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health by **numbers**

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Paulo Jorge **Nogueira** *e d i t o r i a l*

A new beginning

More than 18 years ago, when I started working at the Portuguese National health institute with Dr. Marinho Falcão who was starting the new center for epidemiology and statistics, one of my first tasks was to do some work on the proportion of vaccinated individuals acquiring disease and if this work was to be succeeded we would publish it in the Directorate General of Health Journal: ***"Saúde em Números"***. This was the first time that I heard of this Journal.

Recently when I was appointed Department Director at Directorate General of Health I was wondering if we could bring back that Journal spirit. It is paramount to keep discussing health information, health knowledge, health statistics and epidemiology and to publish what we do and achieve in these matters.

In this first number we have four original papers that directly or indirectly address very important public health subjects: Suicide, hospital acquired infections, heat wave's impacts on mortality and epidemiological surveillance of mass gathering events (with the example of an international summer festival). This wide thematic range demonstrates how interesting this journal is and how enormous is its potential and the challenges that we face. I would be very happy to receive manuscripts from you to include in the next issues, please surprise me!

Here it is…
A new beginning

Paulo Jorge **Nogueira, Editor-in-chief**

Francisco George

e d i t o r i a l

The spirit of the Journal that is (re)launched today.

The present issue of the Journal ***"Health by Numbers"*** [Saúde em Números], can be said to represent Series II of the edition the Portuguese Ministry of Health´s Directorate-General of Health (DGS) formerly published until April 2000, under the direction of Amélia Leitão and Marinho Falcão.

It is known that the production of knowledge is the essence for the New Public Health. After all this is the Age of Knowledge.

Based on the principles of responsibility and transparency and in a perspective of accountability, management and dissemination of knowledge forcibly assume a strategic dimension in the context of the mission and values of the DGS.

Health by Numbers Portugal seeks to achieve these goals.

Though the main focus will be on the dissemination of data produced by the Directorate-General of Health, (from inside to outside), the Journal seeks to be a publishing space open to all those involved in research and who produce health knowledge in general, knowledge on health in Portugal and on Portuguese citizens.

The Editorial Board will be independent, without interference from either hierarchy or any other entity. It is responsible for defining criteria and ensuring scientific quality of the articles that may or may not be submitted to peer review.

In addition to its fixed periodicity, the Journal may also publish **Supplements** on proposal of the Scientific Board.

Eight Priority Programmes have been at present added to the classic programmes conducted by DGS, highlighting the National Immunization Programme, Child Health for their unquestionable successes and achieved gains, as well all the others. They are: Diabetes, HIV/AIDS, Tobacco Prevention and Control, Promotion of Health Nutrition, Mental Health, Oncologic Diseases, Respiratory Diseases and Heart Disease and Stroke.

These Programmes have a necessarily agile governance model to allow synergies both at central and regional levels.

Knowledge production through information analysis (considered as data synthesis) facilitates dissemination, sharing and management. This is the spirit of the Journal that is (re)launched today.

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English version A

Epidemiologic Surveillance System at a Summer Festival in 2010

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Summary: Mass gatherings are events attended by a number of people sufficient to strain the planning and response resources of the location where they are held, providing a setting for increased health risks, particularly the transmission of communicable diseases. BOOM Festival is a psychedelic "Goa-trance" music Festival with around 30 000 participants, lasting for nine days and taking place every two years, near Idanha-a-Nova, Portugal. In 2010 a syndromic surveillance system was set up to provide early detection of disease, threats or syndromes requiring immediate control measures by Health Authorities. The surveillance system collected data using several sources and applying a questionnaire to all participants who attended a health care service ("Field Hospital" at the festival venue, Primary Health Care Center or Hospital). A report was sent daily to Directorate General of Health (DGS); DGS sent aggregated information to European Centre for Disease Control and Prevention (ECDC) on a regular basis. In total, the surveillance system reported 2287 episodes of illness. The majority (61.8%) were observed due to traumatic complaints (small cuts and bruises, insect bites, etc.). There were also 126 (5.5%) episodes of gastrointestinal symptoms and 111 (4.8%) of respiratory symptoms reported. Nevertheless, the most important event detected was a measles case, which was reported to ECDC through Early Warning and Response System (EWRS) and to World Health Organizaton (WHO). The surveillance system fulfilled its role in detecting cases with Public Health importance. It was recommended to maintain a specific epidemiological surveillance system in further editions of BOOM, and eventually adapt it to other similar events.

Keywords: Epidemiologic surveillance, syndromic surveillance, mass events, communicable disease, outbreak.

1

Introduction

Mass gatherings can be defined as gathering of "more than a certain number of people (more than 1000, though most available articles related to events with more than 25000 people) in a particular place with a specific purpose (social function, large public or sports event such as the Olympic games), for a defined period of time"[(1)]. This definition can also be applied if the number of attendants justifies the mobilization of all available resources at the community hosting the event.

The health implications associated with events involving a high number of people concentrated during a certain period of time can be a challenge, particularly for Public Health[(2)].

The circumstances which can affect the participants' health in this type of events depend on a number of factors: **i)** weather conditions; **ii)** distribution of people at the venue; **iii)** duration of the event; **iv)** available hygiene conditions; **v)** existing vectors (such as Aedes or Anopheles mosquitoes); **vi)** behaviours (consumption of addictive substances and other risky behaviours, personal hygiene, mass determined occurrences including stampedes or trauma, oral rehydration and sun protection habits; **vii)** personal characteristics of the attendants (age, chronic disease, carriers of infectious diseases, or susceptibility to contracting disease given the different immune status) [(3)].

Concerning communicable diseases in this type of events, carriers of a disease have a higher number of contacts, while at the same time, the type of contact

varies according to the environmental conditions of the event (closed or open environment, sanitary conditions) or sharing of personal objects. In some cases the symptoms can occur after returning home and therefore, cannot be easily associated with the event [3].

Music festivals are events with high concentration of participants travelling from other regions or countries, using temporary housing and food stalls which can lead to increased risk for communicable diseases.[4] The fact that participants stay away from their home communities and can be exposed to increased alcohol consumption and recreational drugs can also increase risky behaviours.

BOOM Festival is a "Goa-trance" music festival that is held every 2 years since 2002 in the municipality of Idanha-a-Nova. It lasts for more than a week during July or August full moon and takes place on the banks of Marechal Carmona dam attracting around 30000 people (more than a half of them from abroad). The organisers of the festival claim having great concern with the environment sustainability and state that this attracts participants who stand behind values such as individual freedom, nature protection and the connection to spirituality, in light of which there has also been observed a high consumption of recreational drugs.

Moreover, in previous years, thousands of people have gathered for an unofficial event to protest against the high ticket prices of the BOOM Festival. This gathering, called anti-BOOM, did not take place in 2010.

The event usually occupies a vast pasture land area on the banks of the dam, densely covered with trees and with few access roads (18 km from the Health Centre of Idanha-a-Nova and 54 km from the Hospital of Castelo Branco). There are various performance stages, meeting spots, temporary commercial and food stalls placed along the dam shore. Space for camping equipped with toilets and showers and parking lots for cars and trailers are available at the venue.

In the 2008 BOOM Festival, more than 137 cases of gastroenteritis were observed at the Health Centre of Idanha-a-Nova and the Hospital Amato Lusitano. Although none of the cases was confirmed in Portugal, Shigella was diagnosed in 6 of the 14 gastroenteritis patients from the festival who sought medical care in their home countries: Sweden, The Netherlands and Germany. These cases were reported to the *European Centre for Disease Prevention and Control (ECDC)* after the festival.

2

Material and methods

Following this outbreak, in 2010 a decision was taken to create a working group allowing better coordination of efforts between the different entities involved. It included the City Council, Police Authorities, Fire Fighters, Immigration and Borders Control, and the Authority for Food and Economic Safety. The Ministry of Health and its institutions were responsible for implementing an Epidemiological Surveillance System (SVIGBOOM) for rapid detection of diseases, health threats or syndromes requiring rapid intervention.

Development of the System began in April 2010, with meetings every 2 weeks between the several entities and Festival organizers.

SVIGBOOM was presented to health care providers at the Field Hospital, and to doctors, nurses and administrative staff at the Health Centre of Idanha-a-Nova and the Hospital Amato Lusitano.

The City Council, Local Health Unit, Health Administration of the Central Region, and the Organisation of the event provided all logistic conditions to the Surveillance field team which constituted of 4 physicians with training in epidemiology and a Public Health nurse.

The Surveillance team and the Environmental Health staff performed field work that started in May 2010, with water supplies, sanitation and food providers monitored from May to August.

The Surveillance System was based on data collected in the period between August 11th and September 1st, 2010. This was done through specific questionnaire, applied to patients from the festival seeking medical care, and filled out by the clinicians.

Health care was provided at the field hospital, created by fire fighters at the venue, as well as at the Health Centre of Idanha-a-Nova and Amato Lusitano Hospital.

The paper based questionnaire, applied at the Health Centre and the Hospital, collected demographic data (age, sex, and nationality), date of arrival at the festival, and date of symptom onset. It also collected data on type of symptoms, diagnostic tests, and diagnosis at discharge. Fire fighters at the Field Hospital gathered data in electronic format using their own informatic application.

The information was then compiled in an Excel software application and converted daily into a semiautomatic report. The Epidemiological Surveillance Team presented these results at the daily Festival Security facilitated Group meetings, coordinated by the District Command of Rescue Operations – part of the National Authority of Civil Protection in Castelo Branco. These reports were also sent to the General Directorate of Health which in turn forwarded them to the ECDC.

3

Results

There was a total of 2287 reported cases (2160 at the Field Hospital, 85 at the Health Centre, and 42 at the Amato Lusitano Hospital). The majority of cases (89%) were between 20 and 44 years old and 1203 (53%) were male ***(Table 1)***. There were 1405 (61%) residing abroad.

table:

① Distribution of cases registered in the BOOM Festival 2010, by age group and sex (n=2287)

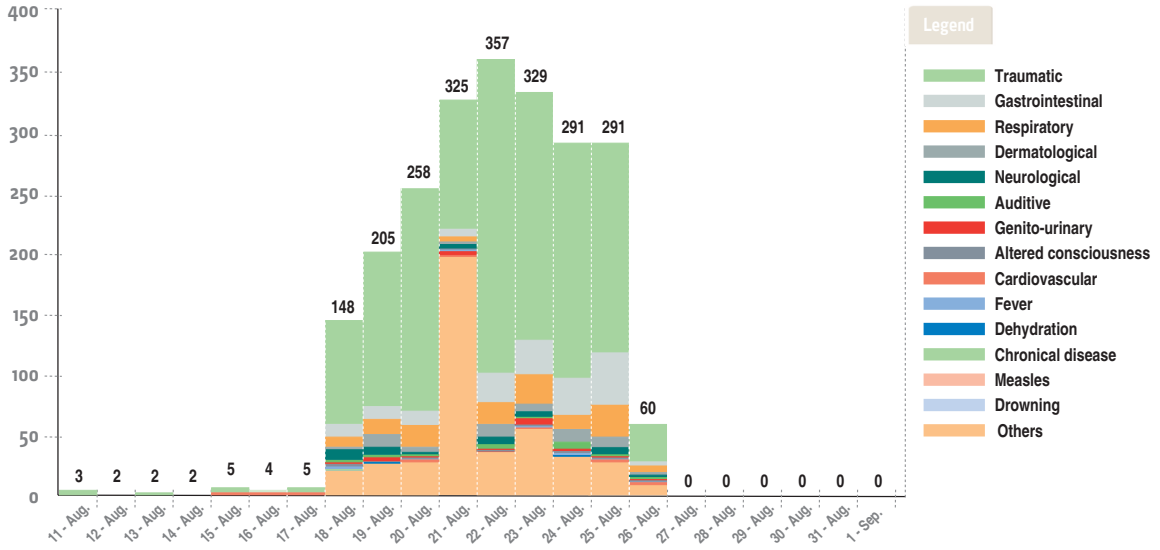
Age - Group / Gender	Male	Female	Unknown	Total
Under 1 year	0	0	0	0
01-04	3	0	0	3
05-09	7	3	0	10
10-14	4	3	0	7
15-19	63	95	1	159
20-44	1080	906	38	2024
45-64	32	14	1	47
65 years and more	0	1	0	1
Unknown	14	19	3	36
Total	**1203**	**1041**	**43**	**2287**

Most of the cases (61.8%) sought care because of trauma (small cuts, scratches or insect bites, among others). There were also 126 cases (5.5%) with gastrointestinal complaints and 111 (4.8%) with respiratory problems.

The distribution according to the day of the event reached its maximum on August 22nd with 357 cases ***(Figure 1)***. Worth noting that the increased number of "other" cases on August 21st resulted from disease codification for that day being done by a different author.

figure:

① Distribution of cases registered by the surveillance system SVIGBOOM 2010 according to diagnostic group and day of the event



One measles case was detected: an unvaccinated 23 years old male, with a epidemiological link to his brother who had measles two weeks before, in England, motivating the intervention of the Epidemiological Surveillance Team.

The case was detected by SVIGBOOM on the 24th August, and preliminary serological results were available on 27th August, with a notification being issued via EWRS. The case was also notified in the National Surveillance System for Notifiable Diseases.

Control measures included recommendations to the patient to avoid contact with susceptible persons, and refrain from returning to the Festival. An alert was issued to Health Care providers in order to detect further cases and to the occupational health team of the hotel where the patient was staying.

4 Conclusions

Compared to 2008, there was a lower number of cases seeking health care at the Health Centre of Idanha-a-Nova and Amato Lusitano Hospital, as both units were able to handle all the cases without unexpected delay. The changes implemented in 2010 can be one probable explanation for this fact.

In 2010, along with the traditional sanitation measures, a Global Security System was implemented, involving several organizations; Police Authorities prevented the settling of ANTI-BOOM, health care was provided on site and reinforced with doctors and nurses, that worked as a true field Hospital, and also the epidemiologic surveillance system that was created.

The fact that this system was implemented with minimal resources, enabling daily reporting and early detection of a potentially epidemic disease (currently under tight surveillance by WHO), allows us to state that the system fulfilled the tasks it was designed for, and to recommend it´s application in further editions of the Festival ans implementation in similar events.

Conflict of interests

The authors do not have conflict of interests to declare.

5

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Distributions of air temperatures in Lisbon and Portugal (by districts): models for time and space to predict and monitoring heatwaves impacts on human mortality

English version B

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Abstract: The frequent occurrence of heatwaves in Portugal has a big impact on mortality and these are recognized as an important public health problem. Since 1999, Portugal has a surveillance system for heatwaves - the Ícaro surveillance system - which operates from May to September. The occurrence of 2003's heatwave showed this system's full potential but it also raised the chance to further research towards better predictions of heat events and thus building models of measurement, prediction and monitoring heatwaves impacts on human mortality.
The aim of this work was studying, learning and understanding the evolution of air temperatures for the months from May to September [1980 to 2001] in Portugal mainland´s 18 districts, either geographically and along the summer period, in order to make the best methodological choices for the construction of predictive models for mortality.
This study allowed to define theoretical thresholds for air temperatures; conclude that the summer temperatures have a well-defined pattern along the weeks; the geographical distribution of temperatures by district in the summer showed that Portugal has a north-south gradient, in which the South tends to be hotter, and a Coastline-Interior gradient, where the coastline tends to be fresher than the Interior; and that the temperatures for all Portuguese districts proved to be mathematically modeled in a uniformly manner.

Key-words: heatwaves; mathematic models; public health

1

Introduction

Given that it is a phenomenon causally associated to excess of potentially avoidable mortality [1-8], the occurrence of heatwaves is currently recognized as a public health problem [9-13]. In scientific literature the episodes of heatwaves are described as occurring in almost any land surface. Portugal is no exception, having a high level of exposure to heatwaves [14]. These events are frequent and have significant impacts, particularly in increased mortality. In the last decade, it has been possible to identify periods of heat impact on mortality, almost every year [10-13, 15]. In fact, for the period 1980 to 2004, several episodes of heatwaves have been identified with different time intervals including: heat episodes with great impact on mortality – big heatwaves – and episodes with lower impacts on mortality – small and moderate heatwaves.

However, the first big alert for dangerous heatwave impacts was the 2003 summer European heatwave, due to its length and intensity. The impact across Europe was estimated in about 50000 excess deaths beyond expected in 2005 [16] and later in 2008 in about 70000 excess deaths [17]. In Portugal this event affected all the mainland districts, an unexpected number of women and, as expected, a huge impact on the elder individuals. An overall total of 1953 excess deaths, corrected for individuals' age, was estimated [18].

These events tend to appear very often with recurrent episodes of high temperatures regularly breaking

records, e.g. the year 2006 where in Portugal mainland the anomaly of mean air temperature in 2006 was 1.05°C higher when compared the reference period (1961-1990) average. This increase of 1°C in mean air temperature in Portugal was higher than the increase globally observed of 0.42 °C above the 1961-1990 average, according to data from the World Meteorological Organization. For Portugal, the year of 2006 was also the 5th warmest since 1931 (the initial year of reference for climatological observations in national Portuguese territory), in some locations, the highest values of maximum air temperature of September were exceeded[i].

At the same time, these past three years (2009-2011) have registered several noteworthy heatwaves, for instance considering the northern regions of Portugal:

> the heatwave of August 2009, which affected the interior districts (Bragança and Vila Real), lasted 7 days (19);
>
> in 2010, seven heatwaves were registered lasting 32 days altogether, especially severe in the months of July and August and more frequent in the districts of Braga, Vila Real and Bragança (20);
>
> in 2011, four heatwaves, with a duration of 14 days within the months of June and August, and also more frequent in the districts of Braga, Vila Real and Bragança (21).

In analogy with 2006, the climatological summer of 2009, covering the months of June, July and August, was characterized in Portugal by values mean air temperature higher than the mean value of 1971-2000, with anomalies of +1.1°C on maximum air temperature, and observed near normal values for mean and minimum temperatures, 0.5ºC and 0.1ºC respectively. It is emphasized that over the last 16 years the average air temperature has been always above the average value, with the exceptions of 2007 and 2008[ii].

According to World Meteorological Organization, the year of 2010 should be positioned between the three warmest years since 1850 (the year of onset the climate records consolidated worldwide), in accordance with preliminary information disclosed for the mean value of the global mean temperature (sea water temperature + air temperature) is 0.55°C (± 0.11°C) above the normal value of 1961-1990 (14.00ºC)[iii].

In terms of mortality, it is agreed that it is mainly the aged individuals who suffer the most substantial impacts. But no one is safe from suffering the adverse effects of severe heat episodes. In fact, there are some cases of severe heat episodes where all age groups are provable to be affected, as was the case of the heatwave of June 1981 in Portugal (22). But in terms of health, the advanced age, cognitive limitations, suffering from illnesses, and housing conditions are just some examples of vulnerability conditions (23-25). However, there are several studies, such as is the case of an Iberian study, that show the risk of suffering the effects of heatwaves is higher in women than in men, with an almost double mortality impact value (26-27).

The impact of summer extreme temperatures in mortality occurs almost immediately, the maximum peak of mortality often occurs 1 day after the maximum peak of temperature, usually there is a delay between the heat occurrence and the respective mortality which is of 1 or 2 days (26-27).

Action is necessary to prevent the occurrence of avoidable mortality and Portugal in this area has a remarkably long history:

1) a prediction model for Lisbon district mortality associated with the occurrence of heatwaves (the ÍCARO model[iv]);

2) the respective index-ÍCARO[v] that allows risk assessment associated to heatwave occurrence and

3) the heatwaves monitoring system[vi] operating since 1999. This system has shown its full potential with the occurrence of 2003 heatwave. This severe event also raised the opportunity to further research towards making better predictions of these heat events and thus building

i http://www.meteo.pt/pt/media/comunicadosimprensa/comunidetail.html?f=/pt/media/comunicadosimprensa/arquivo/2007/CI_rel_clima_final_2006

ii http://www.meteo.pt/pt/media/noticias/newsdetail.html?f=/pt/media/noticias/arquivo/2009/Clima_Verao2009.html3http://www.wmo.int/pages/mediacentre/press_releases/pr_904_en.html

iii http://www.wmo.int/pages/mediacentre/pressreleases/pr904en.html

iv Model for the relation between heat and mortality calibrated with the district of Lisbon data for the big heatwaves of June 1981 and July 1991.

v It relates the predicted mortality with heat impact, with expected mortality without heat impact.

vi The ÍCARO Surveillance System is a system for monitoring heat waves with potential impacts on population's morbidity an mortality.

measurement, prediction and monitoring models for heatwaves with impacts on human mortality.

