

## Did COVID-19 risk perceptions influence the handwashing behavior of the Filipino population?

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### ABSTRACT

The COVID-19 pandemic reminded people of the importance of proper handwashing. The degree of health risk perceptions and handwashing behavior during the COVID-19 pandemic opens essential lessons for delivering water, sanitation, and hygiene (WASH) programs across the globe. We measured the relationship between COVID-19 risk perception and the handwashing behavior of 386 Filipinos in a highly urbanized city in the Philippines. Self-made COVID-19 risk perception scale (CRPS) (Cronbach's  $\alpha$  0.93) and handwashing behavior scale (HBS) (Cronbach's  $\alpha$  0.84) were administered face-to-face. The results show that the overall handwashing behavior has a median of 4.1 (frequently), while the interquartile range (IQR) is 0.5. Regression analysis revealed that COVID-19 risk perception has a significant positive association with overall handwashing behavior ( $B=0.369$ ,  $p$ -value  $<0.05$ ). The COVID-19 risk perception accounts for 36.9% of the variance in handwashing behavior,  $F(1, 384) = 11.6360$ ,  $p$ -value  $= 0.0007$ . This study proposes that public health authorities target people's experiential learning style in designing and delivering intervention programs against non-compliance with proper handwashing.

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## 1. INTRODUCTION

In 2019, the Center for Disease Control and Prevention (CDC) launched a new campaign that promotes proper handwashing among the public. 'Life is better with clean hands' provides campaign resources designed to raise awareness about the importance of adequate handwashing [1]. Health authorities recognize proper handwashing in reducing the transmission of infectious diseases. For instance, hand hygiene compliance in healthcare facilities is required and strictly monitored to avoid nosocomial infections [2]. It is also widely promoted at school as a part of the child's right to grow up in a safe environment [3], [4]. In contrast, children's poor water, sanitation, and hygiene (WASH) conditions present threats of malnutrition, diarrhea, and dehydration [5]. These threats are also a concern at home and in the community [6].

Despite the apparent health advantages of proper handwashing, some people still do not recognize it. In an online article, a social psychologist discussed the concept of 'unrealistic optimism' as a reason other people do not wash their hands properly. It can be attributed to people's tendency to underestimate the risk of not washing their hands. A person's belief that he has immunity from the diseases caused by not washing his hands is an example of unrealistic optimism [7]. Health workers, including doctors and nurses, are not spared

from this health malpractice. Some studies explored why doctors and healthcare workers do not wash their hands. These studies proposed the need for an intervention in healthcare facilities against poor handwashing compliance among healthcare providers [8]–[10].

The public health administrators across the globe intensified the promotion of proper handwashing during the COVID-19 pandemic [11]. The World Health Organization (WHO) and CDC listed frequent and adequate handwashing as one of the most crucial safety measures against COVID-19 [12], along with the restrictions on human movements [13]. The people's experiences during the COVID-19 pandemic resulted in several health behavior changes [14], [15]. These health behavior changes were influenced by a person's perceptions of the seriousness of the COVID-19 pandemic and their perceptions of the effectiveness of safety measures set by the health authorities [16].

A study argues that hand hygiene compliance is more experiential than rational [9]. According to Kolb's experiential learning theory, an experiential learning style requires a concrete personal experience [17]. The substantial experience allows the person to reflect on his observation, conclude lessons learned from the experience (abstract conceptualization), and meet the terms with what was known (active experimentation) [17]. Some studies examined how handwashing averts infectious diseases [11] and how poor handwashing behavior puts an individual at risk of contracting various diseases [18]. These are salient logical findings usually downplayed by the people [7], [9]. Following Kolb's experiential learning theory, COVID-19 provides people with a concrete disease experience [17]. It could be their experience contracting COVID-19 or their actual observation of the surrounding people.

This study was conducted to explore the experiential learning of people toward transmissible disease during the COVID-19 pandemic and its influence on their handwashing behavior. 'Experiential learning' is defined in this study as the COVID-19 risk perception. It is an aspect of people's reflective observation of a health risk, a vital part of experiential learning. The COVID-19 risk perception is hypothesized in this study as a driver of proper handwashing, a specific health behavior change. Literature provides evidence of the association between the general population's risk perception and general preventive practice during the COVID-19 pandemic, but it did not focus on the handwashing behavior [19]. The outcome of this study provides evidence-based data that could help policymakers design effective promotional strategies for proper handwashing against various infectious diseases.

