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# ANALYSIS OF HEALTH FREQUENCY MEASURES AND THE HUMAN DEVELOPMENT INDEX (HDI): CHOLERA BETWEEN GLOBAL ECONOMIC CRISES (2010-2018)

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**ABSTRACT**

Social injuries produce vulnerable groups in public health problems, among which infectious diseases stand out. Socioeconomic factors are related to development and consequently impact on environmental quality, creating weaknesses in human health. One of the metrics used to measure development is the Human Development Index (HDI). Within this context, this work highlights Cholera: one of the most important public health problems in developing countries, especially in areas with neglected populations. Thus, relations between the number of cases and deaths of the disease with the regionalized HDI were observed, during the period between economic crises (2010 to 2018), with the aim of observing the difference in vulnerability between world regions based on the suggested metrics. The areas that presented low or medium HDI (developing regions), in most cases, were expressed as the most subject to the occurrence of the disease, mainly due to the period of economic recovery analyzed. It is suggested that further studies relate social indicators with the number of injuries due to epidemic diseases, as well as temporal analysis, in a situation of economic stability, in order to support the reflection on how much socioeconomic issues have a direct influence on health surveillance actions.

**Keywords**: *Vibrio cholerae*, Socioeconomic Factors, Neglected Diseases.

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## INTRODUCTION

The process of industrial revolution, which began at the end of the 18th century, provided rapid population growth, contributing to the system of social inequalities throughout the world (Rosen, 2015), favoring like this the dissemination of diseases between the population that lived in bad home conditions, food, sanitation and work (Crane-Kramer & Buckberry, 2023).

Several determinants of socio-environmental problems had, at this time, a great development, such as: intensification of modes of transport, expansion of urban areas, problems of sanitation, housing and food, expansion of military forces in various colonies, among others (Britannica, 2023). All these dynamics of social vulnerability directly influenced population displacements around the world, causing a scenario conducive to environmental and human health problems (Rosen, 2015).

Currently, around two billion people live in a situation of social vulnerability around the world, among which the predominantly rural, young and poorly educated population stands out, where thirty-seven of the economies formally classified as socioeconomically fragile are home to 40% of the world's poor (World Bank, 2020).

The social, political, economical, cultural and environmental factors that make up this whole scenario are called "*Social determinants of health*", which are closely related to the development of a given region and end up directly impacting the quality of life environment of the surroundings. Therefore, understanding the status quo of a population's development can reveal its vulnerability to a particular health problem (Britannica, 2023).

One of the measures used in an attempt to assess the degree of development of a region is the Human Development Index (HDI), which, despite suffering numerous criticisms, is widely used as a parameter for analysis in vulnerability studies because this indicator is based on the attempt to reduce inequalities and on being a explicitly normative and democratic index (Dasic *et al.*, 2020). The HDI is calculated taking into account three dimensions: (i) Longevity, which is determined by life expectancy, (ii) Education, where the relevant factor is the schooling rate, and (iii) Income, constructed with GDP per capita; and can classify a region into 5 ranges: very low, from 0.0 to 0.449, low from 0.500 to 0.599, medium from 0.600 to 0.699, high from 0.700 to 0.799, and very high being above 0.800 (Klugman *et al.*, 2010).

Of all the diseases, which have their main determinants in social causes, this work highlights cholera, which is one of the most important public health problems in developing countries, especially in areas where neglected populations occur (Nadri *et al.*, 2018) . The pathology is caused by V.cholerae serotypes O1 and O139, which causes intense diarrhea to the human host, generating a daily loss of electrolytes around 500 to 1,000 mL/hour and Its transmission route is via water and depends on the absorbed infectious dose (WHO, 2022). The survival and reproduction of the organism in the environment are favored by the socio-environmental conditions of the surroundings, such as, for example, precarious conditions of basic sanitation (Silva *et al.*, 2022), which is the main factor related to the disease (WHO, 2022). African and Asian countries accounted for 95% of all cholera cases in the world recorded between the years 2000 to 2018. However, more developed areas showed a potential danger of disease emergence due to human migration and/or ballast water transferred by vessels (Silva *et al.*, 2022).

