

Main Causes of Death in a Moroccan Region In 2012

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Abstract

Original Research Article

According to the WHO, mortality data can be defined as the number of deaths by place, time and cause. Unfortunately, in Morocco causes of death still underestimated due to a lack of precision in death certificates. The main objective of our study was to provide data on mortality profile in Casablanca region during 2012 this is an ecologic study carried out in Casablanca during 2012. The mortality data was taken from the 2012, mortality declaration registries in different departments. To encode causes of death we used the ICD 10 coding. The statistical analysis was made using the version 3.4.3 of R software. For the bivariate analysis, we used the usual statistical tests (Chi2, Student, ANOVA) and for the multivariate one we used a multinomial regression. 5667 deaths were reported, 52.7% of them were males. The mean age of death was 69.4 ± 21.3 years for women and 69.5 ± 22.1 years for men, cause of death was not determined for 37.0% of death certificates. The first cause of death was circulatory diseases 20.8% the second was cancer 17.6% and in the third place diabetes 9.03%, Tuberculosis (all locations included) caused just 1.52% deaths. In Morocco, despite the training received by doctors in charge of filling death certificates, we still have a declaration shortage of causes of death in the region of Casablanca. We noticed that for filling death certificates, we do not comply with the WHO recommendation, by putting the concatenation of events that leads to the death and the other troubles that contribute to the fatal outcomes. We need to improve the quality of mortality data, so we can be able to conduct researches targeting the elaboration and assessment of health politics.

Keywords: Mortality, causes, ICD10, registry, region.

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INTRODUCTION

According to the WHO, mortality data can be defined as the numbers of deaths by place, time and cause. The WHO's mortality data reflect deaths, recorded by national civil registration systems of deaths, with the underlying cause of death coded by the national authority. Underlying cause of death is defined as "the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury", in accordance with the rules of the ICD[1].

The International Statistical Institute adopted the first international classification edition, known as the International List of Causes of Death (ICD), in 1893. The world health organization (WHO) was entrusted with the ICD since its creation in 1948 and published the sixth version, ICD-6, that incorporated

morbidity for the first time. The WHO Nomenclature Regulations, adopted in 1967, stipulate that Member States use the most current ICD revision for mortality and morbidity statistics. The ICD has been revised and published in series of editions to reflect advances in health and medical science over time. We count, to this present day 10 version of ICD; the Forty-third World Health Assembly endorsed the last one in May 1990. It is cited in more than 20,000 scientific articles and used by more than 100 countries around the world [2].

In 1979 the WHO published her fourth edition of the medical certification of cause of death. This book let intended to assist physicians and surgeons in writing certificates of cause of death of the pattern recommended by the WHO. In most countries, those certificates have a dual purpose. Firstly they contribute to the legal record of the death, and secondly, they are the source of mortality statistics which have an

important part to play in medical research, and are likely to become more valuable methods of diagnosis and analysis improve [3].

In 2015, of the 56.4 million deaths worldwide, only 27 million of them were registered with their causes. The report of incorrect or incomplete information about these deaths reduces the utility of data to follow the public health global trend, plan specific measures targeting the improvement of health and assess efficiency of health politics. [4]

Per WHO statistics from 2012, the top 10 killers, which are related to the lifestyle most of the time, account for 51.4% of all deaths globally. The causes, from the lowest to the highest proportion are: 10th: Hypertensive Heart Disease 1.1 million deaths (2% of all deaths) 9th: Vehicular Accidents 1.3 million deaths (2.2% of all deaths) 8th: Diabetes 1.5 million deaths (2.7% of all deaths) and 80 percent of these deaths occurred in low- and middle-income countries. 7th: Diarrhea: 1.5 million (2.7% of all deaths). 6th: HIV and AIDS 1.5 million (2.7% of all deaths). 5th: Lung, Tracheal, & Bronchial Cancers 1.6 million deaths (2.9% of all deaths). 4th: Lower Respiratory Infections 3.1 million deaths (5.5% of all deaths). 3rd: chronic obstructive pulmonary disease (COPD): 3.15 million deaths (5.6% of all deaths). Most of COPD deaths occur in low- and middle-income countries. 2nd Stroke: 6.7 million deaths (11.9% of all deaths) According to the world health federation, 6 million people die of stroke annually, and 5 million of those that do survive are left disabled to some degree. First: Ischemic Heart Disease (IHD) 7.4 million deaths (13.2% of all deaths). In the United Kingdom alone, there are 73,000 deaths from IHD annually, according to the National Health Service, while in the United States there are over 370,000 IHD deaths annually, according to the control disease center (CDC). In the Middle East and North Africa between 1990 and 2010, premature deaths from IHD increased by 44 percent, according to a World Bank report [5].

