Contextual factors associated with epidemiological coverage during mass drug administration for lymphatic filariasis across ten West African countries

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Aim
To explain MDA coverage across time and geographies in West Africa using sociological, environmental and programmatic factors.

Background
Effective mass drug administration (MDA) is the cornerstone in the elimination of lymphatic filariasis (LF) and a critical component in combatting all neglected tropical diseases for which preventative chemotherapy is recommended (PC-NTDs). Despite its importance, MDA coverage, however defined, is rarely investigated systematically over time and geography.

Most commonly, analysis of coverage is in reaction to low coverage or continued transmission despite treatment. These analyses tend to focus on a single year and health district. Such investigations omit more macro-level influences including sociological, environmental, and programmatic factors.

The USAID NTD database contains treatment coverage data from more than 3,880 district-level LF MDA campaigns over 14 years and across 10 West African countries. These data offer insights into the wider contextual influences on MDA performance, measured through epidemiological coverage, calculated as persons treated divided by persons at risk.

Methods
We linked epidemiological coverage data from 3,880 LF MDAs (2007 – 2020) with external data using location (each campaign was specific to a health district) and time (month and year of the MDA). External data included:
- Rainfall & temperature during month of MDA, compared to the month’s climatological average (source: NOAA PSL)
- Events of violence and social unrest during the month of or prior to MDA (source: ACLED)
- Whether the MDA was concurrent with the COVID-19 outbreak and response
- Based on month and location, we assigned a round n to each MDA, being the district’s nth recorded MDA for LF.

We fit a hierarchical linear regression model with coverage as the dependent variable and performed sensitivity analyses to confirm the selection of the explanatory variables. The coefficients of these variables are displayed in the Results section.

Results
- Benefit/Penalty to MDA Coverage (pp)

Interpretation
Sociological factors
The negative effect of COVID-19 may capture behavior change of the general public during the first year of the pandemic and/or implementing adapting to the operational burden of preventative measures taken during MDA.

Environmental factors
As expected, higher than normal rainfall during the month of MDA reduced coverage. Recorded rainfall was compared to the 30-year climatological average for each district.

Programmatic factors
There is evidence of MDA coverage improving with experience, particularly in years 1-6, with a plateau around 9 percentage points above the first MDA. Districts undertaking 6 or more rounds of MDA did so due to historical lower coverage or measured persistent LF transmission.

All estimates in Figures 2 and 3 were significant at the 95% level.

Conclusion
Social context is important to consider when examining MDA performance, areas of persistent infection, and progress toward LF elimination. Results are applicable to other PC-NTDs (e.g. trachoma, onchocerciasis) and non-MDA service delivery (e.g., Vitamin A, bed nets) in as far as their context and service delivery efforts resemble those of LF studied here.

We encourage implementers to consider these findings particularly with respect to the timing of the MDA. Increased rainfall and temperature are relevant to forecasting such campaigns in the light of climate change. Further examination is warranted into the association with increased temperature.

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Figure 1 : Areas included in study

Figure 2: Contextual MDA factors and their association with coverage

Figure 3: Measured increases in coverage with each additional MDA round