

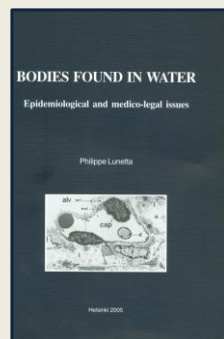
STANDARD WHO DATA ON DROWNING
A CAUTIONARY NOTE CONCERNING
UNDETERMINED DROWNING

WCDP 2011, Danang (Vietnam)

10.-13.5.2011

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***University of Helsinki &
National Institute for Health and Welfare Finland***



**University of Helsinki
Department of Forensic
Medicine**

**National Institute for
Health & Welfare
Injury Prevention Unit**



DROWNING - FINLAND

Data sources on drowning deaths

- 1. Statistics Finland database**
- 2. SUH-database**

DROWNING - FINLAND

Statistics Finland



based on certificate of cause-of-death



medico-legal examiner after full autopsy



**drowning coded by external cause of death
and nature of injury codes**

DROWNING - FINLAND

SUH



Based on commercial news clipping service

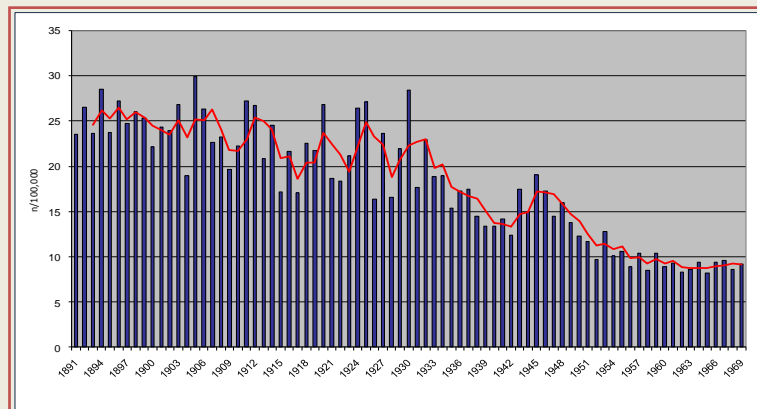


Data processed and tabulated before police
and post-mortem investigations

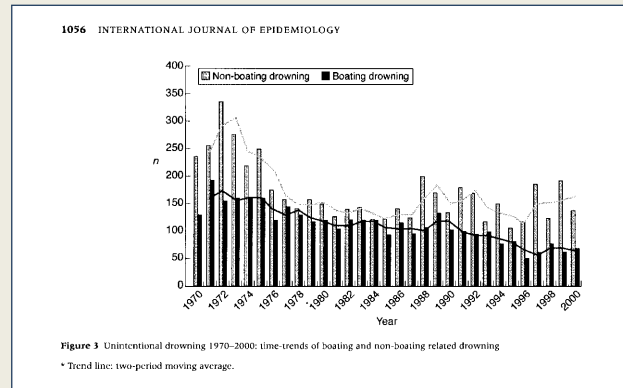


Unreliable, high rates of
false positive/negative cases

DROWNING - FINLAND



DROWNING - FINLAND



Lunetta P et al. International Journal of Epidemiology 2004; 33: 1058-1063

UNDETERMINED DROWNING

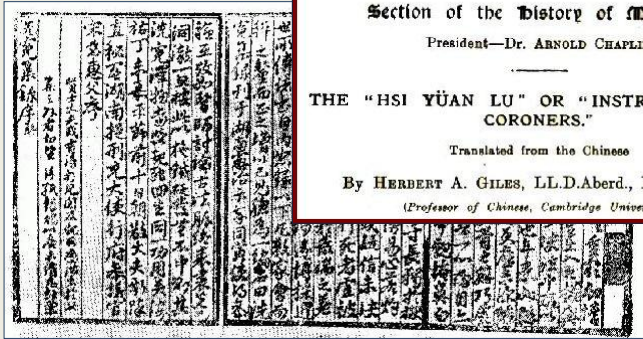
1. Inherent difficulties in establishing the manner (=intent) of death in drowning
2. WHO data on undetermined drowning
3. Reasons for different proportion of undetermined drowning across countries

**BODIES FOUND IN WATER
MANNER=INTENT OF DEATH**



The diagnosis of drowning and its manner is one of the most difficult in forensic medicine.....

**Hsi Yüan Lu (China)
ca. 1247 A.D.**



中國傳統法醫學的奠基者
—宋 慈
Section of the History of Medicine.
President—Dr. ARNOLD CHAPLIN.
THE "HSI YÜAN LU" OR "INSTRUCTIONS TO CORONERS."
Translated from the Chinese
By HERBERT A. GILES, LL.D.Aberd., D.Litt.Oxon.
(Professor of Chinese, Cambridge University.)

