Portugal
health by **numbers**

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Paulo Jorge Nogueira *editorial*

Reflections about time

Here we are with the fourth number of this second series of DGS scientific journal. It is a continuing pleasure to have a new issue ready for publication. And it is particularly uncertain what is going to be in the end in a new non thematic number as this one. The time gap between articles arrival and the final phase of peer-reviewing we know what on the table to come out. But there is always a level of uncertainty: which articles are going to be ready; which one will be in the new issue? I believe we only know when the time finally comes.

Therefore it is deferred to the last moment the knowledge of what might be the common thread of the issue.

Given the main objective of this journal is to publish on Portuguese health in general, without any specific constraints – unless those of the reviewers team in what concerns the original papers and those of the editorial team for the perspectives – I was led to the three fundamental epidemiological concepts: people, local and time.

Time is the single thread I was looking for.

Some of the materials herein presented were already available for quite some time. For example the perspective on the 20 years span of ISAAC project was initially a very simple perspective we asked Dr. Rosado Pinto to make. However, for some reason, reviewers wanted a bit more, and luckily, despite all this national and international busy schedule, the author accepted the challenge. It took longer but it was worth.

The article about the mass event of the European Football Championship of 2004 may, at first impact, look a bit out dated and therefore of limited interest. But there are several pros for its publication: 1) it meets the journal objectives – it is about Portuguese health, people and system, and lacks proper publication; 2) It is one of most recent manuscripts we received; 3) it has some methodological aspects that deserve some registration; 4) none of the reviewers showed concern about it being related to an old event.

The article about the Portuguese Health Statistics Working Group activities waited for some time due to the option of having issue number 3 as thematic. And as you can see the mentioned work has had several years of execution. Its publication is important either for awareness purposes and either for future assessment of that work impact on Portuguese health information and health statistics.

The article on hospital morbidity data suffered the same time delay for the same reason. It is uncertain if it will attract new individuals to the respective data; it is uncertain if the referred publication will maintain its format or will evolve to have less data and more information; only time will tell. At least for historical purposes, here it is.

Purposely, we asked for some “on time” material for this late summer issue. We obtained, in house, a perspective on the current and past experience on the mitigation plan for extreme temperatures (heat module).

On a completely different relation with time, stands the perspective on the strategic implementation of healthy eating in Portugal. This strategy is necessary to gain time while reaching its goals.

I have no doubts that many other reflections about time are possible from this issue. But for now this is it.

See you soon,

Paulo Jorge **Nogueira, Diretor**

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English Version A

The health of health's numbers
Work developed by the Portuguese Health Statistics Working Group (2011-2013)[1]

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Summary: The Portuguese Health Statistics Working Group was created within the Statistics Council, aiming to improve the information system of official health statistics´ adequacy to the challenges Portuguese society is currently facing, particularly concerning the international obligations to which Portugal is subject.
In the produced report thirty-seven recommendations are proposed, not presented here in detail, covering four main areas of intervention: "Use of administrative data"; "Methodological standards"; "Planning and strategy"; and "Institutional cooperation".
The proposed recommendations took into consideration several factors, particularly highlighted is the possibility of its operationalization, both in terms of time and cost, in close relationship with the objectives set out for the group, where the use of administrative sources assumed particular prominence. In this sense a list of the existing information systems was made with potential use for the production of official statistics, especially within the Ministry of Health; was also conducted a survey to the information's users in order to obtain a set of proposals that met their real needs.
Presently the Group is still functioning, with a new mandate, focused on monitoring the implementation of recommendations.

(1) The expressed positions do not necessarily correspond to those of the Statistics Council nor to those of the institutions represented in the Health Statistics Working Group

1

Introduction

The Statistics Council, by creating the Health Statistics Working Group (HSWG), recognises the need to improve the quality of statistical information on health and of better adjust to the needs of national and international users of information in a new political environment, and in a moment of profound transformation in the provision of services and sociodemographic characteristics of the population.

This article is intended to describe work performed so far by the Group. Its publication occurs in a crucial time for the successful implementation of the proposed amendments in its report, aiming at improving the process and outcome of statistical production in the health, strengthening and qualifying the decision-making process and thus, ultimately, contributes to improve the health of the Portuguese.

In the results of the work carried out, beyond the body of recommendations that are thought essential to the modernization of the information system and fulfilment of the proposed objectives, here generically presented, it is worth noting the dynamics created between organisations within the HSWG which may have positive effects on the quality of the statistical information being produced in the medium term.

2

The Statistics Council

The Statistics Council (CSE – *Conselho Superior de Estatística* in Portuguese), created by law nº. 22/2008, of May 13, is the organ that directs and coordinates the National Statistical System (SEN). Under the foundations of the National Statistical System [(1)] are, among others, the CSE skills:

- Define and approve general activity of official statistics and respective priorities and, annually, official statistics operations nationwide, and exclusive interest of the Autonomous Regions, on proposal of the statistical authorities;
- Approve technical instruments for statistics coordination, of mandatory application in the production of official statistics and promote the respective knowledge, publicizing and use;
- Decide on the proposed release of data subject to statistical confidentiality and ensuring compliance with the principle of statistical confidentiality by requestors of confidential information;
- Assess the plan and budget of statistical activity of statistical authorities, as well as the respective implementation report;
- Formulate recommendations within the definition of methodologies, concepts and statistical nomenclatures for the use of administrative acts;
- Pronounce itself on the proposed delegation of powers of the Statistics Portugal IP (INE) in other entities for the production and dissemination of official statistics;
- Define official statistics associated with the provision of public service.

It is in this context that the Council promotes the creation of permanent or eventual sectoral sections and temporary working groups, with goals and well-defined activity calendars. The groups have the great virtue of being forums for discussion between stakeholders, possibly the most relevant entities responsible for statistical production can be effectively influenced. There are present, not necessarily producers of official statistical information, not only entities from the public sector, but seeks to concentrate on a wide range of producers and users of statistical information. Integrate the CSE, namely: the Statistics Portugal IP; the Bank of Portugal; the regional offices responsible for producing statistics in the autonomous regions; several public services; the National Commission for Data Protection; the National Association of Municipalities; business confederations and trade unions; consumer associations; universities; and personalities of recognized scientific merit and independence, invited for the purpose.

3

The Portuguese Health Statistics Working Group

The Health Statistics Working Group was established by the decision of Standing Section of Social Statistics (second Deliberation of July/2010, in its annex C) [(2-3)], with well-defined composition and mission.

The mission was placed in the following terms:
"Defining the Health Statistics Information System content in the areas of "Health status and its determinants", "health care", and "causes of death ". Requiring for each domain:

1. Diagnosis of information needs with reference to the current and future national and international commitments;

2. Identification of the informational content of the current "information system" to identify gaps, redundancies and other inefficiencies;

3. Inventory of information sources that feed the information provided at international level in order to ensure their harmonization and consistency;

4. Establishment of lines of structuring and rationalization of the Health Statistics Information System, with reference to the conclusions previously obtained in above mentioned points 1 and 2, proposing:

- **a.** The informational content to be in force;
- **b.** Collection procedures to adopt (creation, modification or maintenance), in particular, the explanation of administrative acts or inquiries to consider;
- **c.** Institutional networks of support that substantiate the sources to be used;
- **d.** Definition of the implementation plan with proposed timelines and priorities.

The Group was then composed by a set of experts, representative of entities with responsibilities in the production/use of statistical information on health, that through an intense dialogue came to a proposal that we believe consensual and realistic.

The entities represented in the group are as follows:
ACSS - Central Administration of Health System
DGS - General-Directorate of Health
DREM - Madeira Regional Direction of Statistics

INE - Statistics Portugal, IP
INSA - National Health Institute Doutor Ricardo Jorge
SPMS - Ministry of Health Shared Services
SREA - Azores Regional Statistics

Initially the Group had also the collaboration of ACS-High Commissioner of Health (now extinct) and two experts in health economics associated with the Academy. On the other hand, during its work, the Group received several contributions, formal or informal, of entities or individuals of various origins, namely by an inquiry addressed to circa two hundreds of potential and actual users of statistical information.

The direct fundamentals made explicit in the Deliberation of the Standing Section of Social Statistics of the CSE, which led to the creation of the Group have in mind the need to increase the quality of statistical information on health and better adjust to the needs of data users in a new and challenging environment. In the reasons presented we highlight: rationalizing processes, particularly in the elaboration of diagnoses from the perspective of identifying gaps and redundancies by thematic subsystem; and the interinstitutional articulation that encourages the identification and feasibility study of the use of administrative data for statistical purposes – this is a general considering, valid for the whole statistical production, but that in the present case has special importance.

Are still noteworthy, specifically in the area of health:

• The community work in progress, associated to Regulation nº 1338 of the European Parliament and of the Council of the European Union of December 16, 2008 [4-5], in particular those relating to obtaining statistics required for community action in the field of public health and in support of national development strategies of high quality health care, universally accessible and sustainable - that concentrate the attention of Statistics Portugal and the Ministry of Health partners to ensure appropriate response;

• The reference to changes in the structure of the Ministry of Health, particularly those initiated in 2005, arising from the restructuring Program of the Central Administration of the State (PRACE – acronym in Portuguese) [6-7] and, subsequently, of the reduction scheme and Improving the State's Central Administration (PREMAC – acronym in Portuguese) [8-9], as an opportunity to drive the definition of an institutional network more effective and efficient structuring subsystem of statistical information on public health in a perspective essentially directed toward the greater use of administrative data for statistical purposes.

Finally, it should be noted, the mandate of the group is in accordance with the "General Lines of Official Statistical Activity (LGAEO – acronym in Portuguese) for 2013-2017"[10-11] regarding to ownership of administrative sources for statistical purposes, mainly expressed in its goal no. 1 - "enhancing the quality of official statistics, ensuring the optimization, improvement, flexibility, modernization and efficiency of the statistical production process, through its methodological, scientific and technological development"; as well as with the "European Statistical Programme 2013-2017"[12-13], specifically in its goal no. 2 - "Applying new methods for the production of European statistics taking into account efficiency gains and quality".

4

Results

In April 2012 was produced a first report [14] where were presented more than three dozen recommendations in accordance with the defined mandate, subsequently approved by the Standing Section of Social Statistics (SPES – acronym in Portuguese) in October 2012 (third Deliberation of the SPES of 9 October). The analysis of the first report resulted in the renewal of the mandate of the group, in order to:

• Proceed until the end of December 2012 to the prioritisation of proposals presented in the Report and its scheduling (task already completed and approved by the SPES) [15];

• Monitor the implementation of the proposals in the report (ongoing task in close collaboration with entities addressees of recommendations).

So, as we will see, was given response to the mandate, through consensual, practical proposals, without the involvement of great resources, and focused on responding to the needs of national users and international obligations.

5

Work developed

The work that resulted in the first report was developed in two phases: (1) inefficiencies of the current system were identified and national and international needs of information were diagnosed; (2) collection procedures to adopt were defined particularly on the explanation of existing administrative acts and their possible use for statistical purposes.

From the produced report some of its chapters are highlight as follows:

The current system of production of statistical information on health

• Identifies actors, presents and analyses the official statistical production and information systems (IS) with potential statistical interest, which meet the criteria set by the HSWG for its possible use for official statistical purposes (namely: the regular character of production; exhaustiveness; and support on metadata) – Seventy information systems, presented in annex, sheet for each IS;

• Displays the table that summarises the identified potential in each system for the two main references used in HSWG: list of indicators "ECHI European Community Health Indicators" no referred as "European Core Health Indicators"; and the "Community Regulation no. 1338/2008 of December 16" on public health statistics.

Users of statistical information on health

Presents the national needs identified through informal meetings with key users and a survey to 211 potential users of statistical information. The investigation had as particular objectives: knowing the present levels of relevance, use and satisfaction of a list of indicators; and proposals for new indicators.

Identified weaknesses and dysfunctionalities

The analysis of the weaknesses and dysfunctionalities concluded:

• Reduced use of administrative data;

• Non-existent basic files (example: private non-hospital health providers);

• Areas of information not properly covered (for example: ambulatory care; morbidity; pre and post hospital care);

• Existence of numerous information systems but with poor interoperability;

• Multiplicity of actors and fragile institutional relationship;

• Integration deficit of information systems of the Ministry of Health (Mainland) with the autonomous regions;

• Lack or weakness of methodological documentation;

• Lack of basic studies and quality control mechanisms;

• Existence of statistical potential information systems with faulted representativeness and regularity;

• Information disaggregation not coincident with planning needs (sector specific territorial delineations);

• Uncertainties about the future of vital information systems;

• Statistics Discontinued Operations;

• Discontinued Publications;

• Human resources in insufficient number;

• Diversity of interlocutors.