As for transmission, the number of asymptomatic individuals is high (about 75 to 80% of those infected), which represents an important route of transmission of the disease (Nadri *et al.*, 2018). As a treatment measure, the main component is replacement of water and electrolytes intravenously, in severe cases, or orally, where antimicrobials play a secondary role (Ramamurthy *et al.*, 2019).

In the production of actions for the prevention, monitoring and control of health problems, data collection and analysis are one of the main processes in epidemiological surveillance, mainly data related to morbidity and mortality indicators (Stopa *et al.*, 2020),

In this way, mapping health frequency measures, such as morbidity and lethality, identifying areas of greater socio-environmental vulnerability to the occurrence of cholera, contributes significantly to health prevention and control measures, thus building the framework on which they can be based in epidemiological surveillance actions (Silva *et al.*, 2019).

The present work aims to analyze the relationship between morbidity and lethality rates with the Human Development Index, thus suggesting a

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vulnerability mapping of certain population groups in relation to the proposed indicators. Thus, it seeks to influence the direction of investment priority in cholera surveillance worldwide.

## METHOLOGY

The epidemiological frequency measures used were: (i) **Morbidity Rate (MB RATE):** this measure expresses the number of registered cases of the disease and it was calculated by adding up all cholera attacks, between the years 2010 to 2018 (from all countries in a region), and dividing this value by the number of countries comprising the area and later dividing this by nine (total years of monitoring) and (ii) **Mortality Rate (MT RATE):** which expresses the number of deaths and was calculated in the same way as the MB RATE (during the same time interval). Data on cholera cases and deaths, used in the formation of MB RATE and MT RATE, were obtained from the World Health Organization website available at http://gamapserver.who.int/gho/interactive_charts/cholera/atlas.html.

To calculate the **Human Development Index Rate (HDI RATE),** there were used data available on the United Nations Development Program (UNDP) website https://hdr.undp.org/data-center/documentation- and-downloads, in DATALINKS, HDI and components time-series option. This was calculated in the same way and with the same time frame as the two health frequency measures (MB RATE and MT RATE) described above.

The observation interval (2010 to 2018) was selected because it is an important period between world economic crises, which allows an analysis of the behavior of the selected indicators in a period of economic recovery. The start year (2010) was followed by the global financial crisis called “The Great Recession” that occurred between 2007 and 2009 (Gertler & Gilchrist, 2018). This crisis was marked by surprising contractions in the production, investment and consumption sectors, being the longest recession since the Second World War (Christiano *et al.,* 2015). The final year of observation (2018) was the year before the COVID-19 pandemic, which started a period of great economic setback due to the stagnation of the world market (HCL, 2021) which could impact the global economy by the year 2030 (World Bank, 2020). As for the spatial analysis, the regionalization used by Silva *et al*. (2019) was adapted, as shown in Figure 1.