Morocco is a sovereign country located in the Maghreb region of North Africa. It has a population of over 33.8 million and an area of 446,550 km². Its capital is Rabat, and the largest city is Casablanca. During the past 50 years, Moroccan's public health knew an improvement, which resulted in the increase of the life expectancy to the birth (70.5 years against 47 years), rough reduction in the rate of mortality (5.5‰ against 19‰), reduction in infant mortality (40 deaths against 118 per 1000 births), and reduction, even eradication, of the infectious diseases included in the national programs of vaccination [6].

The national and regional mortality data came from the civil registry, considered as the main source of mortality data. The civil registry is the system by which a government records the vital events (births, marriages,

and deaths) of its citizens and residents [7]. Civil registration was institute in Morocco with the arrival of the French Protectorate system in 1912 but it included just foreign resident in Morocco. In 1950 a civil registry dedicated to Moroccan people was implemented. In 1956, the civil registry was extended to the released Moroccan land area. Since 1991, individual and identical death declarations were adopted in all the Moroccan territory. The civil responsibility of the jurisdiction of the Ministry of the Interior. The registrars are appointed within the municipal services for cities or within the civil authorities or military outside urban centers. The Court of First Instance keeps a copy of the civil status registers, allows changing information on the acts, and gives permission to save the unreported deaths. The declaration of the death is required since the Decree of December 13, 1963[8].

Unfortunately, causes of death still underestimated because of the lack of precision about it in the declarations of death emitted usually by doctors. The main objective of our study was to provide data on mortality profile in Casablanca region during 2012.

MATERIAL AND METHODS

Study type and population

This is an ecological study. It included all reported deaths during 2012 in the Greater Casablanca, which is the largest economical region representing 12% of total population whose 91.6% are urban and whose population is homogenous. There are 1.7 million men and 63% of the population are less than 35 years old (mean age 25 years). Life expectancy at birth is 67.1 years for men and 70.7 for women [9]. In 2012, the Wilaya of Greater Casablanca consisted of two prefectures (Casablanca and Mohammedia) and two provinces (Mediouna and Nouacer). Prefecture of Casablanca divided into eight prefectures [10].

Sources of data

The 2012 mortality data was drawn from the Mortality declaration registries in different administrative departments.

The national and regional mortality content is provided by the death certificates emitted by doctors for every case of death during 2012. Those certificates are issued by the municipality where the deceased died or in the town where the deceased used to live. They usually contain: [8].

- The deceased person Socio-demographic information: full name, nationality, date and place of birth, address, profession and marital status.
- Death data: immediate cause, initial cause, the trauma or intoxication's nature (if it exists) and the place of death.
- The identity of the person who confirms the death.

Data were collected by doctors in hygiene control bureau (HCB) who attended training courses to

learn about the coding of causes of death. They were responsible of the data collecting in each district. The

mortality data follows usually the circuit shown in the figure1.[8]