The development of international commitments

At this point the present international commitments have been identified, with emphasis on analysis of statistical information today regularly sent to international organisations and the responsibilities of international representation; and the expected international commitments bearing in mind the ongoing work in the various organizations to which Portugal belongs.

Recommendations

To conclude the above described analysis, the Group presented thirty-seven recommendations. For its presentation were assumed to be assumptions the need for:

• a system of statistical information on health in order to monitor the implementation of policy measures at a time of sociodemographic changes and of actual care providing system;

• ensure maximum stability to the official statistical production, particularly in statistical series available today;

• respond to information users (public, private, social; national, international; etc.);

• introduce higher levels of rationality into the system at the lowest cost and focusing on what is assumed as more relevant and operationally (feasibility and reduced costs) in short term, with relevance on the statistical use of administrative sources and implementation of measures of internal organisation;

• systematizing recommendations in order to facilitate its operationalisation and permanent evaluation of implementation levels.

The recommendations were framed in four large sets (referring the reader to the reading of each of the recommendations in the HSWG report):

• Identified high growth potential of "**use of administrative data**" for statistical purposes. Highlights the possible replacement of the current "Hospitals Survey" and "Health Centres Survey"; but also the (gradual) coverage of new areas of information to tackle the challenges identified (morbidity, for example).

• Need of "**Methodological Standardization**" of current statistical operations; harmonization of information systems of the Ministry of Health with strong potential for statistical purposes; review and approval of new statistical concepts (in the context of the work of SEN).

• Develop skills of "**Planning and strategy**" to achieve efficiency gains of the whole system and the improvement of response to the identified needs: in particular by adequate resource affectation; implementation of regular mechanisms for assessing users' needs; and yet through the evaluation of new procedures for the collection and dissemination of statistical information.

• And, within the framework of the "**Institutional cooperation**", stresses the importance of clarification of responsibilities and the formalization of actions performed by different actors in different official statistics activities in the health area.

To complete the description of the content of the report, reinforcing the high analytical potential in the present case annexes represent, it should be noted the two sets of information therein contained: (1) the characterization sheets of the identified existing information systems in the Ministry of Health and other entities, with administrative information of high potential use for statistical purposes; (2) some of the results of the "Survey to health statistics information users", developed by the Group, meanwhile presented in the "Health Statistics Meeting" organized by CSE in April 2013.

6

The ongoing work

HSWG is presently in its new mandate following the decision of the SPES. After the definition of priorities of the proposals presented in the first report was made the respective timing (presented at the end of December 2012, approved by written procedure in accordance with regulations [15]), and it is now up to the Group to monitor its implementation and submit to the SPES, where meetings are held, a document of progress that allows monitoring the implementation of those proposals.

The HSWG organized (4/10/2013) the Health Statistics Meeting - one of the Group's proposals - which released the activities described here in a public way for a set of Portuguese society representatives. The presentations then performed and the conclusions of the meeting are also available on the CSE website.

The Meeting had as its main objectives the enrichment of future developments of the Group work; and the involvement of different entities addressees of recommendations presented and approved by the SPES. The meeting also sought to "return" the contributions of the different entities at the time of the survey to statistical information users, as mentioned, one of the preparatory work for the presentation of the recommendations contained in the first report of the Group.

7

In conclusion

The work done by the HSWG between years 2011 and 2013 and the set of recommendations and proposals adopted constitute a roadmap and an opportunity for the existence of a current health information system, flexible, more sustained and timely, to meet the current economic and social challenges and thus achieve health gains in the Portuguese population.

At present, monitoring the implementation of the recommendations by the Group can ensure the improvement of the system quality, its transparency and social usefulness and, eventually, on the other hand, its constant adaptation to a changing context. So, given the dynamic nature of health problems and their determinants and consequences, the work now reported must have continuity, promoting higher and deeper articulation between the various actors and stakeholders in health information.

8

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Understanding and interpreting National Health Service hospital morbidity data, 2013

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Summary: The need for information on health is well recognized and of particular importance in the monitoring of diseases present in the community. In recent years focus has shifted from infectious diseases towards chronic diseases and long term conditions due to improvements in health care and an ageing population. Population studies of hospital morbidity are of great importance for the whole community in order to understand and reflect on the evolution of the health care environment. Regular reporting of all diseases in the population is a challenge. In Portugal, morbidity reports have been regularly published since 2004, the amount of information and statistics on health available grew over time. In this article, we discuss this historical evolution of Portugal's morbidity information, of the respective statistics and discuss some of their properties. This article is aimed at individuals interested in health information, its objective is to show how successive publications of morbidity statistics have evolved and discuss the potential of this information for data analysis and research.

Key-words: **Clinical Coding; Day Cases; Length of stay**

1

Introduction

The need for information on health is of major importance, and particularly so the monitoring of diseases present in the community. Recently, the focus has shifted from infectious diseases to chronic disease and long term conditions due to developments in health care and an aging population.

Mortality statistics have been developed on a large scale; however, we can only draw limited conclusions about the burden of disease from data on causes of death. The regular reporting of all diseases in the population is a challenge. Thus, diagnostic data from hospitalized patients as a regular source of information, adds to the body of knowledge about diseases which necessitate hospital care(1).

Studies of hospital morbidity allow individuals and communities to reflect on the strengths and weaknesses of health in Portugal, as well as understanding how hospital health care has developed and evolved over time. Analysis of hospital morbidity data results in information which can contribute to decision making in the field of health, economic and social policy.

Directorate-General of health (DGS) has been carrying out statistical calculations related to hospitalizations from the database of Homogeneous Diagnosis Related Groups (DRG) since the mid-1990s. Initially information was sourced from the IT and Financial Management Institute of the Ministry Health (IGIF), currently the source is the Central Administration of the Health System (ACSS). The primary purpose of these two establishments was to raise awareness of the health community in Portugal about available morbidity information in Portugal which could be produced from the episodes of hospitalization in Continental Portugal.

The aim of this article is to reveal the extensive work that is done in the provision of hospital morbidity information in Portugal and to improve understanding and use of this information for research, health policy development or decision making purposes.

2

Objectives

The objectives of this article are:

- To present to the health community in Portugal hospital morbidity information in the form that is regularly published by DGS;
- To publicize the progress that this publication has had over the course of two decades;

• Explicitly explain the statistics that are currently used in hospital morbidity publications;

• Demonstrate the potential use and interpretation of available data

(1) By comparing the main hospital morbidity statistics (global) by health region and the Portuguese Continental level

(2) By presenting hospital morbidity statistics in terms of; gender, age groups, gender and age groups for Mainland Portugal.

3

Methods

In this article we discuss the current Portuguese hospital morbidity publication and describe, in summary form, the story behind the current publication, the structure of the publication and the methodology used to produce the statistics.

DRG

The DRG is a classification system used by acute hospitals to allocate patients into clinically consistent groups from the viewpoint of resource consumption. DRGs provide an operational definition for the products of a hospital i.e. the set of goods and services that each patient receives according to their needs and as part of specific clinical process.

This system was developed at Yale University during the 1960s. DRGs are organized by Major Diagnostic Categories (GCD). These categories are mutually exclusive and correspond to a particular organic pathology or clinical etiology.

The inpatient episodes records, outpatient surgery and medical clinic held in acute hospitals in DRGs are grouped by series of algorithms performed by a computer application called grouper DRG. Outpatient surgeries and medical clinic attendances are referred to as daycases (DC). Algorithms are applied to the variables of each record, ranking each episode within a GCD and, within this, a DRG.

To this date the grouper mainly used in Portugal was the AP-DRG, version 21.0 (21 AP), introduced through the publication of Decree No. 567/2006 of 12 June. Since 01 January 2013 the grouper AP 27 (http://www.acss.min-saude.pt/Portals/0/Circular%20Normativa%20N1%202013.pdf) has been used.

In the AP-DRG grouper version 27.0, there are 25 GCD, and a Pre-Grande Category, which are subdivided into 684 DRGs.

In Portugal since the early 1990s, the DRGs have been used to determine how resources are allocated to acute hospitals. In acute hospitals a “high sheet” is constructed.

The principal and associated diagnoses, external causes of injury / adverse effects and procedures are coded based on the 9th. Revision of the International Classification of Diseases - Clinical Modification (ICD-9-CM)[2].

Statistics of products associated with hospitalization

The statistics presented in the morbidity report are as follows;

• **Number of hospital discharges per year (US)** – Inpatients who no longer stay in the inpatient services of the establishment, due to discharge in a given year (also includes instances of hospitalization as an outpatient). This figure corresponds to the number of registered inpatient episodes.

• **Number of inpatient days per year (DI)** – The total number of days used by all inpatients in all the different specialties of the hospital. It is calculated using the following formula:

Number of inpatient days (DI) = $\sum_{i=1}^{DS} DI_i$, where DI_i is the duration of stay of an inpatient episode i

• **The mean[1] length of stay per patient per year** – The mean number of days per inpatient episode per patient per year. It is calculated by dividing the total number of inpatient days per year with the number of hospital discharges per year. It is calculated using the following formula:

Mean length of stay (DM) = $\frac{DI}{US}$

• **Standard deviation of the mean length of stay** – the standard deviation of the mean length of stay per patient per year. It is calculated using the following formula:

Standard deviation (DP) = $\sqrt{\frac{\sum_{i=1}^{DS} (DI_i - DM)^2}{US-1}}$, where DI_i is the length of stay of an episode of hospitalisation i

• **Median duration of hospital stay for the year** – the median number of inpatient days per hospital episode.

• **Day Case (DC)** – Patients who are admitted and discharged within 24 hours, excluding those who died during the first day of admission.

• **Ambulatory cases (Amb)** – Patients who were not admitted to hospital but received hospital care.

• **Mean duration of stay excluding day cases** – Mean number of days per hospital episode excluding cases who were admitted for less than 24 hours for a given year. It is calculated by dividing the total number of inpatient days with the total number of inpatients admitted for 24 hours or more. It is calculated using the following formula:

DM\DC = $\frac{DI}{US - DC}$

[1] Mean of the time hospitalised

• **Standard deviation of the duration of stay excluding day cases** – standard deviation of the number of days per hospital episode excluding cases who were admitted for less than 24 hours for any given year. It is calculated using the following formula:

$$\text{(DP)} = \sqrt{\frac{\sum_{i=1}^{DS-DC}(DI_i - DM)^2}{US-DC-1}},$$

Where DI_i is the duration of an episode of hospitalization i and $DI_i > 0 \forall\, i = 1, ..., DS - DC$

• **Median duration of stay excluding day cases** – the median number of inpatient days per hospital episode excluding cases who were admitted for less than 24 hours on any given year.

$$\text{Hospital discharges per 100000 population} = \frac{US}{\text{Annual mid - year population}} \times 100000$$

In the calculation of this indicator, the population statistic is always related to the health region, age group and sex to which the number of hospital episodes relate.

• **Percentage of day cases (%DC)** = $\frac{DC}{US} \times 100$

• **Fatality rate (%O)** = $\frac{Deaths}{US} \times 100$

• **Number of hospital episodes in a given year (Ep.Int) –** The number of episodes of hospitalization (US – AMB) in a given year.

• **The number of individuals admitted in a given year (Indivíduos Int.)** – The number of individuals who accounted for the total number of episodes of hospital care in a given year.

• **Number of individuals admitted only once during a given year (Indivíduos 1 Int.)** – The number of individuals who had only one hospital admission during a given year.

• **Number of individuals with recurrent admissions in a given year (Indivíduos >1 Int.)** – The number of individuals who had more than one hospital admission during a given year.

• **Number of recurrent admissions in a given year (Segundos Int.)**

= Ep.Int – Indivíduos 1 Int. – Indivíduos >1 Int.

