

# The use of Lorenz curves and Gini index for the evaluation of HIV viral load distribution in the community

S. Arsuffi<sup>1</sup>, M. Salvi<sup>1</sup>, S. Calza<sup>2</sup>, M. Alberti<sup>1</sup>, G. Tiecco<sup>1</sup>, E. Focà<sup>1</sup>, F. Castellì<sup>1</sup>, E. Quiros-Roldan<sup>1</sup>

1. Clinica di Malattie Infettive e Tropicali, Università degli Studi di Brescia e ASST Spedali Civili di Brescia

2. Unità di Biostatistica e Biomatematica e Unità di Bioinformatica, Dipartimento di Medicina Molecolare e Traslazionale, Università degli Studi di Brescia

## Introduction

- Community viral load is defined as an aggregate measure of individual viral loads of people living with HIV (PLWH) in care in a specific community.<sup>1</sup>
- It represents an instrument to evaluate antiretroviral therapy (ART) program effectiveness and transmission potential in a specific population.<sup>2, 3</sup>
- Our study aimed to analyze the overtime trend and the distribution characteristics of viral load in PLWH at the Department of Infectious and Tropical Diseases of Brescia.

## Methods

- Our population included all the PLWH in care at the Department of Infectious and Tropical Diseases of Brescia from January 1997 (2494 patients in care) to December 2022 (4197 patients in care).
- We considered viral loads, expressed on a base 10 logarithmic scale, detected after the initiation of ART.
- Using Lorenz curves, we investigated the demographic characteristics of individuals who held the top 10% of viral loads over the years.
- We applied the Gini index to measure the inequality of the distribution of viral load among the study population.

Figure 1 Average HIV viral load (log<sub>10</sub> scale) from January 1997 to December 2022

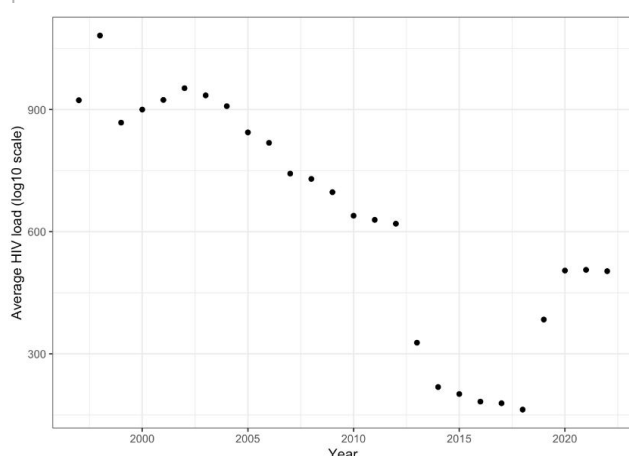


Figure 3 Demographic characteristics of individuals who held the top 10% of viral loads

Top 10% HIV load su 5 anni					
Characteristic	[1997,2002], N = 93 <sup>†</sup>	[2002,2007], N = 150 <sup>†</sup>	[2007,2012], N = 184 <sup>†</sup>	[2012,2017], N = 111 <sup>†</sup>	[2017,2022], N = 190 <sup>†</sup>
Sesso					
F	27 (29%)	39 (26%)	67 (36%)	37 (33%)	66 (35%)
M	66 (71%)	111 (74%)	117 (64%)	74 (67%)	124 (65%)
Nazionalita_Italiana					
No	6 (6.5%)	8 (5.3%)	22 (12%)	21 (19%)	36 (19%)
Si	87 (94%)	142 (95%)	162 (88%)	90 (81%)	154 (81%)
<sup>†</sup> n (%)					

## Results

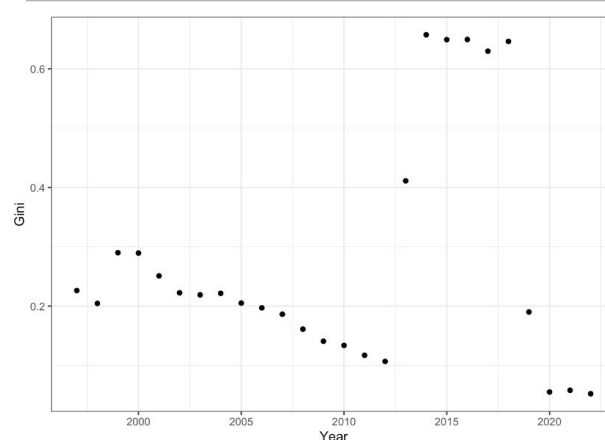
### COMMUNITY VIRAL LOAD

- Overall, our data showed a progressive decrease in the community viral load over the years.
- In particular we observed a linear reduction of community HIV viral load after 2002 and a subsequent sharp decline after 2012.
- On the contrary, in the last two years from 2020, a rebound of viral load was registered among our population, probably in concomitance with COVID-19 pandemic lock down (Fig.1).

### GINI INDEX

- The Gini index had a specular trend during the time span, with a stable homogeneity in the viral load distribution among the population from 1997 to 2012 and a later abrupt increase in the disparity, from 0.1 to 0.6, after this year.
- Similarly to the community viral load, also in 2020, we can observe a trend variation with a new decrease in the inequality of the distribution (Fig.2).

Figure 2 Gini index from January 1997 to December 2022



### LORENZ CURVES

- In all the observed periods, the top 10% of viral loads showed a progressive increase of female individuals, rising from 29% to 35%, and in non-Italian nationals, rising from 6.5% to 19% (Fig.3).

## Conclusion

- Our study evidenced the effectiveness and the improvement of the HIV care cascade over the years, showing an overall decrease in community HIV viral load among PLWH in flow-up during the observed period.
- We hypothesize that the introduction of protease inhibitors in 2002 produced a gradual decline in the viral loads, uniformly distributed among the population.
- On the other side, the introduction of integrase inhibitors seemed to have produced a rapid drop in the community viral load in 2012
- The notable discrepancy in the homogeneity in the population was likely due to some non-adherent individuals with high viral load contrasting the trend to viral suppression.
- The increase in 2020 could be possibly due to the COVID-19 pandemic.
- It is important to underline also the evolution in the population with the top 10% of viral loads over time, with a gradual but stable increase of female and non-Italian subjects.

## References

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