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How to better manage tourism on pandemic-times?

Moving forward on a discussion we should have had before the 2020 crisis

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Abstract

Taking advantage of tourists' intensive flow, the SARS-CoV-2 virus rapidly spread causing thousands of deaths globally. Trying to contain the already pandemic virus, government travel restrictions were suddenly imposed. Consequently, the tourism industry, which at that moment employed one in ten workers globally, suddenly collapsed. Hundreds of thousands of workers immediately lost their income. Flights were cancelled, and thousands of tourists were stuck abroad with no means to return to their home countries. The gravity of the situation raised the question of whether there was scholarly knowledge that could have helped manage tourism during the current pandemic. To answer this question, a methodical literature review was performed, allowing for up to 900 publications to be analysed. Keywords used were pandemic, tourism, tourist and travel. Based on this process, 63 publications were selected for further analysis. Among these, less than 5% were focused on the tourism side of the problem. As such, this research concludes that, by the time the novel coronavirus emerged, there was, virtually, no scholarly knowledge on how to manage tourism during pandemic times so as to avoid chaos, and that the scholarly community studying related issues is very small. Moving forward, this article recommends that

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research funding agencies and universities encourage the sound development of this area of knowledge. Aspects that should be investigated include when, how and by whom should tourism be halted, as well as the feasibility of a Tourism World Fund for supporting related costs.

Keywords: Tourists, Tourism industry, COVID-19, SARS-CoV-2, Coronavirus, Pandemic.

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Introduction

For a long time, it has been known to science that a respiratory virus could rapidly evolve and spread to all countries, causing enormous suffering to humanity (Sellwood *et al.* 2007; Gronvall *et al.* 2006). To avoid this heralded tragedy, scholars have considered this issue thoroughly. So, at the beginning of the 2020 coronavirus pandemic, there was a significant amount of scholarly publications on the issue. To be precise, up to December 2019, Google Scholars' database had 179,000 publications with the word pandemic in their titles (Google Scholar, 2020). However and despite this knowledge, humanity failed to stop the spread of SARS-CoV-2 and on March 11, 2020, the Director of the World Health Organization (WHO), Dr Tedros Adhanom Ghebreyesus, officially declared a worldwide pandemic (WHO, 2020a).

Within the first nine months since the COVID-19 emerged, globally, more than 900,000 people have died of the virus, and about 28 million people had been infected with it (BBC News, 2020). As nowhere in the world health systems had the capacity to deal with the exponentially growing number of patients that succumb to the new coronavirus (Tondo, 2020; Amarato, 2020; Burke and Okiror, 2020), drastic measures were put in place worldwide in an attempt to control the speed of dissemination (Leslie *et al.* 2020). Consequently, humanity was largely put in lockdown (Gopinath, 2020). Hence, unemployment and poverty are reaching new levels (Gopinath, 2020). The negative impact on the global economy is estimated to be in the order of billions of US dollars (CRS, 2020), which will most likely force an additional 500 million people into poverty (BBC News, 2020).

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It was January 2020 when the WHO publicly announced that a new strain of coronavirus had evolved at Wuhan, in East China (WHO, 2020a). During the same month, more than five million international tourists visited China (WTO, 2019) and more than 13 million Chinese nationals visited international destinations (Statista, 2020). As the SARS-CoV-2 virus is primarily transmitted from human to human (WHO, 2020c), the correlation between tourism and dissemination is obvious, besides being largely reported on the media (Oenney, 2020; Tuite *et al.*, Forthcoming; BBC News, 2020) and modelled in related scholarly publications (Hosseini *et al.*, 2010; Chong and Zee, 2012; Tuncer and Le, 2014; Camitz and Liljeros, 2006). Being so, one can, but wonder, why tourism was not halted in a more-timely manner to avoid the current catastrophe?

In this context, this research evaluates whether existing scholarly evidence published before the 2020-pandemic was sufficient to direct decisions in regards to managing tourism in pandemic times (before, during and after the pandemic). This, among others, includes having scholarly capacity to evaluate when and how tourism should be halted to avoid the rapid spread of potentially harmful viruses and when it is safe for tourism to be reinstated. This knowledge, if existent and utilised, may have avoided the current chaos, and, if developed, could prove fundamental when the next new virus comes about.

The current chaos, of course, is not solemnly caused by tourism; neither will it be solved by it. This is a very complex issue that involves a multidisciplinary approach. Contextually, after the pandemic started, in most of the world, health systems collapsed, there were insufficient number of health workers, of beds in intensive care, of personal protection equipment and of respirators; there was intensive flow of fake news and misuse of science by political leaders. While all these issues should be

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addressed before humanity needs to react to the next potentially pandemic virus, this work focuses on contributing with the tourism component of the challenge.

Is it likely that other potentially pandemic viruses can come about?

Viruses are one of the most peculiar forms of beings. They are believed to have ancient origins (Domingo and Perales, 2020) that may date back as far as the beginning of life evolution (Tuncer and Le, 2014). Since ancient times, viruses have been evolving and adapting at rates that can have up to six orders of magnitude (Sharp, 2002). Hence, today, the variety of viruses is significant.

Viruses studied by science have been subdivided into 60 different families: of those, 20 are known to infect humans (Parvez and Parveens, 2017). Viruses' evolution, however, has not stoped and newly evolved viruses are still emerging (Woolhouse *et al.*, 2012). Hence, by chance, some of them may be harmful to society.

As species evolution happens at random, it is impossible to know in advance when or where the next virus will emerge (Wilsonet al, 2010). What we do know is that, historically, humanity has been greatly affected by many viruses. The Spanish Flu (H1N1), for example, from 1918 to 1920, left a death toll of some 50 million people (CDCP, 2020) and Measles is still causing more than 140 thousand deaths per year (WHO, 2019).

We also know that potentially dangerous viruses are still frequently emerging and re-emerging. Ebola, for example, which was first discovered in 1976, had a new outbreak in 2014-2016 in West Africa with a related mortality rate estimated to be between 25% and 90% (WHO, 2020b); and the 'Bird Flu' (H5N1), which emerged in China in 1997 infecting only birds made an evolutionary jump in 2005 and, since then

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has infected more than 600 people (Watanabe *et al.*, 2013); it had a related mortality rate of 60% (WHO, 2020c).

The Spanish, the Bird and the Swine flus, HIV, Ebola, Measles, Dengue, Zika and Chicungunha are some of the many viruses that made international news in the last 100 years. The frequency with which these viruses emerged and re-emerged is a clear indication that it is always only a matter of time until a potentially pandemic virus starts a new outbreak (Epstein *et al.*, 2007; Germann *et al.*, 2006; Gostin, 2009; Ahmad *et al.*, 2009). In this context, this new coronavirus should be of no surprise to those studying viruses.