• **Percentage of recurrent admission (Segundos Int.)**

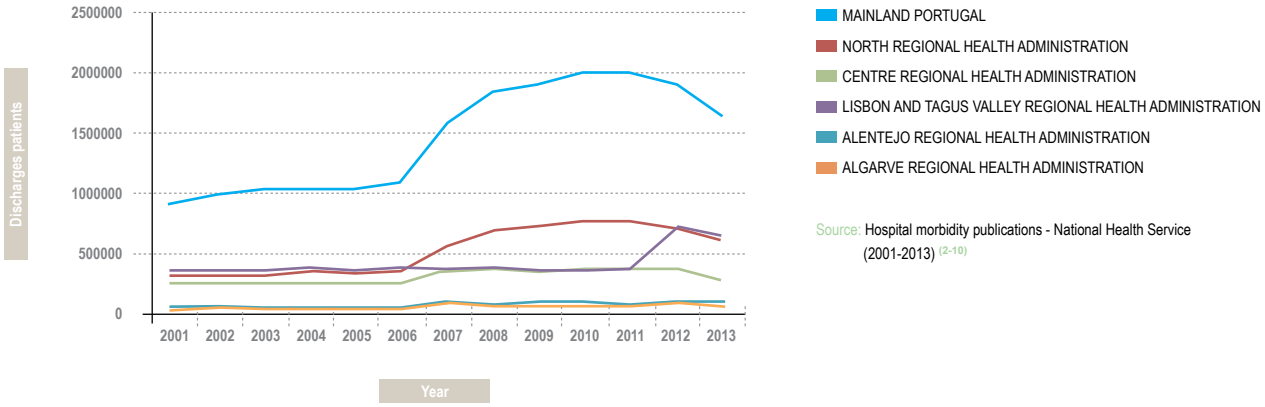
$$= \frac{\text{Ep.Int} - \text{Indivíduos 1 Int.} - \text{Indivíduos >1 Int}}{\text{EP.Int.}} \times 100\%$$

4

Results

Evolution

Although not part of the annual publication of morbidity data, it is important to know how many records of hospital discharges are contained within the GDH databases (these include hospitalizations and outpatient admissions). Two million discharges were recorded between 2010 and 2011. The substantial change observed after 2006 relates mainly to registration of episodes of ambulatory care.



Source: Hospital morbidity publications - National Health Service (2001-2013) [2-10]

Graphic:

① The evolution of the number of hospital discharges in Continental Portugal by health region (2001 a 2013)

Characterizing the production associated with hospitalization

Quadro:

① Charactersing the product associated with hospitalization and the respective patterns of morbidity in Continental Portugal (2013)[10]

Region	US	DI	DC	O	Amb	DM	DP	Med	DM\DC	DP\DC	Med\DC	%DC	%O
North	613566	2204057	305688	14810	287354	3.59	8.5	0	7.16	10.9	4	49.82	3.41
Central	294635	1400928	113428	9882	110470	4.75	19.7	2	7.73	24.72	4	38.5	3.35
Lisbon and Tagus Valley	635267	2510243	318402	18525	305880	3.95	11.22	0	7.92	14.91	4	50.12	2.92
Alentejo	69587	265700	33862	2578	32635	3.82	8.92	1	7.44	11.35	4	48.66	5.7
Algarve	52182	280579	19997	2331	17326	5.38	10.85	2	8.72	12.75	5	38.32	6.47
Continental Portugal	1665237	6661507	791377	48127	753664	4	12.27	1	7.62	16.15	4	47.52	2.89

The statistics hospital discharges (US), length of stay (DI), Day-Cases (DC), Ambulatory Cases (Amb) and Deaths (O) are additive characteristics. The total observed in Portugal is the sum of that which is observed regionally.

The total number of episodes of hospitalization *(Table 2)* is easily obtainable in *Table 1* by subtracting episodes of ambulatory from the total hospital discharges (US - Amb).

Classically, when describing the distribution of hospitalization episodes, only the total numbers of inpatient days (DI) and the mean length of stay. This occurred despite being known that the length of stay were presented as having a markedly asymmetric distribution and occurred due to difficulties in calculating / computing asymmetrically distributed data. Since 2010[7]:

1. Hospital morbidity statistics include standard deviations and also the median length of stay. The reader is able to use the presentation of variability to gain an understanding of the heterogeneity of hospitalization episodes and length of stay. Presentation of the median length of stay is a more robust measure of statistical centrality than the mean in a skewed distribution;

2. The average times, standard deviations and inpatient median excluding Day Cases were also presented systematically ;

3. The systematic presentation and graphical representations allowed direct comparison between sexes, age groups and large groups of ICD9 and GCDs;

4. In chapter 3 of part 3, the information pertaining to the National Reproductive Health Program is presented in greater detail with results in terms of health region;

5. There was systematic presentation of ambulatory cases (Amb);

6. The term "discharged patient" (DS) was substituted for "hospital discharge" (US) in Portuguese this translates as discharged users;

7. Since the publication of 2012 [9] global production indicators (number of episodes of hospitalization, number of hospitalized individuals, number of individuals hospitalized only once, number of individuals hospitalized more than once; numbers of recurrent admissions; and, percentage of recurrent admissions) were added.

The first two points try to give a clearer picture of the length of hospital stay.

Graphics were introduced with the intention of highlighting the issues surrounding length of stay and to facilitate comparison.

Similar to what has been done for other programs, these changes led to the provision of much more information about reproductive health which enables comparison between years.

The intention behind the changes associated with the fifth point was to give a close view of reality in terms of hospitalization times. It is important to analyze outpatient cases as their inclusion can lead to the asymmetrical distribution of hospitalization times, distorting the summary measures of length of stay.

The sixth point was intended to achieve greater accuracy in respect of terms used. It was considered that the term "Patients discharged" (used in previous publications) would not be the most suitable since this indicator also includes ambulatory cases and episodes of childbirth who may not necessarily be considered patients but are users of hospital services .

Episodes of hospitalization

Only in recent years has a unique patient identifier become available which permits the identification of the recurrent admissions of the same person. Using this tool, it was possible to calculate and present in the 2013 publication [10] the number of individuals who were hospitalized, the numbers of first and recurrent admissions.

In 2013 Portuguese National Health Service (NHS) hospitals registered 911 573 episodes of hospitalization relating to 663 391individuals. Of these, 524 336 individuals had only one episode of hospitalization in the year (2013) which corresponds to 79% of hospitalized individuals; and the remaining individuals (139055) had total of 248182 admissions – recurrent admissions corresponded to 27.2% of all admissions of the year.

Table:

② Episodes of hospitalization , individuals hospitalized, single episodes of care and repeat admissions in Continental Portugal (2013)[10]

Region	Hospitalizations	Individuals hospitalized	Individuals 1 hospital episode	Individuals recurrent hospital episodes.	Recurrent Episodes.	% Recurrent Episodes.
North	326213	238354	188953	49401	87859	26,93
Central	184165	134582	105686	28896	49583	26,92
Lisbon and Tagus Valley	329387	243180	193225	49955	86207	26,17
Alentejo	36952	29334	23998	5336	7618	20,62
Algarve	34856	26378	21079	5299	8478	24,32
Continental Portugal	911573	663391	524336	139055	248182	27,23

The proportion of recurrent admissions for health regions shows large variability. The North Region had the highest proportion 26.9% and the region of Alentejo the lowest 20.6%.

We can illustrate the properties of these regional indicators in relation to the Continental Portugal and find that:

• The total number of inpatient episodes in mainland Portugal is the sum of the episodes observed in the five regions;

• The total number of individuals hospitalized in Portugal is less than the sum of individuals hospitalized in 5 regions according to 2013 data [10]. The reason for the difference of 8437 individuals is that there are individuals who have been admitted to hospital in more than one health region;

• The number of individuals with a single episode of hospital care in mainland Portugal in the year is less than the sum of the number of individuals at a regional level (a difference of 8605 individuals). The explanation for this is that there are individuals who had only one episode of care in a particular region in a particular year, but that same year, the same patient had another, separate episode of care in a different health region.

• The same feature is found with the number of individuals with recurrent hospital episodes; although the difference is generally small (168 subjects);

• If we follow this inverse logic, it becomes clear that the number of recurrent admissions in Continental Portugal is greater than the sum of recurrent admissions in the individual health regions (the difference is 8437 admissions).

Morbidity profile of outbound users

The mean length of stay for National Health Service (NHS) Hospitals was 4 ± 12.27 days and the average length of stay, excluding day cases was 7.62 ±16.15 days. This difference reflects the high percentage of daycases (47.52%, almost half of hospital discharges). When excluding day cases, the median time was 4 days.

By sex, the number of hospital discharges was higher in women (53.52%). The distribution of inpatient days was not significantly different between sexes (mean: 2.25 and 3.78 days; the mean without daycases: 8,32 and 7.05 days; the median without daycases: 5 and 4 days respectively for men and women). In most cases, males had longer lengths of stay than females, both in mean and variability (except the global median, which was one in both sexes); the percentages of daycases (49.86% and 46.36%) and mortality (2.36% and 2.48%) were higher in females.

By age groups, the values of longer lengths of stay, belonged to the age groups of; 65 and over, children under 1 year and 15-24. Once daycases were removed, the age group of 15-24 had the lowest values (mean = 4.05; median = 3 days), and the oldest group of 65 and over the highest values (mean = 9 15 and median = 7 days).

By age and sex groups, men recorded the longest length of stay. In the seven age groups considered, three age groups had lower average time of stay in men (1-4 years, 5-14 years and 65 and over). The highest average lengths of stay belonged to the age group: under 1 year of age and 65 and over for both sexes. Also in both sexes, once daycases were removed, the distribution of the length of stay demonstrated a J shaped curve.

Quadro:

③ Characteristics of the products associated with hospitalization and respective patterns of morbidity in Continental Portugal for sex and age groups according to the large groups of ICD9CM (2013)[10]

	US	DI	DC	O	Amb	DM	DP	Med	DM\DC	DP\DC	Med\DC	%DC	%O
TOTAL	1665237	6661507	791377	48127	753664	4	12.27	1	7.62	16.15	4	47.52	2.89
Males	774011	3292225	378187	26005	358871	2.25	14.91	1	8.32	20.1	5	49.86	2.36
Females	891208	3369217	413185	22123	394787	3.78	9.38	1	7.05	11.9	4	46.36	2.48
<1	81438	367397	1763	207	826	3.51	34.91	3	4.61	35.3	3	2.16	0.25
Males	42307	197766	983	115	473	5.67	47.24	3	4.79	47.81	3	2.32	0.27
Females	39122	169612	780	91	353	4.34	11.1	3	3.42	11.2	3	2.99	0.23
1-4	26365	70320	10757	44	9305	2.67	6.93	1	4.51	8.54	3	40.8	0.17
Males	15524	39895	6640	29	5799	2.57	7.43	1	4.49	9.38	3	42.77	0.19
Females	10841	30425	4117	15	3505	2.81	6.13	1	4.52	7.27	3	37.98	0.14
5-14	42957	93182	20392	55	18238	2.17	5.85	1	4.13	7.55	2	47.47	0.13
Males	25119	51021	12281	32	11014	2.03	5.13	1	3.97	6.62	2	48.89	0.13
Females	17837	42162	8109	23	7226	2.36	6.72	1	5.33	8.62	2	45.47	0.13
15-24	57929	193798	19571	109	17659	3.35	8.45	2	4.05	9.96	3	35.79	0.19
Males	24158	82932	10763	69	9885	3.43	10.06	1	7.19	12.87	3	44.55	0.29
Females	33769	110866	8810	40	7775	2.28	7.07	2	3.44	7.91	3	28.08	0.12
25-44	263230	838695	107879	1116	100446	3.19	8.11	2	5.4	9.98	3	40.98	0.42
Males	81743	323473	40098	695	37270	3.96	11.3	1	7.77	14.89	4	49.05	0.85
Females	181484	515220	67779	419	63175	2.84	6.13	2	4.53	7.23	3	37.35	0.23
45-64	481019	1526522	286473	7124	275201	1.17*	9.89	0	7.85*	14.35	4	59.56	2.48
Males	229774	870941	128859	4805	123192	4.79	10.32	0	8.63	14.2	5	55.08	1.09
Females	251245	655583	157616	2317	152008	2.61	9.45	0	7	14.46	4	62.73	-1.08
65+	712299	3571592	344539	39472	331986	5.01	10.52	1	9.71	13.02	7	48.37	5.54
Males	355386	1726198	178562	20255	171240	4.86	10.41	0	9.76	13.08	7	50.24	4.7
Females	356908	1845350	165974	19216	160742	5.17	10.62	1	9.66	12.98	7	46.5	5.38

In the publication, the profile that is presented to the national level and for each of the 5 health regions, contains tables of groups of pathologies with highest values for length of stay, day cases and deaths. These are just some of the many forms in which summaries of the available information can be made.

5

Discussion / conclusion

This is a brief presentation of the extensive information available in the Hospital Morbidity publications of the National Health Service. The primary goal of the publication is to respond to the information needs of health professionals and decision makers. This article seeks to promote its accessibility to a wider audience interested in health information by showing the core aspects of the publication, and briefly discussing the potential this data holds for research and further analysis.

6

Potential conflicts of interest of the co-authors:

There are no conflicts of interest on the part of the authors of this article.

