

Evaluating the potential impact of scaling-up point-of-care HIV viral load testing in Papua New Guinea: a mathematical modelling study

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Background: Early identification of unsuppressed HIV viral load (VL) through scale-up point-of-care (POC) testing could have a substantial impact on HIV transmission and morbidity in Papua New Guinea (PNG) where HIV prevalence and drug resistance are high. Using mathematical modelling, we evaluated the potential impact of POC VL testing on the HIV epidemic in PNG.

Methods: We developed a compartmental model to simulate the epidemiological outcomes of HIV among people aged 15 years and older in PNG from 1994 to 2030. Four scenarios of VL testing were simulated: (1) viral load testing conducted by the central laboratory (reference case); (2) continuation of currently implemented POC VL testing by the ACT-UP PNG study; (3) expanding POC VL testing coverage so that twice the number of people have access; and (4) expanding POC VL testing coverage so that three times the number of people have access. Adherence counselling effectiveness and annual POC VL testing rate were informed by preliminary data from the ACT-UP PNG study.

Results: Under Scenario 1, 86.5% of those on antiretroviral therapy would be virally suppressed, and 8,229 people would experience virological failure in 2030. The number experiencing virological failure in 2030 was estimated to reduce to 6,983 (15.1% decline), 5,888 (28.4% decline) and 5,043 (38.7% decline) people for Scenarios 2, 3 and 4, respectively. Between 2022 and 2030, Scenarios 2, 3 and 4 led to reductions of 442, 869 and 1,232 additional new infections averted compared to Scenario 1, respectively.

Conclusion: While having a small impact on HIV transmission, scaling up point-of-care viral load testing would lead to large reductions in the number of people experiencing virological failure. This would likely reduce morbidity, mortality, and the development of drug resistance. Future research into the full impact of POC VL scale-up on population-level drug resistance and its overall cost-effectiveness is required.

Disclosure of Interest Statement: ACTUP-PNG is funded by the Centre for Health Security, Australian Department of Foreign Affairs and Trade. No pharmaceutical or industry grants were received in the development of this study. The Kirby Institute is funded by the Australian Government Department of Health, and is affiliated with the Faculty of Medicine, UNSW Sydney, Australia.