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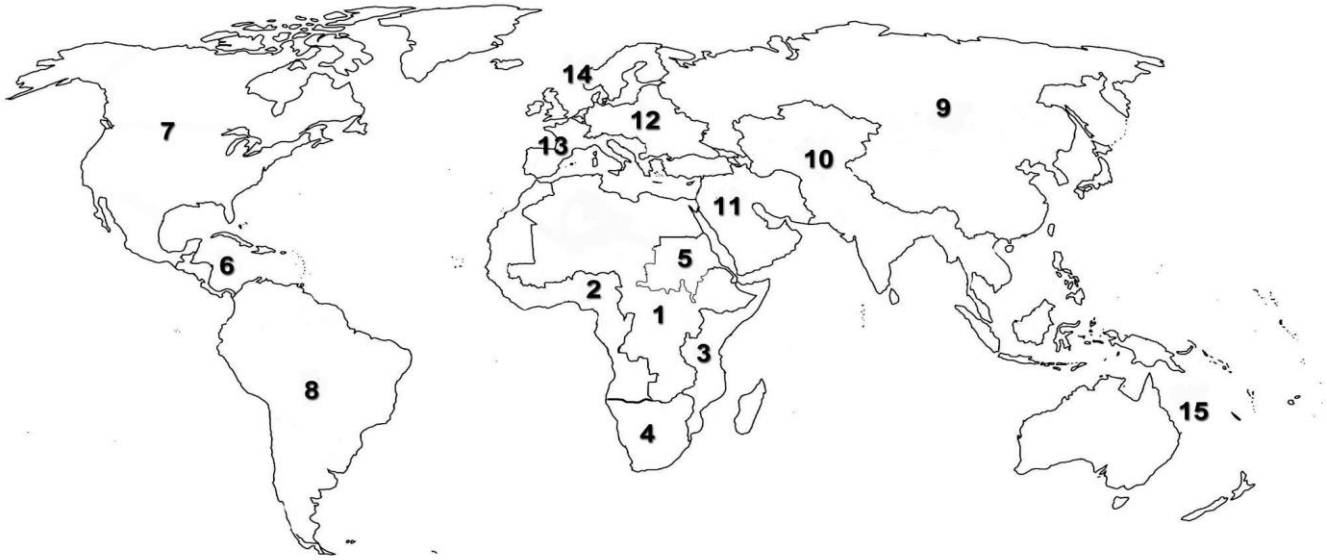
**Figure 1** – World division by areas.




Legend: **01 - Central Africa** (Burkina Faso, Burundi, Central African Republic, Chad, Democratic Republic of the Congo, Ethiopia, Malawi, Mali, Niger, Rwanda, South Sudan, Uganda and Zambia); **02 - Central Atlantic Africa** (Angola, Benin, Cameroon, Congo, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mauritania, Nigeria, São Tomé and Príncipe, Senegal, Sierra Leone and Togo); **03 - Indian Africa** (Comoros, Kenya, Madagascar, Mozambique, Somalia and United Republic of Tanzania); **04 - South Africa** (Botswana, Namibia, South Africa, Swaziland and Zimbabwe); **05 - South North Africa** (Djibouti, Eritrea and Sudan); **06 - Central Caribbean America** (Bahamas, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras and Nicaragua); **07- North America** (Canada, Mexico and United States of America); **08 - South America** (Brazil, Chile, Colombia, Paraguay, Peru and Venezuela); **09 - Central Eastern Asia** (China, Democratic People's Republic of Korea, Japan, Kazakhstan, Republic of Korea and Russian Federation); **10 - Southeast Asia** (Afghanistan, Bangladesh, Brunei Darussalam, Cambodia, India, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Turkmenistan and Viet Nam); **11 - Southern Asia** (Iran, Iraq, Israel, Oman, Qatar, Saudi Arabia, United Arab Emirates and Yemen); **12 - Central Europe** (Austria, Belgium, Czech Republic, Germany, Ireland, Switzerland, Ukraine and United Kingdom); **13 - Mediterranean Europe** (France, Italy and Spain); **14 - Northern Europe** (Denmark, Netherlands, Norway and Sweden); **15 – Oceania** (Australia, Marshall Islands, Micronesia, New Zealand, Papua New Guinea and Tonga).

Source: (adapted of Silva et al., 2019).

## RESULTS AND DISCUSSION

During the nine years analyzed, 3,501,911 cases of cholera were registered with 43,531 deaths (lethality of 0.32) worldwide (Figure 2). Highlight for area 11, which concentrated 41.8% of all cases and 46.7% of all deaths, and for area 06, with 24.2% of cases and 24.1% of deaths. This situation in the Southeast Asian region (area 11) is mainly evidenced by the magnifying factors that occurred in Yemen in 2017.

