

Research Article**Impact of Urbanization on Public Health**Peter F. Lang¹¹. Birkbeck College, University of London.**ABSTRACT:**

This work shows the consequence of increased urbanization on the impact of pandemics and infectious diseases on public health especially in inner city areas. It demonstrates that the Covid-19 pandemic impacts particularly on large cities and urban areas. There have been many pandemics throughout history and they occurred mainly in cities. Mortality rates show vaccines are not 100% effective against all variants. The trend in increasing urbanization enhances the probability of more serious pandemics in the future with disparity against lower income inhabitants in inner cities. This work discusses ways which public health can be improved.

Keywords: Urbanization, Infection, Public Health. Pandemic

INTRODUCTION

Infection is the invasion and establishment of a pathogen in tissues of its host. Such pathogens can be bacteria, fungi, protozoa, metazoa or viruses. Many infections are communicable. Under favourable conditions some infections can develop into epidemics/pandemics. Viruses, which account for 60% of infectious diseases, are most malignant. Host cells do have some molecular constraints on virus attack. However, viruses have many evasion strategies against the host enabling them to take over cells/tissues of the host (Shors, 2016).

Throughout history pandemics have occur from time to time. There are various sources of disease such as flu, cholera etc. which caused epidemics/pandemics. The plague was a common cause of pandemics in history. The plague in 430 B.C. in Greece (Thucydides, 1972) was described as particularly virulent. The plague known as the Black Death was so deadly that many areas were depopulated and in many cities over a third of the population were killed off (Porter, 2009). The 1918-1920 Spanish flu was most deadly flu pandemic. Serious outbreaks of flu occurred in nearly every inhabited part of the world.

The COVID-19 pandemic is the first global pandemic where there was an effective vaccine (Voysey et al., 2020) which prevented it being more disastrous. There was comprehensive data on the

speed of Covid-19 spreading and mortality rate. Some planners proposed a "15-minute city" where all daily living amenities within a 15-minute walking/cycling trip (Vlahov et al., 2024). The long-term impacts of COVID-19 on green infrastructure was examined (Mell, 2024). The disequilibrium highlighted the lack of free to access high quality and multi-functional spaces in urban areas. The importance of reducing inequalities in housing is becoming important to health due to demographic and climate change (Clifford et al., 2024).

There is sufficient data on the pandemic to demonstrate the consequence on health due to unrestricted growth of towns and cities with the probability of frequent and more lethal pandemics in future. This work also aims to stimulate debate and further studies on the importance of public health in local planning.

MATERIALS AND METHOD

To illustrate that urbanisation impacts local health, this work requires data on percentage of population infected, mortality rates, urban population, size of cities, number of large cities and population of the largest city in each country. Unlike earlier pandemics which had little data, Covid-19 data for this work can be obtained from the World Health Organization which publishes Situation Reports on daily and cumulative infection cases from the time

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the first infection was reported, daily deaths and cumulative deaths by country up to August 2020. From August 2020 the World Health Organization only reported cumulative infections and deaths per hundred thousand population. It also reports percentage of the population by country that is fully vaccinated (World Health Organization, 2023). The World Bank publishes data on the percentage urban population by country (World Bank, 2024). The World Population Review publishes data on the population of all major cities (World Population Review, 2024). Harper Collins publishes a comprehensive atlas with surface areas of all countries (Collins, 2020).

Percentage of population infected and mortality rate are calculated by data from the World Health Organization and World Bank. Data from the World Population Review show the number cities in each country which have populations over a million. Similar countries are grouped together to show any correlation between percentage of urban population, number of cities over a million population and percentage of the population infected.

Population density does not show the effect of urbanisation on the pandemic. For example, the population density of Australia and Cambodia are 3.3 and 93.6 respectively. But these figures don't show that 86% and 25% respectively of the population of these two countries live in urban areas.

Australia has five large cities whereas Cambodia has only one large city.

Mortality rate can show whether Covid-19 is a lethal pandemic. During the first six months of the pandemic the number of deaths caused by the pandemic was small but increased rapidly. The mortality rate changed from day to day and there seems to be no stable rate. For example, the Covid-19 mortality rate in the UK at 8th August, 6th September and 4th October 2020 were respectively 15.1%, 12.1% and 8.8%. Hence, it is not meaningful to use such values to determine the mortality rate. The mortality rates for individual countries that have stayed fairly constant for a considerable amount of time is used in this work.

Data on specific countries are shown in six tables. Data including the name and population of the largest city, percentage of urban population, the number of cities with a population of over 1 million, the percentage of population infected by Covid-19, mortality rate and percentage of the population fully vaccinated are shown.

Spain, UK, France and Germany are all industrialised with fairly similar percentage of urban population. Table 1. shows there is a correlation between the number of large cities (population over 1 million) and the percentage of the population infected.