The novel coronavirus, SARS-CoV-2, and its disease, COVID-19

In December 2019, a cluster of pneumonia related fatalities in East China raised suspicions (WHO, 2020d). Looking into these cases, researchers discovered a new strain of coronavirus, the SARS-CoV-2 (WHO, 2020d).

The family of coronaviruses was first identified in the mid-1960s and has been studied since then (CDPC, 2020b). Not all coronaviruses affect humans, only seven are known to do so (including the SARS-CoV-2); of those, four are known to cause symptoms like the common cold (CDPC, 2020b). The other three emerged in 2002, 2012 and 2019, respectively, from viruses that, until then, infected only non-human-animals (NIAID, 2020).

Of these new coronaviruses, the first to emerge causes Severe Acute Respiratory Syndrome; it is also known as SARS-CoV (WHO, 2020e). It originated in the Guangdong province in southern China and it spread to 26 countries (WHO, 2020e). Until 2020, it had infected more than 8,000 people (WHO, 2020e) with an estimated fatality rate of 10% (Park, 2020). Its main form of transmission is from human to

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human during the symptomatic stages of the illness, i.e. when the infected person knows they are sick (WHO, 2020e). Then, the isolation of those infected was one of the main strategies to retard virus dissemination.

The second coronavirus, which causes Middle East Respiratory Syndrome (MERS), was first identified in Saudi Arabia (WHO, 2020f). It is believed to have made the evolutionary jump from camels to humans, and camels are still its main transmission means (WHO, 2020f). Since 2017, this virus was reported in 27 countries, but the large majority (80%) of the human cases were reported in Saudi Arabia (WHO, 2020f). The remaining 20% of the cases were due to travellers who became infected in the Middle East and travelled to other regions; small outbreaks outside the initial region have also occurred, but these were rapidly controlled, as this virus is not efficient at human to human transmission (WHO, 2020f). Until 2020, less than 8,000 cases have been reported of people infected with MERS; its estimated mortality rate is about 30% (WHO, 2020f).

The third novel coronavirus, the SARS-CoV-2, which causes the COVID-19 disease, has a much lower fatality rate than the first two coronaviruses; probably under 5% (BBC News, 2020). Yet, it is causing a much higher number of deaths (BBC News, 2020). This is possibly because SARS-CoV-2 has the capacity to spread more broadly and quicker than SARS and MERS. Its main means of transmission is human to human with transmission taking place even when the infected person is asymptomatic (WHO, 2020g). It is believed that at least 80% of the people infected with SARS-CoV-2 are completely asymptomatic and those that do develop symptoms, may take up to 24 days to do so (WHO, 2020g), then isolation of those infected is significantly ineffective to contain dissemination (WHO, 2020g).

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It is believed that each person infected with SARS-CoV-2 infects, on average, another 6 people (Sanche *et al.*, 2020). Thus, the number of confirmed cases of COVID-19 increased exponentially (Sanche *et al.*, 2020). As such, by January 24, 2020, there were 1,000 confirmed cases in the world, of which 920 were in China. By this time, the virus had spread to five other countries, with no country having reported more than five confirmed cases (BBC News, 2020). One week later, there were 10,000 confirmed cases: 9,802 in China, and no other country had yet confirmed and reported more than 20 cases (BBC News, 2020).

The first country outside China to report 100 confirmed cases was South Korea. At this stage China had confirmed more than 75,000 people were infected by SARS-CoV-2 (BBC News, 2020).

The Italian saga began by the end of February 2020. On February 21, it had 20 confirmed cases; within two more weeks it had 2,500 (BBC News, 2020).

On this same day, March 03, the USA had less than 120 confirmed cases. 25 days later, the country had 120 thousand (BBC News, 2020).

It took four months for the outbreak to start to be controlled in Wuhan, where the SARS-CoV-2 emerged (Davidson, 2020). By the time lockdown restrictions in this region started to be alleviated, 1.6 billion people were confirmed infected in the rest of the world (BBC News, 2020). This was in the second week of April 2020 (BBC News, 2020).

From the beginning, the trajectory of the SARS-CoV-2 was closely followed. Hence, since the start of the outbreak, it was clear that tourists were playing a major role in spreading the virus and accelerating the outbreak to pandemic status (Tuite *et al.*, 2020).

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Tourism numbers before the crisis

The number of tourists travelling internationally has been steadily increasing since World War II. It reached its peak in 2019, when about 1.5 billion tourists visited international destinations (WTO, 2020a) and more than 10 billion visited domestic destinations (OECD, 2020). These numbers were expected to grow by 4% in 2020 (WTO, 2020a).

In 2019, international tourists spent USD 1.7 trillion while abroad, which represents 3.6% of the world GDP and 7% of global exports (WTO, 2020a). In 2019, the tourism industry was the 3rd largest export worldwide with annual revenue 10% greater than automotive products and food (WTO, 2019; WTO, 2020a).

Worldwide and before the 2020-pandemic, one in ten existing jobs were directly or indirectly supported by the tourism industry, adding, globally, to 330 million jobs (WTTC, 2020b). Since 2015, 1 in every 4 new jobs was created by the tourism industry (WTTC, 2020a).

In 2018, China, where SARS-CoV-2 emerged, received 63 million international tourists (WTO, 2019), while 162 million Chinese nationals travelled to international destinations (Statista, 2020a). The total expenditure of Chinese travelling internationally was estimated to be USD 227 billion (WTO, 2019).

This steadily growing tourism flow was supported by 39 million flights, which constantly connected all continents (Statista, 2020b). It was via these flights and tourists that SARS-CoV-2 rapidly arrived in all continents and most countries (Tuite, Ng, and Tisman, 2020). Countries that were last to confirm infected people were those that received fewer tourists, as Nauru for example (Amos, 2020).

To go or not to go? One of the many Sophie's dilemmas of the COVID-19

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Since January 2020, the virus started to make international headlines (e.g. SMH, 2020; BBC News, 2020). Aware of the risks, those people with travels scheduled tried to contact the companies they had booked the services with requesting reimbursements. Reimbursement, however, was not always possible, as normally when a tourism agency is paid for a package, it automatically redistributes the payment to confirm flights, hotels, cruises etc. Therefore, by the time of the pandemic, tourism agencies had no finance to compensate clients (and, soon, there was no budget to pay staff either) (Becker, 2020). Clients were, then, recommended to contact their travel insurers (e.g. Chimu, 2020) who, most likely, would refer them to the part of the contract that explicitly said that pandemics were not covered (e.g. Allianz, 2020). With many thousands of dollars individually invested on travel and no chance of refund, many tourists saw themselves having to decide whether to travel risking their lives or not to travel and loose a hard earned chance of a lifetime dream experience.