Therefore, the aim of this work was to study the distribution of temperatures in Lisbon and Portugal, from May to September, to establish knowledge necessary to define "heatwaves" and to obtain temperature thresholds that will allow building the best predictive models for heat associated mortality.

We recall that there is no agreed definition for a heatwave. In the Portuguese context two criteria can be considered: the heat event duration, and its impact on mortality. In the first case, a meteorological definition that takes into account periods of at least 6 consecutive days, where the daily maximum temperature is 5 ° C higher than the respective daily average maximum temperature during the reference period (1961-1990), is used[vii]. This definition considers only climate variability without any relation with the impacts on public health. The second definition, adopted by DGS, assumes that a heatwave is defined by a period of two or more consecutive days of air maximum temperature above the 32 º C threshold [(26)]. In Portugal, for Lisbon district mortality, in the big heatwaves of 1981 and 1991, the 32°C threshold revealed itself to be a good indicator for excess mortality occurrence. In fact Lisbon's district mortality always increased after two or more consecutive days above 32°C occurrence.

The specific objectives for this work were:

To characterize statistically the distribution of 3-hourly, daily mean and daily maximum air temperatures in Lisbon district, per week;

To define theoretical limits for the variation of 3-hourly distributed and daily mean air temperatures in Lisbon district, per week;

To establish theoretical limits for the variation of daily maximum air temperature in Lisbon district, per week;

To characterize geographic distribution (by districts) of higher 3-hourly distributed temperatures and higher daily maximum temperatures (97.5 percentile) during the summer in Portugal;

To model the evolution of daily maximum temperature thresholds by district, in order to establish criteria for daily monitoring of heatwaves at district level;

To define the threshold limits of summer maximum temperatures by district;

To characterize sets of districts according different thresholds of higher summer temperatures.

vii http://www.meteo.pt

2

Material and methods

The data of air temperature from 1980 to 2001 for the 18 districts of Portugal mainland were supplied by the Portuguese Meteorology Institute. Namely, daily minimum, mean and maximum air temperatures and also 3-hourly measured temperatures in the referred period were supplied.

Three distinct temperatures distributions were used: national distribution, which aimed at gathering knowledge and understanding of geographic distribution; weekly distribution, particularly in Lisbon, where it aimed at improve knowledge and understanding to build more elaborated statistical models; and daily distribution where main objective was its mathematical modeling for future construction of useful information to monitoring heatwaves, at district level.

The geographic study of temperatures' distribution was done constructing descriptive maps of Portugal, presenting 97.5 percentiles of the distributions 3-hourly air temperature measurements, and also, daily mean and daily maximum temperature.

In Portugal the 32°C threshold is a good indicator for excess mortality occurrence and several evaluations showed that this temperature threshold corresponds approximately to percentile 97.5 of Lisbon's observed maximum temperatures distribution for the months of May to September 1980–2000. When the same percentile for Portugal's mainland of 18 districts was calculated, these varied among themselves. However, 97.5 percentile of the daily average maximum temperature of the 18 districts, in the same period was approximately 32°C, so it was a good option.

The weekly distribution of air temperatures in Lisbon district was studied in a descriptive way, using simple summary measures such as median and percentiles and obtaining smoothed Tukey limits for data variation.

These Tukey limits are well established methodology for the definition of mild and severe outliers, respectively L1 = Q3 + 1.5 * [Q3-Q1], and L2 = Q3 + 3 * [Q3-Q1], where Q1 and Q3 are the 1st and 3rd quartile of respective temperature distribution. Q3 - Q1 is interquartile range. These limits were smoothed using a 5 weeks moving average centred on the given week.

The distribution of daily temperatures by districts was modeled using a cubic regression model (particular case of polynomial regression [(29)] which has a form of a multiple regression model) that has the following generic formula:

$$Y_t = b_0 + b_1X + b_2X^2 + b_3X^3 + \varepsilon$$

Where:

Y_t represents the observed temperature the day *t*;

X represents the order of the day in the time sequence chosen (for practical reasons the number of days was counted from the 1st of May);

b_i are the respective regression parameters; and;

ε is a random error process with zero mean expected value.

3 Results

3.1 Lisbon's temperatures

Table 1 shows air temperatures distribution per week in Lisbon during years of 1981 to 2000, using 3-hourly registered observations, daily mean, maximum temperatures, median and quartiles. From this table is obvious that the daily temperatures increase progressively up to the 32nd week of the year (approximately 2nd week of August) and decrease again after that[viii]. It was expectable that 3-hourly distributed temperatures would show a wider variability when compared with daily average temperatures (when measured in interquartile ranges per week). And it is also remarkable that there is a great difference between an observed maximum daily temperature and mean temperature that an individual is exposed to. As an example, consider a median day in the considered period (18th to the 40th week of the calendar year), a maximum temperature of 25.2 °C corresponds to a daily average exposure to 19.7 °C.

Table 2 presents results of smoothed non-parametric extreme threshold values for the considered air temperatures distributions. These extreme values are the standard for the determination of mild (above L1) and severe outliers (above L2) in exploratory data analysis. Threshold values estimates take into account the variability within weeks, and maximum variability occurs around the 30th week, which ends up giving week extreme expected values around the 30th week instead of the 32nd. It is also noteworthy that mild outliers threshold (L1) estimated for 3-hourly distributed air temperatures is very similar to extreme outliers threshold (L2) for daily mean temperatures. This means that a very extreme temperature in a limited time period does not relate necessarily to a wide exposure to extreme temperatures. On the other end, as expected, within considered weeks, 3-hourly distributed temperatures' extreme outliers thresholds are always within the mild and severe outlier thresholds of daily maximum temperatures.

viii Figures 3 give an overview of this pattern, although daily temperatures are shown.

table:

① Summary of air temperatures distribution per week in Lisbon (1981 a 2000)

	3 - hourly distributed air temperatures in Lisbon (1981 - 2000)			Daily mean air temperatures in Lisbon (1981 - 2000)			Daily maximum air temperature in Lisbon (1981 - 2000)		
Week	Percentiie 25	Median	Percentiie 75	Percentiie 25	Median	Percentiie 75	Percentiie 25	Median	Percentiie 75
18	13,4	15,6	18	14,1	15,7	18,3	18,0	19,9	24,3
19	13,4	15,4	17,8	14,3	15,7	16,8	18,3	19,9	21,7
20	13,8	15,7	18,3	14,6	16,3	17,8	18,2	20,6	23,4
21	14,6	16,6	19,6	15,8	17,2	18,5	19,7	21,6	24,2
22	15,4	17,4	20	16,6	17,5	19,3	20,6	22,4	25,5
23	15,6	18,0	20,6	17,0	18,2	19,5	21,1	23,1	25,7
24	16,8	19,8	23,8	18,1	19,7	23,1	23,0	26,1	30,7
25	17,2	19,5	22,6	18,6	19,6	21,0	23,2	25,0	27,8
26	17,4	19,7	23,2	18,9	20,2	21,8	23,6	25,6	29,4
27	17,4	20,0	23,2	19,0	20,3	21,5	23,6	25,7	28,6
28	18,4	21,4	25,4	20,3	21,4	24,5	25,8	27,6	31,7
29	18,8	22,0	25,7	20,1	21,7	24,8	25,6	28,5	32,5
30	18,7	21,6	25	20,4	21,6	23,8	25,4	27,8	31,8
31	18,8	21,6	25,1	20,4	21,8	23,6	25,7	28,1	31,2
32	19	22,0	25,4	20,6	21,8	24,1	26,0	27,7	31,3
33	18,7	21,1	24,8	20,6	21,5	22,9	26,3	27,8	30,2
34	18,8	21,0	24,2	20,4	21,4	22,8	25,5	27,2	30,2
35	18,8	20,8	24,2	20,3	21,5	22,7	25,3	27,4	30,6
36	19	21,2	24,8	20,7	21,5	23,3	26,1	28,3	30,9
37	18,4	20,7	23,6	19,2	21,2	22,7	24,7	26,5	30,4
38	17,7	19,7	22,2	18,6	20,1	21,4	22,8	24,8	27,5
39	17,2	19,2	21,6	17,9	19,4	21,0	22,0	24,3	27,4
40	16,4	18,3	20,9	17,4	18,6	20,1	21,1	24,0	26,5
Mean	**17,1**	**19,5**	**22,6**	**18,4**	**19,7**	**21,5**	**23,1**	**25,2**	**28,4**
SD	**1,88**	**2,12**	**2,54**	**2,15**	**2,06**	**2,29**	**2,74**	**2,79**	**3,08**

table:

② Estimated air temperature theoretical thesholds

	3 - hourly distributed air temperatures in Lisbon (1981 - 2000)		Daily mean air temperatures in Lisbon (1981 - 2000)		Daily maximum air temperature in Lisbon (1981 - 2000)	
Week	L_1	L_2	L_1	L_2	L_1	L_2
18	24,0	30,6	22,0	27,0	29,6	36,9
19	24,8	31,6	22,2	27,0	30,2	37,4
20	25,7	32,6	22,7	27,3	31,1	38,4
21	26,3	33,4	22,5	26,6	30,8	37,6
22	28,3	36,1	24,4	29,3	34,0	42,0
23	29,4	37,5	24,9	29,5	34,7	42,5
24	30,4	38,7	25,6	30,3	36,1	44,4
25	31,4	40,1	26,0	30,5	36,7	45,0
26	32,9	42,2	27,5	32,5	38,3	47,0
27	33,3	42,5	27,7	32,7	38,4	46,8
28	34,0	43,5	28,6	33,9	39,7	48,7
29	34,5	44,2	29,0	34,4	40,1	49,0
30	35,2	45,0	29,9	35,6	40,7	49,7
31	34,8	44,4	29,0	34,2	39,8	48,3
32	34,1	43,2	27,9	32,4	38,7	46,5
33	33,6	42,5	27,4	31,5	38,1	45,6
34	33,4	42,1	27,1	31,1	37,8	45,0
35	32,7	41,1	26,8	30,8	37,8	45,1
36	31,7	39,6	26,7	30,7	37,5	45,0
37	30,9	38,5	26,5	30,8	37,1	44,9
38	29,9	37,2	26,1	30,5	36,3	44,1
39	28,6	35,6	25,5	30,1	35,2	43,0
40	27,3	33,8	24,5	28,8	33,2	40,4
Maen	**30,7**	**39,0**	**26,1**	**30,8**	**36,2**	**44,1**
SD	**3,41**	**4,43**	**2,27**	**2,47**	**3,31**	**3,79**

3.2 Portugal mainland's temperatures

Figures 1 and 2 show the distributions of air temperatures' 97.5 percentile during the months of May to September across the 18 districts of Portugal mainland. It is seen that Portugal mainland temperatures show north–south and coast–interior gradients. It is noteworthy that Lisbon's temperature could be a fair estimate for all the districts average temperature. Empirical observations show that the distributions of air temperatures' 97.5 percentile corresponds approximately to 32ºC threshold, and that mortality in Lisbon district always increased after two or more consecutive days above this temperature.

3.3 Temperatures by districts

In section 3.1. the evolution of weekly temperature in Lisbon district using a set of 20 years data was evaluated, concluding that these temperatures have a pattern of growth during the beginning of Summer, reach a maximum around week 32 and decrease in end of the summer. In this section the goal was to study the maximum temperatures evolution from May to September in all districts of Portugal mainland individually and their combined mean. As shown in Figure 3, using some districts of Portugal mainland districts, they all show a similar time evolution of maximum temperatures (in days), with their data revealing a good fit by a cubic regression model [polynomial regression[29]].

figure:

① 3-hourly air temperature 97.5 percentile (P97.5) May to September 1981–2000 per district of Portugal mainland.

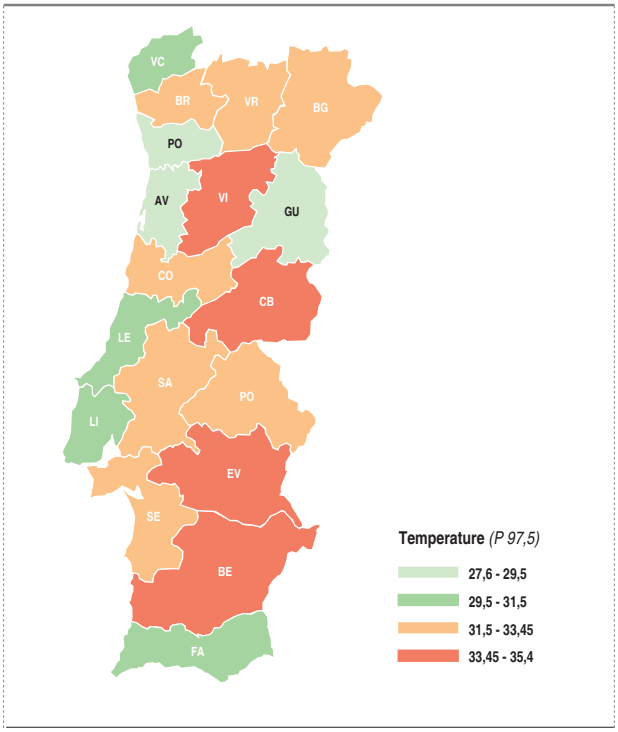


figure:

② Daily maximum temperature 97.5 percentile (P97.5) May to September 1981–2000.

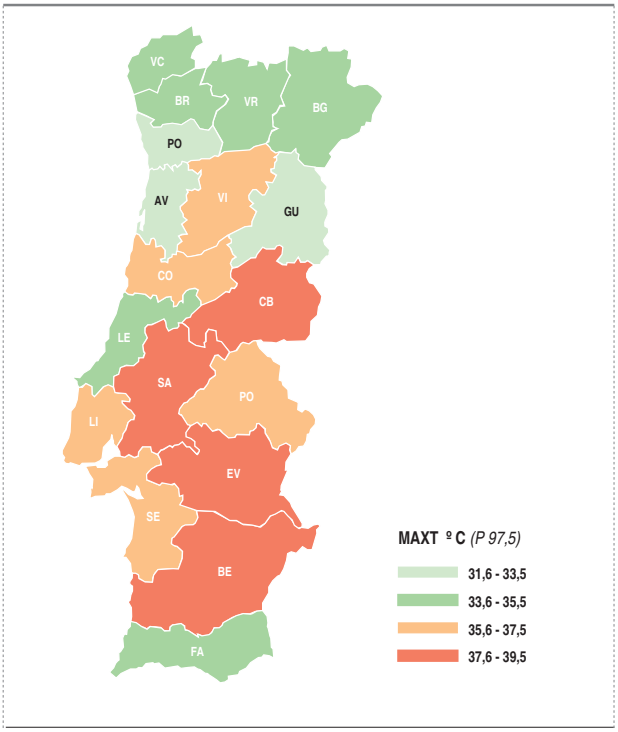
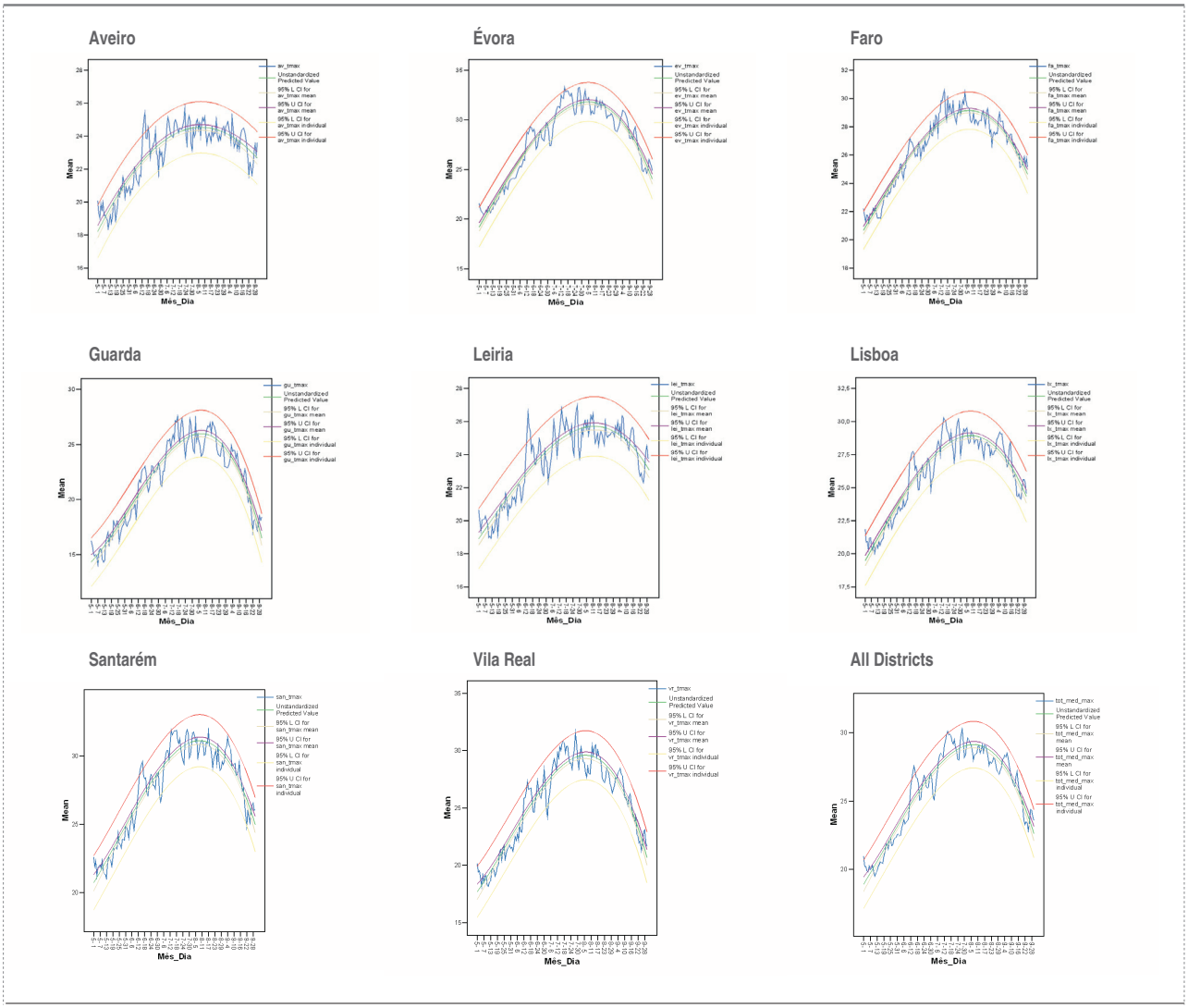


figure:

③ **Cubic modeling of daily evolution of maximum temperature from May to September (1981-2000) by selected district of Portugal.**



Dark green line – expected mortality (average);
Green line – lower limit of 95% confidence interval for expected mortality (average);
Purple line – upper limit of 95% confidence interval for expected mortality (average);
Green line – lower limit of 95% confidence interval for expected mortality for one day;
Red line – upper limit of 95% confidence interval for expected mortality for one day;
Axis xx - represent days from 1st May (5-1) to 30th September (9-30).

For each given district individual graphics show the fit of daily maximum temperature data in the set in a set 20 years by cubic regression model. Blue lines (average of 20 years data for each day) show disturbances in some districts during the heat waves of June 1981 and July 1991. However, the polynomial regression model proves to be resistant to these occurrences. It is observed that the cubic regression models detect anomalies in months June and July for most districts. In fact, in the selected districts ***(figure 3)***, models reveal anomalies in June (reflecting the heatwave in 1981) in the districts of Aveiro, Lisbon, Santarem, Vila Real and the set of all the districts of Portugal mainland.

For July (reflecting the heatwave in 1991) models reveal anomalies in the following selected districts: Évora, Faro, Guarda, Lisbon and the set of all the districts of Portugal mainland.

