

Disease outbreaks in Portugal in the first half of the twentieth century: historical and epidemiological approach. III - Influenza

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Abstract

After carrying out a statistical study of the various epidemics in the first half of the twentieth century in Portugal (bubonic plague, epidemic typhus, smallpox and influenza), the author analyzes in this paper the epidemiologic problem of pneumonic influenza.

The following epidemiometric endpoints are assessed: the epi-

demics evolution over the years, distribution of deaths by gender, age groups, months of the year and relevant districts and regions.

Key words: outbreaks, epidemics, Portugal, twentieth century, influenza.

INTRODUCTION

Of the four infectious diseases that took the form of epidemic outbreaks in Portugal in the first half of the twentieth century – epidemic typhoid,¹ plague,² smallpox³ and influenza – in general, only the latter is referred to in the published medical works and demographics, a fact that is due, notoriously, to the high global mortality caused by this disease. The big question that is asked, in hindsight, regarding the influenza outbreak of 1918, is the total number of deaths that occurred at that time - since this number was clearly not restricted to officially reported cases - and this is one of the aspects that we wish to determine here, based on plausible clinical and epidemiological evidence.

MATERIAL AND METHODS

For the study of epidemics occurring in Portugal in the first half of the twentieth century, we use the official published statistics.⁴⁻¹³

Naturally, these statistics – compiled through turbulent periods in our history, with various changes in the bodies and ministries responsible for gathering them, - present some gaps, shortfalls and discon-

tinuities, which we shall point out in due course. Furthermore, the information collected at that time shows various problems in terms of quality. Let us take, as an example, the decade 1915 to 1924: of the 1,353,488 deaths recorded in the official publications and statistics, 542,727 cases, i.e. 40.1%, were placed in the category of “Unknown or undefined diseases”, hindering a deeper analysis of the mortality rate. Likewise, the different statistical parameters that we investigate are restricted, obviously, to the officially available figures, although others would also be of interest to us, such as morbidity; however, the official statistics only include actual deaths, hindering our calculation of the mortality rates.

To better evaluate the parameters investigated, we complement our analysis, where indicated, with the χ^2 test or calculation of 95% limits of confidence (LC)¹⁴