Ultimately the decision was made for these tourists when governments around the globe began to impose travel restrictions. As a consequence of not being allowed into the destination, the number of passengers showing up for flights started to decline and, when flights were no longer economically viable, flights started to be cancelled by the airlines themselves (Doherty, 2020a). The process was so abrupt that many tourists were simply left abroad with no way to return to their countries (Doherty, 2020b; Borges, 2020).

When the tourism flow stopped, so did the related expenditure. Consequently, the hundreds of millions of people who economically depend on tourism suddenly lost, or are in risk of loosing their incomes.

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Work opportunities within the tourism dynamic are very diverse, varying from the people who sell water and souvenirs at tourism attractions to the CEOs of international airlines and hotel chains. These people will, obviously, be impacted differently depending on the sort of work they do and the social support they receive from their countries. Those without national or communal support and that directly depend on a daily income from tourism are likely to have been immediately thrown into poverty. For others, poverty might not be an immediate threat but, unless the industry recovers quickly, many more workers will end up loosing their incomes as well. Globally, solely due to tourism disruption, 1 in every 10 workers of the industry is on the merge of losing or has lost their income.

Recovery of the tourism industry, however, is unlikely to happen quickly. First, because it will take many months until outbreaks are controlled and travel restrictions are lifted (Devlin, 2020). Second, because once people can travel, will tourists trust the industry again? After all, tourists have paid for services that were not delivered and were left with the financial loss and/or stuck abroad (Matei, 2020).

Could we have handled tourism better?

Before this pandemic, five important factors were widely known. (1) Potentially pandemic viruses emerge all the time. (2) Fatality rate of these viruses can be extremely high (up to 90% for Ebola). (3) Transmission of many viruses occurs from human to human. (4) Tourists are the disseminators of many viruses. (5) More than 330 million people economically depend on tourism. Therefore, if science is to support development, then there should be sufficient scholarly research to assist managing tourism in pre-pandemic times.

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If such research had been developed and published, scholars could have proposed, for example, the creation of a tourism emergency fund to be used to halt tourism as quickly as possible to and from regions where potentially threatening viruses emerge or re-emerge. If each tourist that travelled in 2019 had contributed an average of USD 10 each, by the time the SARS-CoV-2 emerged the fund would have had USD 15 billion. This amount would have been sufficient to quickly isolate Wuhan, and even China, for one year without causing major tourism related disturbances.

Another solution could have been holding the travel insurers accountable for their clients' losses. Airlines could equally be obliged to reschedule flights to and from infected areas as soon as there is confirmed news of a pandemic threat. Potential solutions are likely to be many, but have they been thought of in time?

Methods

This research looks into whether the scholarly literature published before the present pandemic presents reliable methods, models or parameters that could have assisted decision makers on defining how tourism should be managed during pandemic times so to avoid the current chaotic scenario.

Google Scholar was used for this analysis. This search tool was preferred over Web of Science and Scopus, because it is free and easily available to all stakeholders. Time frame for search included works published until December 2019, as this is when the outbreak started, and excluded patents and citations. Works that had paid access were also excluded, as these would not have been available to stakeholders. Only peer-reviewed publications were considered.

To select the scholarly publications for analysis, nine automated searches were undertaken on April 7, 2020. Eight were to identify publications that had on their

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titles the terms '*tourism* and *pandemic*', '*tourist* and *pandemic'*, '*travel* and *pandemic*', '*tourism'*, '*tourist*', '*pandemic'* and '*travel*'; and one to identify publications that had the terms '*travel restrictions* and *pandemic'* anywhere within the text. The first 100 titles of each of these searches, in the order retrieved by Google Scholar, were analysed. Publications that had the potential to throw light onto better managing tourism in pandemic times were selected for further analysis. By this process, 900 publications could have been analysed in this work.

Information about year of publication and number of citations were also collected, as informed by Google Scholar. The number of times a scholarly publication is cited was used as an indication of the impact the work has had on knowledge development, and the average number of citations among each topic gives an idea of the number of scholars studying similar issues. Year of publication was used to understand how the topic has been studied over time.

To test the adequacy of the terms used for searching the literature, a second examination was performed using also Google Scholar but focused on articles published from January 01, 2020 to September 01, 2020 and that had the terms '*pandemic'* and '*tourism'* or '*tourist'* or '*travel'* in their titles.

Results

Through the automated searches using articles published before the current-pandemic, no publications with the terms '*tourist* and *pandemic*' on their titles were found, only 03 were found with the terms '*tourism* and *pandemic*', and 32 with '*travel* and *pandemic*'. Comparatively, in the first nine months of the 2020-pandemic, 114 articles were published with these terms in their titles.

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Thousands of publications published up to 2019 were retrieved with the single searched terms in their titles - 137,000 for '*tourism'*, 49,400 for '*travel'*, 18,500 for '*tourist'* and 13,500 for '*pandemic'* -; however, among the 1st hundred publications of each of these searches, only 9 were selected for further analysis. These were all with the term *'pandemic*'. None of the 300 publications analysed with the terms '*tourist*', '*tourism*' and '*travel'* were related to pandemics (Table I).

The following automated search was focused on works that had anywhere along the text the terms '*travel restrictions* and *pandemic'*. Among those published before 2020, 3,080 publications were automatically retrieved. Among the 1st hundred, 47 were included for further analysis. By this process, excluding duplicates, 63 publications were selected for further analysis (Table II). These were published between 2003 and 2015 (Figure 1).

84% of the analysed publications were developed in the context of Influenza viruses, 5% of Coronaviruses, 4% of Ebola and 7% are non-specific (Table III). 43% of the analysed publications use mathematical models and equations to investigate the impact of travel on the dissemination of viruses; a similar percentage uses literature review - 25% based on scholarly literature and on 15% on policies and documents -; the remaining 17% used interviews and or other sources of primary data (Table IV).

Among the analysed publications, there is consensus that travel restrictions may delay the spread of viruses transmitted among humans. The extent of the delay related to travel restrictions depends, obviously, on the characteristics of each virus. It is also consensus that just travel restrictions cannot impede a pandemic; multiple actions need to be implemented in conjunction, for example use of masks, increased hygiene, social isolation and school closure.

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According to two of the analysed publications, the WHO had, in the past, advised countries not to implement measures that unnecessarily restrict trade and travel (Wilsonet al, 2010; Schwehm et al, 2009). By the end of February 2020, when more than 80,000 people had already been confirmedly infected and more than 4,000 had died (BBC News, 2020), the UN World Organizations of Health and of Tourism were publicly against imposing travel restrictions (WHO and WTO, 2020). The main argument against travel restriction is the related socio-economic impact.