All districts, except Aveiro, showed a cubic relationship between the number of days from May 1st and their maximum temperatures. In Aveiro district this relation proved to be a little bit simpler – being a quadratic model, which is a model without the cubic component – which, in the end, has an identical pattern, although a with lower range of temperatures. Overall, the modeled pattern demonstrates a consistent increase in air temperatures during the first 100 days (approximately) [counted from May 1st] and decreases after that.

Table 3 shows the results of cubic regression by district, whose parameters relate to the upper 95% confidence interval and not to baseline[ix]. Generically, it can be noted that the trends and maximums are concomitant, in both cases. Thus, the point of maximum temperatures ranged from 95 days after May 1st (August 5) in Leiria and 104 (August 13) in Beja and Évora. In ***Table 3*** is also shown estimates for upper thresholds in summer for maximum temperatures by district. To avoid numerical precision of temperatures to tenth of centigrade degree, that will not make practical sense, rounding of model estimated values plus 1°C was performed.

So, four generic groups of districts were defined:

1) Upper summer temperature thresholds below 30°C: Aveiro, Porto, Guarda e Leiria.

2) Upper summer temperature thresholds between 30°C and 32°C: Faro, Braga, Coimbra, Faro, Lisboa e Viana do Castelo.

3) Upper summer temperature thresholds between 33°C and 35°C: Bragança, Évora, Portalegre, Santarém, Vila Real e Viseu.

4) Upper summer temperature thresholds above 35°C: Castelo Branco e Beja.

The results of this section are especially interesting due to their usefulness in defining thresholds and risks of heat at district level, given the impossibility of creating robust models based on observed mortality levels by district (the only exception is Lisbon for having a population density that allows such modeling). Furthermore, these results support those obtained in previous sections (3.1. and 3.2.) and give emphasis to the choices of defining dynamic thresholds for heat related mortality models.

ix Because it was intented to help district level monitoring allowing calculating daily and persistent departures from expected temperatures.

table:

③ **Cubic model of 95% confidence interval upper limit estimates of parameters for daily maximum temperature for each and all combined districts.**

	Cubic Model					Threshold Determination		
District	Constant	β 1	β 2	β 3	R2 Ajusted	Day of Máx. temp.	Maximum	Threshold
Aveiro	19,666	0,129	-6,474		0,829	100,4	26,1	27,0
Beja	22,647	0,201		-7,266	0,940	104,1	35,4	36,0
Braga	20,712	0,151		-5,254	0,860	102,2	30,5	32,0
Bragança	19,119	0,144	10,971	-12,427	0,934	101,8	32,0	33,0
C. Branco	21,492	0,159	8,733	-11,472	0,940	102,1	34,6	36,0
Coimbra	21,604	0,147		-4,984	0,868	100,7	31,3	32,0
Évora	20,985	0,198		-7,066	0,930	103,5	33,6	35,0
Faro	21,868	0,130		-4,407	0,930	100,8	30,5	31,0
Guarda	16,381	0,107	14,209	-13,257	0,920	101,3	28,0	29,0
Leiria	20,623	0,099		-3,038	0,827	95,9	27,4	28,0
Lisboa	21,211	0,143		-4,7	0,893	99,3	30,6	32,0
Portalegre	19,578	0,177	5,926	-10,194	0,937	102,2	33,0	34,0
Porto	19,612	0,104		-3,309	0,810	97,7	26,7	28,0
Santarém	22,526	0,129	5,565	-7,901	0,911	99,1	33,1	34,0
Setúbal	23,104	0,101	6,96	-7,915	0,901	99,2	32,2	33,0
V. do Castelo	20,685	0,126		-4,326	0,816	101,5	29,0	30,0
Vila Real	19,732	0,139	9,15	-11,034	0,917	102,0	31,7	33,0
Viseu	20,302	0,141	8,6	-10,644	0,918	101,4	32,3	33,0
All	20,521	0,132	4,79	-7,71	0,925	101,0	30,8	32,0

β **1** parameter associated with variable **X** - conting days from May 1st.
β **2** parameter associated with variable **X2** - X^2 divided by 10 000
β **3** parameter associated with variable **X3** - X^3 divided by 100 000

④

Discussion and conclusions

The results allow the definition of theoretical thresholds for summer temperatures based on 3-hourly observed air temperature and daily average air temperatures in Lisbon, whose arithmetic mean at weeks 18-40 of the calendar year was around 31ºC.

The summer temperatures have a well-defined pattern over the weeks. Temperatures increase to around weeks 30-32 and decrease during the ending of the summer period.

Based on geographic distribution (by district) 97.5 percentile of 3-hourly observed and maximum air temperatures, it was shown that in summer (May to September) Portugal has a north-south gradient, with the South tending to be hotter (the coastal zone of Algarve escapes this trend), and a coastline-Interior gradient, where the coastline tends to be fresher than the Interior (with Guarda district opposing this trend, perhaps due to presence of Serra da Estrela[x]).

Interestingly, when considering 3-hourly temperatures and their 97.5 percentile the threshold of 31.5°C seemed to delimit Portugal in North-South and Coastline-Interior. This is consistent with the initial experience of ÍCARO Project (and the first ÍCARO model), where the adoption of the threshold 32°C, referred in scientific literature based on North American experience and literature, yielded results with remarkable goodness-of-fit to the Portuguese data. (22, 30)

All Portugal mainland´s districts proved to be similarly mathematically modeled. Only Aveiro district revealed a slightly distinct pattern (a quadratic model instead of cubic) due its temperatures showing a smaller range of values, which is in fact just a mathematical purism since it is a cubic model with the parameter for the cubic component not statistically different from zero (argument still holds: all districts have an identical pattern). This Aveiro situation needs to be further analyzed but is clear that the influence of the proximity to the ocean and Aveiro extensive lagoon area have their effect on these results.

x Portuguese mainland's highest mountain.

The consistency of models throughout all districts shows that all individuals will be exposed approximately to the same temperature change mechanism during the summer. This fact will be able to explain different attitudes or cultural aspects of local adaptation over the summer period, although with answers at different levels of temperature in distinct localizations.

It should be noted that results prove that it is possible to model expected temperature thresholds day-by-day in each district, which represents another component that can be used for surveillance and which is a useful tool for decision at local level (district) given that with the exception of Lisbon, specific models for heat-mortality are not possible given the low population densities.

Conflict of interests

The authors do not have conflict of interests to declare.

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5

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Suicide and death resulting from events of undetermined intent register in Portugal.

Revisiting "The truth about suicide in Portugal", 20 years later.

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Abstract

For a long time suicide was considered a minor problem in Portugal, when compared to the reality of other countries. It was known that there was a substantial underreporting potentially hidden within other causes of death, particularly in deaths resulting from undetermined causes. Our objective was to describe the distribution of mortality from suicide and from deaths resulting from events of undetermined intent and the accuracy of suicide registration in the last 30 years of available data.

We calculated standardized rates and average absolute values for the six five-year periods from 1980 to 2009, by sex, age groups 15-24, 25-64, 65 or older, regions and lethal methods used.

There was an inverse relationship between suicide and deaths resulting from events of undetermined intent, with a tendency to stabilize in the last 30 years and a slight increase in the last 10 years, with an average rate of probable suicide susceptible of rising up to 15.0 per 100.000. This rate was higher in men and has increased in women and the elderly, remained stable in adults and decreased in young people. In relative terms, probable suicide was most likely in the south but much higher in absolute terms in the North and Centre regions of Portugal. Deaths resulting from events of undetermined intent ranked first.

The reliability of vital statistics in Portugal improved in 2002 and 2003 through validation of death certificates by the Directorate-General of Health. Future prevention efforts should take into account the distribution of suicide, the training of doctors in the completion of death certificates and continuous validation of deaths resulting from events of undetermined intent.

Keywords- Suicide, deaths resulting from events of undetermined intent, death register, prevention

1

Introduction

Death intentionally caused by the individual himself, suicide, is a medical complication due to various problems and psychiatric disorders, namely depression [(1)].

Suicide is a public health problem, a major cause of death on the rise since the 1950s, up to one million deaths per year [(2)], about 60,000 deaths in the European Community [(3)]. Traditionally, Portugal is touted as one of the countries with standardized suicide rates among the lowest in Europe and the world, alongside other countries in Southern Europe, where rates have also been declining, currently at around 7.5 per 100,000 inhabitants in contrast to the average of 10 per 100,000 in Europe [(4-7)].

Mortality rates from suicide and other causes of death are displayed in national statistics according to the International Classification of Disease [(8, 9)], which is a globally accepted and standardized methodology. In fact, public health issue of suicide must be more

severe in Europe and particularly in Portugal, than what is currently acknowledged. Portugal presents a general imprecision in statistics by causes of death with about 20% of ill-defined causes [10] and in fact, suicide is poorly recorded, for various reasons [11], leading to the occurrence of suicides masked and recorded as other categories of death: accidental deaths, by overdose, of unknown cause, and especially, violent deaths of undetermined cause [12].

This last category, violent death of undetermined intent, came up with a new codification in the 9th revision of the International Classification of Diseases, used in Portugal since 1980, leading almost immediately to a reduction in the number of suicides recorded since then, which was described in Portugal by Elsa Ferreira de Castro and colleagues in the seminal article "The truth about suicide in Portugal" [13]. These authors analyzed the problem of concealing suicide in "controversial" deaths in Portugal between 1970 and 1985 and concluded that deaths resulting from events of undetermined intent performed a rampant increase between 1980 and 1985 and that the profiles of suicide and deaths resulting from events of undetermined intent remained similar between 1980 and 1985, unlike 1970-79, whereby those correspond to suicide almost entirely, and suicide real numbers would be 1.6 greater than recorded.

As with suicide, frequency of violent deaths of undetermined cause varies greatly between countries but in the case of Portugal the disproportion regarding suicide seems to be the most pronounced with deaths resulting from events of undetermined intent representing approximately 100% of suicides and rates of 8 per 100,000 inhabitants, gone well beyond the benchmark proposed of a double ceiling deaths of undetermined cause corresponding to 20% of suicides an two deaths per 100,000 inhabitants [12]. Also for this reason, analysis and epidemiological publications on suicide in which violent deaths of undetermined intent are used as the equivalent of suicide are becoming more frequent [5,6].

The epidemiology of registered suicide in Portugal in the twentieth century revealed crude annual rates rarely exceeding 10 per 100,000 inhabitants, a profile more frequently in males, the elderly, residents in the south, with profession in primary and secondary sector and unemployed [13-18]. More recently in the years 2000-2004, the predominant methods for males were hanging, poisoning by toxics, and firearms and for females hanging, drowning and poisoning by toxics [19].

Conversely, we know practically nothing about the evolution of the characteristics of deaths resulting from events of undetermined intent over the years, of the distribution of the relationships between suicide and deaths resulting from events of undetermined intent and on how that distribution has evolved over time. In previous work, an analysis making use of crude rates suggested that the variability in deaths resulting from events of undetermined intent wouldn't impact significantly suicide trends recorded by sex and age groups and it would be necessary to evaluate the impact at the level of regions and methods [20].

We have an incomplete picture of suicide by only acknowledging what happens to deaths registered as such and knowing very little or nothing about the characteristics of suicides that are masked which may be of substantial number. And there is certainly a variation on the accuracy of records, which is important identifying to direct corrective actions.

Our aim was to describe the variation of suicide and of deaths resulting from events of undetermined intent, and show the accuracy of suicide registration in the past 30 years.

2 Material and methods

Data collection

Data on suicide and deaths resulting from events of undetermined intent values, sex, age groups, place of residence, methods of suicide, and mid-year population by sex and age groups were collected for the period 1980-2009 in Portugal (Statistics Portugal; INE).

Deaths by suicide were defined as those with basic cause coded with ICD-9[i] [8]: E950-E959 for the period 1980-2001 and CID-10[ii] [9]: X60-X84 e Y87.0, from 2002

i International Classification of diseases - 9th revision.

ii International Classification of diseases - 10th revision.

on, and deaths resulting from events of undetermined intent were defined and those with basic cause codes with CID-9: E980-989 e CID-10:Y10-Y34, Y87.2 in the respective periods.

Death methods of suicide and death from events with undetermined intent were defined and classified into nine groups using the ICD-10 codes: poisoning by drugs (X60- X64; Y10-Y14), poisoning by pesticides and other means (X65-X69; Y15-Y19), hanging (X70; Y20), drowning (X71; Y21), firearms (X72-X74; Y22-Y24), jumping from height (X80; Y30), moving object (X81; Y31), other unspecified means (X84; Y34), and other specified methods. The category 'other specified methods' includes methods that accounted for less than 3% of the overall number (all age groups) of suicides and deaths resulting from events of undetermined intent : explosive material (X75; Y25), fire (X76; Y26), hot vapours (X77; Y27), cutting/piercing with sharp object (X78; Y28), cutting/piercing with blunt object (X79; Y29), crashing of motor vehicle (X82; Y32), with other specified and classifiable means (X83; Y33), and sequelae (Y87.0; Y87.2). The 'other unspecified means' category was maintained as such because it represented more than 25% of causes of death.

The compiled database contains suicide and deaths resulting from events of undetermined intent for the period 1980-2009 and the data on method-specific deaths were obtained from two institutions, Portugal Statistics (INE) (**http:// www.ine.pt/portal**), and Portuguese Ministry of Health's Directorate-General of Health (DGS).

Place of residence was coded through the seven regions as defined by the common classification of territorial units for statistics (NUTS II) – North region, Centre region, Lisbon and Tagus Valley region, Alentejo region, Algarve region, Madeira autonomous region and Azores autonomous region. Mid-year population by sex and age groups was unavailable for the whole period 1980-2009 for NUTS II geographical level but resident population was available for the period 1991-2009.

Therefore we evaluated Standardized Death Rates (SDRs) by regions in the period 2000-2009. Deaths without mention of age were excluded (n=9). Except for the calculation of standardized death rates, deaths of individuals aged 14 years or less (n=1,830; 161 suicides, 8.8% of the total) and all deaths occurring in foreign countries (n=629; 155 suicides, 24.6% of the total) were excluded because they could correspond to different phenomena such as accidents and perhaps homicides disguised as deaths resulting from events of undetermined intent.

Probable suicide was defined a death with basic cause coded as suicide or as a death resulting from events of undetermined intent.

The present study includes a total of 56,204 probable suicides, 25,938 registered suicide cases (46.15%) and 30,266 cases of deaths resulting from events of undetermined intent (53.85%).

Registered suicide included 19,319 men (74.48%) and 6,619 women (25.52%) and deaths resulting from events of undetermined intent, 21,331 men (70.48%) and 8,935 women (29.52%).

Statistical analysis

To achieve our aim we considered the whole period 1980-2009 taking in account individual years and 5-year periods. We decided to make the analysis using 5-year periods to reduce any extreme annual variation due to unpredictable specific factors.

We calculated SDR for suicide (S) and for death resulting from events of undetermined intent (UI) per 100,000 for males and females in the age groups 15-24, 25-64 and 65 or more (partial SDR), NUTS II regions, and also for the nine groups of death methods, as well as mean SDR for the 5-year periods available. We assessed mean SDR variation between 1980-84 and 2005-09. We calculated linear regression equations for SDRs including all cases for the entire period.

In order to give meaning to lower rates that can represent high number of cases and the reverse situation, we looked at raw figures of suicide and deaths resulting from events of undetermined intent, by sex and age groups, NUTS II regions, and groups of lethal methods, and described mean values for the 5-year periods with variation trends purported between 1980-84 and 2005-09.

UI SDR is an indicator for precision of cause of death registration considered adequate in the European setting up to a maximum of 2.0 per 100,000 inhabitants.

3

Results

1. Rates and global trends of suicide and of death resulting from events of undetermined intent

As shown in Figure 1, death rates of suicide and of death resulting from events of undetermined intent showed a marked oscillation and were inversely correlated (r = - .49, p = .006). In only four years suicide rates were higher than 10, between 1983 and 1985 and in 2002. Deaths resulting from events of death resulting from events of undetermined intent presented rates higher than 10 between 1987 and 1992 and between 1996 and 2000, totaling 11 years. The lowest rates of deaths resulting from events of undetermined intent occurred in 2002 and 2003 with values of 2.45 and 2.64, respectively. The lowest rates of suicide occurred at the end of the century, 4.33 in 2000.

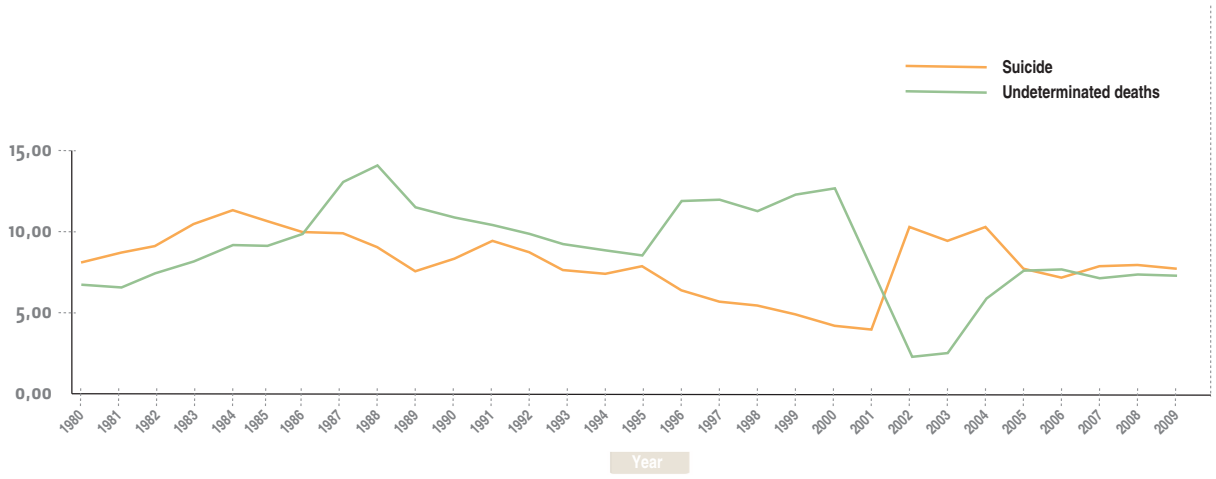
Regarding the progress over the 30 years, there was a slight trend of rate reduction over the period 1980-2009 (linear regression, Y=-0.075X + 9.038 for suicide, Y =-0.0826X + 10.356 for of death resulting from events of undetermined intent). However, the values at the beginning and the end of the period were very similar: 7.94 and 7.86 per 100,000 inhabitants for suicide and 6.91 and 7.55 for of death resulting from events of undetermined intent, respectively in 1980 and 2009.

Among the five-year period 1980-1984 and 2005-2009 *(see Table 1)*, there was a decrease of -17.20% in the annual average rate of suicide (from 9.17 to 7.60) and an increase of 3.30% in annual average rate of deaths resulting from events of undetermined intent (from 7.61 to 7.86). However, a more accurate reading will be a reduction in suicide until 1995-99, a sharp increase in 2000-04 and again a smaller reduction, in 2005-09, while the reverse happened in the of deaths resulting from events of undetermined intent, i.e. an increase, a marked reduction and again a slight increase.

figure:

① Mortality by suicide and deaths resulting from events of undetermined intent in Portugal, 1980-2009

Source: INE



Standardized death rates per 100.000 inhabitants.
Codes X60-X84, Y87.0 (CID10; 2002-2009) and 950-959 (CID9; 1980-2001) for suicide, and Y10-Y34, Y87.2 (CID10; 2002-2009) and 980-989 (CID9; 1980-2001) for deaths resulting from events of undetermined intent.

2. Rates and trends by gender

SDR rates of suicide for males were about 3 to 4 times those for women and 2-fold higher for deaths resulting from events of undetermined intent.

SDR for male suicide were always above 10 within 1980 and 1995 and 2001 to 2009, periods reaching the highest value in 2002, 17.19, and the lowest in 2000, 7.62. SDR of deaths resulting from events of undetermined intent for men were higher than those of suicide in the years 1987 to 2001 and 2006, with the highest value in 2000, 20.54, and the lowest in 2002, 4.04.

Over the past 30 years, in the period between 1980-84 and 2000-2009 (see Table 1), there was an oscillation of -13.74% for the adjusted annual average rates of suicide (from 14:55 to 12:55) and -5.19% for annual average rates of deaths resulting from events of undetermined intent (from 11.60 to 10.99).