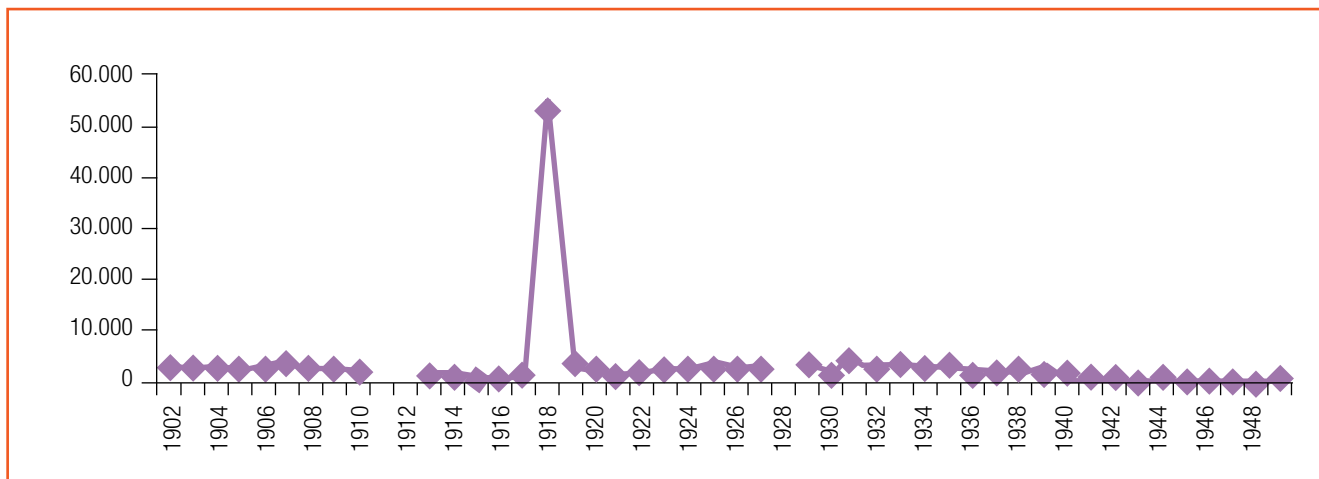
RESULTS

Given that the mortality by influenza in the Ilhas Adjacentes has not been precisely quantified (in the Azores a small epidemic outbreak occurred in 1918, with 1691 deaths; in Madeira, only 114 deaths were recorded in 1918, and 493 in 1919), we concern ourselves here only with Continental Portugal, just as we did for exanthematic typhoid and smallpox.

Mortality by year. Fig. 1 clearly shows epidemic influenza outbreak of 1918, with 53,975 deaths reported in that year. If we restrict our analysis to the decade in which this outbreak occurred, 1915-1924, we see that 81.0% (LC: 81.0-81.3) of the deaths by influenza occurred in 1918 (*Table I*).

Mortality by gender. Of the 53,975 deaths by influenza recorded in 1918, 25,168 were males (46.6% -

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Deaths by Influenza recorded in Portugal in 1902-1949.

FIG. 1

LC: 46.2-47.1) and 28,807 were females (53.4% – LC: 53.0-54.0) – Table I.

Mortality by age. As shown in Table II and Fig. 2, higher mortality was seen in children and young adults up to 30-39 years of age.

Mortality by month. In 1918, 90.0% of deaths (48,565) occurred in October and November, but especially in October (Table III).

Mortality by district. In relation to the total number of deaths, Lisbon was the district with the highest mortality; 19.6% (LC: 19.3-19.9), and Portalegre was the district with the least deaths; 1.7% (LC: 1.6-1.8) – Table IV.

Mortality by greater region. In the overall calculation by greater region, the distribution of the 53,975 deaths occurring in 1918, in decreasing order, was as follows: Central Region: 20,866 deaths (38.7% – LC: 38.3-39.1); Lisbon and Vale do Tejo Region: 14,139 (26.2% – LC: 26.0-27.0); North Region: 11,399 (21.1% – LC: 21.0-21.5); South Region: 7,571 (14.0% – LC: 13.7-14.3).

DISCUSSION

It has been questioned whether various epidemics of Antiquity (such as the one described in 412 B.C. by Hippocrates), and those of Medieval times, may have actually been influenza, although there is no conclusive evidence of this. According to

the *Dicionário Etimológico da Língua Portuguesa*, the term influenza is a “(...) term that was disseminated throughout the Western languages by English, which received it from the Italian influenza, correctly ‘influenza’ hence ‘running of fluid’, and especially, “epidemic”; the term spread soon after the epidemic of 1743, which appeared in Italy. (...)”¹⁵ However, what is widely accepted is that the term influenza designates, in

TABLE I

Óbitos por gripe registados em Portugal Continental na década de 1915-1924, por anos e sexos

Year	Gender		Total		
	Male	Female	n	%	LC
1915	304	344	648	1,0	1,0-1,1
1916	320	344	664	1,0	1,0-1,1
1917	532	528	1.060	1,6	1,5-1,7
1918	25.168	28.807	53.975	81,0	81,0-81,3
1919	1.336	1.142	2.478	3,7	3,6-3,9
1920	953	912	1.865	2,8	2,7-2,9
1921	497	506	1.003	1,5	1,4-1,6
1922	839	817	1.656	2,5	2,4-2,6
1923	913	876	1.789	2,7	2,6-2,8
1924	755	703	1.458	2,2	2,1-2,3
Total	31.617	34.979	66.596	100,0	—

