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Disparities in canine rabies burden: An analysis of high-resolution spatial data from Arequipa, Peru

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Background: Dog-transmitted human rabies is commonly linked to poverty, but few studies have formally investigated the relationship between local socioeconomic deprivation and canine rabies incidence. Moreover, the use of coarse spatial data (aggregated at the subnational level) has even led some to report an increased risk of canine rabies in low-poverty areas.

Methods: We leveraged a unique, high-spatial-resolution surveillance database from the canine rabies-endemic city of Arequipa, Peru to probe the relationship between neighborhood deprivation and canine rabies risk in 2015-2022. We tested the hypothesis that case positivity increases with neighborhood disadvantage.

Results: We included a total 345 confirmed canine rabies cases and 1,343 samples for spatial manipulation and analysis. Although less than half (44.9%) of all households resided in the most socioeconomically disadvantaged blocks, these areas contained 71.4% of confirmed canine rabies cases. Moreover, surveillance effort was low in disadvantaged areas, making up less than a third (32.8%) of all submitted samples. Consistent with our hypothesis, sample positivity had a significant and positive trend with neighborhood disadvantage ($p = 0.0013$).

Conclusion: Neighborhood deprivation was associated with higher incidence of canine rabies despite lower surveillance effort in disadvantaged areas. Mass vaccination programs for canine rabies should target low SES neighborhoods to decrease inequities in rabies risk to human populations and more effectively control epidemics of canine rabies. The collection and curation of high-resolution spatial data is crucial for identifying social and spatial inequities in disease burden so that interventions can be targeted to those who need them most.

Primary author: XIE, Sherrie (University of Pennsylvania, Philadelphia, PA)

Co-authors: ZEGARRA, Edith (Reference Regional Laboratory, Ministry of Health, Arequipa, Peru); DIAZ, Elvis (Zoonotic Disease Research Lab, School of Public Health and Administration, Universidad Peruana Cayetano Heredia, Lima, Peru); SHINNICK, Julianna (University of Pennsylvania, Philadelphia, PA); CASTILLO-NEYRA, Ricardo (University of Pennsylvania, Philadelphia, PA)

Presenter: XIE, Sherrie (University of Pennsylvania, Philadelphia, PA)

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