THE EPIDEMIOLOGY ADVENTURE: BEING A DISEASE DETECTIVE
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Last year in 2019 I proudly obtained a Master in "Nutritional Epidemiology & Public Health" from Wageningen University & Research, and a wise friend advised me that it may be the right moment to share some of my academic knowledge & link it to the current COVID-19 pandemic.

Today more than ever illustrates the important role of epidemiology. Epidemiology is about measuring and improving health by identifying harmful causes in order to properly intervene. Perhaps epidemiology's most fundamental role is to provide a structure for analysis of health problems through its emphasis on the sound use of numbers, "we have to count and we have to think, we have to think about what is worth counting and how best count it, what is practical and how well we measure" (Webb and Bain, 2016). Therefore, epidemiology is like a detective work as we try to find out why and how disease occurs: "What disease/condition is present in excess? Who is ill? Where do they live? When did they become ill? Why did they become ill?". The impact of an epidemic depends on the number of people infected, the infection's transmissibility and the spectrum of clinical severity (Lipsitch et al., 2020).

Moreover, the aim is to share my passion trying to uncover figures, observations and eventually explanations, in order to discover the science behind the scenes. I thought we might kick off with some basic definitions and measures in epidemiology.

Episode 1: Introduction "the Epidemiologist, a Disease Detective at work"

To start I would like to share an example that has certainly strengthened my initial passion for this scientific field and illustrates "Epidemiologist, a Disease Detective at work" and let's check if you can figure out which event it was:

Case study: An historical epidemic (Webb and Bain, 2016)

TABLE: An historical event

	Adult males		Adult Females		Children (Both sexes)		Total population	
SES[1]	Total	% Dead	Total	% Dead	Total	% Dead	Total	%Dead
High	175	67.4%	144	2.8%	6	-	325	37.5%
Medium	168	91.7%	93	14.0%	24	-	285	58.6%
Low	462	83.8%	165	53.9%	79	65.8%	706	74.8%
Other	885	78.3%	23	13.0%	0	-	908	76.7%
Total	1690	80.0%	425	25.6%	109	47.7%	2224	68.0%

SES[1]: Socioeconomic status
Source: http://www.anesi.com

The above table shows the data from an actual human event. It is sorted by socioeconomic status, with the population divided by sex and age, and it recounts what percentage of the population in each group died during this "epidemic".
Now we can start our detective work.

- We have an isolated population (2'224 pers.). What can be observed with regards to number of men & women, i.e. sex distribution? Number of adults and children? Between SES-groups (social economic status, hereafter social class)?
- Death rates: is there is a difference between men and women? Between adults and children? Between high and low social class?
- Risks: how much more likely were men to die than women? And those of low social class versus those of high social class?

Things to note about the above illustrated situation (Table: an historical event):

- About the group of people, the "population": Large predominance of adult males (1'690) 76% > females (425) 19% > very few children (109) 5%. Large representation of low SES especially within man and children, and a total population of 2'224 is quite large: a village, a small town, army barracks…….?
- About the reported death rates: Overall death rate is very high: men 80% > children 47.7% > women 25%, and overall 2/3rd died; By SES, the death rate for man, although overall very high, was noticeable higher in low SES (83.8% > 67.4%). For women, although overall lower death rate the lower SES was most affected. The only children that died were all in low SES.
- With the provided figures we can also calculate the Relative Risk (RR) for men compared to women: 80/25.6 = 3.1, meaning that men had 3.1x more risk of dying. Within the women group, comparing low SES and high SES, the RR=53.9/2.8=19.3, so women belonging to the high social class were exceptionally strongly protected, a 19.3x higher risk of dying for the low social class women.

So here we observe an epidemic with very high death rate, far more men died than women. Women of lower social class were far more likely to die than those of high social class, with this pattern being repeated for children. This example highlights stark differences in risks of dying, and they resulted from a mix of powerful preventive measures, social class and physical characteristics. Any clue? The event… was the sinking of the Titanic: those of higher social class, 1st class passengers situated on the upper decks, were closer to the lifeboats. The males gallantly helped women and children into the lifeboats first. Those of "other SES" were the crew.

This example's aim is to introduce epidemiology and similar structured approaches that are used to analyze various situations[1]. Ranging from a tragic accident like the Titanic in order to develop future improved prevention measures, to explore the causality between smoking and cancer, obesity and other chronic diseases to studying epidemic outbreaks like Cholera, Ebola, SS and the current COVID-19 pandemic, the "Epidemiologist Disease Detective" explores it all. We all have our own approach and see things differently, but epidemiology provides a more structured approach in order to better observe the characteristics of an epidemic taking into account the size of the whole group, how many died, check overall patterns across exposure groups, to then eventually break it down by age/sex and then consider more complex effects. So, I hope this was a good warm up with the next step being to go through some basic principles, definitions, and apply it step by step to the current COVID-19 epidemic. We will also review current scientific evidence as part of epidemiology literature review and share observations. So next episode coming soon …. ☺

Please excuse any oversights I may be blind to
and feel free to contact me and let me know
of any "errors and omissions" in this article

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References and Online sources

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[1] Note: the titanic example illustrates that epidemiology is not only about infectious diseases but about issues linked to mortality (and morbidity) overall. Moreover, I liked the titanic example because with respect to the current COVID-19 epidemic there was in Asia a cruise ship Diamond Princess infected, which will allow for epidemiological studies on coronavirus in a contained environment compared to mainland China and other areas.