7

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8

Appendix

Table:

① Abbreviations of statistics of products associated with hospitalization and associated description

Abbreviation	Description
US	Hospital discharges
DI	Inpatient days
DC	Daycases
O	Deaths
Amb	Ambulatory cases
DM	Average (mean) length of stay
DP	Standard deviation of length of stay
Med	Median length of stay
DM\DC	Average length of stay excluding daycases
DP\DC	Standard deviation of length of stay excluding day cases
Med\DC	Median length of stay excluding day cases
n	Number of patients discharged
%DC	% of Day cases
%O	% of deaths
Ep.Int	Number of hospital episodes
Indivíduos Int.	Number of individuals hospitalized
Indivíduos 1 Int.	Number of indivuduals with a unique episode of hospitalization
Indivíduos >1 Int.	Number of individuals with recurrent episodes of hospitalization
Segundos Int.	Number of recurrent hospital episodes per year
% Segundos Int.	Percentage of recurrent hospital episodes per year

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English Version

Medical assistance in mass gathering events: Experience of the european football championship 2004 (EURO™ 2004) and a proposed model for prediction.

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Abstract

Introduction

Millions of people attend mass gathering events, as defined as an event attended by groups of greater than 1.000 people, every year all over the world. We present the results of the medical emergency assistance of a European Football Championship that occurs once each four years. We also propose a mathematical model to predict the number of occurrences.

Material and methods

We performed a prospective study of the results of the medical emergent care provided during the championship. The parameters analysed were: Number of patients treated; Diagnosis; Patient presentation rate (PPR); Transport to hospital rate (THR). We also analysed the relationship between No. of occurrences and stage of the event. Through linear regression analysis, a mathematical model is proposed to predict the No. of occurrences.

Results

There were 2003 occurrences during the 31 games. There were one cardiac arrest (in 1 165 192 spectators). Chest pain was recorded in 24 cases. Psychological support was provided to 190 persons. Patient presentation rate (PPR) was 1.7. The transport to hospital rate (THR) was 0.033.
The estimated model for prediction is:

$$A = -61{,}53\ F_1 - 45{,}57\ F_2 - 35{,}23\ F_3 + 1{,}408\ E + 67{,}47$$

Conclusions

Planning for a mass gathering event is complex. Our results validate the medical emergency system organized for this event. Although our data allow us to propose a predictive mathematical model of the No. of occurrences, based mainly on the important “weight” demonstrated by the championship stage on the No. of occurrences, it would seem to be of great interest to analyse this experience as a “historical model”, in order to predict the need for medical care at the next European Championships.

Key-words: **mass gathering; planning; emergency medicine.**

1 Introduction

Although several mass-gathering events are held every year throughout the World, no unequivocal recommendations have yet been made on the arrangements necessary to guarantee the provision of medical emergency care at these events. The complex interconnections between the different variables that appear to be involved with the number and type of medical emergencies that occur, as well as the great variety of mass-gathering events themselves, would appear to be the cause of this deficiency in current knowledge of Emergency Medicine [1-7].

The definition of mass gathering event has also been changed. Some authors consider it when there are more than 1000 people in the same place at the same time, and other just accept the term to be applied for more than 25000 people [1,4,6].

Is also important to clarify that this term does not applies for refugees’ camps nor for displaced people but just for otherwise healthy people that in a planned way join with the same objective either it is political, cultural, sportive or other [8,9].

Although it is a group of “healthy” people, the number of medical events is usually superior of what we would expect from the same number of people in the general population [1].

The necessity to predict major medical emergency occurrences, in particular cardiorespiratory arrest, the total number of patient presentations and the number of patients transferred to hospitals, in order to be able to plan the entire medical emergency system to be created for this purpose, led to the attempt to develop models and/or rational and logical foundations for predictions [2,3,10-15].

This is the first report about emergency medical assistance during European Football Championship. Accepting that the "Historical Model" is the best model to plan and prepare an event, the presentation of the results of the experience with EURO™ 2004 might be important for planning future events of an identical nature, held in different European countries every four years.
The medical situations in a mass gathering event are mainly minor. But situations that require advanced life support actions can occur and they were reported from 5 to 54% of assistances [4,5,9,10,16,17]. The cardiac arrest occurs in every 0.5-1/50 0000 spectators [3,4,10,11].

So, the medical assistance has to be planned in order to respond to life-threatening situations, as well as to minor injuries. Besides that, the acceptance that these type of events can create some anxiety among the spectators, suggests the need to include psychologist in the medical team. Such inclusion was not, as far as we now, previously reported. We also present the results of this original experience.

2

Material and methods

A prospective study is made of the results of the medical care provided by the health resources created specifically for this purpose. A clinical record sheet, specifically created for the event, to record all the Medical Emergency occurrences that happened at the EURO 2004 from 12th of June to 4th of July 2004, was created for this event.

Every person assisted by the medical team in our nearby (until 1000m) the stadiums of the event were enrolled. Every member of the medical team is included.

The parameters analyzed were:

(1) Number of patients treated;

(2) Diagnosis;

(3) Patient presentation rate (PPR), meaning the number of spectators treated, per 1,000 spectators;

(4) Transport to hospital rate (THR), meaning the number. of people taken by ambulance to hospital, per 1,000 spectators treated;

(5) Relationship between number of occurrences and stage of the championship

We performed the standard statistical analysis (average, median, mode, standard deviation) of the number of medical occurrences. We also analyzed that by game, by major clinical subgroups (trauma and non-trauma. In the non-trauma group we also considered the cardiac-related, the psychological-related and the "others") and by stage. We considered four stages, as accepted for sportive matters. The same was done for the number of transports to the hospital.

A multivariate study was performed and various mathematical models were tested (t-test, test of Breusch Godfrey, test of Engle, test of White, test of Ramsey, test of Hansen and test of Hansen-Doornik), in order to find one that could predict the number of patient presentations.

Through linear regression analysis, a mathematical model is proposed to predict the number of patient presentations.

3

Results

There were a total of 2003 patients attended during the 31 matches, with a minimum of 16 and a maximum of 156, in the matches with a smaller and greater number of spectators, respectively.

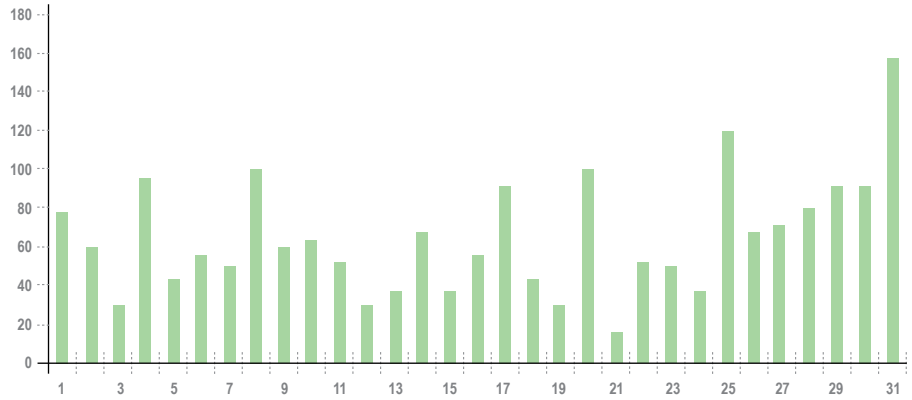
The details are in *table 1*. Information about number of spectators, number of patients assisted, transfers, temperature and occupancy rate. There is also information about the different phases of the event.

Table:

① Data from the medical assistance at EURO™ 2004

Phase	Spectators	Presentation/main complaint						Transport	Temp. (ºC)	Occupancy rate (%)
			Medical issue							
		Trauma	Total	Cardiac	Psychol.	Other	Total			
1	48.761	23	55	0	6	49	78	1	20	94
1	28.212	14	47	1	4	42	61	7	25	94
1	24.090	14	14	0	5	9	28	1	22	80
1	62.487	19	75	0	10	65	94	3	25	96
1	26.612	29	16	0	7	9	45	7	32	89
1	31.621	25	30	0	4	26	55	1	28	61
1	21.744	20	32	1	3	28	52	3	23	73
1	48.196	41	59	1	4	54	100	2	22	93
1	26.642	24	36	0	8	28	60	2	26	89
1	59.273	5	59	3	8	48	64	2	25	91
1	28.214	24	24	0	5	19	48	2	27	94
1	26.960	7	20	0	1	19	27	1	20	90
1	24.131	18	16	0	7	9	34	1	18	80
1	44.926	29	36	2	2	32	65	3	17	86
1	24.601	18	17	1	5	11	35	1	18	82
1	29.935	16	40	1	4	35	56	0	18	100
1	47.391	28	65	0	10	55	93	2	20	91
1	24.347	11	30	0	5	25	41	0	23	81
1	28.111	18	12	0	2	10	30	0	21	94
1	57.047	34	67	1	5	61	101	1	21	88
1	21.222	9	07	0	2	5	16	0	19	71
1	26.115	19	28	1	3	24	47	3	19	87
1	27.904	18	34	0	9	25	52	1	21	93
1	46.849	15	22	3	6	13	37	1	22	90
2	62.564	49	49	4	16	29	118	6	22	96
2	45.390	19	48	1	10	41	67	1	22	87
2	28.762	16	56	2	6	44	72	3	24	96
2	41.092	39	42	1	5	36	81	4	20	79
3	46.679	37	58	0	5	53	95	1	20	90
3	42.449	37	58	1	6	51	95	0	17	82
4	62.865	24	132	0	17	115	156	6	22	97

Source: INEM IP



Graphic:

① Number of patients assisted by match

There was an average of 64.6 patient presentations per match, with a standard deviation of 30.45. With the asymmetry and kurtosis values it can be established that there are no major deviations from the normal distribution.

There were 1431 cases in the stadium and 572 cases in the surrounding area. There were 699 trauma patients and 1304 cases of non-traumatic situations (35% vs 65%).

There was one case of cardiac arrest noticed (1/1 165 192 spectators, 0.86/ 1 000 000 spectators). From the 2003 patients assisted, there were 24 cases of chest pain. 190 cases were assisted by the psychological team.

There is a slight tendency for growth, particularly during the last matches (from the quarter-finals onwards).

Patient presentation rates (PPR) was
(1) Global. PPR = 1.7 (2003 cases / 1 165 192 spectators). If we analyze just inside the stadiums, PPR = 1.2
(2) Per match. PPR minimal of 0.75 (match Sweden vs Netherlands, with 28 762 spectators) and a PPR maximal of 2.5 (match Italy-Bulgaria, with 21 222 spectators).

There were a total of 66 hospital transfers, with an average of 2.13.

The Transport to Hospital Rate (THR) = 32.95 (66/ 2003).

The average percentage of transfers per patient presentation is 3.4%.

Estimating the regression coefficients using least squares regression, the model obtained is

$$A = 0{,}00183\ E - 4{,}09$$

(A is the number of patient presentations and E the number of spectators at each match).
The model disclosed statistical quality and goodness-of-fit. The r^2 adjusted (0.654) means that 65.4% of the patient presentations variance is explained exclusively by the number of spectators; the other 34.6% is due to random fluctuations (possibly, among other factors, related to the other variables analyzed although this relationship is not functional and therefore cannot be included in the model).

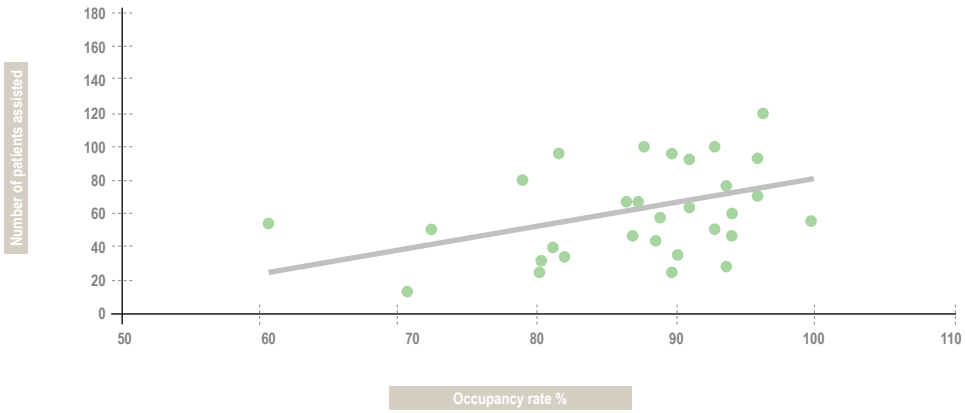
It also satisfied all the autocorrelation, heteroscedasticity, normality, stability and specification tests previously mentioned.
Number of Patient Presentations' explained by the occupancy rate (fig 2):

The correlation between them is not too strong (0.39) with important deviations from the tendency line.

