		0.2	0.6	
RFT		0.9		0.8	0.4	0.7		0.2	0.3	0.5	0.5					
RDT			1.4	1.4	1	0.9	0.6	0.8	1.2	0.4	0.2					
Germany												0.6	0.4	0.5		0.4
F France	0.7		0.6	0.8	0.3	0.6	0.4	0.4	0.4	0.4	0.2	0.4	0.3		0.2	
Portugal	1.7	1.1	1.5	1.9	0.4	2.1	0.5	0.6	0.5	0.4	0.6	0.6	0.9	0.2		1.3
Italy		0.4	0.3	0.3	0.4	0.4	0.2	0.2	0.6	0.2	0.2	0.1		0.2		
England & Wales		0.3		0.1	0.2	0.2	1	0.1	0.1	0.2	0.1	0.1	0.1			0.1
Scotland			0.5		0.9	0.3	0.3	0	0		0	0	0			0
UK								0.1	0.1	0.2	0.1	0.1	0.1			0.1
Northern Ireland	0.7			0	0	0	0	0	0	0	0	0	0.8			0.8
Ireland		0.9	0.9	0.6	0	0	0	0	0	0.3	0.9	0.3	0.3	0.9		
Sweden								0	0.4	2.2	0	0	0.2		0.2	0.5
Russian Fed.	4.6			5	4.3				4.9	4.3	3.1	5.2	4.1	4.4		5.2

Peanuts, in particular, at the moment of their break-up, release cyto-damaging arachidonic acid. The mechanical phenomena are conditioned by the complete or partial obstruction of the respiratory hollow. Taking into account the significance of the problem and with the aim to provide a starting point for future surveys, the present study offers a description, from European countries, of the mortality data for suffocation and the characterization of the trend of this phenomenon for the children under 15 years of age.

### Materials and methods

The present data come from the official annual records of the World Health Organization (WHO)<sup>8</sup>. The database contains the number of deaths classified according to country, year, sex, age group and cause of death; deaths are registered in national vital registration systems, with underlying cause of death as coded by the relevant national authority. The data are included only for countries reporting data cor-

**Table IV.** (1999-2000) number of hospitalizations and mortality rate (referring to 100,000 persons), for children aged between 0-14 years, stratified according to sex and region.

Region	M		F	
	1999	2000	1999	2000
Piedmont	8 (3.05)	7 (2.65)	6 (2.42)	3 (1.20)
Valle D'Aosta		0 (0)		0 (0)
Lombardy	38 (6.3)	36 (0.59)	28 (4.92)	48 (8.36)
A.P. Bolzano	1 (2.48)	4 (9.88)	2 (5.27)	3 (7.82)
A.P. Trento	1 (2.82)	2 (5.57)	2 (5.95)	0 (0)
Veneto	27 (8.84)	44 (14.27)	31 (10.72)	48 (16.45)
Friuli V.G.	4 (5.94)	1 (1.47)	3 (4.66)	2 (3.09)
Liguria	7 (8.07)	8 (9.20)	1 (1.22)	8 (9.78)
Emilia Romagna	28 (12.37)	20 (8.67)	9 (4.22)	15 (6.90)
Tuscany	10 (4.79)	12 (5.72)	8 (4.04)	10 (5.03)
Umbria	3 (5.71)	6 (11.36)	5 (10.1)	4 (8.08)
Marche	4 (4.13)	10 (10.29)	5 (5.47)	2 (2.18)
Latium	24 (6.26)	30 (7.82)	21 (5.78)	19 (5.23)
Abruzzo	8 (8.36)	5 (5.28)	7 (7.73)	12 (13.39)
Molise	0 (0)	0 (0)	0 (0)	2 (0.86)
Campania	32 (5.51)	40 (6.99)	45 (8.15)	30 (5.52)
Puglia	55 (14.91)	42 (11.57)	45 (12.95)	41 (11.99)
Basilicata	5 (9.57)	1 (1.96)	1 (2.04)	5 (10.51)
Calabria	13 (6.9)	16 (8.71)	12 (6.72)	11 (6.30)
Sicily	5 (10.67)	28 (5.90)	47 (10.35)	38 (8.42)
Sardinia	5 (3.93)	7 (5.65)	3 (2.52)	8 (6.89)

ICD933: foreign body in pharynx or larynx.

rectly coded according to the International Classification of Diseases (ICD).

Standardized mortality rates (SMR) have been calculated referring to a population of 100,000 persons, and using data of WHO that are classified according to sex and age group. Data on the population in the corresponding age groups also come from WHO. The formula used for computing SMRs is (1)

$$(1) \quad T_i = d_i/n_i * k$$

$d_i$  = Number of deaths according to cause in the  $i$ -th age group

$n_i$  = Number of persons in the  $i$ -th age group

$K$  = Multiplicative constant (100,000)

Availability of data allows a study of the evolution of the phenomenon, over a time period of about 15 years, ranging from 1980 to 1995.