## **2. RESEARCH METHOD**

### **2.1. Sampling site and samples**

The study was conducted in Pasig City, Philippines, a city featured by the media as having robust COVID-19 pandemic responses [20], [21]. The city is a 1<sup>st</sup> class, highly urbanized city in the National Capital Region with a total population of 803,159 people [22]. The investigators purposively selected the research site. It is an urbanized city with handwashing facilities built under the WASH pandemic, safe Philippines campaign [23]. Therefore, water constraint was not a potential hindrance to proper handwashing of the people in the city. This criterion was the basis for selecting Pasig City as the research site to narrow down biases in the variable analyses. A total of 386 respondents with an average age of 41 years (SD=14.30) participated in the study. The respondents were represented by more females (N=228; 49.07%) than males (N=158; 40.93%). There were also more employed (N=304; 78.76%) respondents during the data gathering than those unemployed (N=82; 21.24%).

### **2.2. Study design and procedures**

A cross-sectional study using an in-person, population-based survey was conducted from November 2022 to January 2023. A debriefing script briefly explained the nature of the study at the beginning of the survey. After signing the consent form, the investigators introduced the survey items to the respondents. It is divided into four parts, including the socio-demographic profile, sources of information on proper handwashing, COVID-19 risk perception, and handwashing behavior. The structured questionnaires were distributed after simple random sampling. The investigators contacted the three local officials from district I of Pasig City to help proportionately distribute the questionnaire to the twenty-three barangays. One district II local official helped the investigators distribute the questionnaire to the seven barangays. The inclusion criteria for participation included: i) must be at least 18 years old, ii) must be a resident of Pasig City in the last three years, and iii) must voluntarily participate in the study.

### **2.3. Measures**

#### **2.3.1. COVID-19 risk perception scale**

A self-administered questionnaire was made to measure the COVID-19 risk perceptions of the respondents. The factor analysis with the respondents suggests that a standard Bayesian method is more appropriate in this study, and the open-ended questions are unnecessary. The questionnaire items were grouped

based on the recommended instrument for assessing pandemic risk perception [24]. However, this study focused only on 'personal exposure' covering two dimensions: infection risks (8 items) and emotional health risks (1 item). Each item was rated on a 1-5 scale, 1 being "not at all likely" and 5 being "totally likely". The nine items that measure the COVID-19 risk perceptions include: i) 'you catch COVID-19', ii) 'you are exposed to COVID-19 infection', iii) 'you are vulnerable to COVID-19 infection', iv) 'you transmit COVID-19', v) 'your family members transmit COVID-19', vi) 'your close friends transmit COVID-19', vii) 'your colleagues/workmates transmit COVID-19', viii) 'the general public transmit COVID-19', and ix) 'you feel distressed due to the COVID-19 pandemic'. The questions were translated into Filipino, the first language of the respondents. The internal reliability of the COVID-19 risk perception scale (CRPS) was best at Cronbach's  $\alpha$  0.93. The questionnaire was also subjected to content validation through the judgment of three experts (S-CVI/Ave=1).

### 2.3.2. Handwashing behavior scale

The handwashing behavior of the respondents was measured based on the five elements of proper handwashing, which include time, mechanical action, running water, hand drying, and surface [25]. All questions were answerable on a scale: (1) never, (2) rarely, (3) occasionally, (4) frequently, and (5) very frequently—a total of seven survey questions measured time in handwashing. The questions include: i) 'you use the concept of "happy birthday song" while washing your hands,' ii) 'you wash your hands before handling food,' iii) 'you wash your hands after handling food,' iv) 'you wash your hands before using the toilet,' v) 'you wash your hands after using the toilet,' vi) 'you wash your hands after contact with human/animal feces,' and vii) 'you wash your hands after sneezing/coughing/blowing the nose'. Only one question assessed the mechanical action of washing hands. In this section, the seven steps of proper handwashing [25] were presented in the questionnaire. The respondents were then asked to measure the frequency of handwashing following the seven steps. Regarding the element of running water, the respondents were simply asked if they were washing their hands with running water. For the aspect of hand drying, the questions were asked: i) 'you dry your hands by shaking them after washing,' ii) 'you dry your hands using a shared towel,' and iii) 'you dry your hands using a paper towel.' The first and second questions were treated with reverse coding. The transmission of microbes is higher on wet hands for a more extended period. Thus, those who scored high in drying hands by shaking them after washing imply poor hand hygiene in terms of hand drying. This goes the same with drying the hands using a shared towel [26]. Lastly, the respondents were given two survey items for the element of surface. The items include: i) 'you are mindful of what you touch before washing your hands' and iii) 'you are mindful of what you touch after washing your hands'. A total of 14 items were asked for this measure. The internal reliability of the handwashing behavior scale (HBS) was better at Cronbach's  $\alpha$  0.84. Like the CRPS, HBS was also subjected to content validity testing (S-CVI/Ave=1).

