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Viral load metrics: an additional benefit for HIV surveillance?

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Background

- Combination antiretroviral therapy (cART) as a strategy to prevent HIV transmission has gained much interest in recent years. The concept of community viral load (CVL) emerged in an attempt to explain the mechanism behind treatment as prevention (TasP).
- However, the use of viral load (VL) metrics as a tool for HIV surveillance has been debated, as results were contradicting and studies often did not explain why certain VL metrics were chosen.

Objective

- To gain more insight in the added value of in-care viral load (ICVL) and other VL metrics for HIV surveillance, by comparing time trends and associations with numbers of newly diagnosed HIV cases.

Methods

- Data from 20,740 HIV patients registered in the national observational Dutch ATHENA cohort from 2002-2013 were used, including viral load measurements, CD4 cell counts, and epidemiological information (e.g. transmission group, region of origin, residence, SES).
- Six in-care VL (ICVL) metrics were calculated (described in Figure 1). Other metrics included: mean and median of all VLs at diagnosis, and proportions of persons with transmission risk (mean VL >400 copies/ml) and with a suppressed VL (mean VL ≤200 copies/ml).
- Differences in VL metrics among subgroups were tested using Kruskal-Wallis tests.

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- Negative binomial regression analyses were performed to analyse the association between the different VL metrics and the number of new HIV diagnoses in the subsequent year, or two, three, or four years later ("lags"), and incidence rate ratios (IRR) were calculated.

Results

- Most patients were male (80%), Dutch (57%), resident of Amsterdam (40%), and MSM (55%). The average number of VL measurements per patient/year was 2.7.
- MSM and patients from Surinam/Caribbean had on average the highest mean ICVL during follow-up, whereas heterosexual men and patients from South-East Asia had on average the lowest mean ICVL (not shown).
- Most ICVL metrics showed similar decreasing trends (Figure 1), and the mean of the mean log VL metric (mean ICVL) was chosen for further analyses.
- The mean ICVL showed the strongest association with new diagnoses compared to other VL metrics (not shown). A decrease in ICVL was associated with a decrease in new diagnoses two to four years later where associations became stronger at longer lag times (Figure 2).
- Stratified analyses showed that a decrease in mean ICVL was associated with a decrease in new diagnoses among MSM four years later, while for heterosexuals a larger decrease in new diagnoses was found, and starting already after one year (not shown).

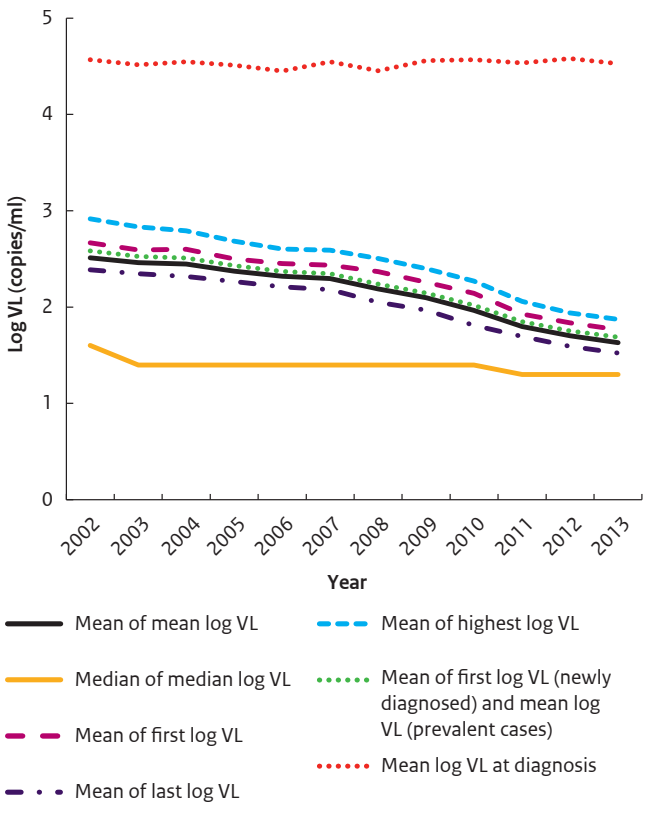

Figure 1: trends in ICVL metrics and in mean log VL at diagnosis.

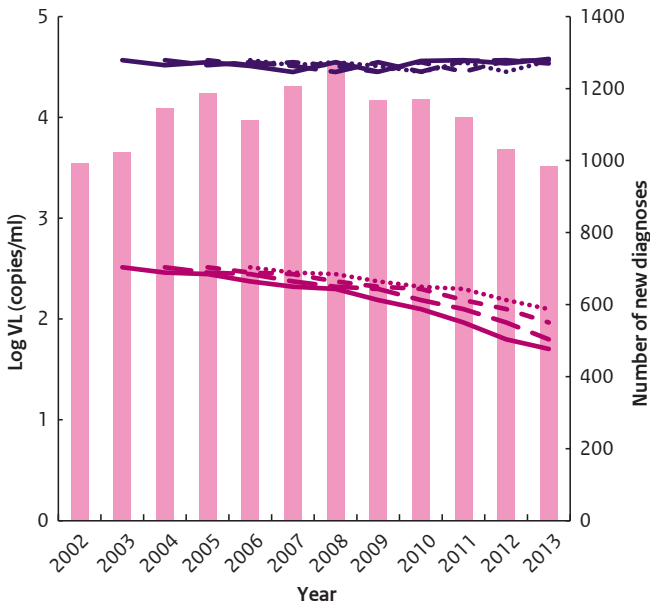

Figure 2: mean ICVL (violet), mean VL at diagnosis (purple), and numbers of new HIV diagnoses (bars).

Conclusion

- VL metrics may have additional value in enhancing HIV surveillance, for example by identifying subgroup differences in impact of TasP, and by predicting numbers of new diagnoses in subsequent years.

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