BODIES FOUND IN WATER
CAUSE OF DEATH



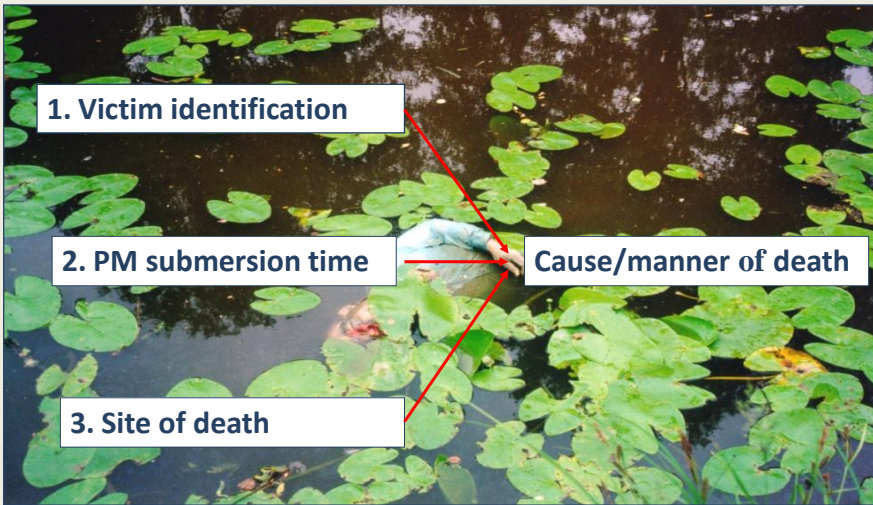
BODIES FOUND IN WATER
MANNER OF DEATH

- 1. Unintentional**
- 2. Suicide**
- 3. Homicide**



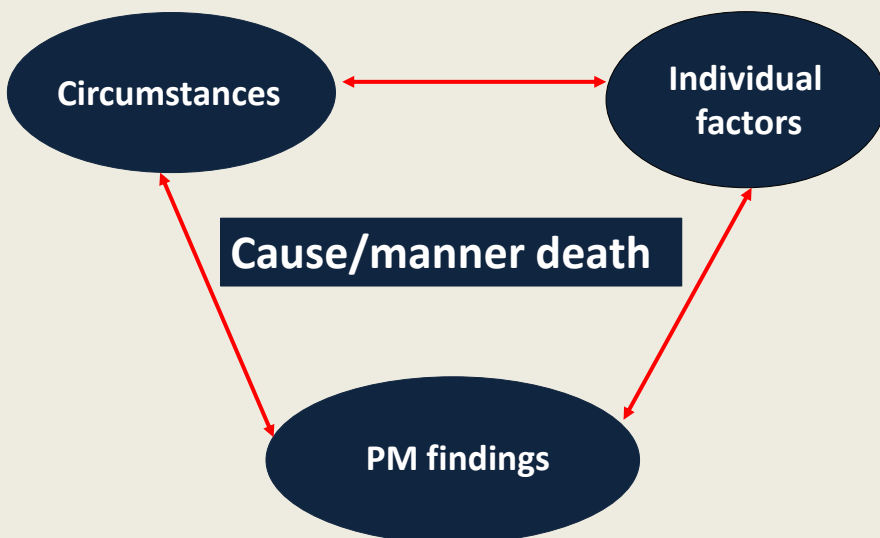
BODIES FOUND IN WATER

CAUSE AND MANNER OF DEATH



BODIES FOUND IN WATER

CAUSE AND MANNER OF DEATH



1. CIRCUMSTANCES

MANNER=INTENT OF DEATH

- Witnessed cases
- Suicide notes

EYE-WITNESSED DEATHS IN WATER

TABLE 1. Frequency of eye-witnessed deaths in water, by site and manner of death

Site	Accident		Suicide		Undetermined		Homicide		Natural		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Seawater		37.3%		12.4%		5.3%		30.8%		30.8%		25.3%
Fresh water												
Lakes	51/132	38.6	1/43	2.3	2/18	11.1	0/1	-	1/4	25.0	55/198	27.8
Rivers	34/69	49.3	19/70	27.1	2/34	5.9	1/3	33.3	0/2	-	56/178	31.5
Bath tub	0/35	-	0/62	-	1/15	6.7	0/0	-	0/2	-	1/114	0.9
Ditch	3/32	9.4	0/8	-	0/11	-	0/1	-	0/8	-	3/60	5.0
Pond	21/36	58.3	1/10	10.0	0/4	-	0/0	-	0/1	-	22/51	43.1
Swimming pool	11/38	28.9	0/6	-	1/10	10.0	0/0	-	0/1	-	12/55	21.8
Other	12/47	25.5	0/17	-	1/12	8.3	3/7	42.9	0/3	-	16/86	18.6
Unknown	1/4	25.0	0/1	-	0/1	-	0/0	-	0/0	-	1/6	16.7
All	333/893	37.3	47/379	12.4	14/263	5.3	4/13	30.8	5/42	11.9	403/1590	25.3

