Tests of BDL Bias and Variance

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Purpose

This file will test the determination of bias and variance when calculating viral loads and other variables that are subject to detection limits. For HIV-1 patients, the objective of antiretroviral treatment is the make their plasma RNA viral load zero.

However, there is a practical limit below which the assays cannot distinguish between the presence of virus and having no virus (the zero objective). This is called the "detection limit" and patients who achieve this level are said to have a viral load "BDL", below detection limit. One of the most important consequences of exactitude in measuring true lack of the presence of virus is the phrase "undetectable = untransmittable" [1]. This frees, at least emotionally, the individual from concern about transmitting the virus to a partner.

There have been various strategies to deal with calculations of viral load in a panel of patients. One has been to eliminate the cases from the calculation, another has been to treat the viral level of those patients who are BDL as 0, assuming they are really without any virus. Still another strategy has been to assign a value equal to the detection limit. Others have used a value of half the detection limit, i.e., half of the difference between the detection limit and zero.

Name	Strategy	Value Assigned to "BDL"
censor	eliminate case	no value
zero	treat as zero	0
dl	treat as detection limit	detection limit
halfdl	treat as half of detection limit	detection limit/2

Bibliography

[1] G. C. Chang *et al.*, "Brief Report: Undetectable HIV-1 Viral Load Among Virally Suppressed People Living With HIV: Implications for Undetectable Equals Untransmittable (U=U) in Resource-Limited Settings Using Dried Spot Testing," *Journal of*

Acquired Immune Deficiency Syndromes (1999), vol. 100, no. 4, pp. 289–293, Dec. 2025, doi: 10.1097/QAI.0000000000003745.