

# **Big Data to Analytics reveals the Zika virus epidemic as only one of multiple factors contributing to year-over-year 28-fold increase in microcephaly incidence**

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## **ABSTRACT**

During the 2015-2016 epidemic of Zika Virus (ZIKV) in Brazil, the geographical distributions of ZIKV infection and microcephaly outbreaks did not match. This raised doubts about the virus as the single cause of the microcephaly outbreak and led to research hypotheses of alternative explanatory factors, such as agrochemical use, vaccinations, and environmental conditions. In this study we attempted to discern how the natural, built, physical and social environments interacted with ZIKV+ and ZIKV-related microcephaly, by identifying associations among 382 nonredundant variables of Zika surveillance and multiple determinants of environmental public health obtained from 5,565 municipalities in Brazil. .

We compared those factors and variables directly associated with microcephaly incidence positive to ZIKV and those associated with microcephaly incidence negative to ZIKV, respectively, and mapped them in case and control subnetworks. We also mapped subnetworks of factors and variables associated with low birth weight and birthweight where birth incidence served as an additional control. Nonsignificant differences in factors and variables were observed and weights of associations between microcephaly incidence, positive and negative to ZIKV, revealed diagnostic inaccuracies that translated to underestimation of the scope of the ZIKV outbreak. A detailed analysis of the patterns of association was conducted and did not support a finding that vaccinations or the use of agrochemicals are factors that contributed to microcephaly but does raise concerns about the relationship between toxicity arising from the presence of heavy metals in the environment and microcephaly not associated with ZIKV.

## **One Sentence Summary:**

Comparative network inferential analysis of patterns of factors associated with Zika virus infections in Brazil during 2015-2016 coinciding with a microcephaly epidemic identifies multiple contributing determinants and advances our understanding of the effects of exposures to chemical and non-chemical stressors in the built, natural, physical, and social environment.

## Bio

Darryl B. Hood, PhD is a nationally recognized environmental public health neuroscientist and environmental justice expert at the Ohio State University. After 20-years at Meharry Medical College, Dr. Hood continues his *innovation in discovery* as co-architect of the novel *Public Health Exposome* framework with Big Data to Knowledge analytics. Dr. Hood has assembled a well-conceived, functional multidisciplinary, community-based research stakeholder team to address disparate health outcomes in high-risk neighborhoods in Columbus, Ohio. He uses the *Public Health Exposome* framework to interrogate hypotheses focused on determining if there are associations between the built, natural and social environment and disparate health outcomes observed in vulnerable populations. The framework is extremely relevant during to the disparities that are being documented during the current COVID-19 pandemic. Looking forward, he expects to continue to build on his previous success to enhance environmental public health research in the high risk, vulnerable, and underrepresented minority communities of Columbus, OH. Recently, the Executive Vice President and Chancellor of Health Affairs at The Ohio State University, Dr. Harold Paz, introduced OSU and the Columbus community to this new innovative community engagement model known as E<sup>6</sup>=Enriching Environmental Endeavors via e-Equity, Education and Empowerment. He is a past President of TAO, Incoming Chair of the ECDC, and serves on the SIG-CG.