



## Editorial Commentary

## Operationalising a One Health approach to reduce the infection and antimicrobial resistance (AMR) burden in under-5 year old urban slum dwellers: The Childhood Infections and Pollution (CHIP) Consortium



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## ABSTRACT

The WHO advocates the use of a One Health approach to address antimicrobial resistance (AMR), focusing on integrating human, animal and environmental health factors. Nevertheless, there is a dearth of AMR research investigating the complexity of down and upstream factors across the One Health spectrum, especially in resource-deprived settings. The Childhood Infections and Pollution Consortium (CHIP)<sup>1</sup> was designed to reduce the burden of childhood infections and AMR in urban slums, particularly in low-and middle-income countries, using One Health and technology-enabled Citizen Science approaches. Currently operationalized in three countries; India, Indonesia and Chile; CHIP is composed of interdisciplinary academics, healthcare professionals, veterinarians, international and local non-governmental organisations, current and former policymakers, local artists and community champions, amongst others. The CHIP Consortium invites collaborations for evidence-driven research, targeted investment and co-development of interventions in slums. We will host our third annual consortium workshop in Hong Kong in 2021 to build on our current work and explore new avenues to tackle childhood infections and AMR.

## The need for the CHIP consortium

Over 300 million children live in urban slums worldwide [1]. These settlements are grossly concentrated in low- and middle-income countries (LMICs) in areas at high risk of climate change hazards with structural and socio-demographic characteristics such as overcrowding, inadequate access to safe water and sanitation, livestock in close proximity, poor housing conditions and suboptimal hygiene and nutrition practices being important infection determinants. [2] LMICs are at the epicentre of childhood mortality, driven primarily from preventable causes such as respiratory, vector-borne and gastrointestinal infections and outbreaks such as cholera [3,4]. Oftentimes, antibiotics are the only treatment available in low resource settings, however poor regulatory governance and antibiotic misuse amongst these populations is leading to widespread increase in antimicrobial resistance (AMR). As a consequence, those most vulnerable to the effects of AMR also inhabit areas where the level of AMR is highest.

The global fight against AMR has seen some progress since the 2016 UN General Assembly where world leaders committed to addressing AMR by integrating human, animal and environmental factors – also known as a “One Health” approach [5,6]. However, given that the gap between the accelerating incidence of AMR and funding availability for tackling AMR in LMICs continues to grow, much work is still needed. In view of these challenges, national and international partners have been focusing their efforts to promote innovative approaches to counter AMR at the country level. In 2019, the World Health Organisation released a

working paper advocating the deployment of focused strategies that engage stakeholders from multiple sectors to help convince policy makers regarding AMR's importance and its incorporation into national development agendas [7].

Researchers have also taken on the challenge of developing evidence-based interventions to address AMR. However, to date, there has been limited research directed at investigating the breadth and depth of up and downstream factors across the One Health spectrum, especially in resource-challenged settings. We therefore take this opportunity to highlight our work with children U5 living in urban slums across three countries – India, Indonesia and Chile – under the *Childhood Infections and Pollution (CHIP) Consortium* [8].

Our consortium is a global multi-funder, interdisciplinary collaboration that brings together academics, local residents, community champions, non-governmental organisations, artists, current and former policymakers, engineers, architects, healthcare professionals and veterinarians. We aim to reduce childhood infections and AMR through co-producing integrated, low-cost behavioural and slum-upgrading interventions using a One Health approach. Recognising community engagement may be sporadic due to slum dweller financial hardship and limited free time, we will concurrently utilise technology-enabled Citizen Science approaches (e.g. mobile phone applications), where possible. We will also build on current efforts to implement the 2030 agenda for sustainable development by directly targeting Sustainable Development Goals 2, 3, 4, 5, 6, 7, 9, 13 and 16 [9]. We will leverage our expertise in community-focused research and close

<sup>1</sup> CHIP: Childhood Infections and Pollution Consortium



Fig. 1. Conceptual map of potential One Health factors associated with infections and AMR in U5s living in urban slums.

collaborations with local, state and national public and private sector actors to integrate primary cross-sectoral research with health policy to improve maternal and neonatal health, infectious diseases, early childhood development and urban health outcomes, alongside AMR.