Among these mentioned 63 publications, only three specifically address tourism management issues in the context of pandemics. One explores the level of concern and precaution among Australian-Queenslander tourists during the H1N1 2009 pandemic (Leggat et al, 2010). Using interviews, the authors found that less than 3% of the tourists had considered cancelling their trips (Leggat et al, 2010). Another of these three works also looked into this issue using Google Trends and the World Health Organization's FluNet data (Fenichel et al, 2013). They found that about 0.34% of travellers missed flights during the flu epidemics and "that people appear to respond to an epidemic by voluntarily engaging in self-protection behaviour" (Fenichel et al, 2013: 1). The third work, *An Influenza Pandemic: what it would mean for the Scottish tourism* (2006), holistically looks into the impacts of such hypothetical pandemic. Authors conclude that:

> As a result of globalised travel patterns and the speed of travel, the spread of Avian Flu and it's mutation into influenza could happen faster than one might expect, in a matter of months according to epidemiologists modelling the spatial spread of an outbreak from Asia to Europe. International travel will facilitate the spread of the disease, therefore complacency and no action would be deemed naïve and irresponsible. Therefore, the focus for VisitScotland and the Scottish tourism industry should be business continuity (Yeoman et al, 2006 : 53).

These authors recommend "to develop a business continuity strategy for Scottish tourism"; to share their findings "with other national tourism organisations through

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the World Tourism Organisation as an example of best practice"; that all tourism organisations prepare operational plans based on different scenarios; that government needs to support a national "plan for the tourism industry as the industry could 'melt down', especially small and medium enterprises"; to perform "simulation exercises to test ports/gateways that handle around 75 million tourists a year"; and to "devise a recovery strategy for Scottish tourism after the pandemic" (Yeoman et al, 2006: 53).

These publications, which focused on tourism, had been cited respectively 15, 42 and zero times. For comparison, the most cited publication with the word '*tourism*' in its title had been cited 16,523 times, and with the word '*pandemic'* 1,672 times. The most cited publication among those here analysed was cited 1,050 times (Min=0, Max=1,050, Average=79, STDV=148, Mode=56).

Discussion

When a potentially pandemic virus emerges, can science indicate the optimum moment to impose travel restrictions?

About half of the publications analysed in this research focus on answering this question. These include several mathematical models developed specifically to assist decision makers in regards to when and if they should implement travel restrictions.

These models are based on knowledge gained from previous viruses, especially Influenza. Hence, when these viruses re-emerge or similar ones emerge, the existing knowledge and models can be easily transferable and of great value.

However, when a new virus emerges, models need to be calibrated accordingly (Gronvall et al, 2006). The problem arises when the time needed to collect the information necessary for adequately calibrating existing models is longer than the

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time the virus needs to disseminate (Grais et al, 2003; Hosseini et al, 2010; Flahault et al, 2006; Gostin, 2009). Pandemic, then, occurs.

Being so and considering that a new virus might emerge with a similar dissemination path and progression of SARS-CoV-2, but with the fatality rate of Ebola, then, the logical strategy would be to halt tourism as soon as potentially harmful viruses emerge and re-emerge. Then, based on solid knowledge future decisions can be made. None of the publications analysed for this research support this argument. On the contrary, because of the socio-economic disturbance that would follow tourism interruption, travel restrictions are currently considered to be a last resort strategy.

When a potentially pandemic virus emerges, can science indicate the optimum way to manage tourism?

The main difference between problems and facts is that facts cannot be changed, while problems can. In this story, the fact that cannot be changed is that potentially pandemic viruses will randomly emerge and, by chance, some maybe harmful to society. The problem, in the context of this research, is the socio-economic system disruption that would follow tourism interruption. This is a problem, not a fact, because, with adequate mitigation strategies, disruption can, at least theoretically, be reduced.

While this is a problem with many potential solutions (e.g. creation of a global tourism fund and cooperation with travel insurers and airline companies), among the hundreds of publications analysed, only one directly addresses tourism management in a pandemic scenario. This publication, however, was published in 2006 and has never been cited. That is, on one hand, it is outdated and, on the other, it was not used for scholarly knowledge development. The other two publications related to the

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tourism problem are also outdated (2010 and 2013) and had been cited significantly less times than the other publications analysed. While the average number of citations among the publications analysed was calculated to be 79, these two publications were cited 15 and 42 times, respectively. That is, the scholarly community researching tourism management on pandemic times is extremely small.

In this context and by the 2020 crisis there was, virtually, no scientific knowledge on how to better manage tourism so to avoid a pandemic or social chaos. Hence, economic and political decisions were made blindly. The consequences are being catastrophic.

Moving forward

The SARS-CoV-2 will not annihilate humanity, therefore society will continue to evolve and so will the viruses. Being so, it can be expected that new viruses will emerge, while known ones will randomly re-emerge. While we cannot know in advance the characteristics of future outbreaks, we know they may cause great disruption and suffering to humanity, if we fail again on containing dissemination. Being so, humanity should prepare for the worst, e.g. a virus that, as the SARS-CoV-2, spreads rapidly and, as Ebola, has a high mortality rate. If such a virus emerges and society responds as amateurishly as we are responding to SARS-CoV-2, it might be the end of society as we know it. Hence, further research is necessary on multiple areas, including the development of prophylactics, of medical equipment, of hospitals and of health systems.

Due to the foreseen socio-economic negative impacts, scholarly literature published before the SARS-CoV-2 outbreak largely indicated travel restrictions as a last resource. This current outbreak, however, have proven science wrong. With hindsight,

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tourism should have been halted as soon the SARS-CoV-2 virus was discovered. At the worst, this would have slowed down geographic dissemination of the virus. Time gained could have been used to produce the medical equipment that is now so urgently needed. With the best scenario, dissemination of the virus would have been kept local. As China is slowly but steadily controlling the number of new people infected, there was a possibility, although remote, that the virus would have been eventually eliminated.

But this approach was not scholarly supported when the current outbreak started. Until now, hopes of controlling viruses were mostly focused on vaccines, which are undoubtedly necessary, but might never be available, as is the case with HIV, Dengue and Malaria. With the lessons learnt from the 2020-pandemic, scholarly perception of travel restrictions will, hopefully, change, gaining more support.

This support, however, is largely dependant on the related negative socio-economic impacts caused by travel restrictions. To alleviate these impacts, scholarly knowledge and strategies are desperately needed.

In this context and moving forward on preparing society for when a new threatening virus emerges, science needs to expand its areas of research focusing on questions such as:

- In case of new outbreaks, when should tourism be halted locally, regionally, nationally and globally?
- Who should make the decision of halting tourism?
- How can tourists and tourism entrepreneurs be fairly compensated when directly affected by potential-outbreaks?
- What should be the role and the responsibilities of airlines and travel insurers on pandemic times?