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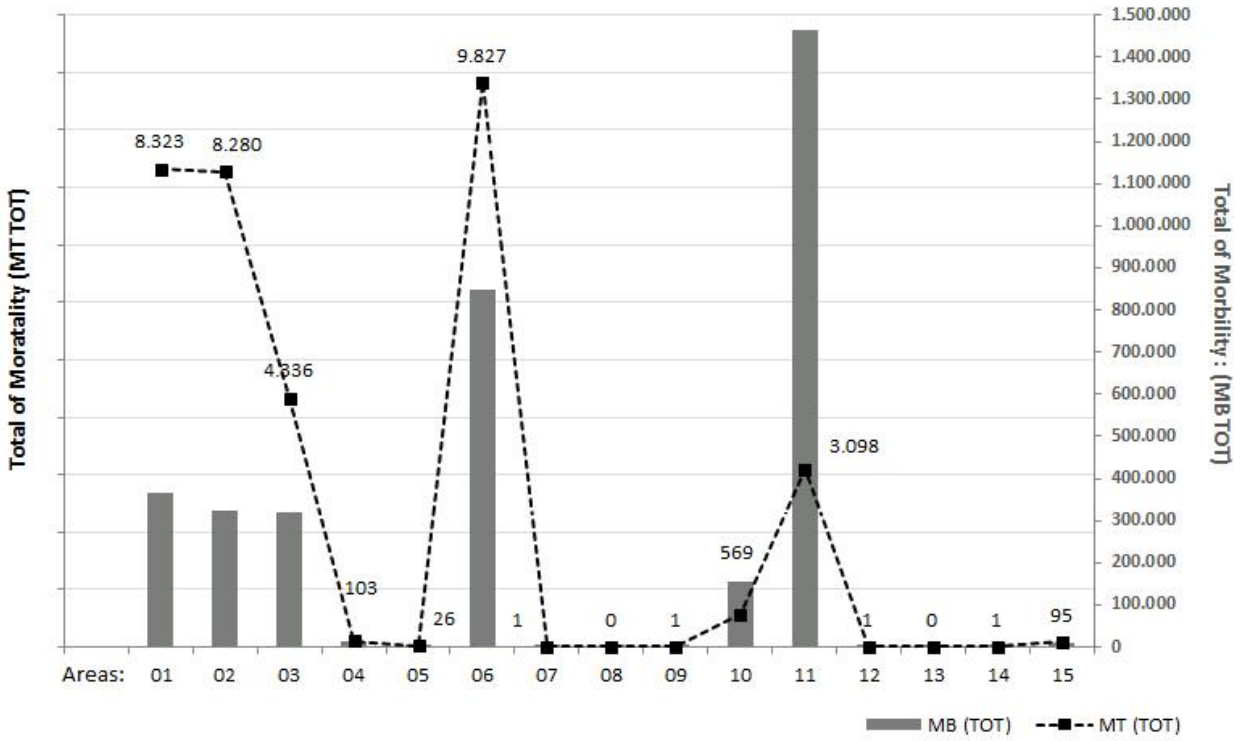
**Figure 2** – Relationship between Morbidity (MB) and Mortality (MT) of Cholera (2000 - 2018).




Source: WHO, 2022; UNDP 2022.

According to the World Health Organization (WHO, 2017), the country had a fast spread of the disease due to its poor hygiene and sanitation conditions, interruptions in water supply and collapse of the health system due to damage, destruction or lack of funding reserve to tackle these problems.

In the Caribbean America region (area 06), this situation was driven by the outbreak that started in 2010 in Haiti. At the time, the country presented a wide scenario of vulnerability to cholera, such as: high levels of social inequalities, high rates of malnutrition, history of civil conflicts, extreme precariousness of the basic sanitation system and open defecation practices (Callaba and Marquetti, 2013). In addition, that same year, the country was hit by a strong earthquake – magnitude 7 on the Richter scale – responsible for further increasing the spread of the disease.

