

Author's response to reviews

Title: Health conditions and occupational risks in a novel group: waste pickers in the largest open garbage dump in Latin America

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Author's response to reviews:

Dear Editor,

We thank you for the opportunity to have our manuscript Number: PUBH-D-18-03422 entitled "A study protocol for assessing health conditions and occupational risks in a novel group: waste pickers in the largest open garbage dump in Latin America" evaluated for publication by BMC Public Health. The reviewers comments were very valuable to improve the manuscript. For the vast majority of comments, we are happy to implement the suggestions to improve the manuscript, as described below.

Yours sincerely,

The Authors

Reviewer 1,

General Comments: The authors have carried out exposure studies on municipal solid waste workers for a large waste dump in Latin America but the reviewer has some comments regarding the scientific rationale of the manuscripts. The queries are as follows:

Comment 1: The authors are requested to highlight some of the important results in the abstract section. They may add an additional section after the Discussion section in the abstract highlighting some of the important results of the study.

Our response: The important results were included in the abstract section as asked by the reviewer. Lines: 32-42.

Comment 2: Page 2, line 12-15, the authors can be more specific mentioning the external and internal injuries experienced by the workers.

Our response: The external and internal injuries were more specified on the lines: 68-70, page 2.

Comment 3: The authors can incorporate the following reference in the Introduction section highlighting the importance of the study

Our response: The reference: Prannoy Thakur, Rajiv Ganguly, Anirban Dhulia (2018) was incorporated in the introduction section: lines 86-91, page 3.

Comment 4: Page 9, Line 248, it can be mentioned 'Waste pickers were registered on this system in the year 2017'.

Our response: We corrected the sentence as per the reviewer's suggestion. Line 261, page 10.

Comment 5: Page 10, line 260-271, the reviewer finds quite interesting that the authors were able to convince the workers for blood samples, similar situation when tried to use in other developing countries, majority of the subjects (workers) turned hostile refusing to give blood samples. Further, caste and religion sentiments were also observed in such instances. So, the situation is slightly paradoxical in such context. Did the authors provide any monetary incentives?

Our response: There were no monetary incentives for the waste pickers to participate in the study. They were convinced to participate by the explanation of the importance to know about their health conditions and the opportunity to receive free treatment according to their needs. Lines: 278-281, page 10.

Comment 6: Page 12, Line 313 please provide the appropriate reference refereeing to the EU testing method.

Our response: The reference refereeing to the EU testing method was included on line 325, REF 31, page 12.

Comment 7: Page 12, Line 316-317 please provide an appropriate reference for the statement made.

Our response: The reference for the statement made was included on line 329, REF 32, page 12.

Comment 8: Page 13, Line 328-337, please describe the references for the methodology used for the collection of samples. Further, if any code provisions were utilized they also need to be mentioned. The sampling methodology needs to be justified by the authors. Further, please discuss how the collected samples were processed for its use in the ICP-MS systems.

Our response: The references for the methodology used for the collection of samples were included on lines 330-337 REF 33, 34, 35, pages 12 and 13.

Comment 9: Please present the statistical results of the responses derived from the questionnaire section and relate the results with the different fractions of the study in the discussion section.

Our response: The statistical results were included and are highlighted in the discussion section.

Comment 11: Please summarize, what is the source of the heavy metals in your study, the reported concentrations in the workers and their impacts on the workers on a long term basis in the discussion section.

Our response: We suppose that the main sources of the heavy metals are described on the lines: 594-598, page 24.

Comment 12: Please present the test results of the representative blood samples as a supplementary material.

Our response: The main results of the blood samples were included in a table as a supplementary material.

Comment 13: Please present the stratification results (age, sex, education, lifestyle etc.) in your discussion section

Our response: The stratification results were included in the discussion section and are highlighted.

Comment 14: The major findings of the study are missing in the discussion section and needs to be incorporated to have a better understanding of the study conducted.

Our response: The major findings of the study were included in the discussion section and are highlighted.

Comment 15: Please mention the results of the per capita generation of waste in the study location in the introduction section.

Our response: The results of the per capita generation of waste in Brazil was included in the introduction section (Lines 53-55, page 1) REF 2 and the study locale- Brasilia in line 236, page 9.

We included the references:

2. ABRELPE. Panorama 2017: Resíduos Sólidos Urbanos. Abrelpe. 2018;;74

11. Thakur P, Ganguly R, Dhulia A. Occupational Health Hazard Exposure among municipal solid waste workers in Himachal Pradesh, India. Waste Manag. 2018;78:483–9. doi:10.1016/j.wasman.2018.06.020.

31. Salomone A, Tsanaclis L, Agius R, Kintz P, Baumgartner MR. European guidelines for workplace drug and alcohol testing in hair. Drug Test Anal. 2016;8:996–1004.