In females, SDR for suicide were over 10 between 1982 and 1986 and below 6.0 in the periods 1993-1994, 1996-2001, and 2005-2009, reaching the highest value in 1984, 12.44, and the lowest in 2000, 2.51. The UI SDR for women were higher than those of suicide in the years 1988, 1996-2000 and 2009, with highest values in 1987 and 2000, 6.80 and 6.25, and lowest in 2002 and 2003, 1.03 and 1.34, respectively.

Between 1980-84 and 2000-2009 ***(see Table 1)*** there was a decrease in the adjusted annual average rates of suicide of -33.46% (from 4.99 to 3.32) and an increase of 22.03% for the average rates of deaths resulting from events of undetermined intent (from 4:12 to 5:03). In both genders there was a pattern of suicide rates reduction of between 1980-1999, of increase in 2000-04, again of decrease in 2005-09 and the reverse for deaths resulting from events of undetermined intent.

Considering absolute values, in the last 30 years ***(see Table 2)***, comparing the periods 1980-84 and 2005-09, suicide increased by an annual average of 102 cases, 11.69%, corresponding to more 128 cases in men (20.88%) and less 37 cases per year, on average, in women (-10.40%). Deaths resulting from events of undetermined intent increased about 350 cases per year (47.63%), more for women (over 210 cases, 98.87%) than for men (over 140 cases, 26.88%).

3. Rates and trends by gender and age

Bearing in mind the distribution by gender and age groups ***(see Table 1)*** and the 30 year´s evolution, in periods 1980-1984 to 2005-2009, the average SDR rates of suicide among men decreased by 36.88% in age groups 15 to 24 years (1.14 to 0.72), 17.91% in 25 to 64 years (8.87 to 7.28) but increased by 11.16% in those over 64 years old (from 2.4 to 4.47). In women, there was a reduction in all age groups, 77.85% (0.69 to 0.15), 31.79% (3.07 to 2.09) and 0.85% (1.08 to 1.07), respectively.

SDR rates of deaths resulting from events of undetermined intent also decreased in men aged 15 to 24 years (-57.14%, 1.57 to 0.67) and 24 to 64 (-25.90%, from 6.91 to 5.12) but increased in the aged 65 years or older (112.37%, from 2.34 to 4.96). In women, there was a reduction in those aged 15 to 24 years (-66.91%, from 0.63 to 0.21) and in 25 to 64 (-47.86%, from 2.29 to 1.20) and an increase in those over 65 years (364.29%, from 0.75 to 3.49).

table:

① Mean of annual standardized death rates by 5-years periods and temporal trends for suicide and death resulting from events of undetermined intent, according to sex and age groups

Suicide

Sex	Age	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	trend 1980-84 / 2005-09 (%)
All		9.17	8.85	7.94	5.58	8.05	7.60	-17.20
	15-24	0.92	0.81	0.57	0.40	0.47	0.44	-52.03
	25-64	5.85	5.39	4.94	3.25	5.06	4.64	-20.63
	>65	2.27	2.59	2.38	1.90	2.48	2.49	9.54
Male		14.55	14.48	13.04	9.18	13.52	12.55	-13.74
	15-24	1.14	1.13	0.83	0.58	0.76	0.72	-36.88
	25-64	8.87	8.33	7.73	5.09	7.95	7.28	-17.91
	>65	4.02	4.58	4.26	3.37	4.53	4.47	11.16
Female		4.99	4.44	3.74	2.64	3.46	3.32	-33.46
	15-24	0.69	0.47	0.31	0.21	0.18	0.15	-77.85
	25-64	3.07	2.69	2.36	1.53	2.24	2.09	-31.79
	>65	1.08	1.22	1.06	0.86	0.99	1.07	-0.85

Deaths resulting from events of undetermined intent

Sex	Age	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	trend 1980-84 / 2005-09 (%)
All		7.61	11.34	10.14	11.45	6.28	7.86	3.30
	15-24	1.11	1.47	1.28	1.29	0.63	0.45	-59.35
	25-64	4.51	6.59	5.58	6.14	3.29	3.12	-30.72
	>65	1.40	2.39	2.37	3.29	2.01	4.11	194.03
Male		11.60	17.59	15.80	18.20	9.73	10.99	-5.19
	15-24	1.57	2.29	2.04	2.10	1.02	0.67	-57.14
	25-64	6.91	10.44	9.11	10.12	5.39	5.12	-25.90
	>65	2.34	3.63	3.49	4.99	2.90	4.96	112.37
Female		4.12	5.75	5.02	5.40	3.15	5.03	22.03
	15-24	0.63	0.64	0.49	0.47	0.19	0.21	-66.91
	25-64	2.29	3.03	2.31	2.40	1.34	1.20	-47.86
	>65	0.75	1.50	1.58	2.05	1.40	3.50	364.29

When performing breakdown of absolute values by age, we found that in the group of young people (15 to 24 years old), in the last 30 years, comparing the 1980-84 and 2005-09 five-year´ periods, there was a more pronounced reduction of suicide in women (-83.66%, less 33 cases/year on average) than in men (-52.05%; less 35 cases/year on average), a total of 109 to 39 cases per year on average ***(see Table 2)***. In adult men, aged between 25 and 64 years old, in the last 30 years, there was an increase of 25 cases/year in the period of 1980-84 to 2005-09 (6.96%) while in women a decrease of 22 cases (-15.83%) was noted. In the older group, aged 65 and over, there was a substantial increase in suicides in men and women, between 1980-84 and 2005-09, representing over 143 cases in men (84.55%) and over 37 cases in women (55.99%).

table:

② Mean of annual raw values by 5-years periods and temporal trends for suicide and death resulting from events of undetermined intent, according to sex and age groups

Suicide

Sex	Age	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	trend 1980-84 / 2005-09 (%)
All		871	890	844	638	972	973	11.69
	15-24	109	95	67	45	48	39	-63.79
	25-64	511	496	470	322	534	514	0.70
	>65	236	292	303	269	388	417	76.48
Male		615	649	631	476	750	743	20.88
	15-24	68	67	49	33	39	33	-52.05
	25-64	371	367	354	244	412	396	6.96
	>65	170	211	225	198	298	313	84.55
Female		256	241	213	162	222	229	-10.40
	15-24	40	28	18	12	9	7	-83.66
	25-64	140	129	116	78	122	118	-15.83
	>65	67	81	78	71	90	104	55.99

Deaths resulting from events of undetermined intent

Sex	Age	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	trend 1980-84 / 2005-09 (%)
All		737	1141	1060	1276	751	1088	47.63
	15-24	131	174	148	144	63	40	-69.31
	25-64	394	607	531	610	347	346	-12.09
	>65	145	270	302	465	314	689	373.73
Male		525	829	773	939	534	666	26.88
	15-24	94	136	120	119	53	31	-67.02
	25-64	289	461	417	487	275	279	-3.53
	>65	99	169	185	295	188	347	251.42
Female		212	312	287	337	216	422	98.87
	15-24	37	37	28	26	10	9	-75.14
	25-64	105	145	114	123	72	67	-35.69
	>65	47	101	117	170	126	342	633.05

In relation to deaths resulting from events of undetermined intent ***(see Table 2)***, the annual average from the first to the sixth five-year period increased more than 350 cases per year. This excess came more from women than men, on average more than 210 annual cases against about 140. And it was in the elderly that an yearly average increase of over 248 cases was observed (+251.42%) between 1980-84 to 2005-09 for men and an average of more than 295 cases (+633.05%) for women. Whilst no major changes were observed in adults aged 25 to 64 years, with a slight tendency to decrease, more substantial in women, and a substantial reduction in young people aged 15 to 24 years, more in males (-69.31% between 1980-84 and 2005-09, an average of 63 fewer cases per year) but also in females (-75.14% between 1980-84 and 2005-09, an average of 28 fewer cases per year).

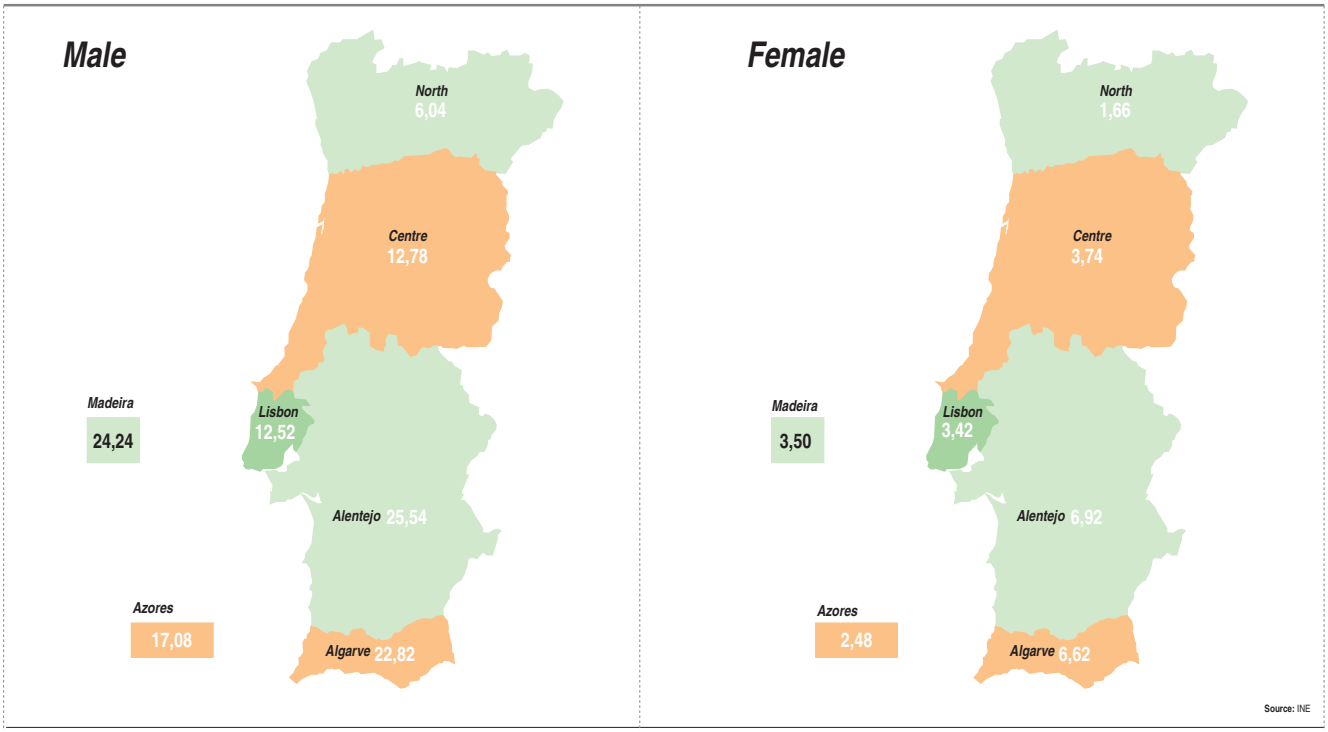
Still considering absolute values, in 2005-09, in men, there were on average more suicides than deaths resulting from events of undetermined intent while in women deaths resulting from events of undetermined intent were twice the number of suicides.

4. Rates and trends by sex and NUTS II regions

Standardized rates were obtained for suicide and deaths resulting from events of undetermined intent between 2000 and 2009. Taking the average for the five years from 2005 to 2009 *(see Figure 2)*, the regions with more suicide were Alentejo (male 25.54, female 6.92), followed by Algarve (male 22.82, female 6.62) and Madeira (male 24.24, female 3.50); followed by Azores (men 17.8, women 2.48), Center (12.78 men, women 3.74) and Lisbon and Tagus Valley (12:52 men, women 3.42); finally in last place was the North region (men 6.04, women 1.66).

figure

② **Mortality by suicide in Portugal, 2005-2009**
Suicide mean standardized death rates, by sex and regions NUTS2, 2005-2009



But if one considers also deaths resulting from events of undetermined intent, the annual average rates of probable suicide was higher in the autonomous region of Madeira, 31.30 per 100,000 inhabitants, followed by the Alentejo region with 23.63, the Algarve region with 23.10, the Centro region with 17.62, Azores autonomous region with 15.30, Lisbon and Tagus valley region with 12.63 and the North region with 11.47.

Between 2000-04 and 2005-09 *(see Table 3)*, the average rate of suicide declined in the North, Centre and Lisbon and Tagus Valley regions while the average rate of deaths resulting from events of undetermined

intent increased, reflecting what happened at the country level. In the Alentejo, Algarve, Azores and Madeira regions the average rate of suicide increased but, while in Alentejo and Madeira regions also increased the rate of deaths resulting from events of undetermined intent, in Azores and Algarve, this rate decreased. In the same period, in almost all regions there was a general decline in average rates of suicide and deaths resulting from events of undetermined intent in men and women aged 15 to 24 years, stabilization of rates in women aged 25 to 64 years, and increase in the elderly aged 65 years or more. The opposite pattern was observed in Azores for men with an expressive increase trend in the younger and a reduction in the elderly.

table:

③ Mean of annual stenardized death rates, mean raw figures and proportion for suicide and undetermined deaths, by 5-years periods according to NUTS II (regions)

	Suicide						Deaths resulting from events of undetermined intent					
	2000-04			2005-09			2000-04			2005-09		
	tmp-m	n-m	%	tmp-m	n-m	%	tmp-m	n-m	%	tmp-m	n-m	%
Portugal	**8.05**	972		**7.60**	973		**6.28**	751		**7.86**	1088	
North	**4.97**	199	20.7	**3.68**	156	16.1	**5.19**	210	28.6	**7.79**	354	33.0
Centre	**8.11**	235	24.4	**8.00**	242	25.0	**8.46**	242	33.0	**9.62**	326	30.4
Lisbon	**7.81**	247	25.7	**7.55**	252	26.1	**3.66**	115	15.7	**5.08**	190	17.7
Alentejo	**15.43**	168	17.5	**16.23**	182	18.8	**6.96**	70	9.5	**7.40**	89	8.3
Algarve	**13.72**	69	7.2	**14.65**	79	8.2	**8.58**	41	5.6	**8.45**	48	4.5
Azores	**7.94**	19	2.0	**9.65**	24	2.5	**7.70**	19	2.6	**5.65**	15	1.4
Madeira	**10.25**	25	2.6	**12.20**	32	3.3	**14.05**	36	4.9	**19.20**	52	4.8

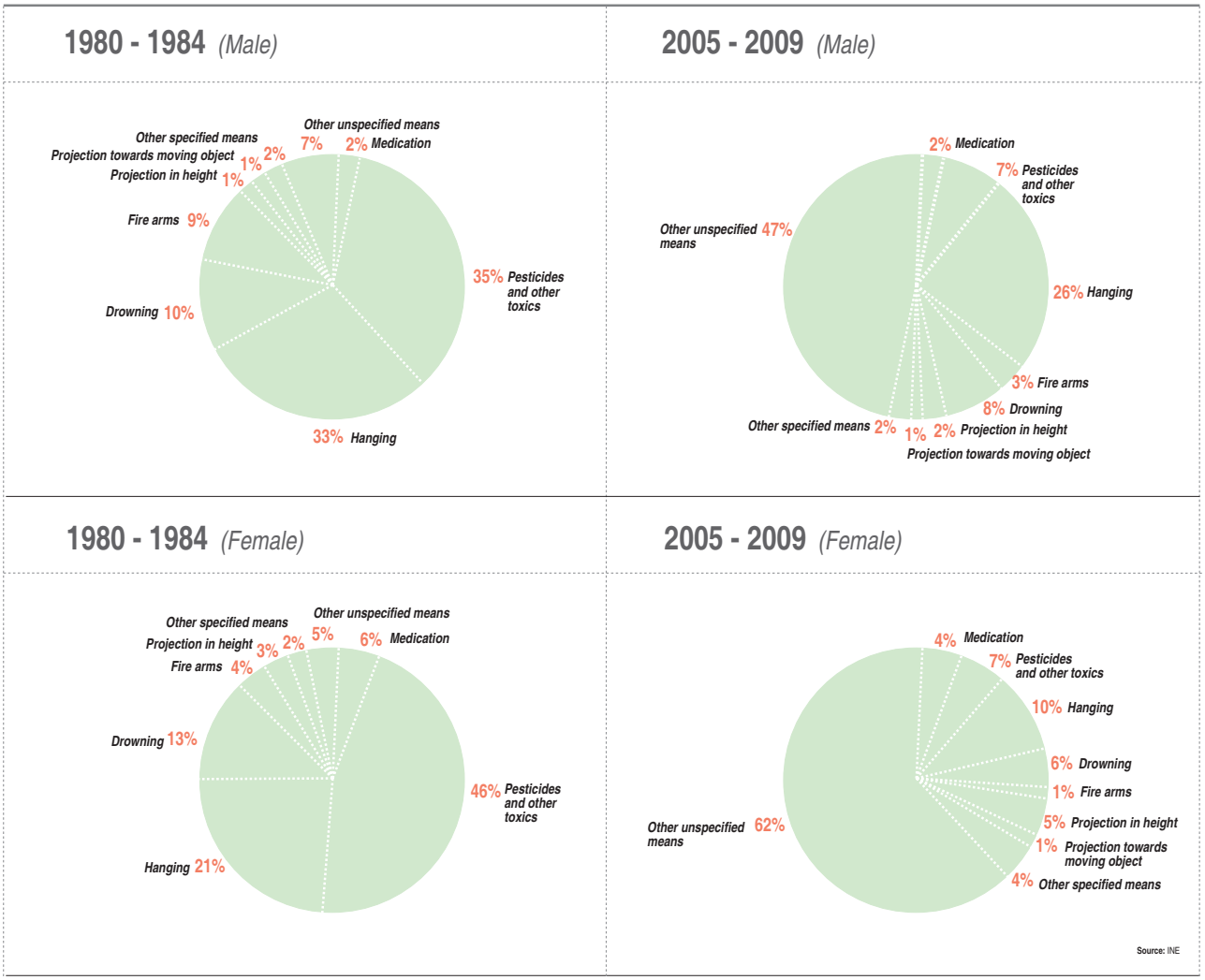
In absolute values, the importance of the three most populous regions, North, Centre and Lisbon and Tagus Valley emerged: in this set, 681 and 650 people died on average each year by suicide (71.8% and 67.2% of average total suicides), respectively in 2000-04 and 2005-09, but 567 and 870 died of deaths resulting from events of undetermined intent (77.3% and 81.1% of total average deaths resulting from events of undetermined intent). In deaths resulting from events of undetermined intent the particular regional impact excelled from North and Centre regions, which represented more than 60% (672/1061) of such deaths. Of these, about two-thirds were male (417/672).

5. Rates and trends by gender and lethal methods

For men in the period 1980-84, "pesticides and other toxics" ranked first position (35%), "hanging", second position (33%), "drowning" third position (11%), "firearms" fourth position (9%) and "other non-specified" fifth position (7%); in 2005-09 the "other unspecified means" went up to first position (47%), "hanging" maintained second (26%), "firearms" third (8%), "pesticides and other toxics" fourth (7%) and "drowning" in fifth position (3%).

figure:

③ **Relative fraquency of lethal methods, crude mortality**
Probable suicide in absolute numbers by lethal methods and sex, 1980-1984 and 2005-2009



In females, in 1980-84, the order for lethal methods was "toxic pesticides and other" (46%), hanging (21%), drowning (13%), medication (6%) and firearms (4%), and in 2005-09, the "other unspecified means" took the first position (62%), hanging maintained second (10%), then "pesticides and other toxics" (7%), drowning (6%) and "jumping from height" in fifth position (5%).

"Other unspecified causes of death" in the period 2005-09 in men corresponded to an average of 659 deaths/year, to 17.79% of male suicides and 78.97% of deaths resulting from events of undetermined intent . The same "other unspecified causes of death", in the same period, were on average 406 deaths/year in women and accounted for 20.68% of suicides and 84.96% of female deaths resulting from events of undetermined intent.

The average standardized rates of suicide by lethal method declined over the five-years periods between 1980 and 2009, except for those caused by "firearms", "jumping from height", "other specific" and "unspecified causes" in the case of both sexes and "jumping towards moving objects" for women *(see Table 4)*.