The typology of witnesses was recorded for the period 1987 to 1998 (n = 311). There was a single adult witness in 57.1% of the cases, whereas in 42.1% more than one witness saw the terminal events. In 1.6% of cases the witness was a child. In 50.3% the sole witness was an acquaintance, in 37.6% an occasional bystander, and in 12.1% a close relative.

TABLE 1. Frequency of eye-witnessed deaths in water, by site and manner of death

From: Lunetta P et al. Circumstances and Macropathologic Findings in 1590 Consecutive Cases of Bodies Found in Water. American Journal of Forensic Medicine & Pathology, 2002

SUICIDE NOTES

Males (n=199)	Females (n=180)	Both sexes (n=379)
17.6%	26.7%	21.9%

TABLE 2. *Suicide drowning: percentage of suicide notes by sex and age*

Age (years)	Males (n = 199)		Females (n = 180)		All (n = 379)	
	n	%	n	%	n	%
15-24	3/19	15.8	0/4	-	3/23	13.0
25-44	11/87	12.6	10/54	18.5	21/141	14.9
45-64	12/55	21.8	33/107	30.8	45/162	27.8
>65	9/38	23.7	5/15	33.3	14/53	26.4
All	35/199	17.6	48/180	26.7	83/379	21.9

TABLE 2. Suicide by drowning: percentage of suicide notes by sex and age

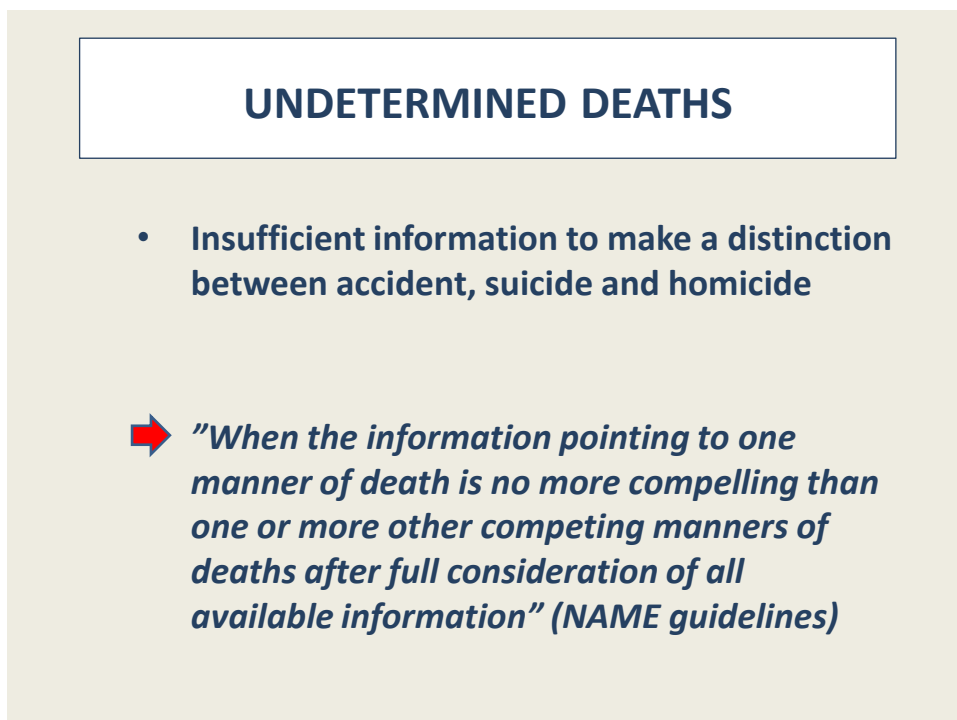
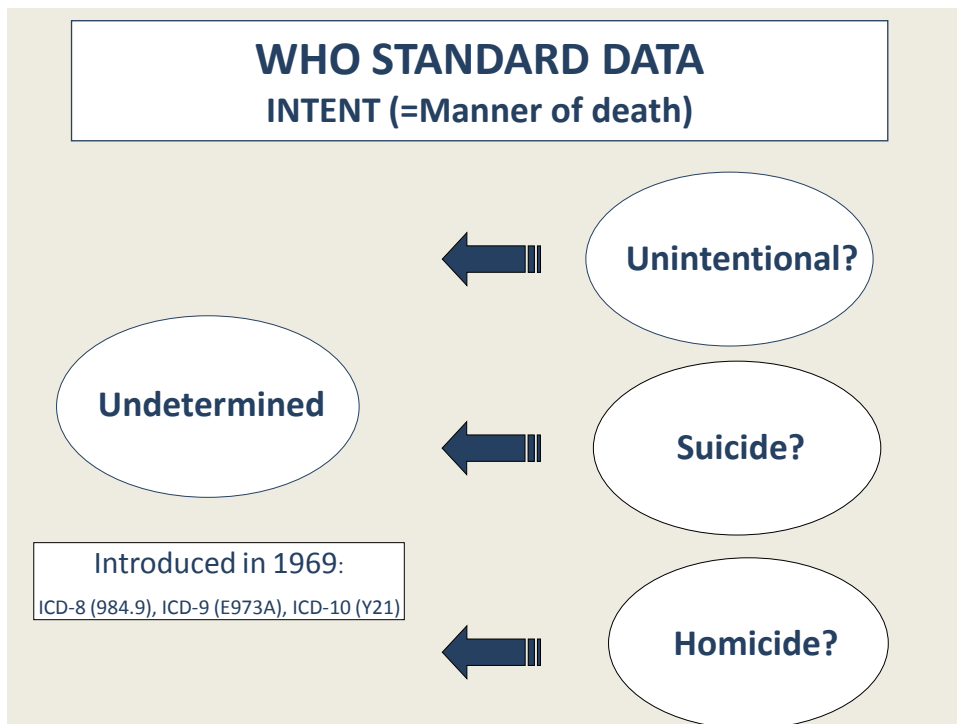
From: Lunetta P, et al. *Circumstances and Macropathologic Findings in 1590 Consecutive Cases of Bodies Found in Water. American Journal of Forensic Medicine & Pathology, 2002*

