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Research and Statistics:
Coronavirus Disease (COVID-19)

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ABSTRACT

A newly identified coronavirus, SARS-CoV-2, is spreading across the globe. Most of our work focuses on large problems that humanity has faced for a long time, such as child mortality, natural disasters, poverty, and almost 100 other problems. This article focuses on a new, emerging global problem: the ongoing outbreak of the coronavirus disease (COVID-19). The outbreak started in China in late 2019, and by March 2020 the disease has spread to countries around the world. The number of infections appearing each day has since plummeted in China, owing in large part to containment efforts, but the outbreak is now a global pandemic. Large outbreaks in South Korea, Iran, Italy, and elsewhere have propelled a spike in international cases across more than 180 countries.

KEYWORDS

Coronavirus Disease, COVID Outbreak, COVID-19, Research and Statistics COVID-19

THE NUMBER OF TOTAL CASES IS WHAT WE WANT TO KNOW, BUT THEIR NUMBER IS NOT KNOWN

To understand the scale of the COVID-19 outbreak, and respond appropriately, we would want to know how many people are infected by COVID-19. We want to know the total number of cases. However, the total number of COVID-19 cases is not known. It is unknown by us at Our World in Data, or any other research, governmental or reporting institution. There are several reasons why the total number is not known. Whilst for some the symptoms are very severe for a large share of the population the symptoms are mild. In such cases people may be unaware that they are infected with COVID-19, and therefore not get seen, and diagnosed, by a doctor. (Read et al., 2020; Koh 2020). The second reason that the confirmed cases are only a fraction of the total number is that many countries are struggling to test a large number of cases. Not every person that should be tested is able to. Since testing is crucial, we looked into this in more detail. Because of large problems with data availability on the scale of testing, we did a manual review of data on COVID-19 testing across national reports, and collated the most recent estimates that we could find as of 23 March 2020.

CONFIRMED CASES IS WHAT WE DO KNOW

What we do know is the number of confirmed cases. The World Health Organization (WHO) explains that a confirmed case is "a person with laboratory confirmation of COVID-19 infection, irrespective

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of clinical signs and symptoms" (Maier & Brockmann 2020). The WHO also speaks of 'suspected cases' and 'probable cases', but the WHO Situation Reports do not provide figures on 'probable cases', and only report 'suspected cases' for Chinese provinces ('suspected cases' by country is not available) (Vaidya et al., 2016). The daily Situation Reports list the number of confirmed cases; we rely on these reported numbers for the regular updates of our own datasets presented below. As explained, the number of confirmed cases is lower than the number of total cases because not everyone is tested.

Growth of cases: How long did it take for the number of confirmed cases to double? In the section below we present the latest data on the number of confirmed cases by country, and how this has changed over time. But in an outbreak of an infectious disease it is important to not only focus on the number of cases, but also the growth rate at which the number of cases is increasing. The growth rate is an essential metric to understand and to monitor. This is because a fast growth rate can lead to very large numbers rapidly, even if the current numbers of cases and deaths are small when compared with other diseases. A helpful metric to measure the rate of change is to look at each country and ask: How long did it take for the number of confirmed cases to double? Let's take an example: if the number of confirmed cases as of today is 1000, and there were only 500 cases three days ago then we would say that it took three days for the number of confirmed cases to double (Danon et al., 2020). The doubling time of cases has changed and it will change in the future. It would be wrong to extrapolate current growth into the future. But it is important to keep focusing on the doubling time. As long as cases are doubling at a constant rate the growth is exponential. We humans tend to think in linear growth processes even when the growth is exponential, as psychological research has shown for decades. Below we give some intuition about exponential growth and provide the referenced psychological research on this.

UNDERSTANDING EXPONENTIAL GROWTH

The time it takes for the number of cases to double will change during the outbreak and it would be wrong to make projections based on the assumption that this stays constant. But it is important to remind ourselves of the nature of exponential growth. If during an outbreak the number of cases is in fact doubling and this doubling time stays constant, then the outbreak is spreading exponentially. Under exponential growth 500 cases grow to more than 1 million cases after 11 doubling times.[6] And after 10 more doubling times it would be 1 billion cases. This is in no way a prediction for the number of cases we should expect; it is simply a reminder that exponential growth leads to very large numbers very quickly, even when starting from a low base. And it is important to be reminded of the nature of exponential growth because most of us do not grasp exponential growth intuitively. Psychologists find that humans tend to think in linear growth processes (1, 2, 3, 4) even when this is not appropriately describing the reality in front of our eyes. This bias – to "linearize exponential functions when assessing them intuitively" – is referred to as 'exponential growth bias' (Stango & Zinman 2009). Psychological research shows that "neither special instructions about the nature of exponential growth nor daily experience with growth processes" improved the failure to grasp exponential growth processes (Wagenaar & Sangaria 1975).

THE GLOBAL AVERAGE HIDES MORE THAN IT REVEALS: WHY WE SHOW THIS DATA COUNTRY BY COUNTRY

It is important to not only look at the global number of cases and deaths. Some countries like China and Korea – have very substantial counter measures in place and new daily confirmed cases have declined. Many other countries do not have comparable measures in place and, as the table shows, numbers are rising fast. The global average does not allow us to understand this. The global average hides the differences between countries that are successfully reducing the number of confirmed cases and those that fail to achieve this – and this is what is most important in this early phase of the COVID-19 epidemic.