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- Is it viable to create a Tourism World Fund to immediately halt tourism when a potentially risky new strain of virus is discovered? How should it work and who should manage it?
- What do tourists and tourism entrepreneurs know about viruses and outbreaks?
- How to efficiently communicate with tourists and tourism entrepreneurs?

Also, scholarly knowledge is urgently necessary to rescue the tourism industry once current travel restrictions are lifted. This involves knowing how tourists and tourism entrepreneurs were affected, and what tourists and tourism entrepreneurs need in order to trust and invest on the tourism industry again.

Answers to these questions and many others in regards to tourism in both pre-pandemic and pandemic times are fundamental for the sustainability of the most important industry of the current era. Without these answers, humanity has very limited chances to respond well to potentially pandemic viruses.

Therefore and in light of the results here presented, we recommend that research funding agencies, universities and research centres include such questionings on their official agenda, and that these questions are analysed by multidisciplinary groups, including not only tourism experts, but also and among others economists, managers, physicians, psychologists and mathematicians. These would allow that, when the next virus emerges, sound scientific knowledge is readily available and can be used by decision makers to implement well-informed strategies in regards to tourism during pandemic times.

References

Ahmad, A., Krumkamp, R., Richardus, J., and Reintjes, R. (2009) Prevention and control of infectious diseases with pandemic potential: the EU-project SARSControl. Europe PMC, 71 (6), pp. 351-357.

Aiello, A., Coulborn, R., Aragon, T., (2010) Research findings from nonpharmaceutical intervention studies for pandemic influenza and current gaps in the research. American Journal of Infection Control, 38 (4), pp. 251-258.

Aledort, J., Lurie, N., Wasserman, J., and Bozzette, S. (2007) Non-pharmaceutical public health interventions for pandemic influenza: an evaluation of the evidence base. BMC Public Health, 7, pp. 1-9.

Allianz (2020) Information for Travel insurance policy holders regarding COVID-19. FAQs for Travel Insurance COVID-19 from (Coronavirus), 17 April, https://www.allianz.com.au/travel-insurance/covid19-faq/

Amarato, S. (2020) Lacking beds, masks and doctors, Europe's health services struggle to cope with the coronavirus. CNBC, 3 April, https://www.cnbc.com/2020/04/03/coronavirus-italy-spain-uk-health-services-struggle-to-cope.html, accessed 15 April 2020.

Amos, O. (2020 3-April) Coronavirus: Where will be the last place to catch Covid-19? BBC News, 3 April, https://www.bbc.com/news/world-52120439, accessed 15 April 2020.

Apolloni, A., Poletto, C., and Colizza, V. (2013) Age-specific contacts and travel patterns in the spatial spread of 2009 H1N1 influenza pandemic. BMC Infectious Disseases, 13 (176), pp. 1-18.

 doi:10.20944/preprints202010.0487.v1

Araz, O., Fowler, J., Lant, T., and Jehn, M. (2009) A pandemic influenza simulation model for preparedness planning. Proceedings of the 2009 Winter Simulation Conference (WSC), Austin, TX, USA, pp. 1986-1995.

Bajardi, P., Poletto, C., Ramasco, J., Tizzoni, M., Colizza, V., and Vespignani, A. (2001) Human Mobility Networks, Travel Restrictions, and the Global Spread of 2009 H1N1 Pandemic. PLoS ONE, 6 (1), pp. 1-8.

Balinska, M., and Rizzo, C. (2009) Behavioural responses to influenza pandemics: What do we know? PLoS Currents, 9 (1), pp. 1-8.

BBC News. (2020) Coronavirus pandemic: Tracking the global outbreak. BBC, 13 April, https://www.bbc.com/news/world-51235105, accessed 14 April 2020.

BBC News. (2020) 'Tsunami' da miséria: coronavírus pode empurrar meio bilhão para a pobreza. BBC, 09 April, https://www.bbc.com/news/world-51235105, accessed 09 April 2020.

BBC News. (2020 09-Jan) Wuhan pneumonia outbreak: Mystery illness 'caused by coronavirus'. BBC News, 09 January, https://www.bbc.com/news/world-asia-china-51047576, accessed 11 September 2020.

Becker, E. (2020) How hard will the coronavirus hit the travel industry? National Geographic, 02 April, https://www.nationalgeographic.com/travel/2020/04/how-coronavirus-is-impacting-the-travel-industry/https://www.nationalgeographic.com/travel/2020/04/how-coronavirus-is-impacting-the-travel-industry/, accessed 15 April 2020.

Borges, A. (2020) Repatriação é esperada por 5.485 brasileiros retidos em 82 países. UOL Notícias, 15 April, https://noticias.uol.com.br/ultimas-noticias/agencia-

 doi:10.20944/preprints202010.0487.v1

estado/2020/04/15/repatriacao-e-esperada-por-5485-brasileiros-retidos-em-82-paises.htm?cmpid=copiaecola, accessed 17 April 2020.

Brownstein, J., Wolfe, C., and Mandl, K. (2006) Empirical Evidence for the Effect of Airline Travel on Inter-Regional Influenza Spread in the United States. PLoS Medicine, 3, pp. 1826 - 1835.

Bunting, C. (2008) Pandemic flu: Are we properly prepared? Public Health, 122 (6), pp. 591-596.

Burke, J., and Okiror, S. (2020) Africa's fragile health systems rush to contain coronavirus. The Guardian, 20 March, https://www.theguardian.com/world/2020/mar/20/africas-fragile-health-systems-rush-to-contain-coronavirus, accessed 12 April 2020.

Caley, P., Becker, N., and Philp, D. (2007) The Waiting Time for Inter-Country Spread of Pandemic Influenza. PLOS One, 2 (1), pp. 1-8.

Camitz, M., and Liljeros, F. (2006) The effect of travel restrictions on the spread of a moderately contagious disease. BMC Medicine volume, 4, pp. 1-10.

CDCP, Centers for Disease Control and Prevention. (2020a) 1918 Pandemic (H1N1 virus), 10 April, https://www.cdc.gov/flu/pandemic-resources/1918-pandemic-h1n1.html, accessed 15 April 2020.

CDPC, Centers for Disease Control and Prevention (2020b) Human Coronavirus Types, 15 April, https://www.cdc.gov/coronavirus/types.html, accessed 16 April 2020.

Chimu Adventures. (2020 20-Mar) COVID-19 Travel Policy, 20 March, https://www.chimuadventures.com/en-au/covid-19, accessed 17 April 2020.

Chong, K., and Zee, B. (2012) Modeling the impact of air, sea, and land travel restrictions supplemented by other interventions on the emergence of a new influenza pandemic virus. BMC Infectious Diseases, 12, p. 309.

Condon, B., and Sinah, T. (2009) Chronicle of a Pandemic Foretold: Lessons from the 2009 Influenza Epidemic. SSRN, May, pp. 1-45.