### 2.4. Statistical analysis

The data analysis was performed using Microsoft Excel 2019 and SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Spearman correlation and simple linear regression were used to examine the relationship between COVID-19 risk perceptions and the hand hygiene behavior of the residents in Pasig City, Philippines. The investigators first computed the CRPS and HBS scores to produce continuous data before conducting the regression modeling and analysis.

### 2.5. Ethical consideration

The study followed the Declaration of Helsinki and received ethics approval from the PUP Research Ethics Committee (UREC-2022-0162). The investigators discussed the study's aims, nature, and procedure in the consent form. The anonymity and confidentiality were assured to the respondents and were strictly maintained.

## 3. RESULTS AND DISCUSSION

### 3.1. Results

#### 3.1.1. COVID-19 risk perceptions of the residents in Pasig City, Philippines

Each item in the CRPS was noted with the number of respondents with either a high or low level of perceived risk. The levels of perceived risk of COVID-19 were identified as 'low' if the rating of the respondents to the CRPS was 3 or lower; 'high' if the rating was 4 or higher. For the 'fear of contracting COVID-19', for instance, the number of respondents with a high perceived risk was 287 out of 386 (74.35%). This is one of the three CRPS items most respondents perceive as high-level risk. Other CRPS items include 'the public as a spreader of the disease' (N=218; 54.68%) and 'colleagues/workmates as a spreader of the disease' (N=217; 56.22%). The rest of the perceived risks were scored by the respondents with low levels of risk. Subsequently,

the nine items in the CRPS were pooled and averaged to determine the overall perceived risk of COVID-19. The averaged ratings of the respondents are reflected in the box and whisker plot as shown in Figure 1.

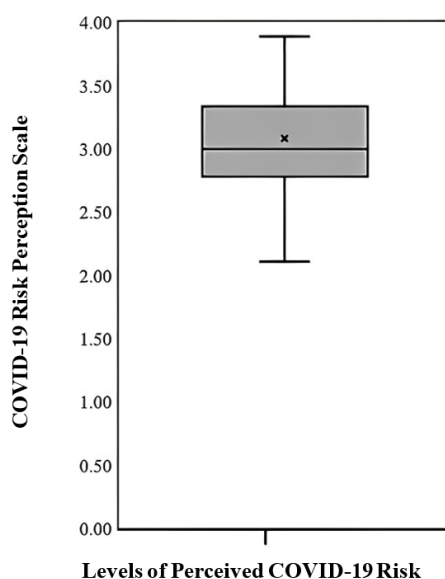


Figure 1. Box and whisker plot showing the levels of perceived COVID-19 risks (N=386)

The responses to the 9-item CRPS ranged from 2.1 (unlikely) to 3.9 (totally likely). The median is 3.0 (likely), while the interquartile range (IQR) is 0.6. This means that when any number in the middle 50% of the distribution is subtracted from each other, the difference is 0.6. Moreover, the box and whisker plot show that around 75% of the respondents perceived COVID-19 as likely or very likely a risk. Meanwhile, 25% of the respondents perceived it as an unlikely risk (Q1=2.8).

