

Cover sheet

NATIONAL UNIVERSITY OF SINGAPORE

SP1541/ES1541 EXPLORING SCIENCE COMMUNICATION THROUGH POPULAR SCIENCE

Assignment: Science News Article 1

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Tutorial Group: S04

Major(s): Data Science and Analytics

Category: C; Discipline of the selected research article: Mathematics

Timing vaccination campaign to reduce measles infections

Despite having a vaccine that is readily accessible, measles cases and deaths are still surging worldwide, especially in recent years. Why is this so and are there any long-term solutions to resolve this?

By: Harry Chang (30 September 2020)

According to an update from the World Health Organisation (WHO), nearly 10 million cases of measles were reported in the year 2018. During that year, more than 140,000 people worldwide have died from the disease. In addition, reported measles cases have surged internationally in devastating outbreaks across different regions.

Besides the mild symptoms of fever, runny nose and body rashes, this highly contagious disease may also lead to long term effects on the immune systems of those affected. For instance, as many as 1 in 20 children with measles will contract pneumonia, which is the leading cause of death amongst young children. In addition, about 1 in every 1000 who contract measles will develop encephalitis - or brain infection - which can result in the child being deaf or developing intellectual disability. This raises the importance of vaccinating children so that they will not have to live with such complications in the long run.

Despite the long existence of an effective and cost-efficient vaccine, the outbreak of measles remains a pressing global health issue particularly for developing countries. These nations have often been identified to lack access to vaccinations and high-quality health infrastructure.

As such, a study on the measles outbreak in Pakistan has predicted that optimising the timing of a vaccination campaign plays an important role in reducing the total infections of measles.

The study, led by senior researcher Niket Thakkar from the Institute for Disease Modelling (based in the USA), was conducted in response to the sudden increase in measles cases within the span of a year. From 2016 to 2017, the number of cases in Pakistan have more than doubled, as confirmed by local laboratories.

Prior to the study, measles vaccination coverage in toddlers aged under 2 was estimated to be 61% nationwide, as cited from Pakistan's Demographic and Health Survey (DHS) in 2012 – 2013. With Pakistan being identified as one of the top countries with the most unvaccinated infants, the need to improve this rate was therefore essential, as suggested by Thakkar and his team of researchers.

The researchers came up with a mathematical model which uses linear regression to predict the severity of future outbreaks. Using case data from Pakistan that contains the number of

new measles cases per month, they predicted the number of cases of subsequent months within the next three years. This data was also categorised by province level to compare the severity of the measles outbreak between different regions in Pakistan.

To understand how linear regression works, let us think of this example. If you spent \$10 on a Monday, \$20 on a Tuesday, \$30 on a Wednesday, how much would you win on Thursday? If your answer is \$40, you've just performed linear regression - this method thus makes use of available information to constantly make predictions.

This model assisted researchers in understanding when and where the vaccine should be distributed within the country. Their results show that holding a vaccination campaign in November has the greatest impact, with an estimated 440,000 more infections that could be prevented in comparison to a January campaign. These results were later used by the Pakistani government in vaccination planning, which led to the implementation of the campaign in November 2018.

According to the study, less cases were confirmed from May to October as compared to the rest of the year. This suggests a low transmission season during this period, reiterating why the campaign is best implemented in November, when cases start to surge again. As a result of this implementation, the estimated measles vaccination coverage in infants aged under 2 had improved to 73% nationwide. This statistic was reported in 2017 – 2018's iteration of Pakistan's DHS, which was published in January 2019.

On the other hand, if the campaign was delayed from November 2018 to May 2019, can you guess the number of additional infections that would have occurred? There would have been more than 600,000 additional infections from 2018 to 2021 - this significant number is sandwiched between the population sizes of Sialkot and Sukkur, the 13th and 14th most densely populated cities in Pakistan respectively (out of 99 cities in total). As such, this further justifies the researchers' preference for the campaign to be conducted in November.

Beyond immediate outbreak response, countries should continue investing in high quality immunisation programmes, as well as disease surveillance. This would help to ensure that these outbreaks are detected quickly and stopped as soon as possible.

It is indeed a tragedy to witness a sudden increase in cases and deaths from a disease that is easily preventable, especially in recent times. Therefore, it is crucial to ensure that even the poorest countries have access to these high-quality vaccination programmes. This would help prevent the unnecessary loss of lives to easily treatable diseases, including measles.

(799 words)

Having some useful context of study provided; could clarify the focus on timing, as opposed to other factors. Useful explanation of linear regression; some parts of reported study could

be refined; do consider logical flow more fully. Some implication of key finding shown though move it to the end could show clearer link to context of study. Writing is generally suited for science news.

References (please provide clickable links and highlight main RA):

Thakkar, N., Gilani, S. S. A., Hasan, Q., & McCarthy, K. A. (2019). Decreasing measles burden by optimizing campaign timing. *Proceedings of the National Academy of Sciences*, 201818433. Also available from <https://www.pnas.org/content/pnas/116/22/11069.full.pdf>

Patel, M. K., Dumolard, L., Nedelec, Y., Sodha, S. V., Steulet, C., Gacic-Dobo, M., ... & Goodson, J. L. (2019). Progress toward regional measles elimination—worldwide, 2000–2018. *Morbidity and Mortality Weekly Report*, 68(48), 1105. Also available from <https://www.cdc.gov/mmwr/volumes/68/wr/pdfs/mm6848a1-H.pdf>

National Institute of Population Studies (NIPS) [Pakistan] and ICF. 2019. *Pakistan Demographic and Health Survey 2017-18*. Islamabad, Pakistan, and Rockville, Maryland, USA: NIPS and ICF. Also available from <https://dhsprogram.com/pubs/pdf/FR354/FR354.pdf>

Pakistan Bureau of Statistics. *Block Wise Provisional Summary Results of 6th Population & Housing Census-2017 [As on January 03, 2018]*. Also available from <http://www.pbs.gov.pk/content/block-wise-provisional-summary-results-6th-population-housing-census-2017-january-03-2018>

Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases. Chapter 10, Measles. 8th Edition, 2004.* <https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html>

Do consider using more of features to enhance dialogic involvement.

Reflective commentary 1

Prior to my peer review session with Ginny, I had 2 main problems in my first draft: explaining the concept of linear regression in layman terms and usage of dialogic tone features such as rhetorical questions and pronouns.

I initially explained linear regression as a 'simple linear approach' that could predict 'explanatory and response variables'. However, she said that these terms were still mathematical jargon and suggested that I come up with an analogy to describe the process instead of attempting to simplify the term. Thus, I wrote an example on predicting how much one would spend on a day given the consistent increase in spending for the past 3 days. Okay much more helpful. But do be more reflective in RC.

Ginny also suggested on how I could include questions in the paragraph where I wrote about the significance of the key finding (additional 600,000 infections if the campaign was introduced at the wrong timing). Again, this was constructive criticism that I leveraged on to amplify the importance of the study.

Along do look at the RC task carefully. Adopt a more reflective stance. You're mainly recounting here - not quite RC focus.

APA -
use
alpha
order

no need to
talk
about
previous
draft -
focus on
substantive
choices
for your
article

In addition, my lead included the key finding that had focused on Pakistan, where the subject was conducted. On the other hand, by introducing the key finding in the lead straight away, I basically had summarised the article in one sentence, which may not entice the layman reader to continue reading beyond the lead. I thus replaced this with a question instead to engage the reader, getting him to think of long term solutions to resolve the surge in cases, which I would elaborate on down the article.

(250 words)