Estimating the regression coefficients the following model was obtained:

$$A = 1{,}415\ T - 59{,}28$$

(A is the number of patient presentations and E the occupancy rate at each match).
Analyzing the statistical qualities and goodness-of-fit of the model, it disclosed statistical quality and goodness-of-fit; only the r^2 adjusted value is low (0.15).



Graphic:

② Number of patients assisted *vs* occupancy rate (%)

Number of Transfers to Hospital explained by the Number of Patient Presentations':

The correlation between them is not too strong (0.41) with important deviations from the tendency line.

Estimating the regression coefficients the following model obtained:

$$EH = 0{,}027\ A + 0{,}388$$

(A is the number of patient presentations and EH number of Hospital transfers at each match).

Analyzing the statistical qualities and goodness-of-fit of the model, r^2 adjusted is also very low (0.14); moreover, the hypothesis of normality of residuals was rejected at 1%.

The analysis of the temperature revealed that there is no correlation between the variables; the correlation coefficient is –0.038, which confirms that there is no correlation between the variables.

No type of influence by this variable on any other was identified. We did not obtain acceptable values for the significance of the parameters in any of the models in which temperature was introduced as an explanatory variable. The day-time of the matches (17.00 or 19.45 p.m.-) could be one of the factors that contributed to this, since there were no great fluctuations in temperature.

The introduction of the Stages of the Championship in the Modelling allowed getting to the following conclusions:
Observing the graphic presented in *figure 1*, corresponding to the number of patient presentations, it can be seen that after match 25th (the first of the quarter-finals) the number of patient presentations increased, the largest number being in the final. Thus, the hypothesis of the number of patient presentations or transfers depending on the stage of the championship will be analyzed. The main problem with this analysis is the fact that the stages did not have the same number of matches.

Table:

② Averages by the different phases of the event.

	Phase			
	1ª	2ª	3ª	4ª
Average of patients assisted by match	54,96	84,5	95	156
Average of assistances by spectator (%)	0,16	0,2	0,21	0,25
Average of transports to hospital by match	0,04	0,04	0,01	0,04
Average of assistances for trauma	19,92	30,75	37	24
Average of assistances for medical conditions	35,04	48,75	58	132
Average of assistances for psychological conditions	5,21	9,25	5,5	17
Average of assistances by cardiac conditions	0,63	2	1	0

The *table 2* presents the averages of the variables described by stage.

The average increases from stage to stage for patient presentations, patient presentations per spectator and patient presentations per illness. In particular the number of patient presentations per spectator corresponds to the patient presentations rate; the fact that they increased over the stages

means that there is a positive variation over time and not only because there might be more spectators in the stadium.
Three binary explanatory variables were constructed with the following rule of formation:

$$X_i = \begin{cases} 1 \leftarrow \text{game } \epsilon \text{ stage } i \\ 0 \leftarrow \text{game } \notin \text{ stage } i \end{cases}$$

The choice was made to include the first three stages, because the last (the final) had only one match and is therefore the least significant. Thus, we introduce the following new variables F_1, F_2 and F_3:

These new models were estimated, trying to explain the Patient Presentations, the Hospital transfers and possibly the Patient Presentations by subtype and the models obtained were assessed. As explanatory variables we consider the variables F_1, F_2 and F_3 and the remaining variables considered earlier.

In the selection of explanatory variables, the "stepwise forward regression" method was used, in other words, besides the stages we entered the variables one by one, eliminating them from the model if they were not statistically significant.

The main results concerning the models that we consider to have a minimum statistical quality and goodness-of-fit for comparison are presented below.

Modelling of the number of patient presentations

(a) Explanatory variables: Stages
Estimated model:

$$A = -101{,}04\ F_1 - 71{,}5\ F_2 - 61\ F_3 + 156$$

All the parameters are statistically significant at the level of 95% (up to the constant); the P-value is sufficiently low (except concerning the variable F_3, which is 4%, undoubtedly because stage 3 only had 2 matches) to confirm the previous result ($p < 5\%$ is now accepted as statistically valid to confirm the validity of the test); the F value confirms that the model is globally significant; the r^2 adjusted is the worst result from this model, since only 43.1% of the variation in patient presentations are explained exclusively by the stages.

The model satisfied all the autocorrelation, heteroscedasticity, normality, stability and specification tests described.

(b) Explanatory variables: Stages and Number of Spectators
Estimated model:

$$A = -61{,}53\ F_1 - 45{,}57\ F_2 - 35{,}23\ F_3 + 1{,}408\ E + 67{,}47$$

Only the parameter corresponding to F_3 is below the critical value of the individual significance test of parameters.

All the other tests had presented satisfactory results, with a value of r^2 adjusted that evidences a reasonable explanatory capacity (77% of the variation in patient presentations is explained by the model).

(c) Explanatory variables: Stages and Occupancy Rate
Estimated model:

$$A = -91{,}11\ F_1 - 64{,}09\ F_2 - 50{,}13\ F_3 + 0{,}989\ T + 60{,}11$$

Once more only the parameter corresponding to F_3 is below the critical value at 5%, but above the value at 10%.
All the other results had been satisfactory.

(d) Temperature as explanatory variable

Once again no significant relationships were found between the number of Patient Presentations and the Temperature; furthermore, when it is added to some of the previous models, they lose statistical quality.

Modelling of the number of transfers to hospital

(e) Explanatory variables: Stages
Estimated model:

$$EH = -4{,}125\ F_1 - 2{,}5\ F_2 - 5{,}5\ F_3 + 6$$

The parameter corresponding to the 2nd Stage is not statistically significant. Furthermore, the model is not globally significant, since the F observed does not reach the critical value at 10%.

(f) Explanatory variables: Stages and Number of Patient Presentations
Estimated model:

$$EH = -1{,}711\ F_1 - 0{,}792\ F_2 - 4{,}042\ F_3 + 0{,}0239\ A + 2{,}272$$

The model does not present statistical quality so it has not any predictive capacity.

(g) Other explanatory variables:

No significant relationships were found between the number of Transfers to hospital and some of the remaining variables, Temperature, Occupancy Rate or one of the Patient Presentation Subgroups.

Models' Comparison:

Since the low quality of the regression models of Transfers to hospital, the comparison will be done only for the models that intend to explain the Number of Patient Presentations *(table 3)*.

Table:

③ Results of the adjusted r^2 , RSS and HQ for the different models analyzed

Model of prediction	$\hat{r}^2$	RSS	HQ
$A = 0.00183\ E - 4.09$	0.64	9944.82	8.76
$A = 1.415\ T - 59.28$	0.12	24305.95	9.66
$A = -101{,}04\ F_1 - 71{,}5F_2 - 61F_3 + 156$	0.43	14725.96	6.48
$A = -61{,}53\ F_1 - 45{,}57\ F_2 - 35{,}23\ F_3 + 1{,}408\ E + 67{,}47$	0.80	5768.67	8.46
$A = -91{,}11\ F_1 - 64{,}09\ F_2 - 50{,}13\ F_3 + 0{,}989\ T + 60{,}11$	0.49	12675.73	6.41

It is possible to conclude that “number of patient presentations” is explained by “number of spectators” and by the “occupancy rate”. Adding “phases” to the model, besides improve the information, also improved the quality of the adjustment and consequently its capacity of prediction and its specificity.

It is also possible to state that “number of transfers” is explained by “number of patient presentations”. “Phases” did not add any quality to the tested models.

4 Discussion

The organization of an event such as the EURO™ 2004 is of extreme importance and great responsibility for the host Country. Among the different institutions that participate in preparing and planning such events, the Health component, mainly the Emergency Medical System has a crucial role.

Definition of “Emergency Medical Care” at “Mass Gathering Events” includes, accordingly to Baker *et al*, “preventive measures, definitive primary treatment and transport to hospitals of otherwise healthy people that assist or participate in important sporting, cultural, political or recreational events…[8]. So, this is to distinguish from the medical care provided to refugees or the victims of a disaster [8,9].

Several articles have been published on medical care at “Mass-Gathering Events”. These articles describe medical care at events of highly varied characteristics, such as the Olympic Games, Concerts, Papal Tours, Air Shows, Fairs, Political Meetings, Car Races, American Football Matches, Golf Tournaments, etc.

However, no article has been published on medical care at European Football Championship [2-5,8-12,16,18-20].

The results of the medical care provided during the 2002 World Championships, held in Korea and Japan, were published in September 2004, by Morimura *et al* [10]. This classified the victims as coming from “inside the stadium” or from the “vicinity” (when within a radius of 1 000 m from the stadium). During the 32 matches of the championship, held in Japan, 1 161 people were treated (inside stadiums - 998, 60%; in the vicinity - 663, 40%), from a total of 1 439 052 spectators.

During the EURO™ 2004, in 31 matches, 2 003 people were treated, from a total of 1 165 192 spectators (1 161/ 1 439 052 vs 2 003/ 1 165 192). Of these, 1431 were treated within the stadiums (71%) and 572 in the vicinity (29%).

The overall RAD of the 2002 World Football Championship was 0.80 and of the EURO™ 2004 was 1.7.

The PPR values described in the literature vary between 0.14 and 90, and most are between 0.5 and 2.6 [2-5,8-10,14,18]. The results presented, although higher than those described during the 2002 World Championship, can be found within these values. A statistically significant relationship was noted between the No. of occurrences/medical presentations recorded and the No. of spectators, as well as between the No. of occurrences/medical presentations and the stadium occupancy rate.

Although not yet analyzed in the works published on “Mass-Gathering Events”, in particular the Olympic Games and/or the 2002 World Championships (Korea/Japan), the results of the medical care provided during EURO™ 2004 clearly demonstrate that there is a direct statistically significant relationship between the No. of occurrences/medical presentations and the stage of the competition.

These data can be used to propose a prediction model for the number of patient presentations (A), depending on the stage of the championship (F):

$$A = -61{,}53\ F_1 - 45{,}57\ F_2 - 35{,}23\ F_3 + 1{,}408\ E + 67{,}47$$

It thus seems possible, according to the results presented, to suggest that when planning events of this nature, the following should be considered as determining factors for the size of the medical team, among others:

1. Number of spectators
2. Stadium occupancy rate
3. Championship Stage

All these “variables” are, to some extent, known in advance, to the extent that the number of spectators depends above all on the number of tickets sold and this happens some time in advance of the match. The Occupancy rate depends on the capacity of the

stadium, which is known, and the number of spectators, which has already been referred to. The stages of the championship are defined in advance.

These results suggest an "increase" in the medical arrangements at matches with predicted larger number of spectators, higher stadium occupancy rate and the final stages of a Competition similar to EURO™ 2004.

Of the incidents cared for by the EURO™ 2004 medical emergency service, and in accordance with the classification of Morimura et al as victims who "return to the event" and victims who are "transferred to hospital", 1937 (96.7%) were from the first group and 66 (3.3%) from the second group. The THR was therefore 0.033. These values are in compliance with the literature, in which most occurrences are "minor" and the number of people transported to hospital is small, with THR that varies between 0.01 and 0.55 [2-5,8-11,14,18-20].

The need to carry out advanced life support maneuvers has been described, in 5 to 54% of occurrences [3-6,16,18-20]. These data, added to the fact that there exists the possibility of the occurrence of a cardiorespiratory arrest among spectators at a "mass-gathering event" (0.1-2/ 1 000 000), justify the existence of medical teams with training and experience in medical emergencies, in particular advanced life support, as well as the existence of advanced life support equipment, within the stadiums, and which can quickly reach the victim [3-6,18]. In the series presented, with regard to EURO™ 2004, these data are confirmed.

The distribution of trauma and sudden illness situations at EURO™ 2004 (35% vs 65%) is in accordance with previously published results [3-6,14,18].

Furthermore, since the more serious clinical situations need to be transferred to hospital, it is essential for the medical emergency arrangements supporting an event of this nature to be perfectly coordinated with the local Integrated Medical Emergency System [1,6].

The number of patients with cardiovascular complaints (n = 24, 0.02/ 1 000 spectators) is higher than that described in the literature (0.005 to 0.007/ 1 000 spectators) at other "mass-gathering events" [3-6,14]. No explanation has been found for this fact. However, it confirms the idea that the presence of a Cardiologist at the stadium, at events of this importance, may be important.

Although the importance of "Psychological Support" in emergency/disaster situations is widely acknowledged and accepted as an essential means of reducing the consequences of any potentially traumatic situation, its use, as well as its potential interest, at "Mass-Gathering Events" has not yet been described. The number of occurrences that required psychological support (n = 190, 0.16/ 1000 spectators), mainly anxiety attacks, during EURO™ 2004 matches, suggests that the presence of psychologists among the medical emergency team created should be considered, specifically, for "Mass-Gathering Events".