### 3.1.2. Handwashing behavior of the residents in Pasig City, Philippines

The self-rating of the respondents to the HBS was also noted with either a high or a low level, the same treatment as CRPS. Of the 14 survey items, eight were scored high by most respondents. These items include 'washing the hands after using the toilet' (N=375 of 386; 97.2%), 'washing the hands after contact with human/animal feces' (N=372; 96.4%), 'washing the hands after handling food' (N=364; 94.6%), 'washing the hands before using the toilet' (N=364; 94.6%), 'mindful of what to touch before washing the hands' (N=364; 94.6%), 'washing the hands before handling food (N=364 of 386; 94.3%), 'washing the hands after sneezing/coughing/blowing the nose (N=362; 93.8%), and 'mindful of what to touch after washing the hands (N=332; 86.0%).

Meanwhile, 371 of the 386 (96.1%) respondents scored low on 'drying the hands by shaking the excess water.' Two other survey items scored low, including 'drying the hands using a shared towel' (N=350; 90.7%) and 'using the concept of "happy birthday song" while washing the hands' (N=210; 54.4%). The other three items, 'following the Department of Health prescribed methods of handwashing,' 'washing the hands with running water, and 'drying the hands using a paper towel,' were rated high by most of the respondents.

Figure 2 shows the box and whisker plot of the respondents' handwashing behavior levels. It is evident that among the five elements of handwashing, the proper way of drying the hands after washing was rated low by most of the respondents (median=3; IQR=0.7). The box and whisker plot shows that more than 50% of the respondents rated occasionally (3), rarely (2), and never (1) followed the proper drying of hands after washing. The other four elements were rated with high levels of handwashing behavior. However, mechanical action and running water use in washing hands have collective outliers that fall into a low level of handwashing behavior. The overall handwashing behavior has a median of 4.1 (frequently), while the IQR is 0.5. It can be observed that the outliers on the general handwashing behavior are well dispersed toward a low level.

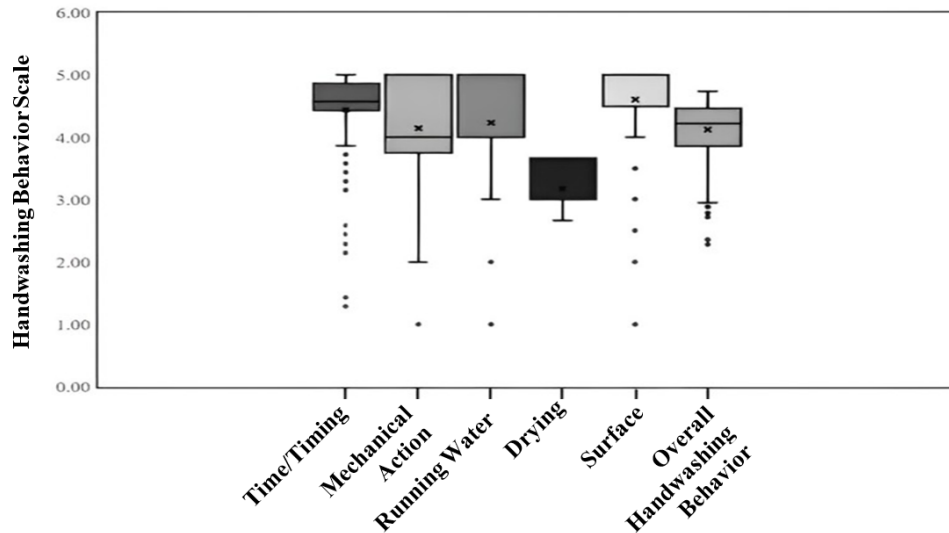


Figure 2. Box and whisker plot showing the levels of handwashing behavior of the residents in Pasig City, Philippines (N=386)

**3.1.3. Correlation between the perceived COVID-19 risks and the handwashing behavior**

The correlations between the perceived COVID-19 risk and the different elements of handwashing of the residents in Pasig City are presented in Table 1. The perceived COVID-19 risk had a very weak negative correlation with the time of handwashing and mechanical action. A very weak positive correlation was observed with the overall handwashing behavior, and a moderate positive correlation was observed with the hand drying. The perceived COVID-19 risk did not significantly correlate with the other elements of handwashing. The time element in handwashing had a statistically significant correlation with all the variables. It has weak positive correlations with mechanical action and running water and moderate positive correlations with the surface and the overall handwashing behavior. Aside from its negative correlation with the perceived COVID-19 risks, it also had a very weak negative correlation with hand drying. In terms of mechanical action, three more positive correlations were observed. It had a strong positive correlation with the overall handwashing behavior, a weak positive correlation with the surface, and a very weak positive correlation with running water. The overall handwashing behavior was also observed, with strong positive correlations with running water and surface elements.