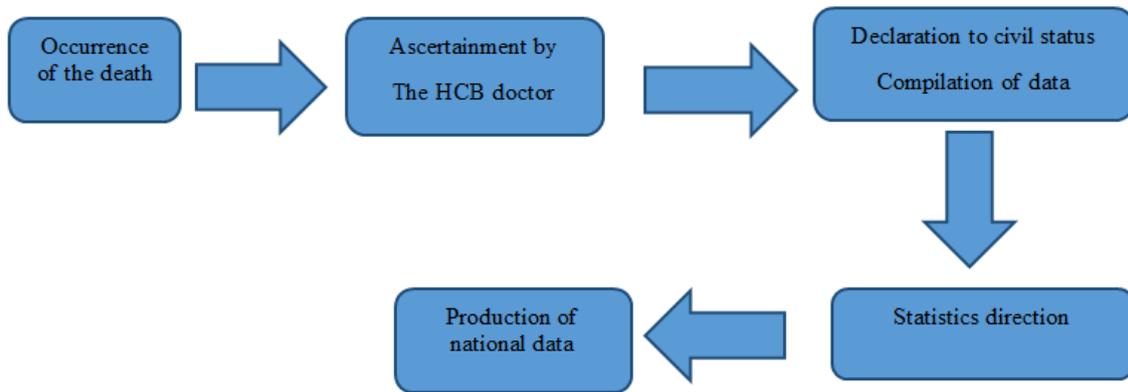


Fig-1: Circuit of mortality data in Morocco

All causes of death were coded according to the 10th version of the international code of diseases (ICD10) as shown in table 1. This code classifies diseases and gives the selection rules for the initial cause of death, used to generate tables and international

comparisons. The initial cause of death is the disease or trauma, which triggers the morbid process conducting to the death. The selection procedure tends to privilege the recording of violent deaths that should be avoided by prevention or improvement of the health system

Table-1: Classification of causes of death and their ICD10 codes in our study

| Cause of death | ICD10 CODES |
|--------------------------------------|---|
| Cancers | |
| Lungs, bronchi, trachea | C33-C34 |
| Gastric, intestinal, liver, pancreas | C15, C16, C18, C22, C25 |
| ORL | C7,C30 |
| prostate | C61 |
| Breast | C50 |
| Cervix, uterus, ovary | C58,C53,C55,C56, |
| kidney | C64 |
| bladder | C67 |
| Others | C97,C15,C20,C67,C21,C78.6,C64,C17,D09,C81,C96,C53, C51, C8, R99, C18, C20, C10, C11, C25, C22, C23, C30, C64, |
| Circulatory diseases | |
| Heart diseases | I00-19,I16-63,I65-199,Q20-Q28,R99 |
| Cerebrovascular diseases | I60-I69 |
| HTA | I10-I15 |
| Others diseases | |
| Diabetes | E10-E14 |
| Neurology diseases | G00-G99 |
| Nephrology diseases | N17-N19 |
| Perinatal diseases | O021, Z39, O95 |
| Respiratory diseases | Z55-Z65 |
| Tuberculosis | A15-A19 |
| Liver diseases | J00-99 |
| Others | B19, B18, A01, A41,A87,D09,D32,D09,F05,F99,F70,F79,G00,G99,G30, G60,I20,I25,J00,J99,J40 ,J47,J80, |

Statistical analysis

We used percentage and headcounts to describe qualitative variables, or means ± standard deviation (SD) to describe the continuous ones. We first describe the allocation of Casablanca habitants

according to age and sex. Then we compare the different main categories of causes of death in our study (tumors, circulatory diseases, respiratory diseases, diabetes, perinatal diseases, and other causes) according to sex and age. The variable age was first taken as

quantitative then as qualitative by cutting the variable into three categories [10, 15, 59], ≥ 60). The cutoff was chosen in such a way that we can compare our results with the national ones. After that, we compare each cause of death according to sex and age categories as described before.

For comparison, we used the CHI-2 test or fisher test to compare two or several percentages, and ANOVA test or simple linear regression, to compare two or several means respectively after having ensured that the validity conditions were satisfied.

Then we used a multinomial regression by taking the causes of death as a dependent variable, and the age categories and sex as independent ones. We considered that our test is significant whenever p-value is less than 0.05, all tests was two-tailed.

The statistical analysis was made at the department of epidemiology and clinical researches, in medical school of Fez, Morocco using the libraries “pretty R” and “Comparegroupes” of the version 3.4.3 of R software. All necessary authorizations for this study were obtained.

RESULTS

In 2012, 5667 deaths, all ages included, were reported in Casablanca 2986 (52.7%) of them were males. In our sample, the mean age of death was 69.5 ± 21.7 years. For women the mean age of death was 69.4 ± 21.3 years and for men 69.5 ± 22.1 years. The table 2 shows the distribution of age categories according to sex. From this total, missing information about cause of death accounted for 2097 (37.0%) of death certificates.

