Urban-rural differentials in the determinants of malaria transmission in Nigeria

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Introduction

Nigeria is one of 10 countries with the highest global malaria burden, accounting for roughly a quarter of global malaria deaths and cases respectively in 2018. Malaria transmission is heterogeneous at lower spatial scales, and understanding the drivers of high transmission can inform decisions on where interventions should be prioritized.

We aimed to identify factors associated with high levels of malaria transmission in urban and rural areas.

Method

Household survey data collected in Nigeria by the Demographic and Health Survey Program in 2010, 2015 and 2018 were used in this analysis.

Probability sample of residential households

Cluster-level malaria parasite prevalence data (PfPR) from U5 children was the outcome variable

Analysis Pipeline

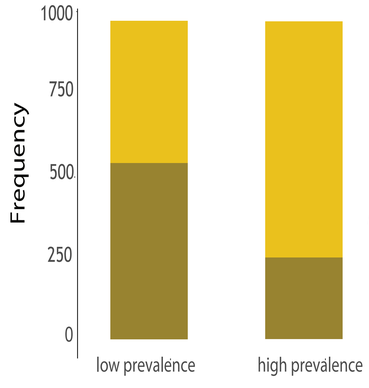
Cluster level estimates of PfPR, and intervention coverage and socioeconomic indicators were generated

PfPR estimates were categorized into low prevalence (<10%) and high prevalence groups (10 - 100%)

Multivariate regression was used to examine association between selected factors and high PfPR in R software

Findings

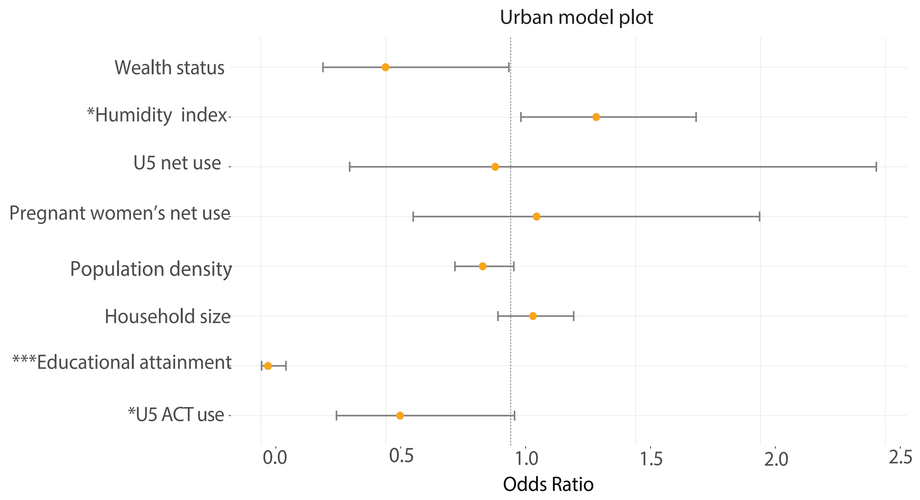
Overall, parasite prevalence was highest in rural clusters (mean: 0.309; SD =0.267) compared to urban cluster (mean: 0.139; SD = 0.195).



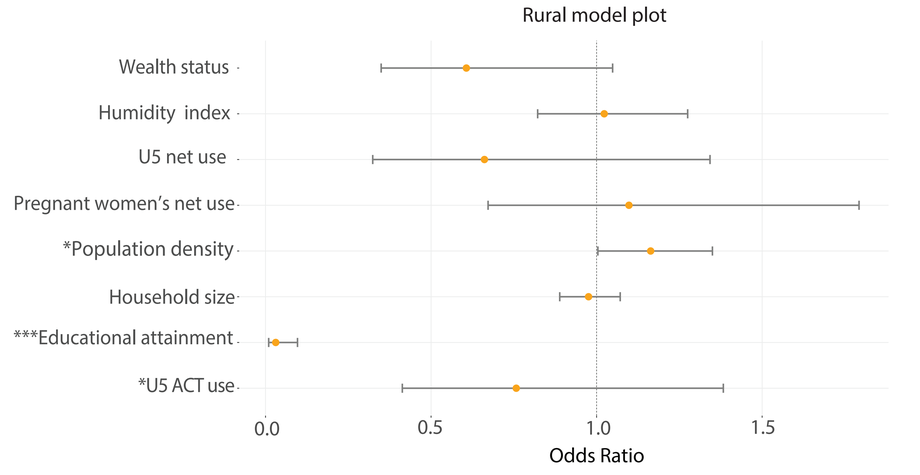
Plasmodium falciparum Parasite Rate among children under the Age of five in Nigeria