2

2. INDIVIDUAL FACTORS

MANNER=INTENT OF DEATH

- Medical conditions
- Risk factors for suicide
- Alcohol use



ICD-10, WHO STANDARD DATA ON DROWNING

1. External Cause of Death codes

- ➔ Unintentional drowning
 - ➔ Boating-related drowning (V90, V92)
 - ➔ Non-boating drowning (W65-W74)
- Suicidal drowning (X71)
- Homicide by drowning (Y90)
- ➔ Undetermined drowning (Y21)

2. Nature of Injury codes (T75.1)

Hidden drowning (land traffic, natural catastrophe)

WHO MORTALITY DATA-BASE (MDB)

- Source of data: WHO Mortality DataBase (MDB), detailed data files in ASCII format
- Origin of data: deaths coded and sent to the WHO by the National Statistical Offices or other relevant national authorities

WHO MORTALITY DATA-BASE (MDB)

- 193 WHO member countries
- 100 (51.8%) countries: ICD-10
- 100 (51.8%) countries: V90,V92,W65-74,Y21
- 72 countries: > 20 unintentional drowning

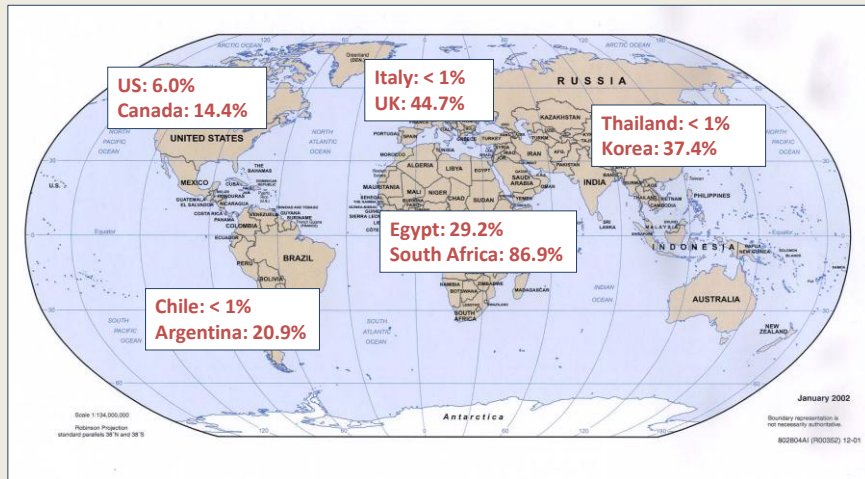
WHO STANDARD DATA FOR DROWNING

% undetermined vs. unintentional+undetermined drowning

29 countries	< 5%
17 countries	5-10%
15 countries	10-24%
8 countries	25-50%
3 countries	> 50%