Table-2: The allocation of Casablanca habitants according to age categories and sex in 2012

| | [ALL] | <35 years | 35 to 59 | ≥ 60 years |
|-------|--------------|-------------|-------------|-----------------|
| | N=5667 | N=406 | N=876 | N=4385 |
| Women | 2681 (47.3%) | 179 (44.1%) | 446 (50.9%) | 2056 (46.9%) |
| Men | 2986 (52.7%) | 227 (55.9%) | 430 (49.1%) | 2329 (53.1%) |

The variables, in this table, are represented by percentages and headcounts.

Main categories of diseases

The first cause of death were circulatory diseases including cardiovascular diseases, cerebrovascular diseases and hypertension by causing 1152 (22.1%) deaths, the second were tumors by causing 986 (18.9%), in the third place came diabetes

505 (9.70%), in the fourth place respiratory diseases caused 210 (4.03%) deaths, and the fifth were perinatal diseases by causing 171 (3.29%) deaths. The figure 2 shows the distribution of leading causes of death by categories.

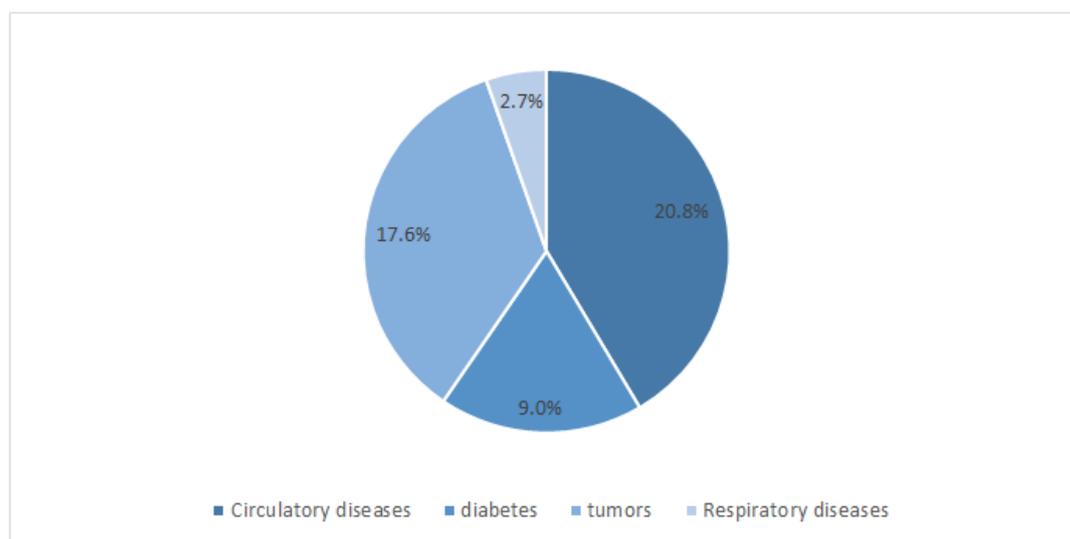


Fig-2: Distribution of the main causes of death in great Casablanca in 2012

The tables 3, 4 and 5, show a description of the main categories of causes of death according to the mean age, age categories and sex respectively.

The variables in this table are represented by means and standard deviations.

Table-3: Description of age means in years according to the main categories of causes of death

| Diseases | MEAN | SD |
|----------------------|------|------|
| Circulatory diseases | 72,4 | 21 |
| diabetes | 73,1 | 19,9 |
| tumors | 73,3 | 15,7 |
| Respiratory diseases | 68,1 | 18,1 |

Table-4: Description and comparison of age categories according to the main categories of causes of death

| | <35 years | 35 to 59 | ≥ 60 years |
|-----------------------------|------------|-------------|-------------|
| Circulatory system diseases | 68 (16.7%) | 115 (13.1%) | 998 (22.8%) |
| Tumors | 24 (5.91%) | 131 (15.0%) | 842 (19.2%) |
| diabetes | 25 (6.16%) | 51 (5.82%) | 436 (9.94%) |
| Respiratory system diseases | 6 (1.48%) | 35 (4.00%) | 111 (2.53%) |