The official mortality coding conforms with the International Classification of Diseases (ICD), which provides a code sequence related to the cause of death. The ICD is periodically updated and until now there have been 10 revisions (the X revision covers from 1999 to the present day). Data illustrated in this report come from the IX revision, which covers the

time period from 1979 to 1998. As suffocation, in European Countries, we considered drowning and submersion, that corresponds to code E521.

Moreover, to investigate the phenomena of non-fatal hospitalization, only for Italy, official data related to number of hospitalizations and deaths have been collected from hospitalization discharge sheets for the years 1999 and 2000, as well as from annual reports provided by ISTAT (National Institute of Statistics). The referral code considered is ICD933: foreign body in the pharynx and larynx.

This additional analysis is useful to evaluate the distribution of the phenomenon in the Italian territory and to illustrate the regional variability of hospitalization risk and the relationship with mortality. SMRs are calculated proportionately to 100,000 persons. The presence of a cyclic trend, during the years observed, has been evaluated with the Nam Test<sup>9</sup>.

The total potential years of life lost (TPYLL), the number of years of life lost when a person dies before an established cut off point (usually 65 years) was calculated:

$$(2) \quad TPYLL = K * \sum (L - m_i) * d_i * \sum n_i$$

where:

$L$  = upper limit fixed at 65 years

**Table Va.** TPYLL in Europe in the years 1980-1987, classified according to country.

Country	1980	1981	1982	1983	1984	1985	1986	1987
Austria		424.50		386.40	548.90	384.90	327.15	220.50
Belgium			316.35	511.15	496.90		80.40	
Greece	226.05	349.85		138.30	97.95	151.75	64.25	187.90
Finland								164.65
NL		669.55		461.40	410.45	385.85	421.45	390.75
Spain	334.30	522.20	448.70	391.15	362.35	272.90	264.70	303.45
RFT		439.45		491.95	314.80	237.50	13.30	287.50
RDT			510.10	461.65	517.30	568.35	263.30	502.90
Germany								
M France	474.85		394.15	420.75	313.40	220.80	267.30	231.40
Portugal	1132.60	840.55	722.10	594.65	692.75	556.75	422.25	248.20
Italy		149.30	154.40	165.20	120.30	67.65	80.90	84.50
England & Wales		217.05		97.95	197.15	195.65	107.60	143.55
Scotland			171.30		101.35	206.50	122.25	64.25
UK								132.70
Northern Ireland	369.15			357.05	119.15	112.50	14.25	14.25
Ireland		196.85	225.80	239.10	239.10	380.55	293.05	157.05
Sweden								40.75
Russian Federation	881.15			994.00	952.70			
Austria		343.20		218.20	178.80	334.80	212.50	183.15
Belgium			111.95	111.95	165.75		175.15	
Greece	74.45	148.85		69.70	25.95	262.80	30.70	110.05
Finland								100.00
NL		348.50		254.75	221.60	145.65	94.70	128.80
Spain	229.15	89.80	154.75	117.25	214.25	162.25	106.95	194.75
RFT		266.55		195.85	141.30	157.40		158.90
RDT			207.05	196.80	184.50	160.80	219.95	309.85
Germany								
F France	164.15		189.45	241.60	173.60	170.95	130.05	162.80
Portugal	697.65	638.95	333.00	496.55	360.05	471.70	290.00	1298.20
Italy		72.55	72.35	59.85	73.55	48.55	46.65	20.65
England & Wales		34.10		129.20	78.40	39.40	105.50	50.95
Scotland			54.75		108.55	52.85	152.85	239.00
UK								70.45
Northern Ireland	6.65						118.75	
Ireland		52.30	96.05	250.95				50.00
Sweden								100.00
Russian Federation	441.70			470.00	425.60			

$m_i$  = central value of the  $i$ -th age group

$d_i$  = the number of deaths for each cause in the  $i$ -th age group

$K$  = the multiplicative constant (100,000)

$n_i$  = the number of persons of the  $i$ -th age group

With regard to the Italian situation, beside the mortality rates, the number of hospitalizations for the years 1999 and 2000 were collected in order to investigate also the phenomena of the non fatal suffocation injury. These data, codified as ICD933 (foreign body in the pharynx and larynx), came from the discharge cards and from the annual reports of the Italian Insti-

tute of Statistics (ISTAT). The analysis of the non-fatal cases is useful to evaluate the distribution of the phenomenon in Italy and to depict the regional variability of hospitalizations and mortality rates. SMRs were calculated for 100,000 persons and the presence of cyclic trends were evaluated with the Nam Test <sup>9</sup>.

