

Determining Causes of Death with ChatGPT: A Case Study of Verbal Autopsy Data in Sierra Leone from 2019-2022

Richard Wen^{1*}, Rajeev Kamadod^{1,5}, Cheryl Chin¹,
Asha Behdinan^{1,3}, Leslie Newcombe¹, Anteneh Tesfaye Assalif¹,
Areeba Zubair^{1,3}, Thomas Kai Sze Ng¹, Patrick Brown^{1,4},
Prabhat Jha^{1,2}

^{1*}Centre for Global Health Research, St. Michael's Hospital, Unity
Health Toronto, 30 Bond St, Toronto, M5B 1W8, Ontario, Canada.

²Dalla Lana School of Public Health, University of Toronto, 155 College
Street, Toronto, M5T 3M7, Ontario, Canada.

³Department of Surgery, University of Toronto, 149 College Street,
Toronto, M5T 1P5, Ontario, Canada.

⁴Department of Statistical Sciences, University of Toronto, 700
University Avenue, Toronto, M5G 1Z5, Ontario, Canada.

⁵Kentropy Technologies Pvt. Ltd., 2nd Main Rd, Bengaluru, 560 034,
Bangalore, India.

*Corresponding author(s). E-mail(s): richard.wen@unityhealth.to;

Contributing authors: rajeevk@kentropy.com;

cheryl.chin@unityhealth.to; asha.behdinan@mail.utoronto.ca;

leslie.newcombe@unityhealth.to; antenehta@gmail.com;

areeba.zubair@mail.utoronto.ca; KaiSze.Ng@unityhealth.to; ;

prabhat.jha@utoronto.ca;

Abstract

The abstract serves both as a general introduction to the topic and as a brief, non-technical summary of the main results and their implications. Authors are advised to check the author instructions for the journal they are submitting to for word limits and if structural elements like subheadings, citations, or equations are permitted.

Keywords: keyword1, Keyword2, Keyword3, Keyword4

1 Background

In 2019, 41 million people die prematurely from noncommunicable diseases every year, accounting for 74% of all deaths globally [1]. Most of these deaths are preventable and treatable, but require adequate resources, interventions, and policies, such as access to primary care, health insurance, healthier diets, and advanced screening procedures [2]. Reliable counts and diagnosis of deaths are crucial for public health planning and policy making — guiding scalable interventions that save lives and reduce premature deaths worldwide [3–6]. However, most low-income countries do not have data on deaths or registered less than half of the deaths in their country, with an even fewer 8% of these registered deaths having a Cause of Death (COD) recorded [7]. To fill this gap in death registrations, an alternative method known as Verbal Autopsy (VA) is used to collect data on deaths and determine their likely causes at scale [8–10], outside of traditional healthcare facilities where over half of the deaths occur at home [11].

VA involves two major components: survey and COD assignment [12]. In the survey component, trained lay surveyors interview those familiar with the deceased (e.g. living spouse, children, family, friends) to gather information using standardized questionnaires and open narratives. In the COD assignment component, physicians evaluate information available from the questionnaires and open narratives to assign probable CODs. Although the survey component has been an effective alternative to collect mortality data at scale, the COD assignment component has been criticized to be expensive and difficult to reproduce due to reliance on physician assigned CODs [13, 14]. Recently, computer algorithms have been studied to automatically assign CODs, as an alternative to physician assignment, with performances close to physicians at the population level, but poor performances at the individual level [15]. Many of these computer algorithms have utilized the questionnaire portion of the surveyed data, but often omit data from the open narrative.

2 Methods

x.

3 Results

x.

4 Discussion

Discussions should be brief and focused. In some disciplines use of Discussion or ‘Conclusion’ is interchangeable. It is not mandatory to use both. Some journals prefer a section ‘Results and Discussion’ followed by a section ‘Conclusion’. Please refer to Journal-level guidance for any specific requirements.

5 Conclusion

Conclusions may be used to restate your hypothesis or research question, restate your major findings, explain the relevance and the added value of your work, highlight any limitations of your study, describe future directions for research and recommendations.

In some disciplines use of Discussion or 'Conclusion' is interchangeable. It is not mandatory to use both. Please refer to Journal-level guidance for any specific requirements.

Supplementary information. If your article has accompanying supplementary file/s please state so here.

Authors reporting data from electrophoretic gels and blots should supply the full unprocessed scans for key as part of their Supplementary information. This may be requested by the editorial team/s if it is missing.

Please refer to Journal-level guidance for any specific requirements.

Acknowledgments. Acknowledgments are not compulsory. Where included they should be brief. Grant or contribution numbers may be acknowledged.

Please refer to Journal-level guidance for any specific requirements.