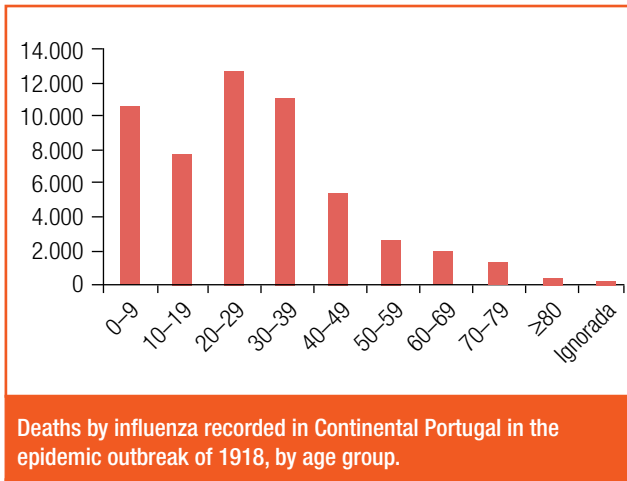


FIG. 2

popular language, the belief that that outbreak of influenza was caused by influenza of the stars, or more concretely, of the cold (influenza di freddo). What is certain is that besides its seasonal epidemicity, and the various epidemic outbreaks supposedly attributed to the Influenza in Europe (around three dozen major outbreaks in the last five centuries),¹⁶ it is the great epidemic of 1918-1919 – commonly designated the “Spanish influenza”, that figures most in our collective imagination, with its estimated 20 to 100 million deaths, more than double those caused by the World War of 1914-1918. Even here in Portugal, various renowned personalities succumbed to the disease, notably, the artist Amadeu de Souza-Cardoso.

Outside our period of analysis, in 1957 an epidemic outbreak – “Asian influenza” – occurred, and again in 1968 – the “Hong Kong” influenza – but these lacked the ferociousness of the influenza of 1918. And now (we write one the eve of 2010), we debate the so-called “Mexican influenza” or “type A influenza”.

The results of our analysis of the statistical data for the influenza of 1918 can be summarized as follows:

Mortality by sex: we did not find any statistically significant differences ($p > 0.05$).

Mortality by age: the number of deaths by influenza showed a decreasing trend with age after 40 years, which is presumably related to the higher vulnerability of children to infections by virus, and the possible existence of older age groups with immunological defences acquired in previous contacts with the influenza virus.

Mortality by month: also in our analysis, the expected

TABLE II

Deaths by influenza recorded in Continental Portugal in the epidemic outbreak of 1918, by age group

Age groups years	Deaths		
	n	%	LC*
0-9	10.638	19,7	19,4-20,1
10-19	7.891	14,6	14,3-14,9
20-29	12.852	23,8	23,5-24,2
30-39	10.853	20,1	19,8-20,5
40-49	5.117	9,5	9,2-9,7
50-59	2.672	5,0	4,8-5,1
60-69	2.007	3,7	3,6-3,9
70-79	1.316	2,4	2,3-2,6
≥80	395	0,7	0,7-0,8
Not known	234	0,4	0,4-0,5
Total	53.975	100,0	—

*LC: 95% limits of confidence.

TABLE III

Deaths by influenza recorded in Continental Portugal in the epidemic outbreak of 1918, by month

Months	Deaths		
	n	%	LC*
January	132	0,2	0,2-0,3
February	86	0,2	0,1-0,2
March	103	0,2	0,2-0,2
April	65	0,1	0,1-0,2
May	66	0,1	0,1-0,2
June	137	0,3	0,2-0,3
July	372	0,7	0,6-0,8
August	370	0,7	0,6-0,8
September	2.250	4,2	4,0-4,3
October	31.471	58,3	57,9-58,7
November	17.094	31,7	31,3-32,1
December	1.829	3,4	3,2-3,5
Total	53.975	100,0	—

*LC: 95% limits of confidence.

and habitual higher prevalence during the colder months is seen (Table III).

Mortality by district: Lisbon, with 10,575 deaths (19.6% - LC: 19.3-19.9), was the district of the country had the highest number of deaths by influenza.