Also observable were marked reductions in mortality average rates by deaths resulting from events of undetermined intent, except for deaths by "jumping from height", "other specific means", "other unspecified causes" in both sexes, and "jumping towards moving objects" for women *(see Table 5)*.

Evolution of standardized rates of suicide and of deaths resulting from events of undetermined intent, as well as absolute values, confirmed a mixed picture of the deaths registry accuracy. Thus, between 1980-84 and 2005-09, for most causes of death was observed a marked reduction of the average rates of deaths for most methods, but from 2000-04 there was a steep increase in deaths from "unspecified cause" either by suicide or death resulting from
events of undetermined intent *(see Tables 4 and 5)*.

Table:

④ Mean of annual standardized death rates by 5-years periods and temporal trends for suicide, according to sex and lethal methods.

	Sex	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	trend 1980-84 / 2005-2009 (%)
Medication								
	All	0.28	0.21	0.18	0.15	0.32	0.22	-20.1
	Male	0.13	0.10	0.08	0.07	0.14	0.11	-15.9
	Female	0.15	0.11	0.10	0.07	0.18	0.12	-23.6
Pesticides, other toxics								
	All	3.44	3.20	2.96	1.13	1.24	0.82	-76.0
	Male	2.20	2.04	2.06	0.74	0.82	0.58	-73.7
	Female	1.24	1.16	0.90	0.39	0.41	0.24	-80.3
Hanging								
	All	3.92	3.87	3.22	2.85	3.71	3.06	-22.0
	Male	3.15	3.20	2.62	2.34	3.16	2.58	-17.9
	Female	0.78	0.67	0.60	0.51	0.55	0.48	-38.6
Drowning								
	All	0.63	0.57	0.40	0.29	0.49	0.43	-31.6
	Male	0.30	0.30	0.20	0.14	0.27	0.19	-38.0
	Female	0.33	0.27	0.20	0.15	0.22	0.24	-25.7
Fire arms								
	All	0.53	0.59	0.68	0.58	0.85	0.77	45.0
	Male	0.49	0.55	0.64	0.52	0.80	0.72	47.5
	Female	0.04	0.04	0.04	0.05	0.06	0.05	16.6
Projection in height								
	All	0.16	0.16	0.23	0.40	0.60	0.45	185.0
	Male	0.08	0.09	0.13	0.20	0.37	0.27	240.0
	Female	0.08	0.06	0.10	0.19	0.22	0.17	126.2
Projection towards moving objects								
	All	0.09	0.11	0.10	0.05	0.10	0.07	-23.0
	Male	0.08	0.08	0.07	0.04	0.07	0.05	-36.8
	Female	0.01	0.03	0.03	0.01	0.03	0.02	66.1

	Sex	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	trend 1980-84 / 2005-2009 (%)
Others specific								
	All	0.10	0.09	0.06	0.07	0.21	0.27	176.8
	Male	0.07	0.07	0.05	0.06	0.16	0.19	180.7
	Female	0.03	0.02	0.01	0.02	0.05	0.07	166.5
Others unspecific								
	All	0.07	0.08	0.06	0.06	0.52	1.46	1960.8
	Male	0.05	0.06	0.04	0.05	0.40	1.09	1894.5
	Female	0.02	0.02	0.02	0.01	0.12	0.38	2179.6

Table:

⑤ Mean of annual standardized death rates by 5-years periods and temporal trends deaths resulting from events of undetermined intent, by sex and lethal methods.

	Sex	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	trend 1980-84 / 2005-2009 (%)
Medication								
	All	0.28	0.32	0.29	0.22	0.19	0.16	-42.2
	Male	0.13	0.17	0.18	0.11	0.09	0.09	-36.6
	Female	0.15	0.16	0.12	0.11	0.10	0.08	-47.2
Pesticides, other toxics								
	All	2.99	3.45	2.79	1.43	0.57	0.30	-90.0
	Male	1.95	2.33	1.93	0.98	0.39	0.21	-89.1
	Female	1.04	1.12	0.86	0.45	0.18	0.09	-91.7
Hanging								
	All	0.85	0.93	0.62	0.85	0.38	0.19	-77.7
	Male	0.67	0.76	0.49	0.73	0.30	0.16	-76.7
	Female	0.18	0.17	0.13	0.12	0.07	0.03	-81.8
Drowning								
	All	1.42	2.25	2.14	1.68	0.83	0.24	-83.0
	Male	1.08	1.65	1.59	1.27	0.63	0.19	-82.7
	Female	0.34	0.60	0.55	0.42	0.21	0.05	-84.1
Fire arms								
	All	0.73	0.89	0.68	0.69	0.44	0.16	-78.5
	Male	0.61	0.76	0.57	0.59	0.37	0.14	-76.5
	Female	0.12	0.14	0.11	0.10	0.07	0.01	-88.5
Projection in height								
	All	0.09	0.09	0.12	0.17	0.22	0.18	97.8
	Male	0.05	0.06	0.07	0.12	0.16	0.11	101.5
	Female	0.04	0.03	0.05	0.05	0.06	0.07	92.2
Projection towards moving objects								
	All	0.02	0.02	0.01	0.00	0.01	0.02	-9.0
	Male	0.01	0.01	0.00	0.00	0.01	0.01	-24.9
	Female	0.01	0.01	0.00	0.00	0.00	0.01	21.9
Others specific								
	All	0.24	0.53	0.64	0.55	0.38	0.31	28.5
	Male	0.15	0.34	0.33	0.32	0.24	0.20	31.2
	Female	0.06	0.16	0.22	0.14	0.10	0.10	70.3
Others unspecific								
	All	1.01	2.92	2.95	5.94	3.27	6.03	497.4
	Male	0.76	2.21	2.29	4.42	2.37	3.85	406.7
	Female	0.25	0.71	0.66	1.52	0.90	2.18	772.6

4

Discussion

Has suicide increased or decreased? And the registry accuracy, does it changes the profile of suicide in Portugal? What are the needs for prevention required for Portugal?

Our main results point out to an excess of deaths resulting from events of undetermined intent with potential to be situations of suicide, the presence of an inverse relationship between these two causes points out to the existence of imprecision in deaths registration that might have biased the profile of suicide in Portugal. Observation point out that bias might have been towards male population and country's south. Results also reveal that in the last 10 years probable suicide seemed to be increasing in Portugal

The inverse relationship between deaths resulting from events of undetermined intent and suicide confirms what has been previously suggested in the literature but our study invalidates the possibility of no impact of excess of deaths resulting from events of undetermined intent in suicide trends inferred only from recorded suicides as depicted before [20].

Therefore, the eventual real standardized rates of suicide in Portugal will be higher than the current official value of 7.5 per 100,000 inhabitants in 2009, and might be around 12.0-14.0 per 100,000. In fact, the simple sum of deaths from suicide and deaths resulting from events of undetermined intent would be, by excess, about 15.0 per 100.000 inhabitants which if not fully credible, is it more than the official rate.

Furthermore, and in relation to other countries, knowing that Varnik et al [12] consider, for Portugal, the five year period 2000-04 for calculating the average of standardized rates of death from suicide and deaths resulting from events of undetermined intent in Portugal, we find that the data from our country despite being the worst results in Europe were, after all, the most favorable picture of the last 30 years with regard to the reliability of suicide registry. The reality, as we have shown, may actually be more severe. Comparing with other countries, Portugal will probably rank higher in suicide SDR than it was apparent before, and might ne above the European average of 10.0 per 100.000 inhabitants.

Also, we must point out that the 1990 decade might have been that when in the imprecision of suicide rates was the highest, questioning many of the conclusions of the study of Campos and Leite [18] on suicide and professional activity in that period.

The typical profile of suicide usually referred for Portugal, is not exaggerated when focusing elders, but the focus towards males and the south of the country might be exaggerated in relation to reality. That said, more men than women of all ages died across the country, but the ratio M/F is much smaller for all ages and all over the country and further reduces with age. One thing is sure, many more people die by suicide in the north than in the south, roughly considering NUTS II regions like North and Centre pertaining to north, and Lisbon and Tagus Valley, Alentejo and Algarve belonging to south, although the mortality rates continue to reflect the general described reality, due to the lower population in south. The analysis of SDR between 2000-04 and 2005-09 suggests that there was a balancing in the North, Centre and Lisbon, between lowering average rates of suicide and increasing of average rates by deaths resulting from events of undetermined intent, and a clear increase of suicide in the Azores, Algarve, Alentejo and Madeira regions where rates of deaths resulting from events of undetermined intent increased or regressed, along with an increase in suicide rates.

There are two aspects of pervasive impact that need clarification to understand and fully appreciate the data.

Firstly, there was a validation of causes of death by the DGS between 2001 an 2004, comprehensive and systematic in 2002 and 2003, in which SDR of deaths resulting from events of undetermined intent reached values of 2.45 and 2.64 per 100,000 inhabitants, very close to the standard of quality equal to or less than 2.0 per 100,000 [12]; this fact enabled rates of suicide and of deaths resulting from events of undetermined intent in recent years, and therefore the five years 2000-04, to be considered particularly accurate, so that simultaneous increases in both rates the next five years, or more simply increases in the average rate of suicide, or further increases in the combination

of both rates, are demonstrative of suicide increases in 2005-09. This is observed from a five-year period to the next, with a reduction of suicide and increase of deaths resulting from events of undetermined intent, the combination of both rates being higher in 2005-09. Furthermore, the validation of data in 2002 and 2003 might have revealed the true nature of the concealing of suicide in deaths resulting from events of undetermined intent and in fact, similarly, confirmed that over 30 years there has always been an inverse correlation between both rates.

The second consideration relates to the fact that suicide is an epidemiologically rare event and Portugal a relatively small country, so it makes sense to examine not only SDRs for five-year periods for comparison and risk evaluation, but also to consider the distribution of absolute numbers [21], particularly if we want to develop effective actions that allow a reduction in suicidality. In fact, if it is true the results show that the combined rates of suicide and deaths resulting from events of undetermined intent in the last five years are higher in Madeira (and also the inaccuracy in the register of deaths), the absolute numbers suggest to direct any prevention program to the North and Center regions of the country, where the inaccuracy of the registration will be highest and deaths from suicide and undetermined might correspond to three-fifths of the nation's total, in absolute values.

This might be sensed as surprising, especially if we take into consideration the fact that in these regions there is one of the highest coverage of specialized services, particularly in the Center. However, despite the assertive treatment of people who committed deliberate self-harm, regarded as a procedure of good clinical practice [22], the evidence in respect to evidence of such interventions continues to run low [23].

Interestingly, in Alentejo and Algarve, regions of low coverage of specialized services, where SDR tend to be higher, and recognized as such, there might also be uncertainty in the registration of deaths, but of minor value.

It will be also inefficient any set of strategies that do not take into account prevention in elderly, men and women. In fact, despite men of all ages continue to dominate the statistics of deaths by suicide; women and elderly women are the group who dies by probable suicide proportionally less well registered. Suicide affects the elderly and has increased in those with 65 years or more; conversely, in adults, suicide stabilized.

There are also reasons to rejoice: the result of 30 years show that among youth aged from 15 to 24 years, there has been a reduction of suicide recorded, along with greater precision in registry, in other words a reduction of deaths resulting from events of undetermined intent. It is a visible effect in other countries, despite a previous analysis that was restricted to the period 2000-2004, in which suicide seemed to be increasing in Portugal in males between 15 and 24 years [24]. It is difficult to explain this reduction but over the last 30 years there have been mostly adequate media coverage and publishing books with great public dissemination directed exclusively to the understanding and explanation of teen suicide, which may have had a preventive effect Papageno-like [25]. Moreover, there was an increase in the supply of specific services, such as the Departments of Psychiatry and Mental Health for Children and Adolescents and consultation for adolescents in the National Health Service, which may have contributed directly to the prevention of suicide among the most young. Interventions for other purposes may have result indirectly in the reduction of youth suicide, as the implementation of programs of school dropout prevention, drug prevention programs, programs aimed at young people from vulnerable socio-economic contexts as the government programme "Escolhas", implemented in January 2001 [26], and the dissemination throughout the country of Commissions for the Protection of Children and Youth.

Another reason for hope results from the visible reduction of deaths from pesticides in the past 30 years, most evident in the last 15 years. Despite difficulties in implementing the law number 173/2005, which would result in a very significant restriction on access to these lethal means by limiting the handling of these substances to certified applicators, the law number 82/1995, with the aim of reducing advertising of pesticides, also insufficiently implemented [27], may have played a role in prevention of suicide by pesticides, even if the high number of deaths by 'unspecified causes' demands interpretative caution.

If a decreasing trend was already previously observable, it became obvious in the last five years. Policies restricting access to lethal methods are effective [28] and this may optimize prevention of suicide by pesticides, and other lethal causes that have increased, such as death by "firearms", by "jumping for height" or in the direction of "moving objects".

Previously in 1989, based on data from 1970-1985, Castro et al [13] called attention to the systematic bias of lower register of suicides in Portugal, caused by a more restrictive definition in ICD-9, and called for greater consistency in the criteria registration of deaths resulting from events of undetermined intent. They claimed for the need of official statistics to be more accurate, in order to address the aim of preventing suicide and protect people at risk.

The results herein presented show that in the following 20 years the quality of official statistics might not only have not improved as it might have worsened, except for the systematic effort made in 2002 and 2003 by DGS. And the results also point out that suicide, conspicuous and dissimulated, without been clear if there was a slight increase over the past 10 years, it stabilized in the last 30 years.

We might presume that the appeal of Castro et al [13] – boosted in their internationally recognized paper, peer-reviewed and widely cited – could have been heard by decision-makers, experts and mental health professionals and public health national contemporaries and newer, but in fact there is no clear evidence that this has occurred.

There have been several local or regional experiences, in Lisbon, Coimbra and Braga, and possibly elsewhere, in the last 25 years were implemented strategies for high-risk in the form of specialized outpatient care for suicide prevention, with particular focus on young people. In this century, the Ministry of Internal Affairs and the Portuguese Society of Suicidology (SPS), founded in 2000, outlined a protocol for suicide prevention in the Public Security Police and more recently in the Directorate General of Prison Services. But the impact of these measures is very limited and very difficult to monitor. Since 2004, there were experiences of combining strategies for populations and high-risk strategies in Lisbon, incorporating a movement of good practice affirming itself throughout Europe and hoping to reach the status of "evidence-based" [29-34].

However, the most important sign of responding to the call of accuracy in the registration of deaths came from the DGS in the beginning of this century. And there are reasons for cautious optimism due to the implementation of the new web based National Death Certification Information System (SICO). Tempered optimism because this new system data may produce a shift, such as the one occurred from the change of IDC8 to ICD9 in 1980's that seemed to have worsened the quality of registration by physicians apparently completing death certificates less accurately, the same might have happened with the transition from ICD9 to ICD10 in 2002, in which the cause of death for approximately half of all death certificates relating to the combination of suicide and deaths resulting from events of undetermined intent was "other unspecified causes" (codes X64 and Y34 of ICD 10). Doctors need to be motivated to complete more accurately the online death certificates.

In the future it will be important to study the relation between probable suicide with other variables such as marital and occupational status and to delineate a map of register inaccuracy at the district and municipality level in order to operationalize a national programme for suicide prevention. Such a programme should be evidence based and good practice principled and aim at correcting errors and gaps that still stand past 30 years.

Conflicts of interest

The authors do not have any conflict of interest to state.

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5

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Surveillance of nosocomial bloodstream infections in portuguese hospitals 2010-2011

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Abstract: Nosocomial bloodstream infections (NBSI) are one of the most serious hospital acquired infections (HAI), associated with high attributable mortality and excess costs. In order to obtain a hospitalwide view of HAI the bacteremia programme was started in 2002 and continues to the present. In 2010 a web-based programme was developed to facilitate data introduction and access to regular local reports. This report describes the results of the first two years of the new web-based programme. In 2011 participating hospitals increased significantly from 19 to 38. Primary NBSI accounted for 59.2% of the episodes (66.7% of unknown source and 33.3% central intravascular catheters (CVC) associated). CVC associated infections were predominantly in Intensive Care Units (ICUs), Hematology/Oncology units and General Surgery. Half of the patients (49.7%) were discharged live, 20.1% were transferred to other hospitals and a total of 1083 patients died during hospitalization (case fatality rate 28.9%). Mortality was highest in polyvalent ICUs (44.2%). Seven per cent of episodes of NBSI were polymicrobial. Almost half of these were in episodes secondary to infection in distal sites. Gram positive organisms accounted for 47.6% and Gram negative for 48.3% of the isolates. Fungi, mainly Candida species were found in 3.9% and anaerobic bacteria in 0.2% of NBSI. The small proportion of isolates tested in relation to the total number of isolates restricted the analysis on resistance. With regard to Gram positive organisms, 62.4% of *Staphylococcus aureus* were *Methicillin-resistant Staphylococcus aureus* (MRSA); 19.4% of *Enterococcus faecium* and 1.2% of *Enterococcus faecalis* were resistant to Vancomycin. In Gram negative organisms a signifcant number of *E. coli* (22.7%) were resistant to amoxicillin/clavulanic acid; 12.3% *E. coli*, 22.9% *Klebsiella spp* and 6.7% *Enterobacter spp* were positive for extended spectrum beta lactamase (ESBL). Around 17.3% *Pseudomonas aeruginosa* were resistant to Imipenem, and 16.7% were resistant to Ceftazidime. Over 90% *Acinetobacter spp* were resistant to Ceftazidime and Imipenem and 4 strains resistant to colistin were identified.

If surveillance programmes are to justify the resources consumed, it is necessary to use the information obtained to design intervention programmes that will reduce the burden of NBSI. These results provide useful information which needs to be used for the planning of preventive interventions. It is essential to secure a greater involvement of the microbiology laboratories so that important information on resistance epidemiologic markers can be obtained consistently in order to calculate the true resistance rates. We consider that mandatory reporting is essential so that preventive efforts can be targeted to the risk factors identified.

Key Words: surveillance; nosocomial bloodstream infections; hospitals

1

Introduction

Nosocomial bloodstream infections (NBSI) are one of the most serious hospital acquired infections (HAI), associated with high attributable mortality and excess costs [1-7]. Over the years, there has been a change in the epidemiology and microbiology probably related to increasing severity of illness in hospitalized patients, wider application of invasive medical devices, increased usage of aggressive drug therapy resulting in immunodeficiency, changing patterns of antimicrobial

usage and increasing multiresistant microrganisms [8-11]. This constitutes a major challenge to medical practitioners and institutions and has led to the inclusion of the surveillance of bloodstream infections in many national HAI Surveillance Programmes [9, 12-15].

The frequency of NBSI has been increasing steadily in Portugal with a prevalence of 3.2% in 1988 and of 5.9% in 2010. The national programme of surveillance of HAI has focused mainly on high risk populations (adult and neonatal ICU, surgical procedures) and these programmes are managed by the specialists from the departments involved. In order to obtain a hospitalwide view of HAI, the bacteremia programme was started in 2002 and continues to the present. Initially, report forms were forwarded to the coordinating centre and introduced manually into a database. Because of operational difficulties the number of participating hospitals gradually decreased. To stimulate participation a web-based programme **(www.insa-rios.net)** was developed to facilitate data introduction and access to regular local reports enabling the hospitals to analyse their own data to identify problems in which interventions and/or intensified surveillance are required. It also allows the participating hospitals to compare their data with the results of aggregated data. Additionally, the timely epidemiological information can guide appropriate empirical therapy of NBSI.

The general objective of the present report is to describe the results of the first two years of the new web-based programme and, more specifically, to describe the epidemiology and microbiology of hospital acquired bloodstream infections in the participating hospitals.