Declarations

Some journals require declarations to be submitted in a standardised format. Please check the Instructions for Authors of the journal to which you are submitting to see if you need to complete this section. If yes, your manuscript must contain the following sections under the heading 'Declarations':

- Funding
- Conflict of interest/Competing interests (check journal-specific guidelines for which heading to use)
- Ethics approval
- Consent to participate
- Consent for publication
- Availability of data and materials
- Code availability
- Authors' contributions

If any of the sections are not relevant to your manuscript, please include the heading and write 'Not applicable' for that section.

Appendix A Section title of first appendix

An appendix contains supplementary information that is not an essential part of the text itself but which may be helpful in providing a more comprehensive understanding of the research problem or it is information that is too cumbersome to be included in the body of the paper.

References

- [1] World Health Organization.: Non Communicable Diseases: Key Facts. Available from: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>.
- [2] Benziger CP, Roth GA, Moran AE. The Global Burden of Disease Study and the Preventable Burden of NCD. *Global Heart*. 2016 Dec;11(4):393–397. <https://doi.org/10.1016/j.gheart.2016.10.024>.
- [3] Lawn JE, Kerber K, Enweronu-Laryea C, Cousens S. 3.6 Million Neonatal Deaths—What Is Progressing and What Is Not? *Seminars in Perinatology*. 2010 Dec;34(6):371–386. <https://doi.org/10.1053/j.semperi.2010.09.011>.
- [4] Lassi ZS, Bhutta ZA. Community-based Intervention Packages for Reducing Maternal and Neonatal Morbidity and Mortality and Improving Neonatal Outcomes. *Cochrane Database of Systematic Reviews*. 2015;(3). <https://doi.org/10.1002/14651858.CD007754.pub3>.
- [5] Liu NH, Daumit GL, Dua T, Aquila R, Charlson F, Cuijpers P, et al. Excess Mortality in Persons with Severe Mental Disorders: A Multilevel Intervention Framework and Priorities for Clinical Practice, Policy and Research Agendas. *World Psychiatry*. 2017;16(1):30–40. <https://doi.org/10.1002/wps.20384>.
- [6] Ewig S, Torres A. Community-Acquired Pneumonia as an Emergency: Time for an Aggressive Intervention to Lower Mortality. *European Respiratory Journal*. 2011 Aug;38(2):253–260. <https://doi.org/10.1183/09031936.00199810>.
- [7] World Health Organization. SCORE for Health Data Technical Package: Global Report on Health Data Systems and Capacity, 2020; 2021. Available from: <https://www.who.int/publications/i/item/9789240018709>.
- [8] de Savigny D, Riley I, Chandramohan D, Odhiambo F, Nichols E, Notzon S, et al. Integrating Community-Based Verbal Autopsy into Civil Registration and Vital Statistics (CRVS): System-Level Considerations. *Global Health Action*. 2017 Jan;10(1):1272882. <https://doi.org/10.1080/16549716.2017.1272882>.
- [9] Thomas LM, D’Ambruoso L, Balabanova D. Verbal Autopsy in Health Policy and Systems: A Literature Review. *BMJ Global Health*. 2018 May;3(2):e000639. <https://doi.org/10.1136/bmjgh-2017-000639>.
- [10] Rampatige R, Mikkelsen L, Hernandez B, Riley I, Lopez AD. Systematic Review of Statistics on Causes of Deaths in Hospitals: Strengthening the Evidence for Policy-Makers. *Bulletin of the World Health Organization*. 2014 Sep;92:807–816. <https://doi.org/10.2471/BLT.14.137935>.

- [11] Adair T. Who Dies Where? Estimating the Percentage of Deaths That Occur at Home. *BMJ Global Health*. 2021 Sep;6(9):e006766. <https://doi.org/10.1136/bmjgh-2021-006766>.
- [12] World Health Organization. Verbal Autopsy Standards: 2022 WHO Verbal Autopsy Instrument; 2023. Available from: <https://www.who.int/publications/m/item/training-curriculum-for-the-training-of-verbal-autopsy-master-trainers-and-supervisors>.
- [13] McCormick TH, Li ZR, Calvert C, Crampin AC, Kahn K, Clark SJ. Probabilistic Cause-of-Death Assignment Using Verbal Autopsies. *Journal of the American Statistical Association*. 2016 Jul;111(515):1036–1049. <https://doi.org/10.1080/01621459.2016.1152191>.
- [14] Morris SK, Bassani DG, Kumar R, Awasthi S, Paul VK, Jha P. Factors Associated with Physician Agreement on Verbal Autopsy of over 27000 Childhood Deaths in India. *PloS one*. 2010;5(3):e9583.