Table 1. Countries Group 1 (Spain, UK, France, Germany)

Country	Spain	UK	France	Germany
Largest city	Madrid	London	Paris	Berlin
Population of largest city (M)	6.8	9.7	11.2	3.6
% Urban population	81	84	81	78
Nr of cities over 1million population	3	4	6	4
% Of population infected by Covid	28.9	35.8	56.6	45.0
Mortality rate (%)	0.9	0.8	0.4	0.4
% Of population fully vaccinated	79.9	74.6	78.9	76.4

In Table 2, Netherlands, Sweden, Norway, Belgium are similar countries all situated towards the North

West of Europe and all have a high per capita GDP and highly industrialized.

Table 2 Countries Group 2 (Netherlands, Sweden, Norway, Belgium)

Country	Netherlands	Sweden	Norway	Belgium
Largest city	Amsterdam	Stockholm	Oslo	Brussels
Population of largest city (M)	1.2	1.7	1.1	2.1

% Urban population	93	88	83	98
Nr of cities over 1million population	1	1	1	2
% Of population infected by Covid	48.9	25.7	27.3	40.2
Mortality rate (%)	0.3	0.8	0.3	0.7
% Of population fully vaccinated	68.7	71.4	75.6	79.5

Both Netherlands and Belgium have a higher percentage urban population. Belgium is a special case because Brussels is a large city, bigger than Stockholm and Oslo and is the headquarters of the European Union with more commercial and

administrative activities than many cities of similar size and Rotterdam is a major port. Sweden and Norway, where there are no mega cities, have lower percentage of the population infected compared to the Netherlands and Belgium.

Table 3: Countries Group 3 (Thailand, Vietnam, Cambodia, Singapore)

Country	Thailand	Vietnam	Cambodia	Singapore
Largest city	Bangkok	Ho Chi Min City	Phnom Penh	Singapore
Population of largest city (million)	11.1	9.3	2.3	6.2
% Urban population	52	38	25	100
Nr of cities over 1million population	6	6	1	1
% Of population infected by Covid	6.7	11.7	0.8	40.3
Mortality rate (%)	0.7	0.4	2.2	0.1
% Of population fully vaccinated	77.3	87.9	87.3	87.4

In Table 3, Thailand, Vietnam, Cambodia, Singapore are all situated close to each other in South East Asia. Thailand, Vietnam and Cambodia have small urban population and have a smaller percentage of the population infected. In particular, Cambodia has

the least urban population and compared to Thailand and Vietnam has the lowest percentage of the population infected. Singapore, which is a city state, compared with the rest of the group has the highest percentage of the population infected.

Table 4 Countries Group 4 (South Africa, Zambia, Mozambique, Morocco)

Country	South Africa	Zambia	Mozambique	Morocco
Largest city	Johannesburg	Lusaka	Maputo	Casablanca
Population of largest city (M)	6.2	3.2	1.1	3.9
% Urban population	68	45	38	64
Nr of cities over 1million population	6	1	2	3
% Of population infected by Covid	6.7	1.8	0.7	3.4
Mortality rate (%)	2.5	1.2	1.0	1.3
% Of population fully vaccinated	35.5	46.4	59.6	63.7

Table 4 shows countries in Africa (South Africa, Zambia, Mozambique, Morocco). It is not surprising that South Africa, which has the most

number large cities and a highest percentage urban population has the highest percentage of the population infected.

Table 5 Countries Group 5 (Japan, Australia, U.S.A., Canada)

Country	Japan	Australia	U.S.A.	Canada
Largest city	Tokyo	Melbourne	New York	Toronto
Population of largest city (M)	37.1	5.2	9.0	6.4
% Urban population	92	86	83	82

Nr of cities over 1million population	8	5	11	6
% Of population infected by Covid	22.9	42.9	30.0	11.7
Mortality rate (%)	0.2	0.1	1.1	1.1
% Of population fully vaccinated	81.4	84.9	68.3	82.8

Table 5 shows Japan, Australia, U.S.A. and Canada which borders the Pacific and all highly industrialized. Japan has a very different culture from the rest of the group and right at the start of the pandemic imposed severe infection prevention measures and hence has a low percentage of infection. Australia has a highest percentage of urban population than the US and Canada has a

highest percentage of infection and contrast to Canada which has the lowest percentage urban population has the lowest percentage infection. Chile, Uruguay, Cuba, Argentina in Table 6, as with other groups, show that the percentage of population infected correlates closely with the percentage of urban population.

Table 6 Countries Group 6 (Chile, Uruguay, Cuba, Argentina)

Country	Chile	Uruguay	Cuba	Argentina
Largest city	Santiago	Montevideo	Havana	Buenos Aires
Population of largest city (M)	6.9	1.8	2.1	15.4
% Urban population	88	96	77	92
Cities over 1million population	2	1	1	5
% Of population infected by Covid	26.3	29.0	9.8	21.6
Mortality rate (%)	0.7	0.7	0.8	1.3
% Of population fully vaccinated	92.5	83.3	88.3	83.7

Data on the tables demonstrate that the urban population is more susceptible to infection and countries which have no, or fewer, large cities have a lower percentage of infection. The tables also show that mortality rate correlates with the percentage of the population vaccinated.