Mortality by greater region: analyzing the excess mortality following the incidence per 100,000 inhabitants, we find, in decreasing order of importance: 1,117.2 deaths/100,000 inhabitants in the Lisbon and Vale do Tejo Region; 1,111.8 in the Center Region; 983.8 in the South Region; 666.5 in the North Region. For the country as a whole, the incidence was 960.1 deaths/100,000 inhabitants (resident population reported in the 1920 census). The reason why the North was spared more is speculative. It is known that the epidemic entered the Alentejo from Spain: thus “(...) its benignity led to the view being supported that far from being influenza, it was sandfly fever, which Prof. Ricardo Jorge showed to be inaccurate. (...)”¹⁷ This first phase of “benignity” would perhaps explain the relatively lower incidence seen in the South Region, compared with the Lisbon/Vale do Tejo and Center Region. “(...) The second phase of the epidemic (...) was very severe, in the form of influenza (...)”,¹⁷ spreading to various regions adjacent to the Alentejo. Could the influenza have then lost its virulence, as it progressed northwards (to the region most spared in terms of incidence)? Could the populations of the nation’s northern populations have had protective antibodies, created by other, previous epidemics? – these are speculations to which, now almost a century later, we will certainly never have conclusive answers.

Overall mortality in the country: there are few works analyzing the influenza epidemic of 1918 in our country,¹⁸ but recently, a book was published entitled “A Gripe Pneumónica em Portugal Continental – 1918”, by João Frada.¹⁹ This is a work that will certainly become a compulsory work of reference, whether for its excellent classification of the epidemic, or for its detailed analysis of the statistical data available. However, I must alert the reader of the fact that the author’s statistical data do not coincide with the data we present here (a fact that would not be serious in itself); however, they do not coincide with the official statistics either (a fact that cannot be ignored). The author bases his figures on a personal premise, which he takes as proven fact, throughout the rest of the book: “(...) We take the sum total of deaths attributed to each of the figures [“gripe” and “pneumonia” (“influenza”

TABLE IV

Deaths by influenza recorded in Continental Portugal in the epidemic outbreak of 1918, by district

Districts	Deaths		
	n	%	LC
Aveiro	3.410	6,3	6,1-6,5
Beja	1.648	3,1	2,9-3,2
Braga	1.337	2,5	2,3-2,6
Bragança	1.578	2,9	2,8-3,1
Castelo Branco	4.515	8,4	8,1-8,6
Coimbra	3.523	6,5	6,3-6,7
Évora	1.901	3,5	3,4-3,7
Faro	3.128	5,8	5,6-6,0
Guarda	3.167	5,9	5,7-6,1
Leiria	2.885	5,3	5,2-5,5
Lisboa	10.575	19,6	19,3-19,9
Portalegre	894	1,7	1,6-1,8
Porto	4.835	9,0	8,7-9,2
Santarém	3.564	6,6	6,4-6,8
Viana do Castelo	1.285	2,4	2,2-2,5
Vila Real	2.364	4,4	4,2-4,6
Viseu	3.366	6,2	6,0-6,4
Total	53.975	100,0	—

and “pneumonia”]) as the definitive and overall figure of deaths by influenza. (...)” – our emphasis. Thus, the on the back cover of the book itself, it states that: “(...) According to our calculations, based on the data of the Physiological Movement of the Portuguese Population of 1918, influenza, in Continental Portugal alone, was responsible for 60,474 deaths. (...)”¹⁹ According to “our own calculations” the author understands a sum total of 53,975 deaths by “gripe” and + 6,499 deaths by “pneumonia”, making a total of “60,474 deaths”. By opting for similar criteria, that author creates an “accounting” problem that is impossible to overcome, namely: Whether, in parallel, we wish to analyze the parameter “pneumonias”, or we will find this item empty (because the deaths by pneumonia were then transferred by the abovementioned author to “flu”) or whether to use these same statistical data again – but then we will be duplicating them. And let’s face it, at the time of the epidemic, physicians and health

officers of that time would have been in a much better position than João Frada, or any one of us, to decide whether a given death should be classified as “flu” or “pneumonia”.