Several authors have attempted to describe "models" that could predict the number of occurrences for a particular event, taking into consideration the expected influence of variables such as temperature, the number of spectators, access to alcoholic drinks, whether the spectators are seated or not, etc. [2,3,10-15,21,22]. Zeitz *et al* [15] compared the accuracy of predictions of the Number of victims that would arise at a "Mass-Gathering Event" calculated using the Arbon "Predictive Model", which analyses the influence of the different variables described above [14], and the Zeitz "Retrospective or Historical Model", which analyses results from similar events that have occurred in the past [2]. The conclusion of this study was that the "Retrospective or Historical Model" is better than the "Predictive Model", in its ability to predict the number of occurrences, and both methods are equally reliable in predicting the number of victims requiring transport to hospital. Thus, whenever there is access to results from similar events occurred in the past, their analysis is the best way to predict the number of clinical occurrences, as well as the number of victims needing transfer to hospital [15].

Although our data allow us to propose a predictive mathematical model of the number of patient presentations, based above all on the important "weight" demonstrated by the championship stage on the number of occurrences/medical presentations, it would seem to be of great interest to analyze the experience of EURO™ 2004, as a "historical model", in order to try to predict the need for medical care at the next European Championships, and thus properly dimension the arrangements to be created.

Recently, Challen et al identified the need to do more studies and research about mass gathering events that occurred in Europe and Australia, to improve the planning of these types of events in those regions [23].

At last, it is important to stress that Lund et all very recently stated that the provision of emergency medical care at mass gathering events may be an important opportunity to train and improve the skills and knowledge that might be useful in a disaster situation [24].

5

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6

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20 years of International Study of Asthma and Allergies in Childhood (ISAAC)

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1 Introduction

The goal of this article is to present in a synthetic way what have been the 20 years of the ISAAC Study and the work that in this context has been developed in Portugal. With this study it has been possible to refer the Portuguese centres results' and compare them with those from other countries and regions.

By the end of 2012 officially ended, after 20 years, one of the more participated epidemiological research at global scale. With about two million of young people involved, 306 centres, 105 countries, 53 languages and more than 500 international publications until now, this study has been recognised by the "Guinness Book of Records", in 2011, as the world's large dimension. Portuguese language (Portugal and Brazil) was the third participation in global terms, after English and Spanish, being the number of Portuguese young participants exceeded 35.000. The success of the project, based in an enquiry, with the main goals of describing prevalence of asthma, rhinitis and eczema in children (6-7 years) and adolescents (13-14 years), was mainly due to the way as it was planned, the organisation capacity and accuracy and the confidence that the data monitoring centre in Auckland (New Zealand) transmitted.

2 General presentation

The ISAAC Study started in Germany, in December 1990, involving 5 centres of 4 countries (Germany, New Zealand, Australia and England) with the priority goal to evaluate and monitor asthma severity in paediatric age [(1)]. Quickly evolved into a broader study, first in English language countries and, since 1992 at world level. Its coordination has been assured by the Department of Paediatrics at the Auckland University (New Zealand).

The ISAAC consisted of four phases:

I - between 1992-1995 – the use of a questionnaire in different languages in two age groups (6-7 and 13-14 years) with the aim of identifying prevalence and severity of asthma, rhinitis/rhino conjunctivitis and eczema. 156 centres in 56 countries were involved with a total of 721.601 children. In the 13-14 years age group participated 155 centres of 56 countries and in the 6-7 years age group 91 centres from 38 countries;

II - between 1990 and 2001 – more individualised study in a small number of centres for more specific population studies in which sought to deepen the atopy role and its risk factors in selected centre [(2)]. Participated, at this stage, 30 centres from 22 countries in a total of 53.383 children;

III - between 2002 and 2005 – the use of a questionnaire at the same centres from phase 1 with the aim of studying trend variations of allergic diseases in children, making comparisons at national, regional and global levels. The questionnaire was also applied to new centres having been extended to questions on the environment and life style. Participated 237 centres from 98 countries with a total of 1.187.496 young people (in the age group 13-14 years, 97 countries and I the 6-7 years age group, 61 countries);

IV - between 2005-2012 – publication of the obtained data and creation of the ISAAC website [(3)]. The various articles resulting from the study focused on thematic as diverse as the reasons of the variations on prevalence and severity of allergic diseases by the light of existing data, on Gross Domestic Product (GDP), climate, pollution, immunisation, food habits, tobacco and drugs consumption. The ISAAC Study also allowed, in many situations, to provide credible of reference documentation to the decision makers for future etiological and environmental research, as well to improve quality of life and medical care related to the pathologies in study.

3

Study organisation and development

ISAAC was based in two reference documents (4;5) which structured all developed activity in the following areas:

1. Study development and management;

2. Goals of different phases;

3. Method:

a) Description of registration: characterisation of participating centres, researchers, selection, sample dimension of the evaluated individuals, time interval, tendency study

b) Description of study: main modules, data collection period, criteria for non-participation, quality control, way of data presentation and rules for translation;

c) data analysis and treatment: quality and treatment of demographic data; way of introduction and analysis at national level

4. Study tools (questionnaires and video-questionnaires of 6-7 and 13-14 years);

5. Tools' validation;

6. Documents for Ethic Committees' approval;

7. Model of implementation in schools and parents' approach;

8. Field work;

9. Guidelines for questionnaire translations;

10. Data codification ways in each country and sending to the International Data Centre;

11. Registration documents

12. Report from the national centres and detailed guidelines for the field work directors.

In Portugal the study was applied, in phase I, to schoolchildren in areas of the health centres selected by lot from defined criteria, in collaboration with local responsible doctors, after previous authorisation from the respective Health Region Administrations and Education Regional Directions. The surveys were carried out during the 1st and 2nd school period. On phases I and III, were respected the same participating schools at municipal level. All data analysis and its compatibility were permanently scrutinised by the Auckland Coordination Centre *(Table 1)*

The ISAAC execution was based in four fundamental pillars: regional coordinators (in each country), national coordinators and regional areas coordinators (divided in 9 regions: Africa, Pacific Asia, Eastern Mediterranean, Latin America, North America, North and Eastern Europe, Western Europe and Oceania) and the Auckland Coordination Centre.

The national coordinator (see *Table 2* with the ISAAC Portugal structure) had as main functions: a) recruit the coordinator centres and identify the leading researchers, promote the translation of questionnaires, organising meetings and contacts, regulate participating centres, inform regularly the regional area coordinator (Western Europe, providing progress reports, and organise the final meeting of phase I and III for discussion of results. In Portugal several joint meetings were made with representatives from ISAAC Spain and Brazil.

Table:

① Participants in ISAAC project, Portugal (1991-2012)

Phase I
Portugal: (1994-95) **5 036** children, age: **6-7** years old (207 schools) **11.427** children, age: **13-14** years old (84 schools)
Phase II
Lisboa (1999-2001) **1.043** children, age: **9-11** years old
Phase III
Portugal (2002-2003) **9.081** children, age: **6-7** years old (408 schools) **12.905** children, age: **13-14** years old (142 schools)

* In phase 3 was included a questionnaire about environment and lifestyle issues

Table:

② ISAAC structure and coordination, Portugal (1991-2012)

National Coordinator	Rosado Pinto
Regional Coordinators (phases I and III)	
Coimbra	Maria de Lurdes Chieira e Emília Faria
Funchal	Fernanda Drumond Bordes e Rita Câmara
Lisboa	José Rosado Pinto
Portimão	Carlos Nunes
Porto	José Lopes dos Santos
Regional coordinators (phase III)	
Alentejo (Évora)	Luísa Lopes
Açores (Ponta Delgada)	José Dias Pereira
Responsible (Phase II)	
Lisboa	Mário Morais Almeida

④

Some reference results

Due to the large amount of results, which were published in different articles or integrated in the documents published by the ISAAC Steering Committee, we decided, in this article, for the presentation of a brief summary of some relevant information.

a) National – the national results concerning phases I and III are synthesised in *Tables 3* and *4* and still today are referred in speciality papers [6]. The results on asthma, rhinitis and eczema symptoms highlight the significant increase of most allergic diseases at paediatric age, in an average interval of seven years. The survey on food habits and life style *(Tables 5 and 6)* of which is only shown a small synthesis, corresponding to a sample of 6963 children, 6-7 years, and 8222 young people [7,8] and reveals at an overall analysis, at the time, a smaller consumption of food, except in fast food, in the age group 13-14 years when compared with the 6-7 years group. An important element to extract refers the percentage (78.5%) of breastfeeding for both age groups. In what concerns the drugs consumed in the first year of age, is highlighted the paracetamol consumption by 79.3% of children and of antibiotics in 54.9%. Finally, it should be emphasised information collected on regular physical exercise (3 or more times per week) and hours in front of a television/computer (3 hours or more per day). It can be seen, when comparing both age groups, a greater number of hours dedicated both to physical exercise and in front of television/computer, by adolescents. The ISAAC activity in Portugal was not limited to the data analysis on the surveys. Its questionnaire was the basis of scientific papers, master's degrees and doctorate theses, and epidemiological studies of great dimension such as SAUDAR (evaluation of the consequences on respiratory health due to the exposure of atmospheric pollutants in schools and homes in the city of Viseu) [9,10] with the sponsorship of the Calouste Gulbenkian Foundation or the ENVIRH (Environment and Health in Children Day Care Centres) co-financed by the Science and Technology Foundation (FCT).

Table:

③ National results of wheezing, asthma, rhinitis and eczema, in the last 12 months (Children with 6-7 years)

	1994/5	2002/3	p-value
Wheezing (asthma symptoms)	12,90%	12,90%	0,983
Sneezing, Runny nose (rhinitis symptoms)	19,90%	24,00%	<0,001
Itchy skin lesions (eczema symptoms)	13,90%	15,60%	<0,013

Source: Acta Paediatric Portuguese, vol. 42, n. º 5, supplement 11, 2011

Table:

④ National results of wheezing, asthma, rhinitis and eczema, in the last 12 months (Children with 13-14 years)

	1994/5	2002/3	p-value
Wheezing (asthma symptoms)	9,20%	11,80%	<0,001
Sneezing, Runny nose (rhinitis symptoms)	21,20%	26,50%	<0,001
Itchy skin lesions (eczema symptoms)	7,60%	8,70%	0,002

Source: Acta Paediatric Portuguese, vol. 42, n. º 5, supplement 11, 2011

Table:

5 National results of eating habits in the last 12 months (Children with 6-7 years old and 13-14 years old)

	6-7 years old	13-14years old
Meat (three or more per week)	65,80%	49,00%
Fish (three or more per week)	44,80%	39,30%
Fruit (three or more per week)	82,30%	66,50%
Vegetables (three or more per week)	52,00%	37,70%
Cereals (bread including) (three or more per week)	84,80%	71,00%
Rice (three or more per week)	58,20%	48,10%
Butter (three or more per week)	55,20%	37,20%
Milk (three or more per week)	86,90%	75,10%
Eggs (three or more per week)	18,50%	17,90%
fast-food (three or more per week)	3,20%	8,50%
Once a week	18,60%	40,50%
Breastfeeding	78,50%	

Source: Acta Paediatric Portuguese, vol. 42, n. º 5, supplement 11, 2011

Table:

6 National results of lifestyle, household energy and maternal education level in the last 12 months (Children with 6-7 years old and 13-14 years old)

	6-7 years old	13-14years old
Physical activity (three or more per week)	9,30%	22,5%
Hours on TV/computer (screen time) (three or more hours/day)	17,30%	31,3%
Antibiotic on first year	54,90%	-
Paracetamol on first year	79,30%	-
Household energy (kitchen)		
Electricity	16,90%	21,3%
Gas	88,50%	83,8%
Household energy		
Electricity	16,90%	21,3%
Gas	88,50%	83,8%
Wood, coal	15,90%	10,6%
Maternal education level		
Basic	27,00%	
Secondary	47,40%	
University	19,30%	

Source: Acta Paediatric Portuguese, vol. 42, n. º 5, supplement 11, 2011

International- We highlight the J Mallol *et al* article [(11)] which, in 2012, presents the global results of phase III by regions. Total prevalence of asthma in children of 6-7 years was situated at 12.7%; rhinoconjunctivitis by 8.1% and eczema by 7.7%. In the case of adolescents (13-14 years) was of respectively 13.4%, 12.7% and 8.2%. We also refer a study led by E. Mitchell [(12)],), of 2012, about the association of smoking and the asthma risk in children and adolescents that points the importance of tobacco consumption by mother during the first year of life, regardless the risk provoked by the father smoking. R. Beasley *et al* [(13)]), in a study published in 2008, involving 205.487 children, 73 centres and 31 countries concluded that the use of paracetamol in the first years of life is associated to a greater risk of asthma, rhinoconjunctivitis and eczema at 6-7 years (in this study Portuguese children until the first year of life are those who consume more paracetamol). Similar conclusion was obtained by S. Foliaki et al [(14)], in 2009, in what concerns the use of antibiotics, analysing the results obtained in 193.412 children from 71 centres in 29 countries. Already in 2013 P. Ellwood *et al* [(15)] showed the risk association between the frequent consumption of fast food and allergic diseases; while, the fruit consumption (more than three times a week) is a factor of protection of asthma in childhood. In this study Portugal appears as the second country with higher fruit consumption in children of 6-7 years (87%).