2 Materials and Methods

Participating hospitals: Participation is voluntary and coverage options include either the total hospital population or specific services selected according to local criteria (patient risk groups and available resources). In the first year (2010), 19 hospitals participated, 12 of which included the total hospital population. In 2011 participating hospitals increased significantly to 41 hospitals of which more than half (58.3 %) included the total hospital population. The included hospitals are of various sizes and types (level one to university level). Regional distribution was variable as described in ***table 1***. Clincal data were prospectively collected by infection control nurses and link nurses in the wards and validated by the infection control doctor when appropriate. A standardized protocol [16] was supplied by the coordinating centre (National Infection Control Programme) together with a data collection form. The data collected include patient´s age, sex, location at the onset of the NBSI, predisposing conditions and presence of intravascular catheters, date of admission and date of discharge, date of blood culture, organism(s) isolated and antimicrobial susceptibility and probable source.

table:

① Regional distribuition of participating hospitals

Region	Participating hospitals	All patients included	Total hospitals in the region
North	11 (34.4%)+1 private	45,5%	32
Centre	4 (16.7%)	0%	24
Lisbon and Tejo Valley	12 (46,2%)+3 private	62,5%	26
Alentejo	4	50%	5
Algarve	2 + 1 private	100%	2
Madeira	1	100%	1
Azores	2	50%	3
Total	**41**	**58,3%**	**93**

Definitions: Only laboratory confirmed NBSI were included. The CDC (Centers for Disease Control and Prevention, Atlanta, USA) [17] criteria were used to identify the presence of infection. NBSI were classified as primary (vascular catheter-associated or of unknown origin) or secondary to infection at a distant body site. Sources of secondary infection were identified by cultures of samples obtained from distal sites that yielded the same pathogen with an identical resistance pattern. Blood cultures were processed according to routine methods in use at each hospital.

Statistical methods: Binomial confidence intervals were calculated for proportions and incidence density estimates using Bliss' exact method [18]. For ratios estimates confidence intervals were calculated using the relationship of binomial and beta distributions [adapted from Silcocks, 1994 [19]]. When presenting estimates and 95% confidence intervals have the format: estimate [95%CI].

3

Results

During the study period from January 2010 to December 2011, 3744 episodes of NBSI with 3955 organisms were reported by participating hospitals. The overall incidence of NBSI was 0,88 [0.86-0.91]) per hundred patients and an incidence density of 1.2 [1.197-1.279] per thousand patient days. The mean age of patients was 60.7 years (median 65 years) with a range of less than one month to a hundred years. Fifty eight percent of patients were male.

Among the potential predisposing factors, central intravascular catheters were the most frequent. Central venous catheters were present in 59,3% [57.7%-60.8%], urinary catheters in 49% [47.3%-50.6%] and mechanical respiratory ventilation in 17.4% [16.2%-18.6%]. A total of 10.7% [9.7%-11.7%] of patients were receiving parenteral nutrition and 4.8% [4.2%-5.6%] underwent dialysis; 19.6% [18.3%-20.9%] had a surgical procedure performed. About one third (32.3% [30.8%-33.9%]) had a malignancy and neutropenia was recorded in 18.6% [17.4%-19.9%]; 11.9% [10.8%-12.9%] of patients had diabetes.

Episodes of NBSI

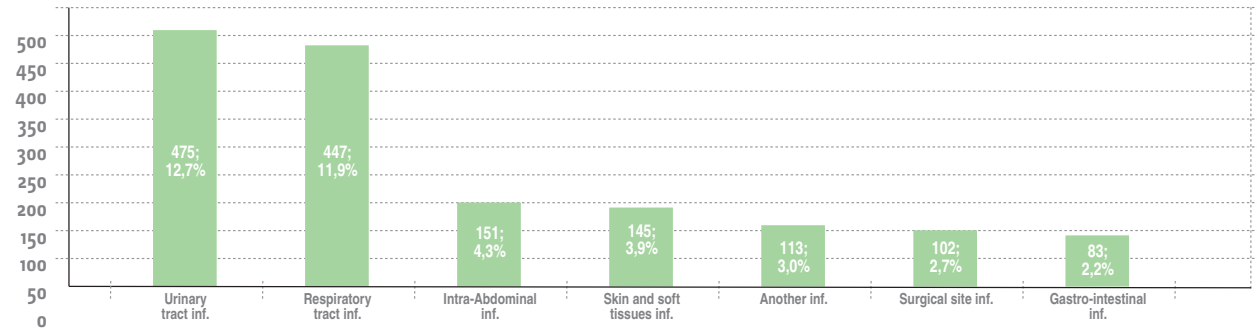
A quarter (25% [23.6%-26.4%]) of the episodes was reported in patients from departments of Internal Medicine, 23,7% [22.3%-25.1%] from ICUs, 19.9% [18.7%-21.2%] from Hematology/Oncology units and 11.6% [10.6%-12.7%] from General Surgery Departments.

Primary NBSI accounted for 59.2% [57.6%-60.8%] of the episodes (66.7% [64.7%-68.7%] of unknown source and 33.3% [31.3%-35.3%] CVC-associated). CVC associated infections were predominantly in ICUs, Hematolgy/Oncology units and General Surgery.

Secondary NBSI were predominantly in Internal Medicine (34,7% [32.3%-37.2%] - due to urinary tract infections and respiratory tract infections); followed by polyvalent ICUs (15,5% [13.7%-17.4%] - mainly due to respiratory tract infections), General surgical wards (11.8% [10.2%-13.5%] - intra-abdominal, surgical site and urinary tract infections), and Hematolgy/Oncology units (10.4% [8.9%-12.1%] - respiratory tract and gastrointestinal infections).

table:

② Distribution of secondary NBSI by origin



Half of all patients with NBSI (49.7% [48%-51.3%]) were discharged live, 20.1% [18.8%-21.4%] were transferred to other hospitals and 30,2% died during hospitalization. The in-hospital case fatality rate was 28.9% [27.5%-30.4%]. Mortality was highest in polyvalent ICUs (44.2% [39.8%-48.6%]) followed by other ICUs (39.2% [34.1%-44.5%]) and Internal Medicine Services (38.8% [35.6%-42.1%]). Age related mortality was highest (42% [38.3%-45.9%]) in patients over 80 years of age and 36.4% [33.2%-39.7%] in the 71-80 age group.

table:

③ Distribution of indicators by services / specialties (excluding services with < 20 episodes)

Service	Total nº episodes	Proportion /100 pts (IC 95%) *	Incidence density /1000 pt days (IC 95%) *	CVC related /1000 CVC days (IC 95%) *	Device Utilization ratio (CVC days/pt days (IC 95%) **
Ped. Hematology / Oncology	121	**5.03** (4.19-5.98)	**8.75** (7.26-10.44)	**6.07** (4.7-7.72)	**0.79** (0.766;0.806)
Adult Hematology / Oncology	625	**4.59** (4.25-4.96)	**5.69** (5.26-6.16)	**3.91** (3.31-4.58)	**0.35** (0.346;0.354)
Polivalent ICUs	510	**4.84** (4.44-5.27)	**8.08** (7.4-8.81)	**1.69** (1.39-2.03)	**1.04** (1.03;1.053)
Other ICUs	363	**2.04** (1.83-2.25)	**3.89** (3.5-4.31)	**1.09** (0.84-1.39)	**0.62** (0.614;0.627)
Internal Medicine	937	**0.94** (0.88-1)	**1.02** (0.95-1.08)	**2.30** (1.79-2.89)	**0.03** (0.033;0.034)
Medical Specialties	326	**0.77** (0.69-0.85)	**1.08** (0.97-1.21)	**2.57** (2.03-3.2)	**0.10** (0.101;0.104)
General Surgery	435	**0.52** (0.47-0.57)	**0.90** (0.82-0.99)	**2.73** (2.24-3.3)	**0.08** (0.081;0.083)
Surgical Specialties	293	**0.46** (0.41-0.52)	**0.64** (0.57-0.72)	**2.54** (2.01-3.17)	**0.07** (0.066;0.068)

*** Bliss binomial confidence interval** [18]

**** Confidence interval based on the relationship of binomial an beta distributions, adapted from Silcocks, 1994** [19].

In average, length of stay was prolonged over 3 times (20.5-45.9 days) in relation to the average length of stay of the total population studied (3.2-7.5 days).

Microbiological features: Seven per cent of episodes of NBSI were polymicrobial. Almost half of these (n=265 - 47.9% [43.7%-52.2%]) were in episodes secondary to infection in distal sites.

Gram positive organisms accounted for 47.6% [46%-49.1%] and Gram negative for 48.3% [46.7%-49.9%] of the isolates. Fungi, mainly *Candida* species were found in 3.9% [3.4%-4.6%] and anaerobic *bacteria* in 0.2% [0.1%-0.4%] of NBSI.

table:

④ Rank order of nosocomial bloodstream

Rank	Pathogen	Nº Isolates	%
1	*Staphylococcus aureus*	728	18.4
2	*Coagulase-negative Staphylococcus*	681	17.2
3	*E. coli*	543	13.7
4	*Klebsiella species.*	437	11.0
5	*Pseudomonas species*	395	10.0
6	*Enterococcus species*	351	8.9
7	*Enterobacter species*	149	3.8
8	*Acinetobacter species*	132	3.3
9	*Streptococcus species*	84	2.1
10	*Proteus species*	72	1.8

Resistance to antibiotics: The small proportion of isolates tested in relation to the total number of isolates restricted the analysis on resistance. The limited information obtained is however sufficient to appreciate the degree of resistance encountered.

With regard to Gram positive organisms, 62.4% of *Staphylococcus aureus* were MRSA; 19.4% of Enterococcus faecium and 1.2% of Enterococcus faecalis were resistant to Vancomycin.

In Gram negative organisms a signifcant number of E. coli (22,7%) were resistant to amoxicillin/clavulanic acid. Although the number tested was significantly lower than the total number of isolates, assuming that ESBL testing is selective, 67 strains of *E. coli* (N=543) were positive (12.3% [9.7%-15.4%]), 100 strains of Klebsiella spp (n= 437) were positive (22,9% [19%-27.1%]) and 10 strains of Enterobacter spp (n=149) were positive (6,7% [3.3%-12%]) for ESBL.

Around 17,3% of Pseudomonas aeruginosa strains were resistant to Imipenem, and 16.7% to Ceftazidime. Over 90% Acinetobacter spp were resistant to Ceftazidime and Imipenem and 4 strains resistant to colistin were identified.

4 Dscussion

A number of caveats associated with the data in this report must be highlighted. The number of participating hospitals was different from one year to the other as also the varying skills and experience of the infection control professionals collecting the information to determine whether the positive blood culture is neither due to contamination from skin bacteria nor acquired in the community rather than in the hospital, or in confirming the origin of the NBSI as primary or secondary to infection at other sites. Additionally, denominators for individual antimicrobial agents vary because not all hospitals test and report all drugs and infection control practitioners do not have access to the full antibiograms having to use the selective report made available to the clincians treating the patients. Nevertheless, the data provide useful information which needs to be used for the planning of preventive interventions.

One important finding is the higher rates of CVC associated NBSI in non-ICU services such as Internal Medicine and General Surgery. The device utilization in these services is very low as can be seen from the device utilization ratios ***(Table 3)*** and this could be related to the difficulty of implementing best pratice due to small number of patients with CVC in relation to the total population. Additionally, certain individual patient co-morbidities may not be considered in the definitions [20].

table:

5 Distribution of main indicators since the beginning of the programme

Period	Episodes	Proportion /100 pts	Incidence density (/1000 pt. days)	% Primary NB (including CVC)	CVC related (/1000 CVC days)	Crude mortality (%)
2002 – 2004	5385	0.79	1.2	69.3	3.1	37.2
2005 - 2007	1248	0.88	1.5	61.6	3.0	37.1
2010 - 2011	3744	0.88	1.2	59.2	3.0	28.9

Comparing data since the beginning of the programme is not a straightforward exercise because participation is irregular and hospitals have joined in and dropped out of the programme through the years. In addition, hospital size is an important aspect since smaller hospitals generally have lower risk of infections [20].

However, a superficial analysis suggests that there have not been significant improvements. It is essential to secure a greater involvement of the microbiology

laboratories so that important information on resistance epidemiologic markers can be obtained consistently in order to calculate the true resistance rates.

If surveillance programmes are to justify the resources consumed, it is necesssary to use the information obtained to design intervention programmes that will reduce the burden of NBSI. Due to the high morbidity and mortality associated with NBSI, obtaining solid epidemiological information is very important. We consider that mandatory reporting is essential so that preventive efforts can be targeted to the risk factors identified.

Conflit of Interests Statement

The authors do not have conflict of interest to declare.

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5

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The place and the role of internet use in health: The Portuguese case

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Abstract

Much of the debate surrounding the theme of the information society emphasises the use of the internet in the emancipation and empowerment of citizens particularly among the better educated. This discussion will pay close attention to its use on the area of health in Portugal. We wish to know to what extent this resource has permitted the reconfiguration of learning in health, particularly in relation to expert knowledge of biomedicine. In truth, it remains imprudent to attribute this status to the internet, since we cannot assume it is a substitute for health professionals and their closest agents. Consequently, this article will discuss its potential and its limitations.

Additionally, with recourse to the construction of a typology of the profiles of internet users in Portugal, this article creates space for the question of technology dependence in how access to information on health care could create new forms of social inequality, especially between the older generation and those who most depend on this access.

Despite now being central to our lives, the use of information and communication technologies (ICT) in Portugal remains associated with certain social groups and is not shared by the whole population. The data used in this article is from a survey of a representative sample of the Portuguese population conducted as part of the SER project (A Saúde em Rede – Health on the Internet), which is dedicated to the theme of ICT in the area of health.

Keywords: Internet, health, empowerment, communication in health, social inequality.

1

Introduction

The days in which we live are marked by strong differences that are perceived in relation to contexts typical of 20th-century modernity. One difference worth noting is that better educated populations tend to result in a whole series of changes, for example, in the means of understanding the citizens' role, in relation to deep-rooted social institutions, such as is the case in respect of modern Western medicine.

While it may be controversial, we accept the premise that there is a relationship between education and critical consciousness, which is understood as the individual's ability to assess and to choose [(1)]. Moreover, there have been many recent examples of once unthinkable cases in which individuals seem to assume the role of an agency, where ICT are generally the first resort for the exercise of this condition [(2) (3) (4) (5) (6)].

Despite everything, it is important to exercise some caution in the interpretation of this type of process, since we are not operating in a sphere that is immune to defined norms, such as with the case of punishment and supervision discussed in detail by Foucault [(7-8)].

Mechanisms for biomedical regulation are thus undertaken with an increasing transfer of competences from the social and political levels to individual responsibility [(9-11)].

What we are dealing with is an apparently paradoxical relationship between normative controls and increasing individual freedom, but the articulation of which is possible and has been growing in the health field.[i] (see end of section 6)

An internet search of matters related to health, beauty and well-being can be considered to be one of the more explicit examples of this synthesis of normative and freedoms.[ii] Accessing the internet with this aim presupposes the individual had previously paid attention to their well-being and/or their body, which demonstrates the existence of a process: first of the normative interiorisation and the subsequent production of lay rationalities about health and illness.

Aware that a growing proportion of social interactions take place in virtual space (2-6), this article concerns itself with the questions that emerge from the use of the internet in the way individuals relate to their health and well-being, and in particular in the production of lay knowledge about health, health education and the relationship with health professionals. On the other hand, knowing about governmental worries concerning new technologies (12), it's important to understand the consequences in terms of the potential increase in inequalities, in access to health care.

2

Data collection and sample

This article is based on the results obtained by the SER Project,[iii] through a questionnaire survey of a representative sample of the resident population of continental Portugal over the age of 15 (N=808), which converges with the age group surveyed in other studies on ICT (13). In order to ensure the representativeness of internet users, the study took as its base recent data that shows 45 per cent of the Portuguese population use the internet (14). This questionnaire survey was applied by GfK Metris during November and December 2010 (15).

3

Methods and discussion: Internet use in Portugal - Revealing profiles

In order to obtain a more accurate understanding of the way in which the Portuguese population use the internet, we established a typological definition of profiles based in a group of variables that, as a whole, translates into logics of social stratification.[iv]

At issue is the matter of the differentiation of individuals in social and relational space. A constant theme in sociological reflection, today it is part of the scientific domain that the unequal positions individuals occupy in respect of access to certain resources are responsible for the processes that shape and distinguish the social space. In the construction of profiles was used the MCA (multiple component analysis) typology, as much for its adaptation to the characteristics of the composition of the social strata typical of Portuguese society, as for its widespread empirical consolidation (16-20).[v]

On the other hand, age is also an explanatory factor explaining the unequal possession of resources. Aware that modern societies are guided by ever greater value being placed on formal qualifications over what is commonly called 'life experience' (21), age must be understood in a more profound and complex manner than its biological condition transmits. Moreover, as Costa (17) notes, age has no value in itself as an essentialist condition, given that it is impregnated with meanings and social attributes, roles and conditions around which position, behaviour and representation are defined (22).

As we can see in ***Figure 1*** , a total of four socio--economic profiles were defined that are revealing in terms of internet use.[vi] The category 'no use of the internet' (NUI) is the one that is largest in Portuguese society (33.7 per cent). It is largely made up of individuals aged from 45 to 64 who have completed only the second cycle of basic education, who have insufficient understanding of foreign languages and whose monthly household income is between €501 and €1000.

The second-largest profile is 'habitual use of internet' (HUI) (29.2 per cent). This includes users who consult the internet two to three times a week, who are aged from 25 to 44 and who have completed compulsory schooling (third cycle) and people with a monthly household income of €1001-1500.

The third group has been designated 'information excluded' (IEX) (21.6 per cent). They tend to be older, retired, with no formal schooling and have the lowest family incomes.

The final group is designated 'daily use of internet' (DUI) (15.5 per cent). Much the same as the previously described profile, there is an almost linear correspondence between the various socio-demographic indicators, which translates into the cumulative character between the possession and non-possession of certain resources. In this case the profile is defined by the higher social classes, of people with greater financial resources and higher levels of education, as well as younger people.

figure:

① Topological and typological space in relation to internet use in Portugal

Currently the role of technology in the production of and access to information appears to be unquestionable. Castells [23] has labelled this dependence of Western societies on the diffusion and circulation of information as the 'network society'. It is not only a technological transformation; it is above all a change in the social structures as a result of this transformation.

In Portugal access to information and the use of the internet has become massive. Technological advances, which are associated with a political atmosphere favourable to new technologies in order to make them more accessible to the citizens, have led to improvements in the national coverage of internet access, as well as the lowering of its cost, although these processes have found some resistances on their path [24-28].

4

Health referring and the internet

In relation to the 2006 data [27], about 5 per cent of internet searches were for themes related to health, beauty and well-being, nowadays this figure is 25.7 per cent.

While those who have a closer relationship with the internet tend to search for illnesses in general, those who have no relationship with the internet or who are information excluded tend to seek assistance from others in order to search for diagnosed illnesses.

According to the terminology employed by Giddens [1], the advance of new technology has led to the emergence of a debate on the role of lay knowledge in the typically asymmetrical power relationship with health professionals. It is in this framework that recent debates over the creation of a user who is increasingly informed and independent in the use they make of their searches [28] and who therefore possess an emancipating individual autonomy [29].

As we can see in ***Table 1***, for the Portuguese health professionals in general, and doctors in particular, are the main reference in matters of health[vii], followed by family and friends. This double relationship in obtaining knowledge about health, between lay knowledge and specialist knowledge, has been documented for some time in the field of the sociology of health, and reflects the complexity of the practices and representations of individuals about their health and illness [30].

While these results show that television retains its preponderance as the main source of mass information [31], it is not possible to ignore the place the internet has assumed.

We must also note the place of alternative medicine practitioners, social networks and patients' associations, which appear to have a residual place as a health reference source. In fact, notwithstanding the fact that we live in a social context marked by a growing scepticism of lay knowledge in relation to medicine [32-33], compared to the other sources of information medicine continues to reproduce its dependence in its knowledge [34]. Second, it also reinforces the idea that the sharing of knowledge through new technologies has an as yet insignificant weight as a source for learning about health and well-being.[viii]

Despite health professionals and friends and family representing the main sources of information on health, their trust tends to be overrepresented among older people who make little use of the internet (NUI and IEX profiles) and underrepresented among the young, the educated and those with a close relationship with the internet (RDI and RHI profiles).

Table 2, on the other hand, shows the average global values on the object of the searches carried out on health, beauty and well-being. The majority of searches are carried out to obtain specialised information about health problems or to increase general knowledge about health.