CRS, Congressional Research Service (2020) Global Economic Effects of COVID-19, https://fas.org/sgp/crs/row/R46270.pdf, accessed 17 April 2020.

Davidson, H. (2020) China reports zero daily deaths from coronavirus for the first time since January. The Guardian, 07 April, https://www.theguardian.com/world/2020/apr/07/china-reports-zero-daily-deaths-from-coronavirus-for-the-first-time-since-january, accessed 15 April 2020.

Decolar.com (2020) Como cancelo minha reserva? https://www.decolar.com/ajuda/alteracoes-e-cancelamentos/como-cancelo-minha-reserva_DMzc, accessed 17 April 2020.

Devlin, H. (2020) Coronavirus distancing may need to continue until 2022. The Guardian, 14 April, https://www.theguardian.com/world/2020/apr/14/coronavirus-distancing-continue-until-2022-lockdown-pandemic, accessed 15 April 2020.

Doherty, B. (2020a) 'I just want to go home': thousands of Australians stranded overseas amid coronavirus chaos. The Guardian, 18 March, https://www.theguardian.com/world/2020/mar/18/i-just-want-to-go-home-thousands-of-australians-stranded-overseas-amid-coronavirus-chaos, accessed 14 April 2020.

Doherty, B. (2020b) Qantas slashes flights as coronavirus hits passenger numbers. The Guardian, 10 March, https://www.theguardian.com/business/2020/mar/10/qantas-slashes-flights-as-coronavirus-hits-passenger-numbers, accessed 15 April 2020.

Domingo, E., and Perales, C. (2020) Virus Evolution. Wiley Online Library, https://onlinelibrary.wiley.com/doi/epdf/10.1002/9780470015902.a0000436.pub3, accessed 10 April 2020.

Eichner, M., Schwehm, M., Wilson, N., and Baker, M. (2009) Small islands and pandemic influenza: Potential benefits and limitations of travel volume reduction as a border control measure. BMC Infectious Diseases, 9 (160), pp. 1-5.

Enserink, M. (2006) Ground the Planes During a Flu Pandemic? Studies Disagree. Science, 313, p. 1555.

Epstein, J., Goedecke, D., Yu, F., Morris, R., Wagener, D., and et al.(2007) Controlling Pandemic Flu: The Value of International Air Travel Restrictions. PLoS ONE, 2 (5), pp. 1-11.

Evans, A., and Thibeault, C. (2009) Prevention of Spread of Communicable Disease by Air Travel. Aviation, Space, and Environmental Medicine, 80 (7), pp. 601-602.

Fenichel, E., Kuminoff, N., and Chowell, G. (2013) Skip the Trip: Air Travelers' Behavioral Responses to Pandemic Influenza. PLOS one, 8 (3), pp. 1-10.

Flahault, A., Vergu, E., Coudeville, L., and Grais, R. (2006) Strategies for containing a global influenza pandemic. 24 (44-46), pp. 6751-6755.

Forterre, P. (2006) The origin of viruses and their possible roles in major evolutionary transitions. Virus Research, 117 (1), pp. 5-16.

Germann, T., Kadau, K., Longini, I., and Macken, C. (2006) Mitigation strategies for pandemic influenza in the United States. Proceedings of the National Academy of Sciences of the USA, 103 (15), pp. 5935-5940.

Goedecke, D., Bobashev, G., and Yu, F. (2007) A stochastic equation-based model of the value Of international air-travel restrictions for controlling pandemic flu. Winter Simulation Conference, pp. 1528-1542.

Google Scholar. (2020) Pandemic. Results of automated search, https://scholar.google.com/scholar?as_vis=1andq=pandemicandhl=enandas_sdt=0,5andas_yhi=2019, accessed on 05 April 2020.

Gopinath, G. (2020) The Great Lockdown: Worst Economic Downturn Since the Great Depression. International Monetary Fund Blog, https://blogs.imf.org/2020/04/14/the-great-lockdown-worst-economic-downturn-since-the-great-depression/, accessed 14 April 2020.

Gostin, L. (2009) Influenza A(H1N1) and Pandemic Preparedness Under the Rule of International Law. JAMA, 10, pp. 1-8.

Grais, R., Ellis, J., and Glass, G. (2003) Assessing the impact of airline travel on the geographic spread of pandemic influenza. European Journal of Epidemioly, 18, pp. 1065–1072.

Gronvall, G., Waldhorn, R., and Henderson, D. (2006) The Scientific Response to a Pandemic. PLoS Pathogens, 2 (2), pp. 1-8.

Guo, D. (2007) Visual analytics of spatial interaction patterns for pandemic decision support. 21 (8), pp. 1-8.

Gustafson, R. (2007) Pandemic influenza: Public health measures. BC Medical journal, 49 (5), pp. 254-.

Hosseini, P., Sokolow, S., Vandegrift, K., Kilpatrick, A., and Daszak, P. (2010) Predictive Power of Air Travel and Socio-Economic Data for Early Pandemic Spread. Plos One, 5 (9), pp. 1-8.

 doi:10.20944/preprints202010.0487.v1

ILO, International Labour Organization (2016) Sustainable tourism: A driving force of job creation, economic growth and development. 17 May, https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_480824/lang--en/index.htm, accessed 16 April 2020.

Inglesby, T., Nuzzo, J., O'Toole, T., and Henderso, D. (2006) Disease Mitigation Measures in the Control of Pandemic Influenza. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, 4 (4), pp. 1-8.

Jauréguiberry, S., Boutolleau, D., Grandsire, E., Kofman, T., Deback, C., AÏt-Arkoub, Z., et al.(2012) Clinical and Microbiological Evaluation of Travel-Associated Respiratory Tract Infections in Travelers Returning From Countries Affected by Pandemic A(H1N1) 2009 Influenza. Journal of Travel Medicine, 19 (11), pp. 22-27.

Juckett, G. (2006) Avian Influenza: Preparing for a Pandemic. American Family Physician, 74 (5), pp. 783-790.

Kim, S., Lee, S., and Choi, B. (2008) A review of mathematical models and strategies for Pandemic Influenza Control. Epidemiology and Health, 30 (2), pp. 156-157.

Lee, V., Lye, D., and Wilder-Smith, A. (2009) Combination strategies for pandemic influenza response - a systematic review of mathematical modeling studies. BMC Medicine, 7, pp. 1-8.

Leggat, P., Brown, L., and Speare, R. (2010) Level of Concern and Precaution Taking Among Australians Regarding Travel During Pandemic (H1N1) 2009: Results From the 2009 Queensland Social Survey. Journal of Travel Medicine, 17 (5), pp. 291-295.