Table 1. Spearman’s rank correlation coefficient for the perceived COVID-19 risks and the handwashing behavior

|                              | Perceived COVID-19 Risks | Time/timing | Mechanical action | Running water | Drying | Surface | Overall handwashing behavior |
|------------------------------|--------------------------|-------------|-------------------|---------------|--------|---------|------------------------------|
| Perceived COVID-19 risks     | 1                        |             |                   |               |        |         |                              |
| Time/timing                  | -0.173*                  | 1           |                   |               |        |         |                              |
| Mechanical action            | -0.180*                  | 0.322*      | 1                 |               |        |         |                              |
| Running water                | 0.079                    | 0.206*      | 0.175*            | 1             |        |         |                              |
| Drying                       | 0.524*                   | -0.141*     | -0.088            | -0.096        | 1      |         |                              |
| Surface                      | -0.032                   | 0.421*      | 0.213*            | 0.326         | -0.012 | 1       |                              |
| Overall handwashing behavior | 0.041*                   | 0.543*      | 0.629*            | 0.707*        | 0.179* | 0.611*  | 1                            |

\*Significant Spearman correlation coefficient at the 0.01 level (2-tailed)

**3.1.4. Association between COVID-19 risk perceptions and the overall handwashing behavior**

This study intended to quantify the association between COVID-19 risk perceptions and overall handwashing behavior. Based on the simple linear regression analysis, the unstandardized coefficient is 0.369. This means that whenever the perceived COVID-19 risk increases by 1 point, the overall handwashing behavior increases by 0.369. Figure 3 presents the scatter plot of the COVID-19 risk perceptions versus the general handwashing behavior. It shows a weak positive association between the two variables. This relationship is statistically significant at a p-value <0.05. However, the R<sup>2</sup> revealed that the relationship between the

COVID-19 risk perceptions and the overall handwashing behavior accounts for only 36.9% of the variation. This means that hardly any variation in the data is explained by their relationship, and only 36.9% of the context of handwashing behavior can be explained by the COVID-19 risk perceptions. In summary, the regression analysis revealed that COVID-19 risk perceptions have a significant positive relationship with handwashing behavior ( $B=0.369$ ,  $p\text{-value} < 0.05$ ). The COVID-19 risk perceptions account for 36.9% of the variance in handwashing behavior,  $F(1, 384) = 11.6360$ ,  $p\text{-value} = 0.0007$ .

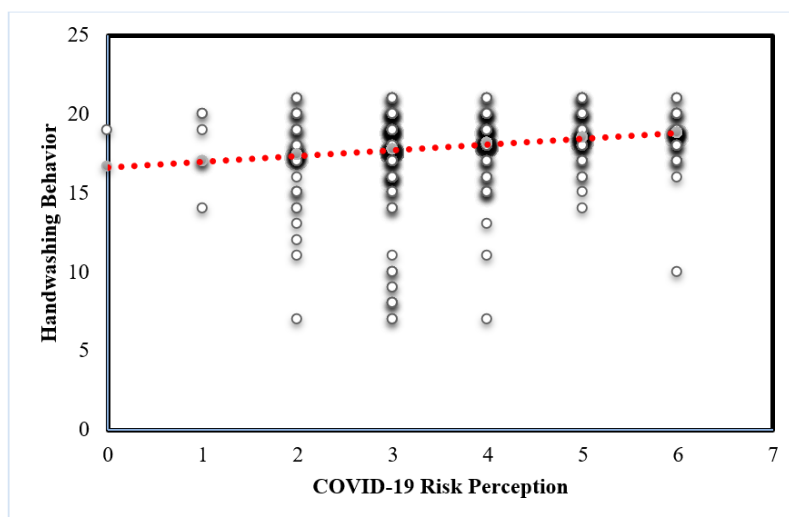


Figure 3. Scatter plot of COVID-19 risk perceptions versus the overall handwashing behavior of the residents in Pasig City, Philippines

### 3.2. Discussion

To our knowledge, no published literature has focused on the association between the COVID-19 risk perception and the handwashing behavior of the residents in urban settings. However, previous research outcomes show evidence that people's attitudes toward the COVID-19 pandemic influence their compliance with various preventive behaviors [27]. Meanwhile, based on a study conducted in 14 countries, lenient health policies may trigger increased COVID-19 cases. The increase in COVID-19 cases may trigger self-regulation, including adherence to proper handwashing [28]. A study in Latvia explored the different factors that could influence COVID-19 preventive behaviors. The aspects explored included the fear of COVID-19, people's trust in COVID-19 information sources, and the conspiracy beliefs against COVID-19 [29].