**Methods and approach of CHIP**

Our work involves undertaking a range of methodological approaches to identify One Health factors leading to infectious diseases and AMR in children U5 in our selected communities. Between September and December 2019, we undertook transect walks, social mapping and 1:1 interview with mothers and key informants in urban slums in India, Indonesia and Chile. We utilised a geo-tagged action camera in walks to observe potential infection pathways as well as social-cultural aspects of each community. This allowed us to digitise mapping information in preparation for utilising technology-enabled Citizen Science methods in the future. We also co-produced a detailed map of slum-level variables with residents. Interviews explored slum dwellers' understanding of infections and their pathways and gave us insight into the feasibility of collecting biological (i.e. nose, throat, stool) and non-biological (i.e. soil, water) samples in the future. A conceptual map of One Health factors associated with infections and AMR in U5s living in slums was created from the data collected (Fig. 1). It summarises the complex relationships we are investigating, and

serves as a roadmap that will be iteratively updated to identify research questions and design interventions to reduce this infection & AMR burden.

The CHIP Consortium calls for action and welcomes interest from individuals, organisations and/or collaborations to join forces for evidence-driven research, targeted investment and co-development of interventions in slums. We intend to host our third annual consortium workshop in Hong Kong in 2021 to build on our current work and explore new avenues to tackle childhood infections and AMR in urban slums globally.

**Declaration of Competing Interests**

This manuscript was submitted on behalf of the Childhood Infections and Pollution Consortium. We have no conflicts of interest to disclose.

**Acknowledgements**

The authors are members of the Childhood Infections and Pollution (CHIP) Consortium aimed at reducing the infection & antimicrobial resistance burden amongst children under five in slums using One Health (i.e. human, animal, environment) and technology-enabled citizen science approaches. The Consortium has undertaken work in

urban slums in Jaipur, Jakarta & Antofagasta.

In addition to the authors, members of the CHIP Consortium consists of Prof Wiku Adisasmito, Dr. Dewi Aisyah, Dr. Alexandra Albert, Dr. Hector Altamirano-Medina, Anila Atin, Dr. Neha Batura, Hemant Chaturvedi, Meghan Cupp, Prof Rajib Dasgupta, Prof Pam Factor-Litvak, Prof Keiji Fukuda, Julia Vila Guilera, Prof Muki Haklay, Dr. Rebecca Katz, Dr. Rajesh Khanna, Dr. Sanweer Khatoon, Dr. Nancy Leung, Dr. Clare Llewelyn, Chyntia Mayadewi, Natasha Mayandra, Dr. Krishna Mohan, Dr. Rintaro Mori, Dr. Emily Nix, Dr. Prejit, Prof Erika Ota, Dr. Raj Panda, Jacob Paulose, Prof Joseph Malik Peiris, Dr. Mahen Perera, Satya Prakesh, Rajendra Prasad, Dr. Obaidur Rahman, Dr. Omar Risk, Dr. Kaushik Sarkar, Sanjay Sharma, Radhika Sharma, Premraj Sharma, Mr. Sandeep Soni, Dr. Pradeep Srivastava & Dr. Hein Min Tun. Organisations include; global universities (UCL, Columbia University, Georgetown University, University of Hong Kong, St Luke's University Tokyo, Public Health Foundation India, University of Antofagasta, Jawaharlal Nehru University, Rajasthan University of Veterinary & Animal Sciences), NGOs (i.e. Save the Children India, PKPU Human Initiative, Jeevan Ashram Sanstha), private sector (Aceso Global Health Consultants Ltd) & networks (India Center for One Health Education, Advocacy, Research and Training & Indonesia One Health University Network).

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