32. Lakshmi Priya MD, Geetha A. Level of trace elements (copper, zinc, magnesium and selenium) and toxic elements (lead and mercury) in the hair and nail of children with autism. *Biol Trace Elem Res.* 2011;142:148–58.
33. Reddy D H K, Seshaiyah K, Reddy AVR, Rao MM, Wang MC. Biosorption of Pb²⁺ from aqueous solutions by *Moringa oleifera* bark: Equilibrium and kinetic studies. *J. Hazard Mater.* 2010, 174(1-3), 831-838. doi: 10.1016/j.jhazmat.2009.09.128. Epub 2009 Oct 2.
34. Jaishankar M, Tseten T, Anbalagan N, Mathew BB, Beeregowda KN. Toxicity, mechanism and health effects of some heavy metals. *Interdiscip. Toxicol.* 2014, 7(2), 60–72. doi: 10.2478/intox-2014-0009.
36. Carneiro MF, Moresco MB, Chagas GR, de Oliveira Souza VC, Rhoden CR, Barbosa F Jr. Assessment of trace elements in scalp hair of a young urban population in Brazil. *Biol Trace Elem Res.* 2011 Nov;143(2):815-24
37. Batista BL, Rodrigues JL, Nunes JA, Tormen L, Curtius AJ, Barbosa F. Simultaneous determination of Cd, Cu, Mn, Ni, Pb and Zn in nail samples by inductively coupled plasma mass spectrometry (ICP-MS) after tetramethylammonium hydroxide solubilization at room temperature: Comparison with ETAAS. *Talanta.* 2008;76:575–9.
44. Zolnikov TR, da Silva RC, Tuesta AA, Marques CP, Cruvinel VRN. Ineffective waste site closures in Brazil: A systematic review on continuing health conditions and occupational hazards of waste collectors. *Waste Manag.* 2018;80:26–39. doi:10.1016/j.wasman.2018.08.047.
45. IBGE-Instituto Brasileiro de Geografia e Estatística. População chega a 205,5 milhões, com menos brancos e mais pardos e pretos. IBGE Notícias - Agência Brasil. 2017. <https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/18282-populacao-chega-a-205-5-milhoes-com-menos-brancos-e-mais-pardos-e-pretos>.
49. Brasil, Saúde M da. Vigitel Brasil 2016. 2017. http://bvsmis.saude.gov.br/bvs/publicacoes/vigitel_brasil_2016_saude_suplementar.pdf.
55. Hussein Were F, Njue W, Murungi J, Wanjau R. Use of human nails as bio-indicators of heavy metals environmental exposure among school age children in Kenya. *Sci Total Environ.* 2008;393:376–84.

The following reference was excluded because it was written in portuguese:

Jimenez, R. S.; Dal Bosco, S. M.; Carvalho, W. A. Remoção de metais pesados de efluentes aquosos pela zeólita natural esolecita - influência da temperatura e do pH na adsorção em sistemas monoelementares. *Quím. Nova.* 2004, 27(5), 734-738. <http://dx.doi.org/10.1590/S0100-40422004000500011>.

Reviewer 2:

General Comments: This well-written manuscript entitled "A study protocol for assessing health conditions and occupational risks in a novel group: waste pickers in the largest open garbage dump in Latin America" provides new and important methods and a questionnaire for public health surveillance and future etiologic research on a socially vulnerable, extremely difficult to access population in need of health services. The health assessment methods are very thorough and based on sound evidence. Additionally, the health assessment serves as a mechanism to link the study participants to healthcare/public health services so that there is an existing public health structure that can use the findings of this study and provide ongoing follow up. The broad systems approach used by the authors to define the public health challenges of the waste pickers is very strong, potentially leading to more comprehensive and effective solutions overall.

Publishing methods to assess the exposures, health status and possible public health interventions of waste pickers is particularly important because these workers exist throughout the world. Making available standardized methods that could be used by many researchers enables comparisons of the public health experience of these workers globally.

The exposures and health effects of waste pickers, including in Brazil, have been studied previously including with published photographs. Citing this literature could strengthen the rationale for the detailed health protocols presented in the submitted manuscript. Examples of previous studies are:

Binion E, Gutberlet J. The effects of handling solid waste on the wellbeing of informal and organized recyclers: a review of the literature. *Int J Occup Environ Health*. 2012 Jan-Mar;18(1):43-52.

M C da Silva, A G Fassa, C E Siqueira, D Kriebel. Brazilian ragpickers, A job with contradictions: environmental stewards and exploited workers of the informal sector, *Occupational and environmental medicine*, November 2005 DOI: 10.1136/oem.2005.020164.

In terms of effective public health practice, it is a good idea to treat the waste pickers as part of the waste recycling system, as the authors propose, rather than trying to abolish the waste pickers activities and livelihood. "Waste picking," however, is an "end-of-pipe" solution to waste management, that is, it focuses on hazards at the end of the production cycle, well after they have been released into the environment. Even if waste pickers' health is improved, the discussion in this manuscript could be strengthened by linking the waste pickers health to the system of production, consumption and hazardous waste and identifying solutions at the source of the exposures. Ultimately, one of the most effective public health interventions for waste pickers would be to reduce the toxic and other hazardous materials and the total volume of waste overall and to transform the work of waste pickers into more sustainable productive activity. This is of

course a long-term goal and the methods in this manuscript are immediately important for moving towards that goal.

Our response: The reviewer considerations were very important to strength the paper and were considerate to complete the discussion. We also included the 2 references that were suggested:

43. Binion E, Gutberlet J. The effects of handling solid waste on the wellbeing of informal and organized recyclers: A review of the literature. *Int J Occup Environ Health*. 2012;18:43–52. (pages 18, 20,21 and 24)

46. Da Silva MC, Fassa AG, Siqueira CE, Kriebel D. World at work: Brazilian ragpickers. *Occup Environ Med*. 2005;62:736–40. (pages 19, 20 and 21)