WHO STANDARD DATA FOR DROWNING

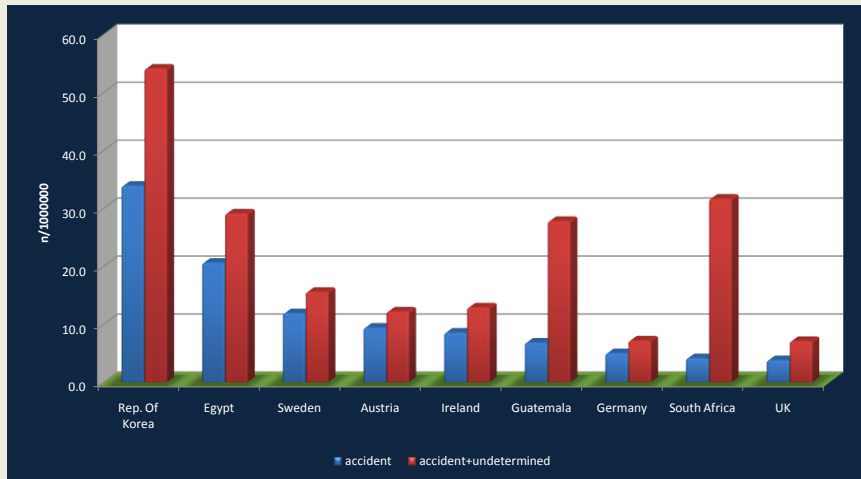
% undetermined vs. unintentional + undetermined drowning



COUNTRIES WITH HIGH % OF UNDETERMINED DROWNING

DOMINICAN REPUBLIC	87.5%
SOUTH AFRICA	86.9%
GUATEMALA	75.4%
UK	44.7%
REPUBLIC OF KOREA	37.4%
IRELAND	29.8%
EGYPT	29.2%
GERMANY	26.7%
AUSTRIA	25.5%
SWEDEN	25.2%

COUNTRIES WITH HIGH % OF UNDETERMINED DROWNING



COUNTRIES WITH LOW % OF UNDETERMINED DROWNING

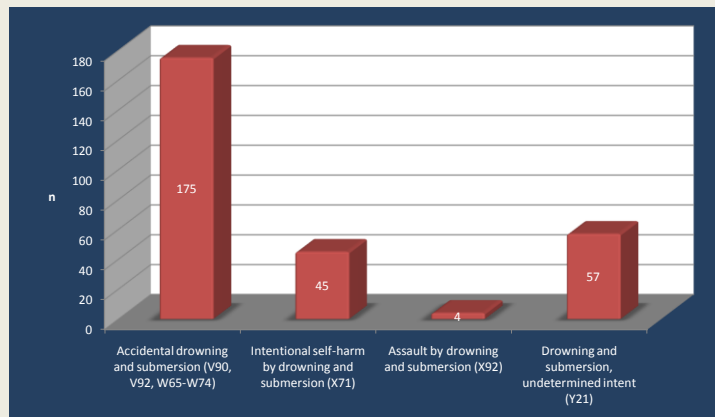
CROATIA	2.1%
PHILIPPINES	2.0%
FRANCE	1.6%
SPAIN	1.6%
BULGARIA	1.1%
UZBEKISTAN	0.9%
NICARAGUA	0.5%
LATVIA	0.4%
ROMANIA	0.2%
THAILAND	0.1%

15 countries have no undetermined drowning (Guadeloupe, Cyprus, Bahamas, Suriname, Puerto Rico, Trinidad and Tobago, Israel, Mauritius, Norway, Azerbaijan, Estonia, El Salvador, Italy, Chile, Ecuador)