5

Conclusions

The experience lived in a study of global dimension during 20 years was only possible due to an exemplary organisation and monitoring, permanent, and in network, taking advantage of a relatively prosperous period of the world economy that allowed that, in each country, were obtained the adequate funding to its implementation. On the other hand, ISAAC showed, by its dimension, the possibility of having an epidemiological research on allergic diseases in children, by implementing a standardisation of case definition, and in its methodology, in order to obtain structures for etiological research at level of genetic, environmental, lifestyle and medical care factors. It is stressed that the collected data also reinforce the determinants' importance, either genetic or environmental, in what concerns allergic diseases in children.

It is the responsibility of national and international decision makers to know how to use the documents and tools legated by ISAAC, updating them regularly, for better quality of life of our young people and our community.

6

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7

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p e r s p e c t i v e s

English Version E

The Contingency Plan for Extreme Adverse Temperatures – Heat Module.

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1

According to the European Environment Agency (EEA) the mean temperature of the atmosphere to the surface increased 1.3ºC compared to the average in pre industrial period, being the decade of 2002-2010 the warmest in Europe [(1)].

The projections of the referred Agency point that global climate change will lead to the intensification of various extreme weather events, like heat waves, that can be more intense and frequent, associated with warmer summers and milder winters [(1)].

Recent studies conducted in Portugal suggest a clear trend to the increase of average air temperature and an increase of the number of days per year with very high temperatures [(2)].

In 2003 summer, the western and central European countries were subject to a heat wave, reached temperatures above normal for the season, between July and September [(3)].

This heat wave was marked by its duration, intensity, geographic range and health impact. Countries like France, Spain, Portugal and Italy reported a summer mortality excess associated with the heat wave which occurred in the first two weeks of August [(4-7)].

The estimated impact, in 2005, for this heat wave episode, resulted in a mortality excess of 50 000 deaths than expected [(8)]. Later, in 2009, this evaluation was established in 70 000 deaths than expected [(9)]. In Portugal, the mortality excess was estimated in 1 953 deaths, after correction for individuals age [(10)].

The Contingency Plan for Extreme Adverse Temperatures (PCTEA) – Module Heat is based on a forecast, warning and appropriate response system that is activated between May 15 and September 30. This period can be extended depending on weather conditions observed, at any time of the year, before or after their usual activation period.

Since 2006, the assessment and risk management for the health of the population has become the responsibility of Regional Administration of Health (ARS), at regional level, in partnership with Local Health Units (ULS) and Health Centers Grouping (ACeS), at local level, due to their knowledge of the local specificities.

In 2011, the Plan adopted the designation of Contingency Plan for Extreme Adverse Temperatures – Module Heat, based on evidence that exposure to high temperatures pose a risk to human health without being in heat wave.

Until 2014, the alerts were defined by district, but in 2015, these alerts become to be defined by ACeS, due to the difficulties experienced due to the district alerts do not match the current organization of health services.

This Plan mobilizes health structures, at national, regional and local levels, but also other entities with responsibility in the population protection, like, National Authority for Civil Protection (ANPC) and Social Security Institute, I.P. (ISS).

The Plan has three alert levels: GREEN (level 0), YELLOW (level 1) and RED (level 2).

Table:

1 PCTEA Alert levels

Green	Normal temperatures for the time of the year
Yellow	High temperatures that can result in negative health effects
Red	Too high temperatures that can cause serious health effects

The five ARS have the responsibility to ensure the development and implementation of PCTEA – Module Heat at regional level, wherein the respective Public Health Department proceeds to risk assessment and definition of the alert level.

Six criteria are used to establish alert levels and should be used jointly.

These criteria include: Ícaro warning index, maximum and minimum temperature, fire occurrence, sudden rise in maximum temperature equal or greater than 6 degrees and other factors, such as exceedances of ozone levels, ultraviolet radiation levels, weather warnings and bio meteorological index Universal Thermal Climate Index (UTCI), developed by Portuguese Institute of the Ocean and Atmosphere (IPMA).

The information for risk assessment is provided from several institutions, namely:

- Portuguese Institute of the Ocean and Atmosphere, I.P.;
- National Health Institute Dr. Ricardo Jorge, I.P.;
- Portuguese Environment Agency, I.P.;
- National Authority for Civil Protection;
- Regional Coordination and Development Commissions.

Table:

2 Ícaro warning index criterion

Criterion	Meaning	Application	Warning
Ícaro-warning-index	0,01 a 0,99	Non significant effect on mortality	
	>= 1,0	Probable effects or severe consequences on health and mortality	

Table:

3 Maximum temperature criterion

Criterion	Period	Maximum temperatures by region	Application	Warning
Maximum temperature	may - june	>=32ºC e <35ºC (all regions)	1 day of observed temperatures + 2 days of predicted temperatures	
	july, august and september	>=35ºC e <38ºC (Alentejo, Santarém and Castelo Branco)		
		>=32ºC e <35ºC (except Alentejo, Santarém and Castelo Branco)		
	may - june	>=35ºC (all regions)	3 days of observed temperatures + 2 days of predicted temperatures	
	july, august and september	>=35ºC (except Alentejo, Santarém and Castelo Branco)		
		>=38ºC (Alentejo, Santarém and Castelo Branco)		

Table:

4 Minimum temperature criterion

Criterion	Period	Maximum temperatures by region	Application	Warning
Minimum temperature	may - september	>=24ºC e <26ºC (all regions)	2 days of observed temperatures + 2 days of predicted temperatures	
		>=26ºC (all regions)		

Table:

5 Fires occurrence criterion

Criterion	Period	Maximum temperatures by region	Application	Warning
Forest fires	may - june	>=32ºC e <35ºC (all regions)	forest fire + days of predicted temperatures	
	july, august and september	>=35ºC e <38ºC (except Alentejo, Santarém and Castelo Branco)		
		>=32ºC e <35ºC (Alentejo, Santarém and Castelo Branco)		
	may - june	>=35ºC (all regions)	Forest fire + 2 days of observed temperatures + 2 days of predicted temperatures	
	july, august and september	>=35ºC (except Alentejo, Santarém and Castelo Branco)		
		>=38ºC (Alentejo, Santarém and Castelo Branco)		

Table:

6 Sudden rise in maximum temperature equal or greater than 6 degrees

Criterion	Period	Maximum temperatures by region	Application	Warning
sudden rise of maximum temperature (≥6ºC)	may - june	>=35ºC (all regions)	2 days of observed temperatures + 2 days of predicted temperatures	
	july, august and september	>=35ºC (except Alentejo, Santarém and Castelo Branco)		
		>=38ºC (Alentejo, Santarém and Castelo Branco)		

According to the alert levels different interventions measures are adopted.

In general, the main measures to be taken when the alert level is **GREEN** include maintaining surveillance situation, as well as, ensure that general preventive measures are complied.

In **YELLOW** alert level, the measures to be taken focus on dissemination of recommendations to the population, to competent health authorities and other institutions that develop their activity in proximity to the most vulnerable population groups and strengthening the responsiveness of health care units.

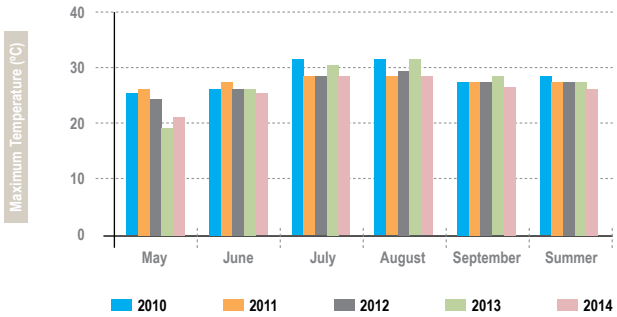
In relation to the **RED** alert level, ensure that yellow alert level measures are taken, adding coordination with health authorities and other partner organizations, as well as, National Authority for Civil Protection and Social Security Institute, I.P., to promote transport to climate-controlled shelter locations and the monitoring of vulnerable groups. In this level, it is sent a statement to the media to promote the dissemination of recommendations related to what to do when the temperatures are rising.

In addition to monitoring and daily risk assessment, another important component of PCTEA – Module Heat is the dissemination of information. Information to the general public is disseminated via the internet page www.dgs.pt, Saúde 24 (808 24 24 24) and media. This disclosure is made at national level, regional and local level, and should be promoted at the beginning of the PCTEA implementation, as well as throughout the duration of PCTEA.

DGS has produced flyers, posters and guidelines with general recommendations related to the effects of intense heat on health and specific recommendations taking into account vulnerable groups or groups with particular characteristics. These guidelines can be found in Health from A to Z/Heat in the internet page of DGS.

Retrospective 2010-2014

The summer of 2010 (from 15th may to 30th September) was the warmest of the last five years. The mean maximum temperature at national level was 28 degrees, mainly as a result of the high temperatures that occurred in July and August *(Graphic 1)*.



Graphic:

1 Mean maximum temperature at national level, per month, between 2010 and 2014

Portugal, like other countries, features a seasonal pattern of daily mortality function of various environmental variables, especially temperature [11-13], with the highest mortality being observed in the lowest temperature extremes and lowest mortality at moderate temperatures [11, 14-16].

The Epidemiology Department of the National Health Institute Doctor Ricardo Jorge (INSA) analyzes the effects of intense heat periods in mortality. This analysis is based on the daily mortality data from the Daily Surveillance Mortality System (VDM).

The periods of intense heat identified by INSA are defined by the set of 3 or more days with at least one of the following criteria:

• Daily Ícaro warning index higher than 1;
• A district with maximum temperature equal or higher than 36 degrees;
• Two or more districts with maximum temperature equal or higher than 35 degrees.

Table 7 shows the heat wave [1] periods, Ícaro intense heat periods and mortality excess evaluation associated with Ícaro heat period, between 2010 and 2014.

Table:

7 Heat wave periods, Ícaro intense heat periods and mortality excess evaluation (between 2010 and 2014)

Year	Heat Wave (6 days T. max >5º T. max in reference period)	Ícaro intense heat period	Mortality excess
2010	17 to 23 May	16 to 23 May	352
	3 to 11 July	27 June to 12 July	618
	24 to 31 July	22 July to 26 August	1141
	3 to 11 August		
		TOTAL	2111
2011	9 to 19 May		109
	20 to 30 May		
	29 September to 7 October	No information	
	9 to 21 October	No information	
		TOTAL	109
2013	22 to 30 June	23 June to 14 July	1675
	3 to 13 July		
	9 to15 August	No information	
	26 August to 3 September	No information	
		TOTAL	1675
2014	28 April to 18 May	No information	
	11 to 16 June	12 to 18 June	163
		9 to 21 July	No excess
		25 August to 5 September	51
		TOTAL	214

For more information on the Contingency Plan for Extreme Adverse Temperatures (PCTEA) – Module Heat, please consult the DGS internet page in www.dgs.pt, Health from A to Z/Heat.

[1] Definition of HWDI - Heat Wave Duration Index of the World Meteorological Organization (WCDMP-No.47, WMO-TD No. 1071) is defined as a period of at least six consecutive days with a maximum daily air temperature 5ºC or more above the mean maximum daily temperature for the normal climatic period (1971-2000).

2

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Strategy for the promotion of healthy eating in Portugal

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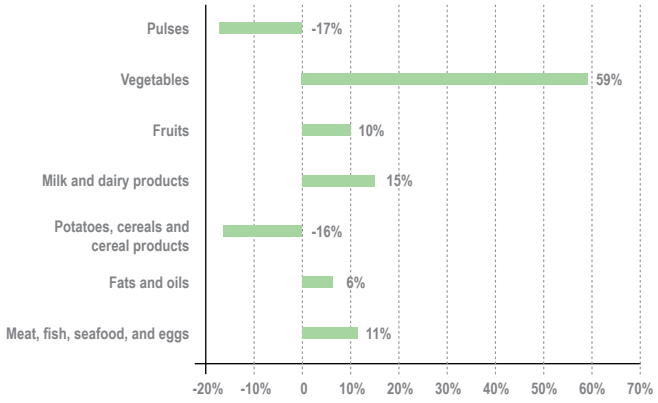
The National Programme for the Promotion of Healthy Eating (PNPAS), established in 2012, aims to improve the nutritional status of the population and to promote their health, through a coordinated and transversal set of actions intended to guarantee and encourage the availability and the access to a specific type of foods. PNPAS was approved and considered as one of the eight priority health programmes to be developed by the Directorate-General of Health (DGS) according to the Dispatch number 404/2012 of January 3rd, 2012 [(1)].