This means the use of the internet is far from being a sign of the emancipation of lay knowledge. From another perspective, while it is undeniable that more and more areas of knowledge about the daily management of health and sickness are outside the traditional biomedical domain – for example, acupuncture and homeopathy [35] – these areas continue to account for a residual amount of internet searches compared to biomedicine.

table:

① **Sources of information on health** (average)

Doctors (*)	3,1
Pharmacists	2,58
Family and friends (**)	2,45
Nurses (*)	2,34
Television (**)	1,93
Books (**)	1,59
Internet sites (**)	1,56
Radio	1,55
Magazines (**)	1,54
Newspapers (**)	1,52
Therapists/alternative medicine professionals (**)	1,32
Social networks (**)	1,29
Patients' associations (**)	1,23

(*) **<0,05** (Anova)

(**)**<0,05** (Kruskal-Wallis)

table:

② Purpose of internet search (%)

To obtain specialist information about a health problem	86.1
To increase general health knowledge	82.7
To share experiences about health problems	41.7
To seek treatment	33.7
To find a health professional	30.0
Self-diagnosis	23.2
To compare prices of medicines	19.0
To compare the price of beauty and well-being products	16.4
To find other people who are not health professionals	16.6
To find another professional/therapist	14.9
To purchase health, beauty and well-being products	5.8

This data relates to the generality of cases in which individuals feel the need to access sources of health information. Consequently, it is important to understand whether the perceived seriousness of the symptoms introduces substantial changes to people's behaviour.

In any case, from the statistical point of view there is no relationship between the profiles of internet use and the resources sought in situations that are considered to be non-urgent (Cramer V = 0.165) and urgent (Cramer V = 0.114). In non-urgent cases, the main resource tends to be the family's National Health Service (SNS – Serviço Nacional de Saúde) doctor.

While this is true across all individuals, this tendency is greater for the profile in which people are older and less well educated, given that the others have slight increases in the use of other information sources. Among those aged 25-44 and with average levels of education, and those who work as tradesman, as well as those aged from 45-64, domestics and the unemployed there is a greater tendency to seek information from a pharmacist. The young and those with greater capital resources will tend to either seek advice from friends and family or use a private health service.

There is a new convergence in cases in which the illness is considered urgent; in this case in the use of the public hospital accident and emergency service and the health centre's permanent attendance service (SAP – serviços de atendimento permanente). The main differences are between those who have more resources where there is a slight increase in the use of private emergency services.

The reasons for these choices are explained in ***Table 3*** below. It can be seen that the repetition of choices, independently of what they are, are mainly a result of lessons that have become routinised in each person's day-to-day life. These figures are revealing in that they allow us to elucidate the actual weight social influences assume in individual choices in relation to health.

table:

③ Reasons for taking a particular decision about what health sources to use

In non-urgent cases		In urgent cases	
Because I am used to doing this	51.4	Because I am used to doing this	45.0
Because the last times I did this I was pleased with the outcome	9.3	Because the last times I did this I was pleased with the outcome	9.2
Because a friend/family member told me to	1.4	Because a friend/family member told me to	1.0
Because I had more confidence	29.5	Because I had more confidence	38.4
Because it is faster/more practical/closer	4.1	Because it is faster/more practical/closer	3.4
It was a question of money	0.8	It was a question of money	0.8
Because it is not a serious health problem	0.5	Because it is always taken care of	0.9
Because it was the correct procedure	1.3	Other reason[IX]	1.3
Other reason[X]	1.7		
Total	**100.0**	**Total**	**100.0**

[ix] Such as: no alternative close by; they have the best equipment; has to be overseen by the company doctor.

[x] Such as: having a special relationship with the health professional; the medical service belongs to the company the individual works for; because it is where the insurance company has an agreement.

Beyond the significance of these conclusions, it is important to outline others, such as the confidence the population has in the health professionals in the public institutions, which converges with international data on the relationship with health systems (36).

Read another way, the effects of the existence of a Beveridge-style general and universal health care system can be seen,[xi] prove the marginal importance that the possession of financial resources represents in relation to access to health services or the insignificance of whether they were or were not attended or even the speed, convenience and proximity of the service.[xii]

Thus, the practice of individuals in the management of their illness demonstrates the yet peripheral position of new technologies, particularly in those situations in which one might expect there to be an advantage in its use, such as in the case of health problems that are considered to be non-urgent. Health professionals and the public services remain the preferred resources in a society that in a short space of time has constructed a relationship of trust with these providers.

In addition to existing work in which the present challenges facing the Portuguese health system are discussed, particularly in terms of the openings that have been made to private health care providers in the name of the public sector (37-39), there are as yet very few conclusions concerning the future implications of this intense public-private relationship on the Portuguese health system.

5

The role of the internet in health

In a way that is consistent between the profiles of internet users, the preferred method of searching is through the use of search engines, revealing the relatively open and contingent nature of internet searches.

table:

④ Health, beauty and well-being themes search on the internet [xiii]

	Average values	Standard deviation
Fitness and exercise	2,08	1,003
Nutrition and eating problems	1,83	0,998
Beauty and well-being	1,65	0,897
Sexually transmitted diseases	1,54	0,778
Contraception	1,53	0,810
Fertility and pregnancy	1,47	0,811
Drug addiction	1,42	0,747
Sexual condition and performance	1,31	0,672

In common with previous analyses and by the nature of the themes that are most searched for, the internet has become a source with few physical and temporal barriers to accessing generalist and/or specialised information on fitness and exercise, nutrition, beauty and well-being. In fact, there is statistical evidence that allows us to state that the Portuguese are today more concerned with health, but as a wider social process associated with the secularisation of societies (40-41), and with a less direct relationship with the internet.[xiv]

The internet represents one more source of access to information about health, with well marked potential and limitations. On the one hand, it involves a verbal and/or written interaction that allows the source of discredit in which a potential social stigma is based to be left invisible (42). On the other hand, it is precisely here that the limitations on the internet lie, especially on topics related to health, beauty and well-being.

Specifically in respect of the lower levels of trust in the internet than in other means of information, it is important to note that one of the aspects that was given greater importance by the respondents was the existence of institutions that certify the quality of information made available, while there was also some concern with the need to seek information in sites with an established scientific reputation.

With the matter of the quality of information made available on the internet being an undeniable problem, we also have to consider the way in which searches are carried out. Above we noted that searching through the intermediary of institutional sites is practically non-existent, with search engines being the main way in which people access generic sites dealing with health. It is precisely in the sites that the Portuguese frequent less that the quality of the content and knowledge of the sources can be most assured. From this point of view, this may involve the need for a more critical schooling in filtering access to existing resources.

6

Conclusion

The first conclusion of this article allows us to reach is that a significant proportion of the population of Portugal continues without access to new technologies, or that it doesn't know how to take advantage of their potential.

Sociologically speaking, it is important to understand that only the oldest, least literate and those with the fewest financial resources are excluded from access to ICT.

Thus, and considering that the internet has come to play a progressively more central role in society, it has made visible yet another form of social inequality.

Another conclusion is in relation to the function and reach of the internet on the relationship people have with their health, beauty and well-being. For the first time in Portugal the content and implications of internet use have been measured, showing that, on one hand, online searches have assumed a contingent nature that is relatively unstructured and involves diverse themes, and, on the other hand, that despite the increasing visibility of social interactions, health education continues to be configured through the intermediary of already instituted sources: the expert knowledge of health professionals and close socialisation agents. This conclusion reaches across the population and enables a discussion of problems associated with consulting the internet. Among the most significant are: the lack of technological literacy that allows searches of more reliable sources; and the very private nature of the issue of health, which makes the forms of social interaction more difficult without the physical presence of an interlocutor.

[i] Examples such as the kind of food consumed, preoccupation with the body or the adoption of healthy lifestyles, demonstrate in which way the social pressure for increasingly restrictive conceptions of health coexist with the growing space for freedom and the consequent individual responsibility. This can explain the involvement of individuals in the promotion of their health, those who are called to make correct use of the health service, to provide correct and necessary information to health professionals and to make the correct daily management of their health and illness.

[ii] The decision to have such a broad health category, which includes beauty and well-being, was not fortuitous. Bearing in mind the complexity involved in the meanings individuals attribute to health and illness [30-43], the goal was to introduce the least possible filtration of these understandings during the application of the information gathering tools.

[iii] The SER Project is the result of a partnership between CIES-IUL and the Calouste Gulbenkian Foundation (FCG), with this latter providing the funding. This main aim of this research project was to understand the main traits characterising ICT in the field of health care in Portugal, its use, its potential and the challenges it poses for Portuguese society.

Briefly, the SER Project seeks o contribute towards a better understanding of the main challenges facing Portuguese society as a result of the progressive and global implementation of information systems in the area of health care and of the divulgation and proliferation of information about health that is made available by the new communication tools, considering the potential, the risks, the limitations, the consequences and their respective impacts on health policy.

[iv] The variables included in the analysis were: (I) employment status; (II) ability to speak a foreign language; (III) frequency of internet use; (IV) age; (V) socio-professional status; (VI) education level comple ted; (VII) relationship with internet use; (VIII) net monthly household income. The technical element used was the application of clusters following the identification of the multiple correspondences between the variables (Homals, or the analysis of homogeneity) [44]. The final solution in respect of the selected profiles was obtained consistently through the intermediary of two distinct statistical methods (the 'ward' method and the 'furthest neighbour' method). The variable categories were subjected to the necessary re-codification in order to improve the quality of the statistics. Note that the non-inclusion of the 'sex' variable was the result of its almost complete absence in relation to the other variables analysed.

[v] One of the arguments legitimating its use relates to the fact that it links two key dimensions in the shaping of the social space: professional status and profession. While the former allows an assessment of the relationship with the means of production (briefly, over its possession or non-possession), the latter allows the inclusion of educational resources and the status involved in the performance of a particular profession. For a more detailed discussion see [16-17].

[vi] It should be noted that the positioning in relation to categories describe the Guttman effect in a practically linear manner [45], which translates into an ordered series and a relatively close distance between the categories. The distribution extremes can be found in quadrants 3 and 4, while the privileged associations between the categories of quadrants 1 and two represent intermediate situations. Mauritti [22] identified a similar effect.

[vii] Average values on a quantitative scale in which 1 means 'never' and 4 means 'always'.

[viii] Self-help groups refer to a broader debate on the involvement of individuals in institutional participation [46] through the concepts of the governance or empowerment of individuals [47]. For a review of the literature on this matter see Serapioni and Sesma [48]. These can be interpreted as manifestations of new social movements [49] [50] seeking to create alternatives to the increasing weaknesses perceived in the provision of institutional health care that is being felt as a consequence of public actions that are increasingly based on financial considerations [51-52], while aware, on the other hand, that private liberal activity cannot be a substitute. In the case of alternative medicine, and following Clamote's [53] reflections, it is important to note the heterodoxy of the forms of medical pluralism in a globalised world. Without getting too deep into the debate, the term 'alternative' is based on a reference to the present social regulation of biomedical medicine, the references of which do not coincide with other forms of medicine.

[ix] Such as: no alternative close by; they have the best equipment; has to be overseen by the company doctor.

[x] Such as: having a special relationship with the health professional; the medical service belongs to the company the individual works for; because it is where the insurance company has an agreement.

[xi] Health care systems based on the Beveridge model are those that largely depend on taxes levied by the state and are characterised by well-established systems of finance (54).

[xii] The relevance of these last indicators is related to the known difficulties of access to emergency services, whether in health centres or in hospitals. However, even knowing the problems they will face, people still use these services because they trust them and have learned to do so.

[xiii] Average values obtained on an ordinal scale treated as quantitative, in which 1 means 'never' and 4 means 'frequently'.

[xiv] By using the Two-step Cluster procedure (combining the variables: 'medical matters are more important today than in the past'; 'today I am concerned about my health'; 'today I have a greater concern about my appearance') three profiles were defined concerning the concerns people have in relation to health, beauty and well-being: 'highly concerned position' (26.7 per cent); 'slightly concerned position' (28.2 per cent); 'not at all concerned' (32.3 per cent). As a whole, these three profiles accounted for 87.3 per cent of the total explained variation.

Conflict of interests

The authors do not have conflict of interests to declare.

7

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The Portuguese National Immunization Programme: an historical note

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The Portuguese National Immunization Programme [Programa Nacional de Vacinação] (PNV) has started in October 1965, with a "mass campaign of vaccination against poliomyelitis", to all children up to 9 years old. This disease, also known as "infantile paralysis", had a great impact in the Portuguese health and in the society due to its mortality and sequelae. During the decade 1956-1965 2723 cases of paralytic polio and 316 deaths were registered. Almost every case and death occurred prematurely, in childhood.

The Portuguese epidemiological picture of the vaccine-preventable diseases by the time of the PNV genesis, are herewith described, mainly in the first person, through their "creators" testimony.

"The epidemiological panorama of specific preventable diseases with specific vaccination, in Metropolitan Portugal, were putting us, for a long time, in a dishonourable situation in relation with the remaining European countries. Health services and, particularly, DGS, had been trying, with their low financial resources, and without enough infrastructures, to improve that deplorable nosologic picture, responsible for death and suffering of many of our children. Excepting smallpox eradication, obtained in the beginning of the fifties, the results were tiny, due to extraordinary difficulties in being capable to immunize, in time, the most susceptible age groups to those diseases: whooping-cough (pertussis); diphtheria, poliomyelitis and tetanus" (1).

"… these factors and the increasing gap verified between our incidence and mortality rates for these diseases and those registered in the great majority of European countries, imposed the study and implementation of a real National Vaccination Programme in Portugal, which was possible due to the financial help of the invaluable Calouste Gulbenkian Foundation"(1).

"In order to prevent certain diseases, the vaccination of the population, is mainly conditioned by scientific and administrative factors…the administrative ones…depend on financial availability, on the structure of the existing services, on tradition of previous experience, on culture level and on population education, etc."(1)

"The study on disease distribution by age and some epidemiological and serological surveys…. showed that most infections that PNV wanted to prevent perform early in life, which made it was imperative to begin vaccination before children were one year old and complete primary vaccination before two years old" (1).

"… The Programme was conceived by a Committee…". The Committee confronted itself with the dilemma of creating a vertical program or integrating it in the existing services, although the lack of an adequate net of health services, staff shortage and services administrative structure, made it difficult to find a common coordination and orientation.

"… the Committee, having studied pros and cons… decided to integrate the new PNV in the existing services, introducing the necessary corrections in these to grant its own execution" [(1)]. Two thousand one hundred and thirty "vaccination posts" were made available/created, situated in places chosen to shorten, as much as possible, the distances that vaccinated people had to travel, in order to facilitate the access to vaccination. The cartogram ***(figure 1)*** shows the location of the vaccination posts where PNV was applied by then.

To support the program, legislation has also been assured, a "vaccination calendar" has been established, norms for its execution were created and published, a system for the registration of the inoculations and the PNV evaluation has been developed and the vaccination posts were resourced with materials such as *"…refrigerators…, syringes, needles, pincers, scissors, boilers for syringes and needles sterilization and other material"* [(1)].

An upgrade course has been organized *"… where all scientific and administrative matters concerning the PNV execution and all its diseases epidemiology and prophylaxis were dealt"* [(1)].

"PNV begun in October 1965, through a mass vaccination campaign against poliomyelitis, which was preceded by a Health Education Campaign, which begun with a speech from the Minister of Assistance and Health…."[(1)]. Some excerpts of this speech herewith described.

*"Press conference at the S.N.I., **October 4, 1965**,*
where the Minister of Assistance and Health announced
Health Education and Vaccination Programs.

I took the liberty to bother your excellencies, asking you to please come here, due to two motives: first, to inform you that the health education and vaccination programs, after detailed study, will be launched by the Ministry of Assistance and Health in collaboration with the Calouste Gulbenkian Foundation…; second, to ask the collaboration, for these programs, of the means of communication and information that your excellencies represent, as, without that collaboration, it will be impossible to get the wished results.

… these measures must be massively applied… On the other hand, such application implies the most strict collaboration of the population.

… In what concerns the creation, in our organism, of self defences, we have today many vaccines, capable of efficiently protect us against the development of certain kinds of diseases…

…Many of the mentioned diseases have a particularly serious incidence in the first years of age and due to that, contribute to worsen our infant mortality …

…Taking into account the available means, the developed action… was only possible due the dedication of doctors, nurses and other staff who serve it, with true spirit of sacrifice, that is all righteousness note – I do it very heartily" [(1)].

When it was conceived, PNV was based, therefore, on several essential pillars for its robust birth and growth. It was based on knowledge about the population reality and needs through serologic and epidemiologic studies that made it possible to evaluate the impact of different diseases against which, vaccines were available, by the time. This unfavourable evaluation originated a strong political and technical commitment to change the situation.

This commitment lead to the creation of a Committee of Technicians, mainly from the Directorate General of Health, that took into consideration two distinct kinds of factors but fundamental to propose solutions and make decisions: the scientific criteria and fundamentals – Science – nowadays called "scientific evidence" and the so called administrative factors, that had mainly to do with financing, with public services structure and organization and with human and material resources. It is interesting to note that the primacy that always guided PNV, overlapping to administrative aspects, was science.

Thus, in what concerns science the available information about different diseases and respective vaccines allowed the organization of a "Vaccination calendar" that contained the specific recommended ages for the administration of each vaccine, the intervals between doses and the number of necessary doses for primary-vaccination and boosters. This vaccination calendar was an "universal prescription" to be applied to every person except if clinical or epidemiological reasons justify an exception scheme. It is important to note that, with specific exceptions, the application of the PNV was not (and it is not) mandatory. In what respects organizational/administrative aspects what stood out: was ensure financial sources, for what much contributed the Calouste Gulbenkain Foundation, in the beginning of the program, and its sustainability, that was later assured by financing from the state budget; the decision of developing a net of vaccination posts based on the existing public services, allowing proximity services and free access to vaccination; the creation of municipal files and registries allowed the implementation of an information system to monitor and evaluate the results, with national and regional statistic summaries. The impact of vaccination was measured through the evaluation of morbidity and mortality of the respective diseases. With this vaccination information system it was possible to call individuals for vaccination according to the established vaccination calendar. As an individual vaccination card was provided, vaccinated persons were also in possession of all their vaccination history.

Administrative and scientific aspects were included in widely disclosed Guidelines which allowed the safe application of the program without inequalities at national level.

Additionally, culture, population's educational level, tradition and experience have not been neglected, resulting in "health education campaigns" and in training courses to professionals across the country. Thus training, information and communication were also included.

Together with access to vaccination, all the conditions for citizens adherence and acceptance from the professionals were created.

Science and organization combined this way, allow us to state that PNV was (and is) an efficient program and the future showed that it was extremely effective as it lead to the eradication, elimination and control of the target diseases, contributing to the reduction of infant mortality in Portugal, surpassing the *"…dishonourable situation in relation with the remaining European countries"* [(1)].

In short, PNV is characterized, since the beginning, be universal free to the user, decentralized although nationally managed, mainly used by the public net of health services, supported by a strong normative, technical and scientific referential, materialised by a vaccination scheme/calendar which is an "universal prescription" that provides access to safe effective and quality vaccines.

It is an efficient program, because its vaccines are bought and managed with strict criteria through public tenders and adequate stock management moreover, it is a transparent program - evaluated at national and international levels through coverage rates, by serological data and its impact on the target diseases, which demonstrates its effectiveness.
Taking in consideration the vaccination against poliomyelitis, the "mass vaccination campaign against poliomyelitis" that covered all Portuguese children up to 9 years of age and with which PNV started in October 1965, it lead to extraordinary results at a short term as

the disease almost vanished in one year *(fig. 2)*, and the last sporadic case occurred in December 1986.

However, with the vaccination against poliomyelitis, we also have prematurely learnt a lesson, population "pockets" with low vaccination coverage (susceptible), are what it needs for the disease reemergence as an outbreak or epidemic. That's what happened in a small community weakly vaccinated where an outbreak occurred in the beginning of the seventies *(fig. 2)*. Figure 2 shows very well vaccination success, but also the reemergence risk of the disease, if the vaccination coverages meanwhile achieved are not maintained and are not homogenously distributed in the population (occurrence of susceptible pockets).

The achieved success of the Portuguese National Vaccination Programme, known at national and international levels, is due to several factors from which stand out the way it was conceived, planned and implemented, the way it has been managed during its forty seven years, but, mainly due to health professionals acceptance and commitment and to the citizens adherence and trust in vaccination.

It is essential to maintain the strong social, technical and political commitment, that gave rise to the program, to ensure its sustainability and continue its success, with the inherent health gains.

