HIV INCIDENCE AND VIRAL BURDEN AT THE COMMUNITY LEVEL IN HPTN 071 (POPART)

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BACKGROUND

HPTN 071 (PopART) was a 3-arm cluster-randomized trial that evaluated use of a combination HIV prevention strategy to reduce HIV incidence. The intervention package included universal HIV testing and treatment (UTT). The trial was conducted in 21 high HIV prevalence communities in Zambia and South Africa (7 matched community triplets). The primary outcome of the study was HIV incidence in the period 12 to 36 months after the start of the study, measured in a Population Cohort (PC) of ~2000 randomly-selected adults per community (aged 18-44). The intervention effect was greatest in the study arm that included treatment according to national guidelines (Arm B); a lesser effect was observed in the full UTT arm (Arm A), compared to the standard of care arm (Arm C).

METHODS

For each community, HIV incidence was estimated for PC12-PC36, using imputation methods. HIV viral load (VL) was obtained from nearly all HIV+ participants at PC24, and from a random sample of ~75 HIV+ participants/community at PC0, PC12 and PC36. Viremia was defined as having a VL>400 copies/mL. Viral burden was defined as the proportion of the entire community that was viremic.

Viral burden estimates were weighted by the sampling plan of HIV+ persons at each visit. HIV incidence and viral burden were also weighted by age and sex, using post-stratification of 10 estimated stratum weights (2 sex, 5 age groups) calculated from Intervention Data on Arm A and B communities near the end of the study. Within each triplet, each stratum weight was averaged for the A and B communities and the weight was used for each community within that triplet.

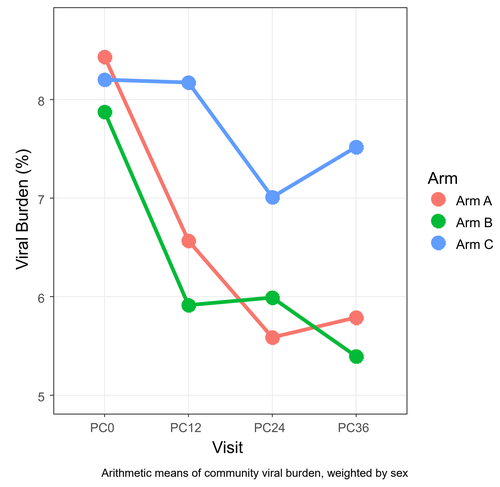
We examined associations of viral burden at PC24 with HIV incidence and the intervention effects on PC24 viral burden using multiple linear regressions. To examine whether PC24 viral burden mediated the PopART intervention effect on HIV incidence, we used a model-based causal mediation analysis with *mediate()* in R, accounting for triplet.

- **HIV incidence was highly correlated with HIV viral burden.**
- **The PopART communities saw a *general decrease* in viral burden across the trial.**
- **The reductions in viral burden did not explain the differential reduction of HIV incidence observed in the two trial intervention arms.**

RESULTS

HIV viral burden at PC24 was strongly associated with HIV incidence (Figure 2; p<0.001). We estimated a mean difference of -1.2% in viral burden for Arm A vs Arm C (95% CI: -2.8%, 0.4%) and a mean difference of -0.85% for Arm B vs Arm C: (95% CI: -2.5%, 0.8%), after accounting for study triplet. The average causal mediation effect of viral burden on HIV incidence was not significant (Arm A vs. C p=0.50; Arm B vs. C p=0.77; Arm A vs. B p=0.61).

Figure 1: Mean Viral Burden Across Visits



Arithmetic means of community viral burden, weighted by sex

Figure 2: HIV Incidence vs Viral Burden by Community

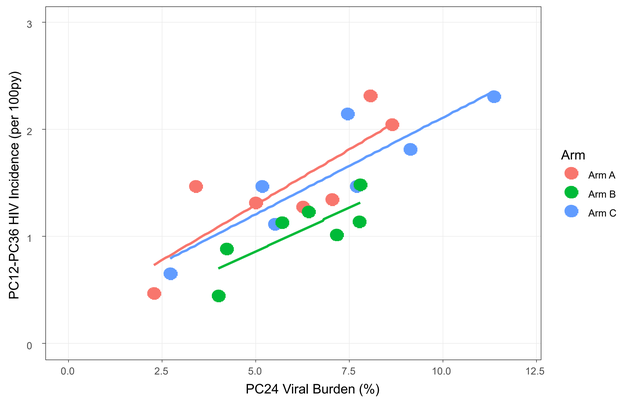
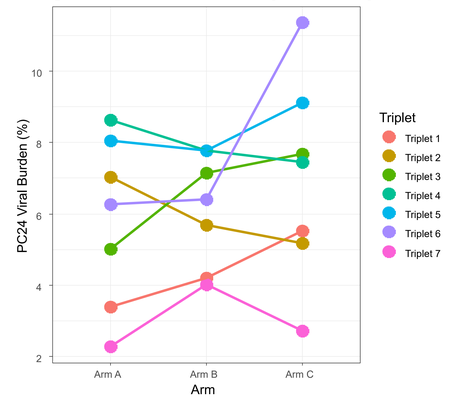


Figure 3: PC24 Viral Burden by Community



CONCLUSIONS

In HPTN 071 (PopART), higher HIV incidence was associated with higher viral burden. We observed a general decrease in HIV viral burden across the four visits of the trial for all trial communities (Figure 1). At PC24, we saw decreases in viral burden comparing Arm A vs C and Arm B vs C, but these were not strong intervention effects (Figure 3). The reduction in viral burden did not explain the differential reduction of HIV incidence observed in the two trial intervention arms.

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