On the other hand, two Europe regions were the ones with the fewest cases and deaths from the disease, with five cases and no deaths in Northern Europe (area 14) and six cases and no deaths in Mediterranean Europe (area 13). These results are mirrors of the high HDI's of these countries, which are among the 30 highest in the world (UNDP, 2022). Northern Europe (area 14), during the analyzed period, had an average HDI above 0.900 and Mediterranean Europe (area 13), with an average above 0.888. The World Health Organization (WHO, 2022) indicates that some of these cases came from other countries, which suggests that travelers have contracted the disease in other locations and were diagnosed in the locations in question.

The quantitative number of deaths and patients and the relationship found between these two measures of health frequency in 2018, corroborates the concern of the World Health Organization, which presents cholera as a significant and worrying re-emerging disease, especially in countries with low income (WHO, 2022), since its lethality found (0.28) was higher than that of some of the most important infectious diseases in the world, in the same year, such as AIDS with a lethality of 0.05, Malaria

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with 0.18 and Dengue with 0.01 (WHO, 2019).

As for the HDI, the regions with the highest averages throughout the analyzed period were areas 14 and 12, with 0.935 and 0.901 (very high) respectively. The ones that presented the worst indexes were in areas 01 and 05 with 0.455 and 0.477 (low) respectively (Table 1).

**Table 1** – Morbidity, mortality and HDI data by areas (2010 - 2018).

| CArea | NC | MB TOT | MB RATE | MT TOT | MT RATE | LT RATE | HDI TOT | HDI RATE |
|---|---|---|---|---|---|---|---|---|
| 01. Central Africa | 13 | 366.124 | 3.129 | 8.323 | 71,137 | 0,023 | 52.008 | 0,445 |
| 02. Central Atlantic Africa | 17 | 325.096 | 2.125 | 8.280 | 70,769 | 0,025 | 79.507 | 0,520 |
| 03. Indian Africa | 06 | 317.888 | 5.887 | 4.336 | 37,060 | 0,014 | 28.269 | 0,524 |
| 04. South Africa | 05 | 13.455 | 299 | 103 | 0,880 | 0,008 | 28.056 | 0,623 |
| 05. South North Africa | 03 | 2.377 | 88 | 26 | 0,222 | 0,011 | 12.883 | 0,477 |
| 06. Central Caribbean America | 09 | 847.740 | 10.466 | 9.827 | 83,991 | 0,012 | 55.086 | 0,680 |
| 07. North Americ | 03 | 372 | 14 | 01 | 0,009 | 0,003 | 23.384 | 0,866 |
| 08. South America | 06 | 58 | 01 | 00 | 0,000 | 0,000 | 41.008 | 0,759 |
| 09. Central Eastern Asia | 06 | 453 | 08 | 01 | 0,009 | 0,002 | 37.233 | 0,690 |
| 10. Southeast Asia | 17 | 155.561 | 1.017 | 569 | 4,863 | 0,004 | 101.879 | 0,666 |
| 11. Southern Asia | 08 | 1.463.596 | 20.328 | 3.098 | 26,479 | 0,002 | 55.423 | 0,770 |
| 12.Central Europe | 08 | 156 | 02 | 01 | 0,009 | 0,006 | 64.889 | 0,901 |
| 13. Mediterranean Europe | 03 | 06 | 00 | 00 | 0,000 | 0,000 | 23.964 | 0,888 |
| 14. Northern Europe | 04 | 05 | 00 | 01 | 0,009 | 0,200 | 33.661 | 0,935 |
| 15. Oceania | 06 | 9.024 | 167 | 95 | 0,812 | 0,011 | 39.527 | 0,732 |
| **TOTAL** | **114** | **3.501.911** | **-** | **34.661** | **-** | **-** | **-** | **-** |

Caption: CArea = Code and name of Area; NC = Number of Countries; MB TOT = Accumulated Morbidity | MB RATE = Morbidity Rate; MT TOT = Accumulated Mortality; MT RATE = Mortality Rate; LT RATE = Letahality Rate; HDI TOT = Accumulated Human Development Index; HDI RATE = Human Development Index Rate.