NATIONAL STATISTIC DATA FOR DROWNING

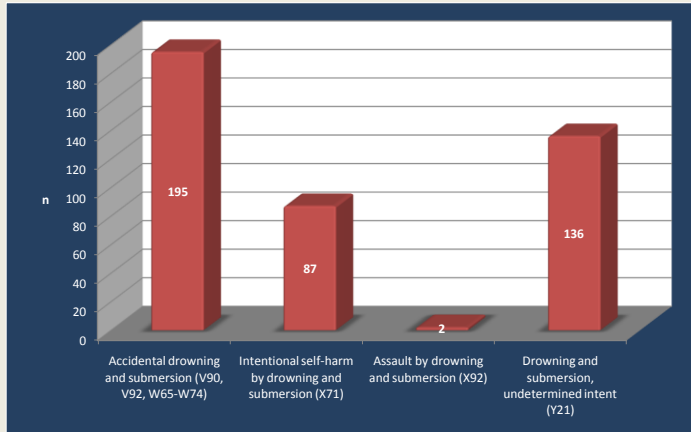
AUSTRALIA	Australian Bureau of Statistics
CANADA	Statistics Canada
FINLAND	Statistics Finland
FRANCE	INSERM
GERMANY	Federal Statistical Office
SWEDEN	National Board of Health & Welfare
UK	Office for National Statistics
US	NCIPC - WISQARS

AUSTRALIA, 2008



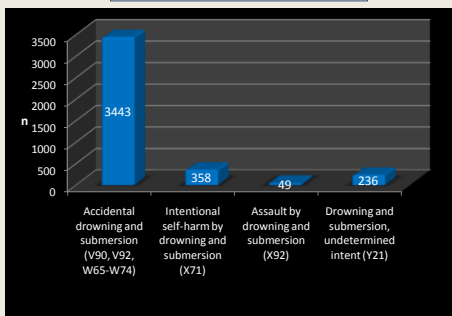
Source: ABS, 2010

UNITED KINGDOM, 2005

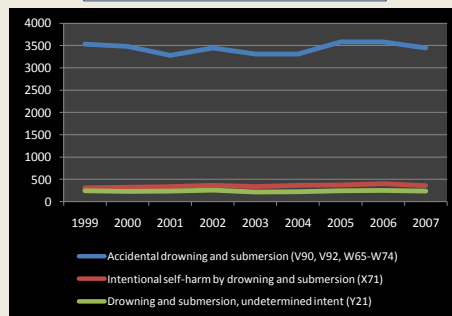


Source: ONS, 2009

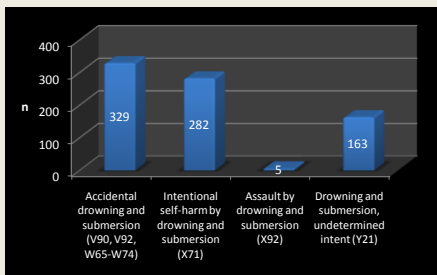
US (2007)