The need to implement a national food and nutrition strategy in Portugal is not recent. In fact, a lot of thought has been put towards formulating and implementing a national food and nutrition strategy since the 1970's. In Portugal, public discussion in the field of food and nutrition began in 1976, with the creation of the Centre of Nutrition Studies (CEN) which aimed to gather and organise information regarding food intake and nutritional status of the Portuguese population[(2)]. Later, in 1980, the National Food Council (CNA) was established – and later renamed National Food and Nutrition Council (CNAN) – with the main task of designing and implementing a food and nutrition policy in Portugal [(3)]. Despite these official political commitments at that time, the implementation of a national strategy for food and nutrition did not happen until 2012[(4)]. However, despite the inexistence of a formal food and nutrition policy in Portugal until recently, the interest in designing a national strategy for the promotion of healthy eating was kept alive for the past 4 decades. For that reason, there has been a substantial investment in food and nutrition education. The first national food and nutrition education campaign, named "Knowing how to eat is knowing how to live", began in the 1970's, and led to the development of the first food guide for the Portuguese population. The political investment in food literacy measures continued in the following decades, with emphasis in the 1990's, namely in schools, with the "Health Promoting Schools" initiative[(5)]. Following the political recognition of obesity as a severe public health issue, the National Programme Against Obesity[(6)], was launched, in 2005, being replaced by the Platform against Obesity, in 2007, which was established as a Division in DGS's structure [(7)]. The Platform against Obesity, despite setting very specific goals around obesity, symbolised the first approach in developing a multi-sectoral, nationwide approach for the prevention and control of obesity.

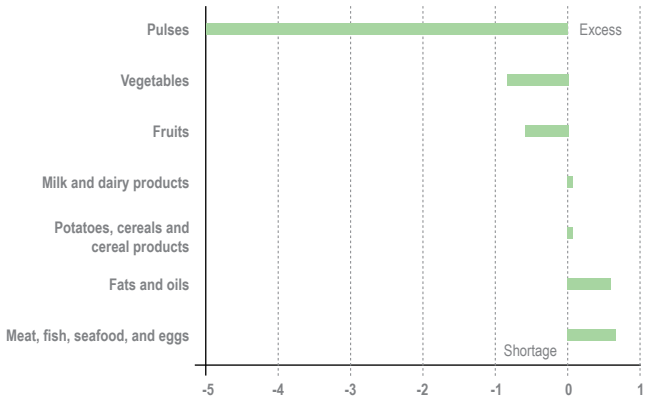
In 2012, due to the complexity of food/nutritional problems in Portugal, there was a need to implement an integrated multi-sectoral strategy in order to promote healthy eating. Despite the fact that data regarding food consumption of the Portuguese population were from 1980, more recent, indirect data regarding food availability (Portuguese Food Balance Sheet 2003-2008, gathered by the National Institute of Statistics (INE)) suggest that, between 2003 and 2008, in comparison with the 1990's, the eating pattern of the Portuguese population has strayed from healthy eating recommendations *(Graphic 1)*[(8)]. Data regarding food availability suggest an energy intake above needs (average of 3883 kcal available, daily). It also shows that the intake of saturated fats (16%) and of foods from the "Meat, fish and eggs" and "Fats and oils" food groups had increased and was above the recommended by the World Health Organization (WHO). In contrast, there was a decrease in the availability of pulses. When compared with the Portuguese Food Wheel recommendations, the availability of foods from the "Fruits", "Vegetables", and "Pulses" groups was below recommendations; on the contrary, availability of foods from the "Meat, fish and eggs" and "Fats and oils" groups was above recommendations, highlighting the shift of the Portuguese eating pattern from the healthy eating recommendations *(Graphic 2)*.



Source: Portuguese Food Balance Sheets 2003-2008, INE 2010.

Graphic:

① Variation of daily availability per capita (between 1990's and 2003-2008).



Source: Portuguese Food Balance Sheets 2003-2008, INE 2010.

Graphic:

② Imbalance of food groups' availability against Food Wheel recommendations

While in the 1990's, 6g of vegetables fats were "eaten" for every 4g of animal fats, in 2008, only 5.5g of vegetable fats were "eaten" for every 4.5g of animal fats. This shift in proportion of fats was consistent throughout the period studied *(Image 1)*[8].

Dietary imbalances in Portugal have contributed to a high prevalence of obesity and other chronic diseases, such as cardiovascular disease, cancer and diabetes. Data from the last nationwide epidemiological study looking at obesity in adults show that the prevalence of pre-obesity was 53.3% in men and 27.8% in women, while the prevalence of obesity was 11.2% in men and 10.4% in women[9] *(Table 1)*. Obesity rates in children and adolescents are also high. It is estimated that 36.2% of male children and 34.8% of female children aged between 2 and 5 years of age have overweight (pre-obesity + obesity) [10]. In children aged 6 to 9 years, according to data from COSI (Childhood Obesity Surveillance Initiative) Portugal 2010, 34.0% of boys and 30.3% of girls had overweight, with 15.6% and 13.5% of boys and girls, respectively, being obese *(Table 2)* [10]. In adolescents (11-15 years of age), 35.3% of males and 32.7% of females had excess weight [10].

Table:

① Nutritional status of adults, in Portugal

	Women	Men
Underweight	2,6	0,3
Normal range	59,2	35,2
Pre-obese	27,8	53,3
Obesity Class I	7,8	10,3
Obesity Class II	1,7	0,6
Obesity Class III	0,9	0,3

Source: SPCNA, 2009.

Table:

② Nutritional status of children aged 6 to 9 years, in Portugal

	Boys	Girls
Pre-obesity (85thC ≤ BMI < 95thC)	2,6	0,3
Obesity (BMI ≥ 95thC)	59,2	35,2
Overweight (BMI ≥ 85thC)	27,8	53,3

BMI – Body Mass Index; C – Centile;

Source: COSI Portugal 2010 – Childhood Obesity Surveillance Initiative.

Concomitantly with the high prevalence of obesity, chronic diseases – associated with inadequate eating habits – are the leading cause of death in Portugal. In this country, similarly to Europe, it is estimated that 28% of DALY – Disability Adjusted Life Years: number of life years lost due to premature death and number of productivity years lost due to incapacity and early retirement – are caused by the same risk factors as chronic diseases, namely low fruit and vegetable intake and low physical activity levels. This percentage rises to 35% when taking into account pre-obesity and obesity[12].

In addition to high levels of obesity and dietary imbalances in the Portuguese population, recent concerns with food insecurity have arisen, both quantitatively and qualitatively, as a result of Portugal's current economic and social status. The association between social status and obesity, as well as social inequalities in accessing healthy eating, make the promotion of healthy eating an even greater challenge.

Despite national specificities – that should be taken into account when designing a food strategy – the formulation and implementation of a national food and nutrition strategy cannot be detached from international guidelines, namely those from strategic WHO and European Commission (EC) documents. In this context, the strategies to be implemented in the scope of PNPAS were based on guidelines of several documents: "Global Strategy on Diet, Physical Activity and Health" (WHO, 2004)[13], "European Charter on Counteracting Obesity" (WHO Europe, 2006)[14], "The Challenge of Obesity in the WHO European Region and the Strategies for Response" (WHO Europe, 2007)[15], "Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020" (WHO, 2013)[16], "Health 2020 – A European policy framework supporting action across government and society for Health and well-being" (WHO, 2012)[17], "WHO European Action Plan for Food and Nutrition Policy 2014-2020" (WHO Europe, 2013)[18], Vienna Declaration on Nutrition and Noncommunicable Diseases in the context of Health 2020 (WHO Europe, 2013)[19], "The Helsinki Statement on the Health in All Policies" – document from the 8th Global Conference on the Health Promotion (WHO, 2013)[20], White Paper on " A Strategy for Europe on Nutrition, Overweight and Obesity Related Health Issues" (Commission of the European Communities, 2007)[21] and White Paper "Together for Health: A Strategic Approach for the EU 2008-2013" (Commission of the European Communities, 2007)[22].

Therefore, and taking the aforementioned guidelines into consideration, the implementation of the national strategy on food and nutrition has abide by the following principles:

1) to understand food intake as being strongly influenced by different State sectors (especially the healthcare sector and its professionals), private sector and civil society, as well as by social, economic and cultural factors;

2) to implement integrated and intersectoral actions by developing common initiatives based on the "health in all policies" principle;

3) to consider the fight against social inequalities in accessing healthy eating and health as one of the major current challenges;

4) to include human rights, namely the right to food in the implementation of this policy;

5) to understand the promotion of healthy eating as a coordinated set of measures with the aim of empowering citizens to adopt healthy eating habits and to create environments conducive to healthy eating; and

6) to design a medium and long term strategy capable of reaching consensus and possible to evaluate throughout its implementation.

PNPAS was established with the mission to improve the nutritional status of the Portuguese population, by motivating physical and economic availability of foods that make up a healthy eating pattern, and to create such conditions so that the population values, appreciates and eats such foods as a part of their daily routine [23]. This plan is based on the assumption that an adequate food intake and the consequent improvement of the citizens' nutritional status will have a direct impact in the prevention and control of the most prevalent diseases nationwide (cardiovascular diseases, cancer, diabetes, obesity) and will simultaneously allow for the growth and economic competitiveness of the country in other sectors, such as those associated with agriculture, environment, tourism, employment and professional qualification. PNPAS has five main goals:

a) to increase knowledge of food intake of the Portuguese population, its determinants and consequences;

b) to modulate the availability of some foods, namely in schools, workplaces and public spaces;

c) to inform and empower citizens, especially those in more disadvantaged groups, for the purchase, cooking and storing of healthy foods;

d) to identify and promote cross-sectional actions that promote the intake of high nutritional quality foods, articulating and integrating other sectors, namely agriculture, sports, environment, education, social security and municipalities, and

e) to improve training and action of different professionals who, due to their activity, can influence knowledge, attitudes and behaviours towards food.

In order to reach these five main goals, PNPAS proposes a set of activities in six major areas:

a) systematic gathering of indicators of nutritional status, food intake and its determinants throughout the life cycle, evaluation of food insecurity situations, and evaluation, monitoring and dissemination of good practice with the aim of promoting nationwide eating habits that are healthy or protective against diseases;

b) modulating the availability of specific foods (high in sugar, salt and fat), managing its supply and sale in schools, healthcare facilities, workplaces, and institutions that provide social support, promoting the availability of other foods, such as water, fresh fruits or vegetables and encouraging nutritional reformulation of food products, through a joint action with the food industry and the catering sector, or through other activities that may influence food availability, taking into account the latest scientific knowledge and consensus;

c) increasing food and nutrition literacy and empowering citizens from different age and socioeconomic groups – especially the most disadvantaged ones – for healthy eating choices and practices, and encouraging good practice on labelling, advertising and marketing of food products;

d) identifying and promoting cross-sectional actions with other sectors of society, namely agriculture, sports, environment, education, municipalities and social security so as to allow, amongst others, to promote the adoption of a Mediterranean eating pattern – which can encourage the intake of seasonal, national, plant foods, that use sustainable packaging and logistics –, to develop electronic tools to help planning healthy menus, that are easy to use, affordable and provide price information for individuals and families, and to develop municipal networks to monitor good practice and projects in the field of health promotion for their citizens;

e) improving training, qualification and action of different professionals that can influence quality dietary habits, namely in healthcare, schools, municipalities, tourism and restaurants, or social security; and

f) improving the intervention and articulation of different professionals and organisations dealing with the obesity phenomenon [23].

The impact of PNPAS strategies will be evaluated directly, through the modulation of knowledge and behavior of the population towards healthy eating and through the change of availability in the "food environment". The evaluation of the implemented procedures – namely regarding building partnerships with other sectors and the empowerment of professionals dealing with the field of food and nutrition – will also be an important evaluation process to be considered by PNPAS.

In recent years, the efficacy of purely educational measures has been questioned while evaluating nutrition policies. This has raised the interest in changing the "food environment", particularly through changes in legislation and taxation of specific foods or ingredients.

Despite positive outcomes, namely the reduction of salt intake in the Portuguese population and apparent stabilisation of obesity rates in some age groups, there is still a lack of evidence showing an association between such outcomes and the implemented strategies.

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Conflict of interests:

The authors report no conflict of interests.

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