Effectiveness of indoor residual spraying on malaria morbidity in Kinyinya and Ryansoro health districts, Burundi

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Discussion
The impact of indoor residual spraying (IRS) is probably much greater than estimated in this study if the under-reporting/under-diagnosis of symptomatic cases is considered. The impact of IRS is not only associated with the insecticide used, but:
- Associated with the moment when the IRS is introduced;
- Associated with the rate of transmission in the intervention area;
- Associated with certain logistical aspects such as the accessibility of dwellings, the construction material or certain human aspects.

Results
Kinyinya
Rapid reduction in the number of cases of malaria after each IRS
Additional impact on the impact of Mass Campaign of nets distribution
The number of cases fell immediately by
-52% after the 2019 IRS
-28% after the 2020 IRS
-40% after the 2021 IRS.
A medium-term reduction in the number of malaria cases was only achieved after the 2019 IRS.

Ryansoro
After the first IRS in 2018 (February), there was an immediate reduction in the number of cases (-53%) and a reduction in the medium term (incidence reduced by 2% per week). The next IRS (August 2018) had no effect on the number of cases. IRS in July 2021 led to an immediate reduction in the number of cases (-19%) but no effect in the medium term. Additional impact on the impact of mass campaign of nets distribution.

In conclusion, IRS is more effective in epidemic or outbreak contexts.

Conclusions
Overall, IRS is effective in reducing the number of cases very rapidly and is therefore recommended in times of epidemics. They have an additional effect on long-lasting insecticidal nets (LLINs). A period of 12 months between IRS is effective, whereas performing an IRS while the number of cases is still low does not seem to prevent a resurgence of cases. IRS will have a greater impact if carried out in an area of high transmission.

Methodology
This is a quasi-experimental interrupted time series analysis study with non-equivalent control group using routine data of weekly confirmed malaria cases reported in DHIS2 from January 2014 to December 2022. This analysis considers the seasonality of malaria and uses segmented regressions where pre-intervention trends and intercepts are used as "expected" post-intervention trends and intercepts. As a control group, we selected the district Kibuye for Ryansoro and Gihofi for Kinyinya, where the IRS intervention had not taken place. The trends and seasonality of intervention district were compared to the those of control districts.
- LLINs (long lasting insecticidal nets)=nets which last an average of 3 yrs
- IRS (indoor residual spraying)=spraying insecticide inside the walls of houses.

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