Conflict of interests

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Ana Leça, Paula Valente, Teresa Fernandes

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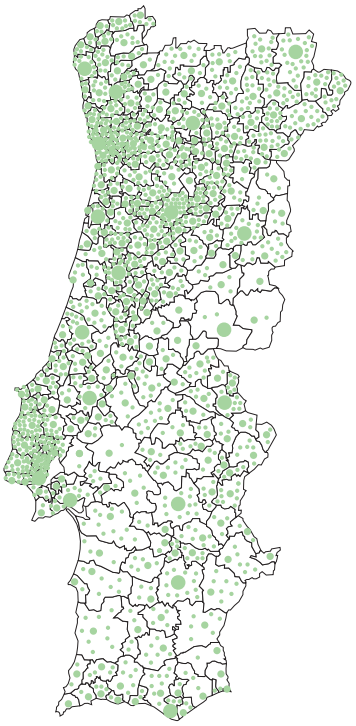
figure:

① **Cartogram with the geographic distribution of vaccination services in place in Portugal (Continental), in 1967, to ensurance the activities of the PNV.**

From van Zeller, Castro-Soares, Sampaio, Melo-Caeiro, Cayolla-da-Motta (1968)

Cartogram
Portugal (Mainland)
PNV vaccination services



PNV vaccination services
by country, in **1967**

Aveiro	**101**
Beja	**90**
Braga	**72**
Bragança	**261**
Castelo Branco	**22**
Coimbra	**99**
Évora	**75**
Faro	**54**
Guarda	**79**
Leiria	**95**
Lisboa	**167**
Portalegre	**81**
Porto	**298**
Santarém	**70**
Setúbal	**67**
Viana do Castelo	**84**
Vila Real	**88**
Viseu	**327**
Total	**2130**

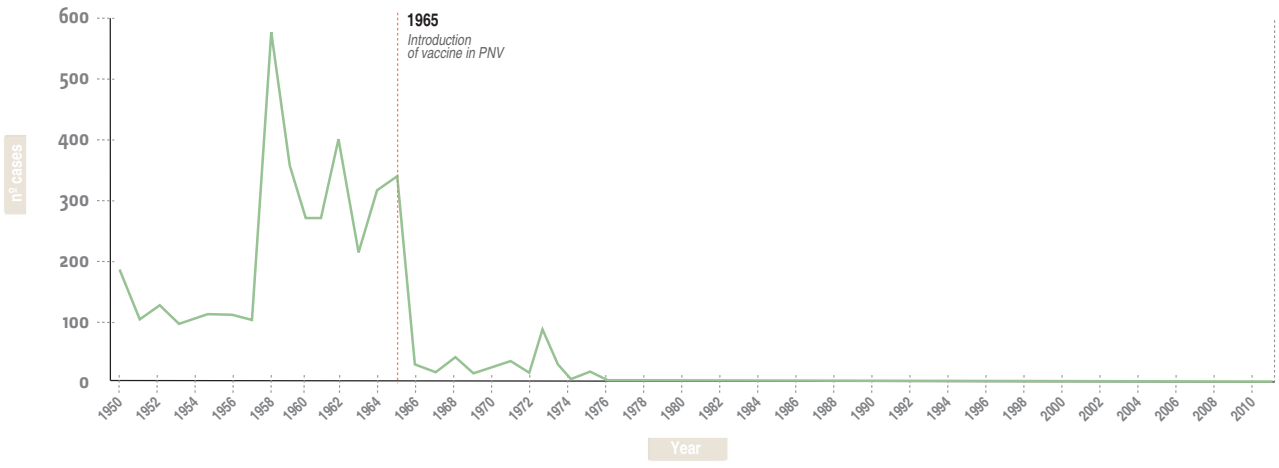
Legend:
- Administration Services by Country
- Administration Services by Municipality
- Vaccination Services

0 20 40 mi
0 20 40 kms

figure:

② **Polio cases notified in Portugal, 1950-2011**

Source: DGS, Notifiable Diseases



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Influenza Cases Admited in Portuguese Intensive Care Units: **We need to know them!**

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More knowledge about the epidemiology of influenza cases requiring treatment in Intensive Care Units (ICU) is extremely important for the planning of health services. Thus, based on hospital routine procedures a pilot study was issued to epidemiologically follow the influenza cases admitted in the ICU of 6 Portuguese hospitals with laboratorial confirmation in the 2011-2012 season. This study resulted from the collaboration between the Portuguese Directorate-General of Health (DGS) and the Portuguese National Institute of Health Dr. Ricardo Jorge (INSA) on the country's influenza surveillance.

As a condition to participate, it has been defined that only hospitals with ICU able to perform influenza laboratorial confirmation and provide information on the subtype of the influenza virus identified in the influenza suspected cases could participate. The following hospitals participated: Centro Hospitalar Lisboa Norte, E.P.E.(1) (including Hospital Santa Maria and Hospital Pulido Valente), Hospital Curry Cabral E.P.E. [Lisbon and Tagus Valley region]; Hospitais Universitários de Coimbra [centre region of Portugal Mainland]; Hospital Divino Espírito Santo from Ponta Delgada E.P.E. [Azores autonomous region]; and Hospital São João E.P.E. from Porto [northern region of Portugal Mainland]. In each hospital a focal point was identified. And at DGS, from its Public Health Emergencies Unit (UESP), one study coordinator was appointed, that was responsible for the weekly data (compiling and validation) and for its subsequent sharing with INSA in order to integrate it in the Weekly Epidemiological Surveillance of the Influenza Syndrome Bulletin. An electronic questionnaire (Microsoft Excel format), to be filled by the physician every time a suspected case was admitted in the ICU - although not laboratory confirmed - was made available. This questionnaire could be answered in 2 steps, so that all the relevant information, even late (death, discharge, laboratorial results, or other), could be collected. In the received data, only the ICU hospitalized patients with confirmed influenza laboratory results of the participating hospitals were considered.

The results are herewith briefly described.

Keywords: Influenza; intensive care units.

During the 2011-2012 influenza season, 8 cases of patients admitted in the Intensive Care Units with influenza laboratory confirmed were notified.

1

Cases Origin by Hospital

The cases were notified by 3 institutions:

2 by the Centro Hospitalar Lisboa Norte, E.P.E.;

5 by the Hospital São João E.P.E.;

1 by the Hospital Divino Espírito Santo E.P.E.

2

Distribution of cases by Sex and Age Group

From the 8 cases, 5 were females (62.5%) and 3 males (37.5%). Concerning the age group, 3 patients (37.5%) were aged between 35 and 44, 3 (37.5%) between 55 and 64 and 25% were over 75 years old.

table:

① Distribution of cases per age group

Age group	Nº of cases
35 - 44	3
55 - 64	3
75 or more	2

(1) **Entidade Pública Empresarial** (enterprise public entity - a specific model that allows private management of public detained resources).

3

UCI Admission Rate

The highest admission rate was estimated as 3.2%, in the 10th week of 2012 (Table 2).

table:

② Distribution of the number of admitted patients of influenza and other causes and estimated admission rate of influenza (%), by admission week in the UCI

Weeks since October 2011	Nº of ICU admissions with influenza	Nº of ICU admissions with other causes	Nº of hospitals that answered (do total de 6)	Admissions with influenza in the UCI (%)
40-52	0	-	-	-
1	0	na*	na	0
2	1	39	2	2,6
3	0	na	na	0,0
4	0	na	na	0,0
5	0	na	na	0,0
6	1	70	4	1,4
7	2	72	4	2,8
8	1	68	4	1,5
9	0	na	na	0,0
10	2	62	6	3,2
11	0	na	na	0,0
12	0	na	na	0,0
13	1	69	6	1,4
...	...	...	...	...
20 de 2012	0	na	na	0

* **na - Not applicable.** There were no cases of influenza (numerator = 0), the denominators were not specified

4

Therapeutics

Regarding the antiviral therapeutics, only 5 (62.5%) patients were treated with oral oseltamivir, 2 of them begun treatment in the ICU admission day, 2 on the day after the admission and 1 only 3 days after admission. Other therapeutics were performed, namely mechanical ventilation to 7 patients, having 3 of them been submitted to renal replacement technique; and to one of them only oxygen therapy.

5

Biological Material Collection for Laboratorial Confirmation

A sample for laboratorial influenza confirmation of was collected, in 4 patients, in the same day of the ICU admission and in one patient, the day before the admission; the collection of the other 3 patients was made 1 or 2 days after their ICU admission. Nasopharyngeal or oropharyngeal swabs, were the collected biological products in 6 patients (75%); in 2 patients (25%) endotracheal aspirate or respiratory secretions or bronchial or alveolar lavage were collected.

6

Types and Subtypes of Identified Virus

3 cases of influenza A(H3) virus were identified, 1 case of seasonal A(H1), 1 case of pandemic A(H1) and 3 cases of non-subtyped A.

7

UCI Admission Duration and Mortality

The time in ICU ranged from 1 to 56 days, the average was 13 days.

Only one death occurred, in a woman over 75 years old.

It should be noted that the interpretation of these results should be cautious, considering the small number of notified cases and the fact that this is a pilot study developed in a hospital sample, without ensured representation. Indeed, the small number of reported cases does not allow an in depths epidemiological analysis nor the extrapolation of results.
It will be important to extend the study to other hospitals, to increase the sample robustness and, if possible, its representativeness aiming at improving existing knowledge about this subject.

Conflict of interests

The authors do not have conflict of interests to declare.

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PIP Breast Implants "crisis"

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Since mid December 2011 that a public health "crisis", related with the *Poly Implant Prothese* (PIP) brand breast implants, has been worrying users, health professionals, investigators, *media*, legislators and also governments of several European countries where the referred implants have been used.
This "crisis" management, at European level, has been coordinated by the European Commission, through the *Directorate General for Health and Consumers/Health Security Committee*, with the scientific collaboration of the SCENIHR - *Scientific Committee on Emerging and Newly Identified Health Risks Group*.
Based on the information that has been released on this matter, each country took the measures considered necessary and adequate for the situation resolution. Portugal was no exception.
At national level, the coordination of the "crisis" has been of the Directorate-General of Health (DGS) responsibility, through the National Health Authority Support Unit and Public Health Emergency Management (UESP), in collaboration with the INFARMED – National Authority of Medicines and Health Products, I.P. and representatives of the Colleges of the Medical Specialties - Plastic, Reconstructive and Aesthetic Surgery; Gynecology/Obstetrics. The working group also integrated a representative of Oncology, from the Portuguese Institute of Oncology Francisco Gentil E.P.E.[i] .; thus, it was possible to compile existing information on this issue, promote meetings with DGS and external experts, to present and discuss proposals and take action for controlling the situation. These are the main actions and measures taken in Portugal, until now, concerning the management of this situation.

Keywords: PIP; breast implants.

1

Alert on the Suspicion of Complications Arising from PIP Implants

On December 14, 2011, in France, the *Ministére du Travail, de l'Emploi et de la Santé* released the conclusions of the meeting of the follow-up committee for women carrying silicone gel filled PIP breast implants.

In these conclusions, suspicion of complications with PIP implants aroused, caused by increased risk of ruptures, estimated in 5%[ii].

2

Portugal Situation Evaluation and Management

As soon as the DGS was informed of this situation, a meeting with INFARMED and the persons in charge of the importing implants company was immediately promoted.

It was found that around 3000 prosthesis of that brand were bought by Portuguese institutions and health services, and was also estimated that between 1500 and 2000 women were using these implants. These prosthesis commercialization had already been suspended in March 31, 2010, by INFARMED (Informative Circular no.063/CD de 31/03/2012).[iii]

A working group was created to follow up the situation gathering INFARMED, the Medical Society (representatives of the Colleges of Plastic Surgery, Reconstructive and Aesthetic Surgery, Gynecology/Obstetrics and Oncology Specialties, the Lisbon branch of Portuguese Oncology Institute Francisco Gentil, E.P.E) and DGS technicians.

i **Entidade Pública Empresarial** (enterprise public entety) - a specific model that allows private management of public detained resources

ii **Comunicado de imprensa disponível em:** http://www.sante.gouv.fr/premiere-reunion-du-comite-de-suivi-des-femmes-porteuses-de-protheses-mammaires-pip.html

iii http://www.infarmed.pt/portal/pls/portal/docs/1/4000246.PDF

Press releazes to citizens and health professionals

Two joint communications, on the situation, were released on December 21, 2011, by DGS and INFARMED, one to the public and another to health professionals, as follows:

To citizens

Informing about the suspicion of complications resulting from using PIP implants [iv] and counseling, without emergency, women that had PIP implants to contact their surgeon or their General Practitioners (GP), in the unit where implants were done, so that surveillance examinations can be done.

To health professionals

Informing about the situation and recommending that women carrying PIP implants, with interventions performed between 2001 and March 2010, should make image examinations to control the referred prosthesis integrity; stressing the need for systematic notification to INFARMED of adverse reactions and incidents related with PIP implants [v].

At international level, in France, some measures were taken: on December 23, the *Ministére du Travail*, *de l'Emploi et de la Santé* released a new press release[vi], proposing French women the implants explantation as a prevention, but not as an urgency.

On the other hand, the French Security Agency of Health Products (AFSSAPS) updated periodically, the number of reported incidents and clinical complications related with the PIP prosthesis in the country and disseminated the conclusions of the performed analysis. Also the United Kingdom and other European countries disseminated results of evaluations done and of measures taken.

Notification reinforcement of the adverse events related with medical devices

On January 6 (2012), the message on the need of notification to INFARMED was reinforced through a circular[vii], on adverse reactions related with medical devices. In order to adequate risk management and guarantee the best safety levels on the usage of these medical devices, that institution asked, once again, for GPs accompanying women with PIP implants to notify detected incidents using the respective form.

Update statement for health professionals

On January 9 (2012), DGS and INFARMED updated December 21 press release to health professionals, recommending again, surveillance of women with implants and the need for report of adverse incidents related with implants. The press release also informed that the National Health Service (SNS) would assure the adequate follow up and treatment, including explantation, in all women with complications resulting from placing breast implants, namely when evident rupture or periprosthesic inflammation, or any other reason resulting from clinical evaluation. In this press release, was informed that the SNS would also assure, when technically indicated, implantation of substitution prosthesis in cases that PIP implants had been made by the SNS or in cases of post-mastectomy breast reconstruction (Press release C35.02.v1, de 09/01/2012).[viii]

National participation on the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR)

DGS proposed that a Portuguese expert (Dr. Celso Cruzeiro, from Coimbra University Hospitals) to participate in the European Commission's *Scientific Committee on Emerging and Newly Identified Health Risks* – SCENIHR. One of the purposes of this group is to release updated scientific opinion on the safety of the PIP implants at European level.

In March, the Informative Circular no. 058/CD dated 08/03/2012 of the INFARMED was released[ix], with information concerning the report conclusions of the SCENHIR, of previous February. In this press release, was highlighted that the results of the psycho-chemicals properties tests of silicone and capsule, and the irritation studies in vitro, did not exclude existence of adverse effects to PIP breast implants users' health, namely those related with increase of inflammatory reactions due to PIP breast implants rupture. The report underlined that, based on limited clinical data and in the absence of epidemiological studies, it had not been possible, until then, to conclude that PIP breast implants were associated with a major health risk to their users, when compared with other breast prosthesis.

iv http://www.dgs.pt/upload/membro.id/ficheiros/i016715.pdf

v http://www.dgs.pt/pagina.aspx?f=3&mid=5005&id=21508

vi http://www.sante.gouv.fr/actualisation-des-recommandations-pour-les-femmes-porteuses-de-protheses-mammaires-poly-implant-prothese-pip.html

vii http://www.infarmed.pt/portal/pls/portal/docs/1/7162313.PDF

viii http://www.dgs.pt/upload/membro.id/ficheiros/i016812.pdf

ix http://www.infarmed.pt/portal/pls/portal/docs/1/7364266.PDF

As it was impossible to determine a global risk-benefit evaluation, after this report, the European Commission asked SCENIHR a more detailed evaluation of the situation. This group should compile scientific information on the matter, until January 2012, as well as data related with laboratorial tests to the referred implants. This group also had to make a European survey to the implanted patients, actually under validation by the state members.

Survey launched in Portugal

In the end of January 2012, DGS made a survey on PIP implants, to all public and private health care units that bought this specific brand, to get information about the situation in Portugal.

The respective results are available[x], since March 2012, but one should be very careful when interpreting them, as they may not represent exactly the situation in Portugal.

This survey refers to 799 users implanted with PIP prosthesis. This sample corresponds to approximately half the initially total estimated users and about 1/3 of prosthesis done (totaling 3095). Due to the high proportion of non-response (57,1%), it is not possible to guarantee that cases and answers referred by the institutions that filled the survey are similar, considering variables, to the institutions that did not answer. Anyway, these are the main results of the survey:

- 24 institutions and health services answered the survey, from which approximately 80% were private;
- Results refer to 799 users implanted with PIP prosthesis;
- 1001 implanted prosthesis were reported, being 467 (87.5%) bilateral and 67 (12.5%) unilateral;
- In 40.4% of implanted users, the most frequently reported motive was "exclusively aesthetic". The presence of "other motives: tubular breasts, hypoplasia, asymmetry, atrophy, agenesis, severe post-pregnancy atrophy or rupture of previous prosthesis of the same PIP brand" has been the 2nd most frequently reported motive, in 38.0% of implanted users. The "reconstruction" motive has been reported only in 21.6% users;
- "Prevention" has been the most frequent cause for explantation (61.7%), this means that users were explantated without being identified signs or symptoms of prosthesis deterioration. The prosthesis capsule rupture was the 2nd cause of explantation, reported in 25% of all causes.

Audio-conferences

At European level, the situation has been monitored through several audio-conferences with the *Health Security Committee* (promoted by the European Commission), where most of the European countries participated and where it has been possible to transmit in detail the Portugal situation and the measures taken, as well as to accompany the dimension of this problematic evolution in several countries. The latest has been on May 30, 2012.

Adverse reactions notified to INFARMED

Until mid September 2012, 45 incidents with PIP implants, in 36 women, were officially notified to INFARMED. These incidents led to 45 explantations and involved: 44 ruptures (rupture average approx 1.5%) and 1 case of deformation.

In the mentioned cases, 12 non detected ruptures by ultrasound examinations are included: 7 cases by ultrasound scans, 4 by Nuclear MRI and 1 by mammography.

Information available at DGS website:

All information related with the PIP implants "crisis" has been available in the DGS website, in the Health Experts Area[xi]. Press releases can be found, from DGS and INFARMED, as well as international related information. The model of the questionnaire that was launched in Portugal, in the beginning of the 2012, and the study conclusions of the received survey were also included.

3 Conclusions

In this crisis management, in terms of Public Health, we highlight:

Found difficulties

- Getting data on users and on PIP implants done in Portugal, in some cases due to absence of implants registration;
- The controversy due to the existence of different compensation benefits to PIP prosthesis users in several European countries, leading to explanation requests made by Portuguese women and emigrants that returned to Portugal;

x http://www.dgs.pt/?cn=683368347583AAAAAAAAAAAA

xi http://www.dgs.pt/?cn=683368347583AAAAAAAAAAAA

Some exception situations posed by users, which forced specific answers.

Positive Measures

The DGS, INFARMED and medical experts group prompt response, on the risk evaluation and the measures to take;

The quick availability of information to the public and health professionals at DGS website;

The clarifications given by the General-Director of Health to the media, mainly television and radio, among others;

The notification reinforcement, to the INFARMED, about the adverse events related with medical devices, in order to decrease the existent under notification;

The reinforcement of the available medical devices screening, specially on the implanted patients identification, either through the information transmitted to the patient on the implant (brand, manufacturer and lot), or by the existence of updated data of the patients submitted to plastic, reconstructive or aesthetic surgery. Only the rigorous accomplishment of the pointed requirements will allow a quick evaluation of any situation that, like this one, is a threat to the implanted individuals public health;

The European Parliament approval, on June 14, 2012, of a resolution reading that all breast implanted women must have a passport that allows control quality, in order to avoid cases like those of the PIP manufacturer;

The preparation of a European survey, made by the SCENIHR group, under the European Commission proposal, that may be filled with the relevant European information to a posterior study.

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