The variables, in this table, are represented by percentages and headcounts

Table-5: Description and comparison of sex according to the main categories of causes of death

| | Women | Men |
|-----------------------------|-------------|-------------|
| | N=2486 | N=2719 |
| Circulatory system diseases | 603 (22.5%) | 578 (19.4%) |
| Tumors | 408 (15.2%) | 589 (19.7%) |
| diabetes | 281 (10.5%) | 231 (7.74%) |
| Respiratory system diseases | 46 (1.72%) | 106 (3.55%) |

The comparison between age means according to the main categories of causes of death show a significant difference ($p < 0.001$). In addition, the

comparisons between age categories and sex according to the main categories of causes of death were significant p-value was less than 0.001 for both of them.

Table-6: Description and comparison of causes of deaths according to sex

| Diseases | ALL | Women | Men | P |
|--------------------------------------|--------------|--------------|--------------|--------|
| | N=5667 | N=2681 | N=2986 | <0,001 |
| Cancer | | | | |
| Lungs, bronchi, trachea | 216 (3.81%) | 41 (1.53%) | 175 (5.86%) | |
| Gastric, intestinal, liver, pancreas | 177 (3.12%) | 78 (2.91%) | 99 (3.32%) | |
| ORL | 31 (0.55%) | 8 (0.30%) | 23 (0.77%) | |
| prostate | 74 (1.31%) | 0 (0.00%) | 74 (2.48%) | |
| Breast | 104 (1.84%) | 97 (3.62%) | 7 (0.23%) | |
| Cervix, uterus, ovary | 52 (0.92%) | 51 (1.90%) | 1 (0.03%) | |
| kidney | 5 (0.09%) | 1 (0.04%) | 4 (0.13%) | |
| bladder | 25 (0.44%) | 3 (0.11%) | 22 (0.74%) | |
| Others | 313 (5.52%) | 129 (4.81%) | 184 (6.16%) | |
| Circulatory diseases | | | | |
| Heart diseases | 683 (12.1%) | 356 (13.3%) | 327 (11.0%) | |
| Cerebrovascular diseases | 283 (4.99%) | 137 (5.11%) | 146 (4.89%) | |
| HTA | 215 (3.79%) | 110 (4.10%) | 105 (3.52%) | |
| Others diseases | | | | |
| Neurology diseases | 38 (0.67%) | 20 (0.75%) | 18 (0.60%) | |
| Nephrology diseases | 153 (2.70%) | 66 (2.46%) | 87 (2.91%) | |
| Perinatal diseases | 132 (2.33%) | 51 (1.90%) | 81 (2.71%) | |
| Respiratory diseases | 152 (2.68%) | 46 (1.72%) | 106 (3.55%) | |
| Tuberculosis | 86 (1.52%) | 13 (0.48%) | 73 (2.44%) | |
| Liver diseases | 114 (2.01%) | 41 (1.53%) | 73 (2.44%) | |
| Others | 205 (3.62%) | 84 (3.13%) | 121 (4.05%) | |
| Undetermined ^a | 2097 (37.0%) | 1068 (39.8%) | 1029 (34.5%) | |

The variables, in this table, are represented by percentages and headcounts. P: p-value. ^a: the category undetermined includes : cardiorespiratory arrest and senescence and unspecified cause.

Causes of death according to each disease

The analysis of causes of death shows that cancer was responsible of 986 deaths (18.9%) and the respiratory location was the most frequent (3.52%). Senescence was responsible of 740 (14.2%). Cardiovascular diseases caused 617 (11.9%), diabetes

causes death of 505 (9.70%), cerebrovascular diseases causes death of 414 (7.95%), and respiratory disease for 124 deaths (2.38%), excluding the pulmonary tuberculosis. Tuberculosis (all locations included) caused 86 (1.65%) deaths.