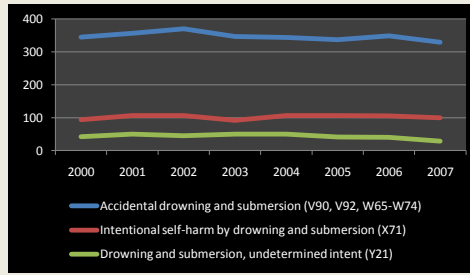
US, time-trend

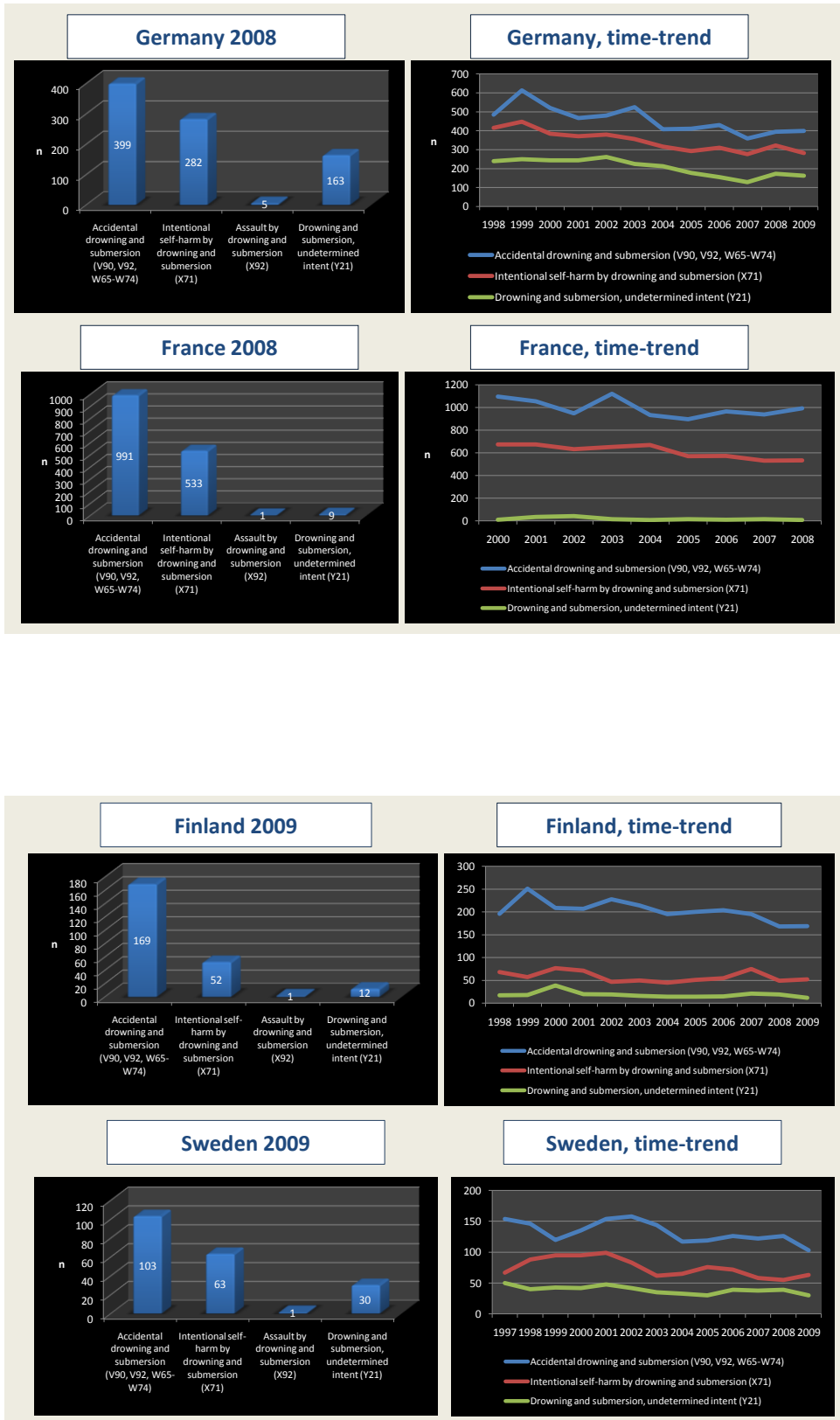


Canada (2007)



Canada, time-trend





UNDETERMINED DROWNING - FINLAND

COMPLIANCE BETWEEN CERTIFICATE OF DEATH AND INVESTIGATOR'S SUGGESTIONS BEFORE FULL INVESTIGATIONS

		Investigator's suggestion before investigations*			
		Accident	Suicide	Homicide	Undetermined.
Certificate of death	Accident =965	601	18	19	350
	Suicide=408	25	306	3	87
	Homicide=13	1	0	30	1
	Undetermined=276	117	73	24	108
	Natural=45	13	1	0	30

*Investigators have suggested two or more options in 74 cases

From: Lunetta P et al. Undetermined drowning. *Medicine Science & Law*, 2003

UNDETERMINED DROWNING - FINLAND

VARIATION BETWEEN FORENSIC PATHOLOGISTS' EVALUATION IN UNDETERMINED DROWNING (N=276)

	Bodies in water investigated	% undetermined	range
4 medical examiners	> 200	14.5%	11.9-17.2
13 medical examiners	20-200	17.9%	7.7.-33.9
11 medical examiner	< 20	22.8%	-

➔ Confidence in making decisions

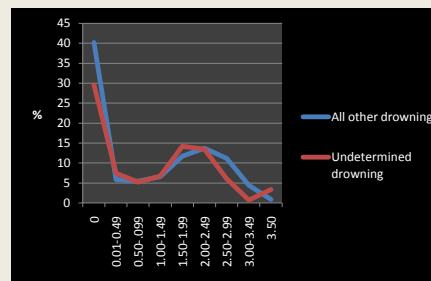
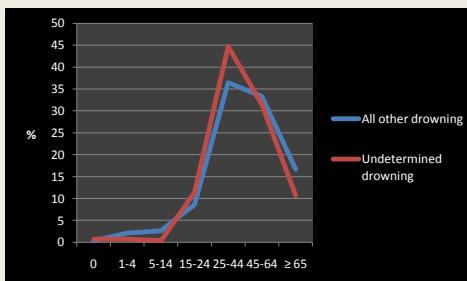
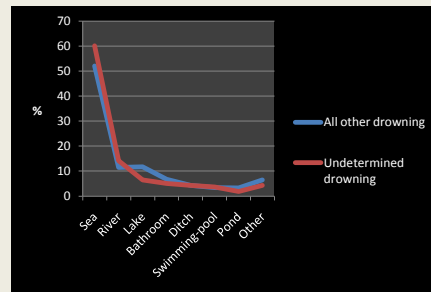
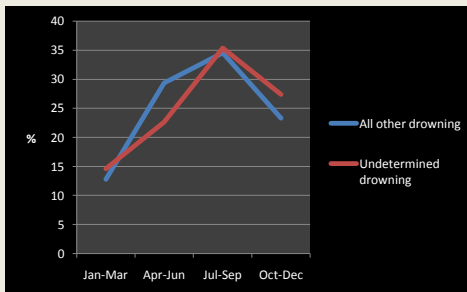
UNDETERMINED DROWNING - FINLAND