Findings

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

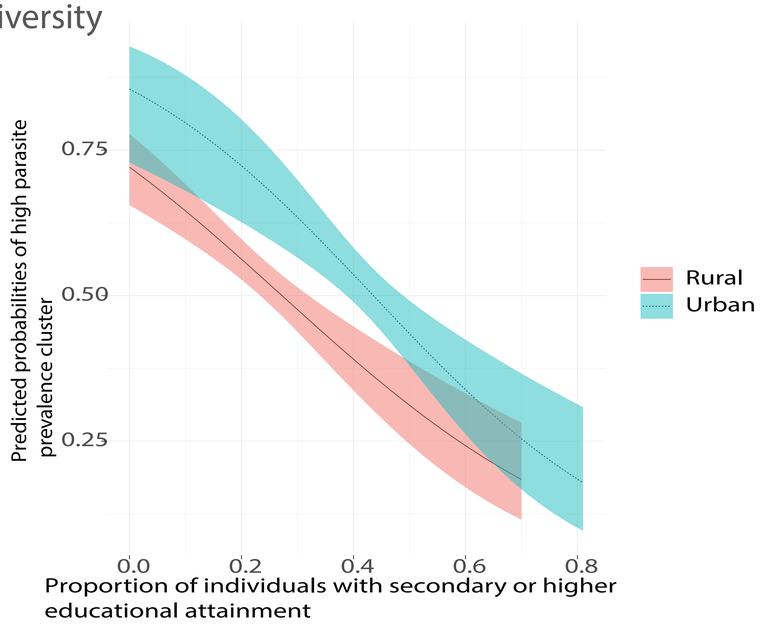


Forest plot of the estimated odds ratios in the multivariable regression analysis of factors associated with parasite prevalence in urban areas



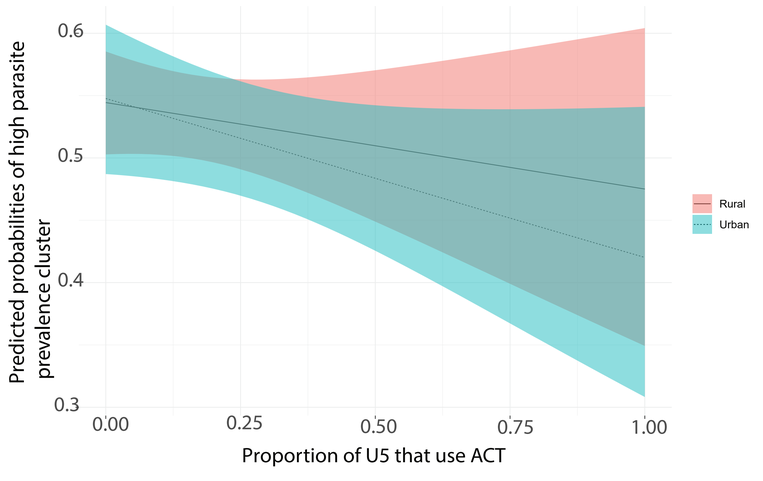
Forest plot of the estimated odds ratios in the multivariate regression analysis of factors associated with parasite prevalence in rural areas

Clusters with greater levels of secondary or higher educational attainment were associated with 98% (95% CI: 0.002, 0.096) and 97% (95% CI: 0.009, 0.095) lower odds of being a high prevalence cluster in rural and urban areas, respectively. Increases in the proportion of children that use ACT in urban clusters were negatively associated with high parasite prevalence (0.53 OR, 95% CI: 0.30, 0.90). Lastly, the analysis showed that population density was positively associated with high parasite prevalence (1.12 OR, 95% CI: 1.00, 1.35) in rural clusters.



Plots above show the predicted probabilities of high parasite prevalence for varying levels of the proportion of individuals with scondary or higher educational attainment controlling for a range of factors seperately for urban and rural areas

In urban areas, educational attainment has greater impact. Compared to rural clusters, urban clusters tended to have a greater probability of high levels of malaria transmission when secondary or higher educational attainment was low.



Plots above show the predicted probabilities of high parasite prevalence cluster for varying levels of the proportion of ACT use controlling for a range of factors seperately for urban and rural areas.

Discussion

Our analysis highlight similarities and differences in the determinants of high transmission in urban and rural areas. Additional studies are warranted to understand the mechanisms that relate educational attainment with parasite prevalence in both urban and rural areas, and to unveil the reasons underlying the observed positive association between population density and parasite prevalence in rural areas. However, our findings provides supporting evidence for the positive impact of increased access to ACTs and suggest the need for greater intervention distribution in highly populated rural areas. Future work will explore the drivers of insecticide treated net use and access by urban and rural area of residence.

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