Table-7: results of multinomial regression testing the cause of death according to Age categories adjusted on sex

| Diseases | <35 years N=406 | 35 to 59 N=876 | ≥ 60 years N=4385 | P1 | P2 | P3 | P4 |
|--------------------------------------|--------------------|-------------------|----------------------|-------|------|-------|------|
| Cancer | | | | | | | |
| Lungs, bronchi, trachea | 11 (2.71%) | 25 (2.85%) | 180 (4.10%) | - | - | - | - |
| Gastric, intestinal, liver, pancreas | 3 (0.74%) | 29 (3.31%) | 145 (3.31%) | - | - | - | - |
| ORL | 0 (0.00%) | 7 (0.80%) | 24 (0.55%) | - | - | - | - |
| prostate | 0 (0.00%) | 8 (0.91%) | 66 (1.51%) | - | - | - | - |
| Breast | 0 (0.00%) | 17 (1.94%) | 87 (1.98%) | - | - | - | - |
| Cervix, uterus, ovary | 1 (0.25%) | 4 (0.46%) | 47 (1.07%) | - | - | - | - |
| kidney | 1 (0.25%) | 1 (0.11%) | 3 (0.07%) | - | - | - | - |
| bladder | 1 (0.25%) | 5 (0.57%) | 19 (0.43%) | - | - | - | - |
| Others | 7 (1.72%) | 35 (4.00%) | 271 (6.18%) | - | - | - | - |
| Circulatory diseases | | | | | | | |
| Heart diseases | 27 (6.65%) | 54 (6.16%) | 602 (13.7%) | - | - | - | - |
| Cerebrovascular diseases | 28 (6.90%) | 37 (4.22%) | 218 (4.97%) | 0,005 | 0,04 | 0,004 | 0,04 |
| HTA | 13 (3.20%) | 24 (2.74%) | 178 (4.06%) | - | - | - | - |
| Others diseases | | | | | | | |
| Neurology diseases | 1 (0.25%) | 8 (0.91%) | 29 (0.66%) | - | - | - | - |
| Nephrology diseases | 5 (1.23%) | 20 (2.28%) | 128 (2.92%) | - | - | - | - |
| Perinatal diseases | 132 (32.5%) | 0 (0.00%) | 0 (0.00%) | - | - | - | - |
| Respiratory diseases | 6 (1.48%) | 35 (4.00%) | 111 (2.53%) | - | - | - | - |
| Tuberculosis | 1 (0.25%) | 13 (1.48%) | 72 (1.64%) | - | - | - | - |
| Liver diseases | 6 (1.48%) | 26 (2.97%) | 82 (1.87%) | - | - | - | - |
| Others | 9 (2.22%) | 41 (4.68%) | 155 (3.53%) | - | - | - | - |
| Undetermined | 129 (31.8%) | 436 (49.8%) | 1532 (34.9%) | - | - | - | - |

The variables, in this table, are represented by percentages and headcounts. P1: crud p-value for the category “35 to 59 years”, P2: p-value of the category “35 to 59 years” adjusted on sex, P3: crud p-value of the category “≥60 years”. P4: p-value of the category “≥60 years” adjusted on sex.

- The category of age “<35 years”, was taken as reference class, for the variable age and for the variable sex the category “women” was taken as the reference.
- The category undetermined includes: cardiorespiratory arrest, senescence and unspecified cause.

DISCUSSION

As reported in the results above, from the 5205 deaths registered in 2012. The first cause of death were circulatory diseases (22.1%) deaths, the second were tumors (18.9%), the third was diabetes (9.70%), the fourth were respiratory diseases (4.03%) deaths, and the fifth were perinatal diseases (3.29%). The mean age

of death 70.1±21.1 years for women and 68.2±21.5 years for men.

According to the Moroccan ministry of health’s statistics, in 2012, crud mortality rate was 5,1‰. The principal causes of death were circulatory system diseases represents 28,4% of death’s causes (17,2% of them were due to cardiac diseases), then tumors (10,5%), then endocrine, nutritional and metabolic diseases (9,2%), and finally perinatal diseases (8,2%)[11].

We tried to generalize the mortality data of the region of Casablanca to the Moroccan population. Comparing the data published by the high commissioner for the plan, showed that the age structure of Moroccan and Casablanca’s habitants is the same, as shown in table 8.