Leslie, T., Gourlay, C., Byrd, J., Hanrahan, C., Elvery, S., Liddy, M. (2020) What we can learn from the countries winning the coronavirus fight. ABC, 13 April

 doi:10.20944/preprints202010.0487.v1

https://www.abc.net.au/news/2020-03-26/coronavirus-covid19-global-spread-data-explained/12089028, accessed 15 April 2020.

Lugnér, A., and Postma, M. (2014) Mitigation of pandemic influenza: review of cost–effectiveness studies. Expert Review of Pharmacoeconomics and Outcomes Research, Jan, pp. 547-558.

MacKellar, L. (2007) Pandemic Influenza: A Review. Population and Development Review, 33 (3), pp. 429-451.

Mackey, T., and Liang, B. (2012) Lessons from SARS and H1N1/A: Employing a WHO–WTO forum to promote optimal economic-public health pandemic response. Journal of Public Health Policy, 33, pp. 119-130.

Matei, A. (2020 14-April) Should passengers return to cruise ships after the pandemic? No. The Guardian 14 April 2020, https://www.theguardian.com/commentisfree/2020/apr/14/cruise-ships-coronavirus-passengers-future?CMP=Share_AndroidApp_Gmail, accessed 15 April 2020.

Mateus, A., Otete, H., Beck, C., Dolanc, G., and Nguyen-Van-Tam, J. (2014) Effectiveness of travel restrictions in the rapid containment of human influenza: a systematic review. Systematic Reviews, 92, pp. 868-880.

McLafferty, S. (2010) Placing Pandemics: Geographical Dimensions of Vulnerability and Spread. Eurasian Geography and Economics, 51 (2), pp. 143-161.

McLeod, M., Kelly, H., Wilson, N., and Baker, M. (2008) Border control measures in the influenza pandemic plans of six South Pacific nations: a critical review. The New Zealand Medical Journal, 121 (1278), pp. 62-72.

Mniszewski, S., Valle, S., Stroud, P., Riese, J., and Sydoriak, S. (2008 April) EpiSimS simulation of a multi-component strategy for pandemic influenza. SpringSim, pp. 556-563.

Moon, S., Sridhar, D., Pate, M., and et al.(2015) Will Ebola change the game? Ten essential reforms before the next pandemic. The report of the Harvard-LSHTM Independent Panel on the Global Response to Ebola. The Lancet, 386 (10009), pp. 2204-2221.

Mounier-Jack, S., and Coker, R. (2006) How prepared is Europe for pandemic influenza? Analysis of national plans. The Lancet, 367 (9520), pp. 1405-1411.

Mounier-Jack, S., Jas, R., and Coker, R. (2007) Progress and shortcomings in European national strategic plans for pandemic influenza. Bulletin of the World Health Organization, 85, pp. 923–929.

Mukherjee, P., Lim, P. L., Chow, A., Barkham, T., Seow, E., Win, M. K., et al.(2010) Epidemiology of Travel-associated Pandemic (H1N1) 2009 Infection in 116 Patients, Singapore. Emerging Infectious Diseases, 16 (1), pp. 21-26.

NBS, National Bureau of Statistics of China (2020) Tourism. http://data.stats.gov.cn/english/easyquery.htm?cn=C01, accessed 15 April 2020.

NIAID, National Institute of Allergy and Infectious Diseases (2020) Coronaviruses. https://www.niaid.nih.gov/diseases-conditions/coronaviruses, accessed 15 April 2020.

OECD, Organisation for Economic Co-operation and Development (2020) Domestic Tourism. https://stats.oecd.org/Index.aspx?DataSetCode=TOURISM_DOMESTIC, accessed 15 April 2020.

Oenney, J. (2020) U.S. got more confirmed "index cases" of coronavirus from Europe than from China. The Intercept, 13 April, https://theintercept.com/2020/04/12/u-s-got-

 doi:10.20944/preprints202010.0487.v1

more-confirmed-index-cases-of-coronavirus-from-europe-than-from-china/, accessed 14 April 2020.

Oshitani, H. (2006) Potential benefits and limitations of various strategies to mitigate the impact of an influenza pandemic. Journal of Infection and Chemotherapy, 12, pp. 167-171.

Park, S. (2020) Epidemiology, virology, and clinical features of severe acute respiratory syndrome -coronavirus-2 (SARS-CoV-2; Coronavirus Disease-19) Clinical and Experimental Pediatrics, forthcoming.

Parvez, M., and Parveens, S. (2017) Evolution and Emergence of Pathogenic Viruses: Past, Present, and Future. Intervirology, 60, 1-7.

Pestre, V., Morel, B., Encrenaz, N., Brunon, A., Lucht, F., Pozzetto, B., et al.(2012) Transmission by super-spreading event of pandemic A/H1N1 2009 influenza during road and train travel. Scandinavian Journal of Infectious Diesases, 44 (3), pp. 225-227.

Pike, J., Bogich, T., Elwood, S., Finnoff, D., and Daszak, P. (2014) Economic optimization of a global strategy to address the pandemic threatPNAS. Proceedings of the National Academic Studies of the USA, 111 (52), pp. 18519-18523.

Poletto, C., Gomes, M., Piontti, A., and Rossi, L. (2015) The Revised International Health Regulations: A Framework for Global Pandemic Response. Assessing the impact of travel restrictions on international spread of the 2014 West African Ebola epidemic, 19 (42), pp. 1-8.

Postma, M. (2014) Dynamic modeling for pandemic influenza. expert Review of Vaccines, 11 (12), pp. 543-546.

Rashid, H., Ridda, I., King, C., Begun, M., Tekin, H., Wood, J., et al.(2015) Evidence compendium and advice on social distancing and other related measures for response to an influenza pandemic. Paediatric Respiratory Reviews, 16.

Sanche, S., Lin, Y., Xu, C., Romero-Severson, E., Hengartner, N., and Ke, R. (2020) High Contagiousness and Rapid Spread of Severe Acute Respiratory Syndrome Coronavirus 2. Emerging Infectuous Diseases, 26 (7), 1-8.

Schwehm, M., Eichner, M., Wilson, N., and Baker, M. (2009) A freely available software tool for assessing aspects of pandemic influenza risk reduction for small islands. The New Zealand Medical Journal, 122, p. 94.

Sellwood, C., Asgari-Jirhandeh, N., and Salimee, S. (2007) Bird flu: if or when? Planning for the next pandemic. Postgraduate Medical journal, 83 (981).

Sharp, P. (2002) Origins of Human Virus Diversity. Cell, 108 (3), pp. 305-312.

Shi, P., Keskinocak, P., Swann, J., and Lee, B. (2010) The impact of mass gatherings and holiday traveling on the course of an influenza pandemic: a computational model. BMC Public Health, 10, pp. 1-8.

Sinay, L. (2008) Brisbane, Queensland, Australia: Modelling and forecasting culturaland environmental changes.