FREQUENCY OF RISK FACTORS FOR SUICIDE, OF BODIES FOUND IN WATER, BY MANNER OF DEATH

	Suicide N=408	Unintentional N=860	Homicide N=13	Natural N=45	Undetermined N=276
Suicide attempts	28.7%	0.7%	-	-	4.7%
Suicide threats	39.5%	0.8%	-	6.7%	10.9%
Mental Disorders	60.8%	2.6%	-	11.1%	19.6%
Substance abuse	14.5%	9.8%	7.7%	11.1%	14.1%

From: Lunetta P et al. Undetermined drowning. *Medicine Science & Law*, 2003

UNDETERMINED DROWNING – FINLAND



REASONS FOR DIFFERENCES

1. DIFFICULTIES TO ASSESS INTENT OF DROWNING

2. SOURCES OF BIASIS

- Investigation
- Certification
- Codification

2. SOURCES OF BIASIS INVESTIGATIONS

- REPORT TO LEGAL AUTHORITIES - INVESTIGATIONS
 - Laws
 - Attending physician/other professionals
- RATE AND QUALITY OF INVESTIGATIONS
 - Police investigation
 - Collection of AM data
 - External examination
 - Medico-legal autopsy
- FEED-BACK TO STATISTICAL OFFICES

2. SOURCES OF BIASIS CERTIFIERS

- 1. CORONERS**
intent proved beyond any reasonable doubt

- 2. MEDICAL EXAMINERS**
intent based on the balance of probability

- 3. MEDICAL PRACTITIONERS/OTHERS**
intent based on preliminary information

2. SOURCES OF BIASIS CERTIFIERS

- **PERSONAL CHARACTERISTIC OF CERTIFIERS**
 - Subjective judgement , experience

- **OTHER REASONS**
 - Cultural and religious stigma
 - Legal or insurance issues faced by the relatives

DISCUSSION

1. Countries with high % of undetermined drowning

- High legal proof of intent required
- Low quality in mortality statistics



*Underestimation
accidental/suicidal/homicidal drowning*

DISCUSSION

2. Countries with medium % of undetermined drowning

- High quality in investigation and mortality statistics



Low underestimation, proportional distribution

DISCUSSION

3. Countries with low % of undetermined drowning

- Decisions taken without in-depth investigations



High possibility of misdiagnosis

CONCLUSIONS

SHOULD WE REDUCE UNDETERMINED DROWNING?

Double-edge sword:

- Better estimate of drowning by intent
 - Decrease in countries with low quality and rate of investigations → misclassification
- Decrease must be associated to improved investigations and certification

CONCLUSIONS

WHAT CAN WE DO?

- Post-mortem investigations (police, medico-legal, psychological autopsies)
- Medical and non medical data collection
- Physician and certifier training
- Standardise death certificate
- Feed-back on investigation results to statistical offices
- Update national databases after investigation

CONCLUSIONS

FUTURE STUDIES

1. Effects of undetermined drowning category on cross-countries comparisons of drowning rates by intent
2. Effects of undetermined drowning category on
 - Epidemiological profiles
 - Time-trends

RECOMMENDATIONS

- **BODY FOUND IN WATER ≠ UNINTENTIONAL DROWNING**
- **MAKE A BETTER USE OF EXISTING DATA BASE AND SOURCE OF DATA ON DROWNING**
- **IDENTIFY AND ADDRESS THE MULTIPLE SOURCE OF BIAS IN DROWNING CLASSIFICATION AND CODIFICATION**
- **CALCULATE GLOBAL BURDEN OF DROWNING... BUT WITHOUT FORGETTING THE ANALYSIS OF DROWNING BY INTENT**

THANK YOU FOR LISTENING...

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