Table-8: The allocation of Morocco and Casablanca habitants according to age and sex in 2014 [12]

| | Casablanca 2014 | | | Morocco2014 | | |
|-------------------|-----------------|--------|-------|-------------|-------|-------|
| | male | Female | Total | Men | Women | Total |
| < 15years | 27,4% | 26,1% | 26,8% | 28,9% | 27,5% | 28,2% |
| 15 to 59 years | 63,3% | 63,8% | 63,6% | 61,8% | 63,0% | 62,4% |
| 60 years and more | 9,2% | 10% | 9,6% | 9,3% | 9,5% | 9,4% |

To compare the results of our study to the national data, we supposed that the deaths from a known origin, and those, which are not, have the same profile. As we can see in table 9, the proportions of the top five of main categories of causes of death in Casablanca during 2012 are close to those of Moroccan population during the same period.

National death profile found at the end of this extrapolation consists with the health ministry (HM) published data concerning the causes of death. According to the HM statistics, the pathologies concerned by their estimation, namely cancers, cardiovascular and respiratory diseases are responsible of 39,9% of the global mortality in Morocco as shown in table 9[8].

Table-9: Main causes of death in Morocco during 2012

| Cause | Casablanca | Morocco |
|-----------------------------|------------|---------|
| circulatory system diseases | 22.1% | 23,4% |
| Tumors | 18.9% | 10,7% |
| Perinatal diseases | 3.29% | 8,7% |
| Respiratory system diseases | 4.03% | 5,8% |
| Diabetes | 9.70% | 4,7% |

Source: health in numbers edition of 2013; Source: health ministry.

The table 10 shows the most frequent causes of death found in our study in the region of Casablanca in

2012 and those diseases during the same period in Morocco according to sex.

Table-10: The national allocation of deaths according to causes and sex in 2012

| Diseases | Casablanca | | | Morocco | | |
|--------------------------|------------|-------|-------|---------|-------|-------|
| | Women | Men | Total | Women | Men | Total |
| Cancers | 19.5% | 18.4% | 18.9% | 11% | 10,4% | 10,7% |
| Respiratory cancers | 3.50% | 3.53% | 3.52% | 0,6% | 2,4% | 1,7% |
| Digestive cancers | 2.57% | 2.46% | 2.52% | 2,5% | 2,6% | 2,5% |
| Heart diseases | 11.4% | 12.2% | 11.9% | 15,4% | 16,4% | 16% |
| Hypertension | 2.25% | 2.39% | 2.32% | 2,7% | 1,5% | 2% |
| Cerebrovascular diseases | 7.80% | 8.09% | 7.95% | 2,5% | 2,3% | 2,4% |
| Diabetes | 10.3% | 9.19% | 9.70% | 5,5% | 4,1% | 4,7% |
| Respiratory diseases | 2.17% | 2.57% | 2.38% | 4,9% | 6,4% | 5,8% |
| tuberculoses | 1.81% | 1.51% | 1.65% | 0,8% | 1,3% | 1,1% |
| Digestive diseases | 0.40% | 0.48% | 0.44% | 2,4% | 2,6% | 2,5% |
| Liver diseases | 2.70% | 2.61% | 2.65% | 0,6% | 0,6% | 0,6% |
| Renal diseases | 1.89% | 2.32% | 2.11% | 2,5% | 2,3% | 2,3% |
| Perinatal | 2.70% | 3.82% | 3.29% | 8,3% | 8,7% | 8,5% |

Source: health in numbers edition of 2013; Source: health ministry.

To compare our data with the other Arab world countries we took the results of Mekdad *et al.* study, which includes all Arab countries of North Africa and western Asia, they studied disability adjusted life years (DALYs). They found that ischemic heart disease was the leading cause of death in Arab world in 2010 (14.3% of deaths). They ranged causes of death according to income level of each country. In high-income countries (HICs) (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates), the first cause of death was road injuries (8.4% [6.7%-9.7%] of death). In the middle-income countries (MICs) (Algeria, Egypt, Iraq, Jordan, Lebanon, Libya,

Morocco, occupied Palestinian territory, Sudan, Syria, and Tunisia), the first cause was ischemic heart disease (6.0% [5.4% -6.5%] of death). In the lower-income countries (LICs) (Comoros, Djibouti, Mauritania, Yemen, and Somalia), the first cause was lower respiratory infections (12.2% [7.4%-15.8%] of death) [13].