Therefore, personally, we defend that the *official* data should not be the object of statistical ‘engineering’, as this could give rise to discrepancies between the various investigation works, making comparison impossible. There is no doubt that the official statistics contain gaps and obvious limitations, but they should be analyzed in the way they are published, with only the authors having the legitimate right, in the “Discussion” section, to make the necessary subsequent adjustments or construct a corrective index, duly underpinned.

But we shall judge, then, the importance of influenza in the general calculation of deaths in Portugal: in the ten-year period 1915-1924 there were 1,353,488 deaths by all causes and 37,164 by pneumonia, which gives an overall percentage of 2.7% of deaths by this pathology. For the decade in question, there are five years (1915, 1916, 1917, 1921 and 1922) in which the percentage of deaths by pneumonia was higher than the average for the decade as a whole. As for 1918, the year of interest for our purposes, it had an index equal to that of the decade as a whole (2.7%), which means that as a percentage, no more deaths by pneumonia were recorded in this year of the influenza epidemic. In fact, João Frada made carried out just one transversal evaluation of the occurrence of pneumonias (1918), methodologically imposing a longitudinal evaluation of at least one decade.

We see, realistically, how the facts occurred at that time: faced with a population with extremely low resources and a very poor public healthcare service, patients of the working classes were rarely seen in the home, and of those that were, cases diagnosed as “flu” were advised to stay at home, with only cases believed to be “pneumonias” being referred to hospital (despite the lack of diagnostic means at that time, the fact is that physicians used a rich semiology which enabled them to make very reliable diagnoses). For those who went to the hospitals (already overburdened), the criteria was also the same: cases diagnosed as “pneumonias” were hospitalized, while those considered to be “flu” were sent home. Thus, deaths certified as caused by pneumonia, in 1918 as in the other years, were those who had benefited from medical care, i.e. those whose *exitus* occurred in hospital institu-

tions, for which reason the deaths were accurately reported. As for the others, given that health officers were “(...) *poorly paid civil servants* (...)”¹⁷ they had not provided clinical care for the patients who died in the home, but limited themselves, consistently, to doing the bare minimum: these deaths were declared as being of “unknown cause”.

Obviously we accept, like João Frada and other authors, that the number of deaths by influenza in 1918, was higher than the 53,975 cases recorded in the official statistics. However, by examining the various causes of death notified, it is possible to determine where the individuals that ended up dying without medical care were allocated. Let us take the item deaths by “*Unknown or undefined diseases*” and analyze the deaths in the ten-year period 1915-1924: 1915: 49,371 deaths; 1916: 51,679; 1917: 53,631; 1918: 94,070; 1919: 61,587; 1920: 52,797; 1921: 46,600; 1922: 43,363; 1923: 47,965; 1924: 41,664. With these values, we constructed Fig. 3, which makes it impossible to ignore the 94,070 deaths of 1918 due to “unknown or undefined diseases”. Now, the mean number of deaths under this item is calculated, eliminating, obviously, the anomalous year of 1918: for the remaining nine years, we obtained a mean value of 49,851 deaths/year, a figure that may have been approximate to the number of deaths expected for 1918 due to diseases of unknown cause. Finally, by a simple arithmetic process of subtraction ($94,070 - 49,851 = 44,219$), we see that in 1918 a very high excess number of deaths was recorded: 44,219 deaths, besides those what would be statistically expected under “Unknown or poorly defined diseases”. Thus, we ask ourselves, in *epidemiological* terms: what disease(s) could have justified, in 1918, a growth of 44,219 deaths by unknown cause(s)? Undeniably, only pathologies of the infectious type could have contributed to this situation of epidemic proportions. So, did infectious pathologies occur then in epidemic form? As we showed in other works, we would need to consider: smallpox, the typhoid epidemic, and influenza.^{1,3}

a) In relation to smallpox, the signs provoked by the disease may be considered pathognomonic (vesicles and pustules of centrifugal distribution), and any doctor at the beginning of the last century would have known perfectly well how to recognize them. Thus, the cases reported as smallpox should correspond to the epidemiological reality of the time,

and there would be no need to go looking for them under “diseases of unknown cause”.