Source: WHO, 2022; UNDP, 2022.

However, despite having a medium to high HDI, area 10 proved to be a region of attention due to the number of cases. This alert is due to the high number of cases of the disease in Afghanistan, which represented approximately 73% of the total cases in the area during the years analyzed. According to Kakar *et al.* (2008), the country has faced outbreaks of the disease since the last century, due to numerous problems related to lack of hygiene, difficult access to drinking water and problems of basic sanitation, precarious health system and social conflicts.

The relationship between MT RATE and HDI RATE (figure 4) during the years analyzed, despite presenting small variations, followed the same trend found in the analysis of MB RATE and HDI RATE. Area 13 was the best scenario within this analysis. Likewise, with the exception of areas 06 and 11, regions 01, 02 and 03 presented the worst scenarios, indicating that the lower the HDI, the greater the possibility of deaths from cholera. The countries with the highest numbers of deaths from the disease in areas 01, 02 and 03, were, respectively, during the years analyzed: Democratic Republic of Congo (approximately 68%), Nigeria (approximately 58%) and Somalia (approximately 75%).

The lethality of cholera is strictly related to the promptness and adequacy of its treatment (Djouma *et al.*, 2016), that is, the longer and more inadequate it is, the greater the number of deaths. This fact suggests that the countries mentioned above do not have adequate accessibility, assistance and efficiency in their health system, a factor directly related to the HDI. This context proposes that these localities have serious problems of life quality and face the cholera problem, especially with regard to issues of basic sanitation, food, population disputes and lack of an adequate assistance system (WHO, 2019; Silva *et al.*, 2019).

The selected period is an interval between crises and this scenario impacts several fields of human development and, consequently, human health. It can be clearly seen that the socioeconomic injuries of each region, sedimented before the analysis period, were magnificent for coping with the disease during the period: developing regions proved to be less resilient - with regard to morbidity and mortality numbers - than the developed ones.

## CONCLUSION

Despite being a pathology controlled by effective actions in basic sanitation, cholera still appears, in the 21st century, as an infection of great attacks and deaths worldwide, especially in regions that present social injuries. This situation suggests a slow or stagnant epidemiological transcription of the disease in these regions due to several magnificent socio-environmental factors as well as a lack of investment and public policies in coping with the pathology.

In this whole scenario of fragility to human health, with regard to cholera, it was noticed with this work that countries with low HDI, for the most part, were more vulnerable to occurrence and deaths from the disease. As much as the indicator used is actually an index composed of several measures - the issue of development and its components (such as income, education, medical care, sanitation, among others) - the HDI proved to be closely related to the mapping of the disease worldwide, signaling its importance in future disease surveillance projects, policies and actions.

However, an important analysis hovers over how some economic indicators, at the same time that they can foster intimate relationships with the occurrence of harm to human health, can also be elements of imprecision in epidemiological studies in public health. In the present study, it was observed that some areas presented a good to high HDI, but had significant cases of the disease in the analyzed period, much of this due to the occurrence of developmental policies adopted by some countries in these regions, added to the situation of accentuated environmental degradation with significant lack of concern and assistance policies for the vulnerable population.

In general, the relationship between the number of deaths from infection and the HDI was much closer than the relationship between the number of cases and the HDI, thus suggesting precariousness in social and health services directly linked to cholera care and treatment around the world.