The same study reported that in the middle-income countries like Morocco, ischemic heart disease was the leading cause of DALYs in MICs in 2010 for male individuals, whereas major depressive disorder was the highest for female individuals. Cardiovascular

and other circulatory diseases were the most common causes of death in people aged 40 years or older in MICs in 2010, in agreement with the results of our results. Major depressive disorders rose from 1990 to 2010. Diet and raised blood pressure were the highest risk factors for DALYs in MICs. Major depressive disorder ranked second in Algeria, Libya, Syria, and the occupied Palestinian territory, third in Lebanon and Tunisia, and fourth in Morocco for causes of DALYs in 2010. Iron-deficiency anemia remained the tenth cause of DALYs for MICs in 2010. It ranked sixth in Syria, seventh in Sudan, and eighth in Lebanon. Tuberculosis was not a major cause of DALYs in most MICs with the exception of Morocco where it ranked tenth, Sudan 16th, and Algeria 22nd. Patterns of causes of death in Sudan, a lower class MIC, were more similar to the patterns in LICs, with lower respiratory infections, diarrheal diseases, and HIV/AIDs ranking first, second, and third, respectively, in 2010 [13].

The principal limitation of our study was the missing data, regarding the cause of death. Thus, in 20.2% of deaths the reported cause of death was cardiorespiratory arrest (CRA) without any precision of the original cause that leads to it. For 16.9% of deaths the reported cause of death was senescence, but when we take a closer look to the age data we can see that there is an inconsistency (death caused by senescence in young or middle age). In Morocco, despite the training received by doctors in charge of filling death certificates, we still have a declaration shortage of causes of death in the region of great Casablanca, estimated at 18, 9%. In addition, doctors do not confirm a big part of deaths that is why their causes remain unknown [8].

The lack of interest of some local registers has been pointed out as one of the main constraints to the development of the system, as they still do not perceive the importance of a good civil registration and vital statistics system. On top of that, there are significant limitations in the number and skills of civil registration personnel and in office resources. Proper training for the local registers and proper control of their work are needed, especially about the transcription and transmission of the statistical reports, which translates into low coverage rates of births and deaths and problems in data quality. Finally, there is still a sector of the population, for whom civil registration has no meaning in their lives and thus it is a contributor to the present under-registration of births and deaths [14].

Among the 21 countries of the western Mediterranean region, the mortality data was considered as complete in three countries; and inexistent in six ones. In Morocco the registers covers less than 50% in 1998 [8].

A recently published article, written by Adair and Lopez, presents a novel empirical method to

estimate completeness of death registration at the national and subnational level. The method demonstrates sufficient flexibility to predict a wide range of completeness levels at a given registered crude death rate. The method can be applied using data readily available at the subnational level, and can be used to assess completeness of deaths reported from health facilities, censuses and surveys. Its utility is diminished where the adult mortality rate is unusually high for a given under-five mortality rate. The method overcomes the considerable limitations of existing methods and has considerable potential for widespread application by national and subnational governments [15].

We also noticed that for filling death certificates, we do not comply with the WHO recommendations. As the WHO recommends: The death certificate must contain two parts: The first one is applied to concatenation of events that led to death, run counter to the direct cause of death, The second one concerns the other troubles that contribute to the fatal outcome. The consultation of the ICD10 is the best way to appreciate the precision of the pathology process data, which can be used to statistical analyses. Overall, it is right to write down the diagnosis as precisely as possible, according to the information we have (records of histology, autopsy reports) it is also important to mention if some information is missing [16].

CONCLUSION

Morocco has few reliable data about mortality causes; which prevent the production of researches used to bolstered elaboration and assessment of health politics. The need to improve the quality of this data is essential and can be accomplished by:

- The reinforcement of the existent declaration system.
- The establishment of training modules on coding the mortality causes, in favor of staff in charge of declaration, and awareness about the importance of having quality data.
- Implantation of homogenization procedure for the declaration and coding.
- The normalization of the mortality data circuit wherever the death occurs.
- The establishment of an information system for the declaration of death causes.

Competing interests

The authors declare that they have no competing interests.

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