RESULTS AND DISCUSSION

Up to the 19th century, over 90% of the population lived off the land (Epstein, 2009). This changed with the coming of the Industrial Revolution (Hobsbawm, 1962). which gave birth to large scale manufacturing and populations of towns and cities grew rapidly. At the end of the 19th century Europe was thriving on the scale of massed populations, dwelling in cities, industrial centers and large towns (Ramm, 1984).

Since the beginning of the twentieth century the number of cities and their size continue to increase. The Department of Economics and Social Affairs of the United Nations projected the growth of the world's urban population on all continents would be much bigger than all previous centuries (Department of Economics and Social Affairs, United Nations, 1969). Past pandemics affected cities and urban areas much more than rural areas and the tables above demonstrate that the Covid pandemic is no exception. Before the successful development of a vaccine and mass vaccination was made available in many countries the global mortality rate remained above 2% from December 2020 to July 2021. The global number of infections reported by the World Health Organisation at the beginning of 2023 was 656 million. Assuming there is no vaccine, 2.2% of 656 million is about 14.4 million deaths. Urbanization is a factor of the pandemic (Lang,

2022) and politics and decisions made by politicians is another factor (Nehring et al., 2021). The probability is that there will be more and serious pandemics in future. In the 20th century there were no less than 4 disastrous influenza pandemics with other less serious influenza epidemics (Glezen, 1996). Hence, local planning and management needs take account of probability of future pandemics.

The above discussion and results in tables 1 to 6 show that large cities and urbanization enhances the transmission of infectious diseases and amplifies the probability of epidemics and pandemics. Opportunities for disease transmission increase exponentially in an urban environment (Hardt, 2016).

Global warming also increases the risks of diseases transmission such as the dengue fever spreading from tropical and subtropical regions. To reduce the risk of harmful consequences of pandemics, the increase of urbanization especially growth of large cities has to be limited and where possible this trend has to stop. There needs to be a political will to improve urban health not just for the sake of economic growth. Health authorities have to work with government to reduce air borne pollution which are factors enhancing epidemics/pandemics (World Health Organization, 2018) (Gupta et al., 2021).

Improving cities can be achieved by a combination of ways. Improved housing reduces the inequalities between rich and poor. The government can encourage development of new housing estates away from large cities. People can be enticed to occupy these estates by a cap on rent or very low interest mortgages with agreements that the occupants have to live in them for a certain number of years. Secondly, the road network has to be improved with dedicated bus lanes and or lanes for

cars with at least two or more occupants. Other forms of public transport, including trains and/or trams, have to be improved so that part of the population that is living in rural/semi-rural areas or new housing estates can easily be transported to their place of work. The working population living these areas can be offered discount bus and/or rail fares. Businesses should be encouraged to provide company transport for employees to travel to (and from) large commercial/industrial sites. This way, buildup of large cities can be delayed. Encouragement of home working can also reduce the population that have to live in cities and makes the environment more healthy. By delaying the buildup of large cities incidences of diseases such as tuberculosis can be reduced, lessen the impact of epidemics/pandemics and local health can be improved especially in deprived areas.

Although the vaccines are safe (Munro et al., 2021) the general public needs to be assured and encouraged to take up vaccination. The data indicates large cities are likely to be worse affected by pandemics and health authorities need to focus their attention and efforts on cities and larger towns. Continuous mutation of the virus means that vaccines may not be 100% effective against all variants of the virus.

The U.S. population, migration and unemployment data for 4 years 2019 to 2022 was analysed (Hart, et al, 2024). It showed the pandemic exposed social, economic and health vulnerabilities and an extremely uneven landscape of negative health outcomes, economic hardship and social cleavages. There are concerns regarding the vulnerability of cities with a high proportion of older adults, cities with a high proportion of racial and ethnic minorities, and cities reliant on industries require cramped working conditions. The adverse impacts

from future pandemics on these communities could accelerate the development of new shrinking cities and disproportionately impact existing ones. This shows many cities are not sustainable and limiting further developments in cities should be considered by local planners. Existing and new virus infections are becoming more serious. There is information published available on the World Health Organization web site (www.who.int) on infectious diseases which supports what has been discussed in this work.

Future pandemics are likely to be more malignant unless the trend of increasing urbanization is halted.

Appropriate planning and environmental management can reduce the disparity between rich and poor and improve environmental health.

CONCLUSION

It is likely there will be more frequent and more deadly pandemics in the future. Urbanization and large cities will be more affected by pandemics. Good environmental management and planning promotes public health and reduce the disparity between rich and poor especially in inner cities and also decreases the probability of more pandemics.

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