The development burden of a region suggests a close relationship with the confrontation of infectious diseases, especially in the case of crises, as analyzed in this work. Much of the success of actions to combat various diseases to human health comes from previous socio-environmental care, such as epidemiological surveillance actions supported by reserve funds for their maintenance, as well as for quick responses in coping with health crises that can be aggravated in moments of crisis economic instabilities.

Finally, there is a need for further studies that will relate social and economic indicators, such as the Human Development Index, with the number of cases and deaths from epidemic diseases, in order to propose a mapping, the vulnerability of certain population groups, as well as directing investment priorities in surveillance, care and treatment of these diseases worldwide.

## REFERENCES

CALLABA, C. A. F.; MARQUETTI, M. C. Experiences of the vector control brigades during the cholera epidemics in Haiti. **Revista Cubana de Medicina Tropical**, [*s. l.*], v. 65, n. 1, p. 99–106, 2013. Disponível em: https://www.medigraphic.com/cgi-bin/new/resumenI.cgi?IDARTICULO=40810. Acesso em: 16 jun. 2022.

CHRISTIANO, L. J.; EICHENBAUM, M. S.; TRABANDT, M. Understanding the great recession. **American Economic Journal: Macroeconomics**, Pittsburgh, v. 7, n. 1, p. 110-67, 2015. Disponível em: http://dx.doi.org/10.1257/mac.20140104. Acesso em: 07 ago. 2022.

CRANE-KRAMER, G.; BUCKBERRY, J. Changes in health with the rise of industry. **International Journal of Paleopathology**, [*s. l.*], v. 40, p. 99-102, 2023. Disponível em: https://doi.org/10.1016/j.ijpp.2022.12.005. Acesso em: 26 jun. 2023.

DASIC, B. et al. Human development index in a context of human development: Review on the western Balkans countries. **Brain and Behavior**, [*s. l.*], v. 10, n. 9, 2020. Disponível em: https://doi.org/10.1002/brb3.1755. Acesso em: 26 jun. 2023.

DJOUMA, F. N. *et al*. Factors associated with fatal outcomes following cholera-like syndrome in far north region of Cameroon: a community-based survey. **The American Journal of Tropical Medicine and Hygiene**, Virginia, v. 95, n. 6, p. 1287-1291, 2016. Disponível em: https://doi.org/10.4269/ajtmh.16-0300. Acesso em: 24 mai. 2022.

ENCYCLOPEDIA BRITANNICA. **Industrial Revolution**. *BRITANNICA. 2023. Disponível em:* https://www.britannica.com/event/Industrial-Revolution. Acesso em: 27 jun. 2023.

GERTLER, M.; GILCHRIST, S. What happened: Financial factors in the great recession. **Journal of Economic Perspectives**, Pittsburgh, v. 32, n. 3, p. 3-30, 2018. Disponível em: https://doi.org/10.1257/jep.32.3.3. Acesso em: 19 jun. 2022.

HOUSE OF COMMON LIBRARY. **Coronavirus: Economic impact**. Commons Library Research Briefing. Inglaterra: HCL, 2021. 74 p. Disponível em: https://commonslibrary.parliament.uk/research-briefings/cbp-8866/. Acesso em: 10 ago. 2022.

KAKAR, F. et al. A successful response to an outbreak of cholera in Afghanistan. **Tropical Doctor**, [*s. l.*] v. 38, n. 1, p. 17-20, 2008. Disponível em: https://doi.org/10.1258/td.2006.006336. Acesso em: 01 ago. 2022.

KLUGMAN, J.; RODRÍGUEZ, F.; CHOI, H. The HDI 2010: new controversies, old critiques. **The Journal of Economic Inequality**, [*s. l.*], v. 9, p. 249-288, 2011. Disponível em: https://doi.org/10.1007/s10888-011-9178-z. Acesso em: 05 ago. 2022.

NADRI, J. et al. Sensitivity, specificity, and public-health utility of clinical case definitions based on the signs and symptoms of cholera in Africa. **The American Journal of Tropical Medicine and Hygiene**, Virginia, v. 98, n. 4, p. 1021-1030, 2018. Disponível em: https://doi.org/10.4269/ajtmh.16-0523. Acesso em: 27 jul. 2022.