On the other hand, a cross-sectional study in China compared the preventive behaviors of the people residing in urban and rural settings. It was found that people in rural areas were less concerned about the danger of the COVID-19 pandemic during its first wave. Thus, preventive behaviors were not intensified [30]. These studies did not focus on the handwashing behavior of the public during the COVID-19 pandemic.

The purpose of this study was to systematically explore the association between COVID-19 risk perceptions and overall handwashing behavior. The point of the analysis was borne from the results of a pencil-and-paper self-administered survey intended for the residents of Pasig City, a highly urbanized city with access to water and sanitation. The positive association between the COVID-19 risk perceptions and the handwashing behavior of the Pasig City residents suggests that the individuals who were worried about contracting COVID-19 are more likely to comply with proper handwashing, a preventative behavior. Regarding the overarching question, 'How can health authorities influence the public in properly washing their hands?', this study supports the idea that the right approach to promoting proper handwashing should target the experiential thinking style of the public. Using Kolb's experiential learning model as a reference, the health risks and the actual benefits of proper handwashing must be perceived and experienced by an individual for him to improve handwashing behavior continuously.

This study provides a quantifiable measure of 36.9% influence of the COVID-19 risk perceptions accounted for in the variance in handwashing behavior. Outside the context of the COVID-19 pandemic, the results of this study can be used in formulating intervention strategies, particularly in science communication and infrastructure. For instance, in a study in Bangladesh, the authors concluded that the psychosocial factor is an essential component in designing a handwashing infrastructure [31]. The intrusive analysis of people's

emotions is found to be a crucial aspect of promoting health. Kolb's experiential learning theory corresponds to the need for concrete experience of the people [17], [32].

The different facets of proper handwashing were also assessed in this study. The results of the correlation analysis encompass the five elements of proper handwashing [25]. This can be useful in formulating a robust intervention strategy for promoting proper handwashing behavior. About the 'abstract conceptualization' of Kolb's experiential learning theory [32], proper handwashing is suggested to be clearly understood by the people. In detail, a strong positive correlation between the perceived COVID-19 risk and the drying of hands after washing was observed in this study. This relationship can be attributed to the strengthened preventive measures on cross-contamination during the COVID-19 pandemic [33]. While people perceive the high risk of COVID-19, they are also possibly conscious of eliminating microbes on their hands and avoid using drying material they don't own.

Meanwhile, handwashing time positively correlates with mechanical action, running water, surface, and overall handwashing behavior. The prescribed duration of proper handwashing is at least 20 seconds [34]. The prescribed mechanical action in proper handwashing is directly related to the time of washing it. Results show that the overall handwashing behavior is positively correlated to all five elements. This implies the importance of all these elements in educating people on adequately washing their hands during or outside a pandemic.

This study is limited to analyzing the association between two variables: risk perception and handwashing behavior. The study design is more focused than comprehensive. The weak relationship between these two variables implies that other factors are playing a role in influencing people's handwashing behavior. Those factors are not part of the scope of this study.

#### 4. CONCLUSION

This study found that about a quarter of the sampled residents did not consider COVID-19 a risk in a highly urbanized city in the Philippines. Its implication to the handwashing behavior of the respondents was sought. When the handwashing behavior of the same respondents was assessed, it was generally found to be excellent, except in hand drying. Most respondents used shared towels to dry their hands, or they shook their hands after washing. Health authorities do not recommend these practices. After analyzing the COVID-19 risk perceptions and the handwashing behavior, it was found in a regression analysis that they have a positive relationship of less than 1 point. The research outcomes provide reference to the policymakers in formulating health communications and mapping intervention strategies related to proper handwashing as a health-protective behavior against infectious disease during or outside a pandemic.

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