b) As for the typhoid epidemic, we admit that some patients who died by this zoonosis may have been included in the notifications of unknown cause. However, with an excess of 44,219 deaths in relation to the expected values, we need to think not only of an *infectious* disease, but also of a *contagious* disease – which is not the case with typhoid. We understand, then, that the possible contribution of typhus to this excess would have been very small, occurring mainly in the North region of the country (92.7% of deaths in 1918),¹ while the virulence of the influenza was felt in the Center and Lisbon/Vale do Tejo regions.

c) Thus, the possibility remains that the vast majority of excess deaths of 1918 included in “unknown or undefined diseases” were motivated by influenza, an extremely *contagious* disease in short periods of time, so much so that this was what was also seen in other countries of Europe, for example in Spain, where “(...) *in the pandemic [influenza] of 1918, more than 250,000 people died in a single year (...)*.”²⁰

We wish to make it clear that it is not our intention to criticize the author of “*A Gripe Pneumónica em Portugal Continental – 1918*”. We simply seek to present our epidemiological and clinical reasoning, in order to arrive at a number of deaths by influenza, in 1918, but in keeping with the reality derived from the official statistics: not with the 60,474 deaths claimed by João Frada, but rather, a much higher number, 98,194 deaths, arising from 53,975 deaths reported as influenza, plus a further 44,219 *exitus* that were relegated to “unknown or undefined diseases”. In other words: of the supposed 98,194 patients whom we calculate plausibly died of the influenza, 45% did not receive any kind of healthcare – due to deficiencies in the national medical services – and on their deaths, were correctly certified as having occurred due to an unknown cause.

Obviously, the 53,975 officially recorded deaths are not agreed upon by other authors. For example, for Silva Correia “(...) *the number of deaths [by influenza] must have been close to 150 thousand, the highest in all our epidemiological history. (...)*”¹⁷ However, we have not based the assumption of this amount, therefore the 98,194 deaths calculated by us (*grosso modo*, 100,000 deaths), which are somewhere between the 60,474 of João Frada and the 150,000 of Silva Correia – *in medio virtus* –, seem to us much more consistent

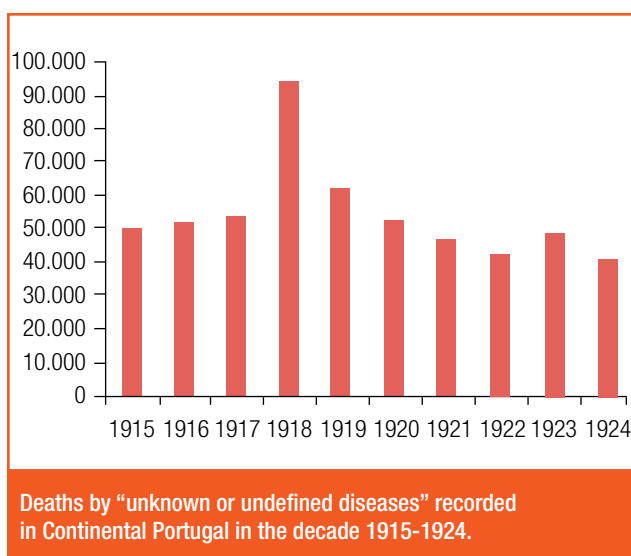


FIG. 3

with the epidemiological reality of the time, and with the possible inference based on the official data available. Or in other words: for us to calculate the most realistic number of deaths by influenza, in 1918, we must multiply the officially reported numbers by a corrective index of 1,819.