RAMAMURTHY, T. et al. Revisiting the Global Epidemiology of Cholera in Conjunction With the Genomics of Vibrio cholerae. **Frontiers in Public Health**, [*s. l.*], v. 7, n. 203, p. 1-10, 2019. Disponível em: https://doi.org/10.3389/fpubh.2019.00203. Acesso em: 27 jul. 2022.

ROSEN, G. A history of public health. 1. ed. Baltimore: **John Hopkins University Press**, 2015. Disponível em: https://doi.org/10.56021/9781421416014. Acesso em: 12 ago. 2022.

SILVA, E. S. S.; OLIVEIRA, D. D.; LOPES, A. P. Access to basic and analytical sanitation of cholera: a quantitative analysis between 2010 and 2015. Saúde em Debate, Rio de Janeiro, v. 43, n. Esp 3, p. 121-136, 2019. Disponível em: https://doi.org/10.1590/0103-11042019S309. Acesso em: 24 mai. 2022.

SILVA, E.; COSTA, B. S.; FERNANDEZ, M. A. Comparative Analysis of Spatial Distribution of Cholera by Temporal Fragments from 2000 to 2018. **Journal of Health Care for the Poor and Underserved**, Baltimore, v. 33, n. 1, p. 167-181, 2022. Disponível em: https://doi.org/10.1353/hpu.2022.0013. Acesso em: 24 mai. 2022.

SILVA, E. S.; COSTA, B. S.; FERNADEZ, M. A. S.; FILHO, G. S.; ALFONSO-VARGAS, N. Identification of *Vibrio cholerae* in the Port òf the city of Rio de Janeiro: A Contribution to the problem of Ballast Water and the possible intection with human health. **Revista Interfaces: Saúde, Humanas e Tecnologia**, Juazeiro do Norte, v. 10, n. 3, p. 1521–1531, 2022. Disponível em: https://doi.org/10.16891/2317-434X.v10.e3.a2022.pp1521-1531. Acesso em: 15 jul.

2022.

STOPA, S. R. *et al*. Pesquisa Nacional de Saúde 2019: histórico, métodos e perspectivas. **Epidemiologia e Serviços de Saúde**, Brasília, v. 29, n. 5, p. 1-12, 2020. Disponível em: http://dx.doi.org/10.1590/s1679-49742020000500004. Acesso em: 15 jul. 2022.

UNITED NATIONS DEVELOPMENT PROGRAMME. **Human Development Report**. Data Downloads: HDR 2020 Tables and Dashboards. UNDP, 2022. Disponível em: https://hdr.undp.org/data-center/documentation-and-downloads. Acesso em: 7 ago. 2022.

WORLD BANK. **Poverty and Shared Prosperity 2020: Reversals of Fortune**. International Bank for Reconstruction and Development. WORLD BANK, 2020. Disponível em: https://policycommons.net/artifacts/1246008/poverty-and-shared-prosperity-2020/1801290/. Acesso em: 14 jul. 2022.

WORLD HEALTH ORGANIZATION. **Cholera count reaches 500 000 in Yemen.** Geneva, Switzerland: WHO, 2017. Disponível em: https://www.who.int/news/item/14-08-2017-cholera-count-reaches-500-000-in-yemen. Acesso em: 14 jul. 2022.

WORLD HEALTH ORGANIZATION. **Cholera.** WHO, 2022. Disponível em: https://www.who.int/health-topics/cholera#tab=tab_1. Acesso em: 24 jul. 2022.

WORLD HEALTH ORGANIZATION. **Global Health Estimates: Life expectancy and leading causes of death and disability.** The Global Health Observatory. WHO, 2019. Disponível em: https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates. Acesso em: 24 jul. 2022.