Sinay, L., Sinay, M., Carter, R., and Martins, A. (2019) Who is Writing the Science behind the Management of Protected Areas? Annals of Ecology and Environmental Science, 3, 18-24.

Sinay, Sinay, M., Carter, R., and Braga, I. (2020) International Journal of Social Science and Human Research, 3 (2), 1-20.

Sinay, Sinay, M., Carter, R., and Martins, A. (2019) (R. a. Garfield, Ed.) RAUSP: Revista de Administração da Universidade de São Paulo, 54 (4), 548-549.

SMH, The Sydney Morning Herald. (2020 9-January) Report says mystery illnesses may be from new coronavirus. The Sydney Morning Herald, 09 January, https://www.smh.com.au/world/asia/report-says-mystery-illnesses-may-be-from-new-coronavirus-20200109-p53q4x.html, accessed 09 January 2020.

Statista. (2020a) Number of flights performed by the global airline industry from 2004 to 2020, 10 March, https://www.statista.com/statistics/564769/airline-industry-number-of-flights/, accessed 15 April 2020.

Statista. (2020b 22-Jan) Number of outbound journeys of Chinese tourists from 2008 to 2018, 22 January 2020, https://www.statista.com/statistics/277250/number-of-outbound-journeys-of-chinese-tourists/, accessed 17 April 2020.

Tatsuo, H., Ono, N., Tanaka, K., and Yanagi, Y. (2000) SLAM (CDw150) is a cellular receptor for measles virus. Nature.

Tondo, L. (2020 10-Mar) Italian hospitals short of beds as coronavirus death toll jumps. The Guardian, 10 March, https://www.theguardian.com/world/2020/mar/09/italian-hospitals-short-beds-coronavirus-death-toll-jumps, 16 April 2020.

Tuite, A., Ng, V., and Tisman, D. (Forthcoming) Estimation of COVID-19 outbreak size in Italy. The Lancet, doi: https://doi.org/10.1016/S1473-3099(20)30227-9

Tuncer, N., and Le, T. (2014) Effect of air travel on the spread of an avian influenza pandemic to the United States. International Journal of Critical Infrastructure Protection, 7 (1), pp. 27-47.

Wang, L., Zhang, Y., Huang, T., and Li, X. (2012) Estimating the value of containment strategies in delaying the arrival time of an influenza pandemic: A case study of travel restriction and patient isolation. Physical Review, 86 (3), pp. 1-8.

Warrena, A., Bell, M., and Budd, L. (2010) Airports, localities and disease: Representations of global travel during the H1N1 pandemic. 16 (4), pp. 727-735.

Watanabe, Y., Ibrahim, M., and Ikuta, K. (2013) Evolution and control of H5N1. EMBO reports, 14 (2), 117-122.

WHO, World Health Organization (2006) Nonpharmaceutical Interventions for Pandemic Influenza, National and Community Measures. World Health Organization Writing Group: Emerging Infectuous Diseases, 12 (1), pp. 88-94.

WHO, World Health Organization (2019) Measles. 05 December, https://www.who.int/news-room/fact-sheets/detail/measles, accessed 15 April 2020.

WHO, World Health Organization (2020a) WHO Director-General's opening remarks at the media briefing on COVID-19. 11 March 2020, https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020, accessed 05 April 2020.

WHO, World Health Organization (2020b) Ebola virus disease. https://www.who.int/health-topics/ebola#tab=tab_1, accessed 10 April 2020.

WHO, World Health Organization (2020c) FAQs: H5N1 influenza. https://www.who.int/influenza/human_animal_interface/avian_influenza/h5n1_research/faqs/en/, accessed 12 April 2020.

WHO, World Health Organization (2020d) WHO Statement regarding cluster of pneumonia cases in Wuhan, China. https://www.who.int/china/news/detail/09-01-2020-who-statement-regarding-cluster-of-pneumonia-cases-in-wuhan-china, accessed 15 April 2020.

WHO, World Health Organization (2020e) SARS (Severe Acute Respiratory Syndrome). https://www.who.int/ith/diseases/sars/en/, accessed 14 April 2020.

WHO, World Health Organization (2020f) Coronavirus disease 2019 (COVID-19): Situation Report – 73. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200402-sitrep-73-covid-19.pdf?sfvrsn=5ae25bc7_2, accessed 15 April 2020.

WHO, World Health Organization (2020f) Emergencies preparedness: Frequently asked questions on Middle East respiratory syndrome coronavirus (MERS-CoV). https://www.who.int/csr/disease/coronavirus_infections/faq/en/, accessed 15 April 2020.

WHO, World Health Organization (2020g) QandA on coronaviruses (COVID-19), https://www.who.int/news-room/q-a-detail/q-a-coronaviruses, accessed 15 April 2020.

WHO, World Health Organization, and WTO, World Tourism Organization (2020), A Joint Statement on Tourism and COVID-19 - UNWTO and WHO Call for Responsibility and Coordination, 27 February, https://www.who.int/news-room/detail/27-02-2020-a-joint-statement-on-tourism-and-covid-19---unwto-and-who-call-for-responsibility-and-coordination, accessed 16 April 2020.

Wilson, K., Brownstein, J., and Fidler, D. (2010) Strengthening the International Health Regulations: lessons from the H1N1 pandemic. Health Policy and Planning, 25, pp. 505-509.

Wood, J., Zamani, N., MacIntyre, C., and Becker, N. (2007) Effects of Internal Border Control on Spread of Pandemic Influenza. Emerging Infectious Diseases, 13 (7), pp. 1038-1045.

Woolhouse, M., Scott, F., Hudson, Z., Howey, R., and Chase-Topping, M. (2012) Human viruses: discovery and emergence. Philosophical Transactions, 367 (1604), pp. 2864–2871.

WTO, World Tourism Organization. (2020a) International Tourism Growth Continues to Outpace the Global Economy. https://www.unwto.org/international-tourism-growth-continues-to-outpace-the-economy, accessed 14 April 2020.

WTO, World Tourism Organization. (2019) International Tourism Highlights: 2019 Edition. https://www.e-unwto.org/doi/pdf/10.18111/9789284421152, accessed 15 April 2020.

WTTC, World travel and Tourism Council. (2020a) China: 2020 Annual Research: Key Highlights. file:///Users/admin/Downloads/China2020.pdf, accessed 15 April 2020

WTTC, World travel and Tourism Council. (2020b) Economic Impact Report. https://wttc.org/Research/Economic-Impact, accessed 15 April 2020.

Yeoman, I., Page, S., Connell, J., Walker, L., and Munro, C. (2006) An Influenza Pandemic - What it Could Mean for Scottish Tourism. Quarterly Economic Commentary, 30 (4), 47-54.

 doi:10.20944/preprints202010.0487.v1

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