CONCLUSIONS

We do not know of any study on the overall figures for epidemics occurring in Portugal in the first half of the 20th century. Thus, as the final conclusion of our works regarding this time lapse,¹⁻³ we highlight:

a) Specificity of the occurrence and persistence of the bubonic plague in the Azores:² particularly via extremely different conditions of combating its rat colonies, the Azorean Archipelago was the last region of Europe to manage to eradicate this pestilence.

b) Co-morbidity influenza/typhoid/smallpox: The most important aspect that we make clear with our studies was that, after all, in 1918-1919 Continental Portugal was afflicted by not just one epidemic, but three, all at the same time (a fact that generally passes unnoticed among academics): influenza – a situation that is well-known – typhoid epidemic, and smallpox. But clearly, it was the influenza that had the highest death toll among the Portuguese population, with far more recorded fatal cases than the other two nosological entities put together.

Clearly, this would have occurred by a set of propitious conditions (social, economic, sanitary,

nutritional, political, etc) which, in a certain way, interacted between them and gave rise to the epidemic. The crisis that affected the country at the end of the 19th century and beginning of the 20th century had both internal and external causes, the latter culminating in the World War of 1914-1918. At an internal level, "(...) diving into an economic crisis, the roots of which touched the start of the century, Portugal presented in 1918 a very high human cost, whose index (292.7) practically tripled in relation to 1914 (100). (...)”¹⁹ Consequently, hunger became widespread, and the country "(...) experienced an authentic and acute "question of bread" which ruffled the feathers of nearly all the economists of the time (...) and motivated a considerable number of political and social crises. (...)”²¹ In the origin of this dire food shortage, several years passed of more collections, the rural exodus, employment, emigration and the fact that "(...) the War disorganized all the mercantile navigation and reduced the wheat imports (...)", whereby "(...) the cities came to know the spectre of hunger. (...) The social turbulence of 1916-18 was prompted by hunger. (...)”²¹ We only need to look at what happened *verbi gratia* with the indispensable wheat imports (approximate values): 169,000 tones were imported in 1913; 141,000 t in 1914; 124,000 t in 1915; 182,000 t in 1916; 62,400 t in 1917; 43,200 t in 1918²¹ (only ¼ of the imports of 1913). Likewise, Portugal's efforts to participate in the international war effort further exacerbated the already precarious national situation. And all this added to inflation and the leakage of capital: "(...) In the middle of the nineteen-twenties, it was calculated that some eight million pounds sterling the sum total of deposits accumulated by Portuguese citizens overseas, i.e. more than ten times the total monetary circulation. Besides these, more than one or two million were in Spain for contraband of cattle, wheat and salt. (...)” Also, for example "(...) from 1919 to 1924, the value of the Portuguese escudo fell almost twenty times (...)",²¹ with the low purchasing power of the vast majority of the population and the subsequent widespread malnutrition providing, in the context of a disorganized healthcare system, a "melting pot of culture" that led to increased morbidity, the progress of endemics and the outbreak of epidemics, which led to others and determined the excess mortality recorded.

Also in 1938, a sanitarian wrote about the Public Health problem in Portugal: "(...) The most important gaps that have opened in the creation of our public health

[are]: 1) lack of medical care, whether due to difficulty of access by patients or due to the ignorance and poverty of the populations, whether, particularly, by the shortfall of institutions that evaluate this lack (...). 2) blindness in the abandonment of procedures of prophylaxis to be adopted, which are those of immunization, which are those of salubrity (...). 3) the scepticism that still occurs in a certain portion of physicians regarding the advantage of the percentage of diseases (...).”²³

In short: in the case of epidemics of the bubonic plague,² typhoid epidemic¹ and smallpox,³ it was a question of nosological entities that were condemned to oblivion, through the socioeconomic transformations and the medical progresses that were taking place in the country. But in relation to influenza in particular, given the extremely contagious nature of a virus with a high capacity for genetic mutation, it is able to keep "one step ahead" of our prophylactic strategy, therefore, we have to suffer the perpetuity of its cyclical recurrences, with variable incidences of morbidity/mortality ("Spanish influenza", "Asian influenza", "Hong Kong influenza", "type A influenza", etc.). For example, the modern antiviral medicine Oseltamivir, recently so widely advertised and marketed, ended up serving the mercantile strategy of the laboratory that produced it more than the claimed usefulness that was attributed to it in the combat of the current "type A influenza" epidemic. ■

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