## Results

The mean suffocation mortality rate in Europe exceeds nearly one death every 100,000 persons. The standard-

**Table Vb.** TPYLL in Europe in the years 1988-1995 stratified by country.

Country	1988	1989	1990	1991	1992	1993	1994	1995
Austria	118.60	353.80	565.95	388.25	110.45	299.85		97.55
Belgium			268.60	207.00	151.90			
Greece	361.55	109.50	154.60	99.85	60.05	37.90		64.80
Finland	158.00	174.70	211.40	263.70	287.95	260.30		105.15
NL	361.00	276.35	327.70	305.15	434.75			376.30
Spain	384.10	288.05	238.60	190.20		230.45	279.80	
RFT	325.60	256.10	353.45	8.55				
RDT	278.90	246.30	532.45					
Germany				300.10	218.15	353.90		233.85
M France	254.30	252.15	215.85	269.00	196.65		168.95	
Portugal	223.35	358.40	175.25	257.85	119.15	336.95		70.50
Italy	92.45	777.30	651.15	59.30		83.15		
England & Wales	129.55	163.65	123.30	182.10	142.35			137.85
Scotland	155.15		49.45	293.65	8.55			8.55
UK	130.25	156.70	110.55	183.05	124.30			132.05
Northern Ireland	225.00	481.00	112.50		14.25			356.25
Ireland	160.45	219.95	171.05	233.55	233.55	17.10		
Sweden	330.60	217.00	203.80	61.95	140.75		33.55	54.75
Russian Federation	936.55	892.10	937.35	1035.90	1010.50	921.90		775.95
Austria	223.50	223.50	187.90	254.75	281.25	246.80		288.90
Belgium			145.00	50.00	26.90			
Greece	28.80	57.20	38.85	2.85	4.75	36.95		1.90
Finland	52.85	56.25	106.25	413.45	50.00	55.70		258.00
NL	150.40	108.15	208.15	140.35	81.25			81.25
Spain	90.35	132.25	241.65	149.10		115.65	80.70	
RFT	223.10	162.50	143.00					
RDT	407.65	78.80	257.65					
Germany				124.45	200.80	131.00		72.55
F France	182.05	106.55	173.40	112.05	189.60		110.40	
Portugal	154.75	128.80	111.95	143.20	96.05	145.65		124.85
Italy	11.95	52.90	20.65	32.20		20.65		
England & Wales	96.95	78.40	89.95	58.70	64.20			84.45
Scotland				100.00				221.00
UK	84.20	65.65	77.20	58.45	64.20			91.20
Northern Ireland					257.60			7.60
Ireland		209.10	177.30	121.60	121.60	127.30		273.00
Sweden	35.05	83.40	56.25		108.15		168.90	29.75
Russian Federation	426.80	413.10	427.70	511.90	460.95	484.55		460.90

ized mortality rates, for males, is 0.06 in the 0 years age group, 3.9 in the 1-4 age group and 2.04 in the 5-14 age group; for females, the rate is 0.13 in the 0 years age group, 1.68 in the 1-4 age group and then decreases to 0.60 in the 5-14 age group (Tables I-III). Mortality rates are higher for males compared with those for females, with the higher number of deaths being observed in the 1-4 years age group (Table II). No countries have shown a statistically significant cyclic trend over the years for deaths, in the time period considered.

In Italy, in the years 1999-2000, the ratio between the number of hospitalizations and the mortality rates due to foreign bodies in the larynx and pharynx was approximately one death every 10 hospitalizations (x 100,000) (Table IV). The higher mortality rates and number of hospitalizations are located in the Puglia region.

Computation of the TPYLL (Table V) clearly indicates the effects of deaths in young age, as it gives, in this case, a synthetic measure of all the mortality rates between 0-14 years. A higher TPYLL can be



found in the Russian federation, with a larger number of deaths in the youngest males: mean 933,81 (x100,000) years of life lost every year (approximately 0.93%).

## Discussion

Studies on mortality data present several difficulties, from the methodological point of view, in particular the little disaggregated data available at the fourth decimal digit ICDX (XXX.X), which identifies specifically the cause of death; furthermore, the years considered are those available in the official WHO database, characterized by a rather long latency time of pre-publication of the data<sup>9</sup>.

From the official data, it emerges that the children with the higher hospitalization rates due to suffocation are those between 1-4 years old, with a prevalence of males. This evidence could be explained in terms of a more pronounced explorative behaviour in the surrounding world, in this age group with respect

to newborns and the natural tendency to put items in the mouth, with respect to the older children.

There are no geographical areas particularly stricken by these accidents; drowning and submersion injuries appear to be randomly distributed throughout Europe. Clearly, these data contain too little information to provide a deep insight into the factors influencing the risk of suffocation. Additional studies are needed to assess, at epidemiological level, the impact of socio-cultural variables, as well as behavioural aspects, as in the case of foreign body injuries, the greater or less attention paid by those who involved with children or the type of toys and food used.

In general, aspiration and ingestion of foreign bodies are common events, which can be prevented in paediatric age. Prevention should be based on clear epidemiologic evidence of the behaviour and factors increasing the probability of suffocation<sup>10</sup>. Focusing attention on the lack of such evidence, by performing large scale studies, should be one of the priorities of future research in the field of suffocation injuries.

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■ Received: January 10, 2006  
Accepted: February 23, 2006

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