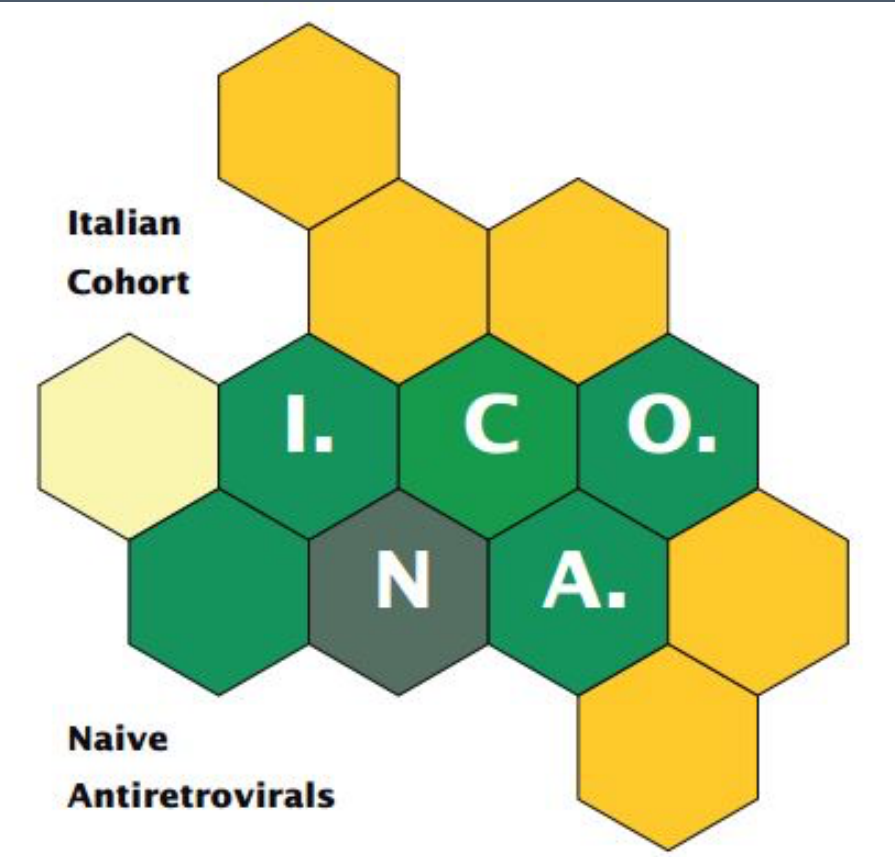


# Quantifying the future clinical burden of an ageing HIV-positive population in Italy: a mathematical modelling study

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## BACKGROUND

- The ageing HIV-positive population has been shown to experience an excess burden of non-communicable diseases (NCDs) compared to uninfected persons<sup>1</sup>.
- Country-specific forecasts of NCD burden will be key to guide future HIV policies on optimal management of multi-morbid patients and which screening and treatment services will be most needed.
- Recent model-based projections in The Netherlands showed the clinical implications of an ageing population characterised by a sharp increase in the burden of NCDs, and potential complications with use of co-medication.<sup>2</sup>

## AIM

- To use model-based analyses to provide national forecast of the future age structure and NCD burden amongst HIV-positive patients on antiretroviral therapy (ART) in Italy.

## METHOD - DATA

- The model was designed using information from 7,469 HIV-positive patients on ART receiving care from 1997 onwards at any of the 42 infectious disease centres registered with the ICONA (Italian Cohort Naive to Antiretrovirals) Foundation Study.
- National surveillance data on HIV incidence, and number of people starting ART was used to extrapolate the model to national level<sup>3</sup>.

## METHOD - MODEL

- We adapted an individual-model of the ageing HIV-positive population to Italy.<sup>2</sup>
- Model follows ageing Italian HIV-positive population on ART from 1st January 2010 to 31st December 2035 or death and probabilistically simulates clinical events (hypertension, dyslipidaemia, chronic kidney disease (CKD), diabetes, non-AIDS defining malignancies, strokes or myocardial infarctions (MIs), and mortality).
- The model was built using 1997-2010 data, and validated against 2010-2015 out-of-sample data to ensure projection robustness prior to expanding to national level.
- Model results were based on the average of 100 model simulations.

## RESULTS – FUTURE AGE-STRUCTURE

- The model projects that the mean age amongst patients on ART will increase from 46.1 to 58.8 in Italy between 2015 and 2035.
- The proportion of patients on ART aged  $\geq 50$  years old will increase from 30% to 76% between 2015 and 2035.

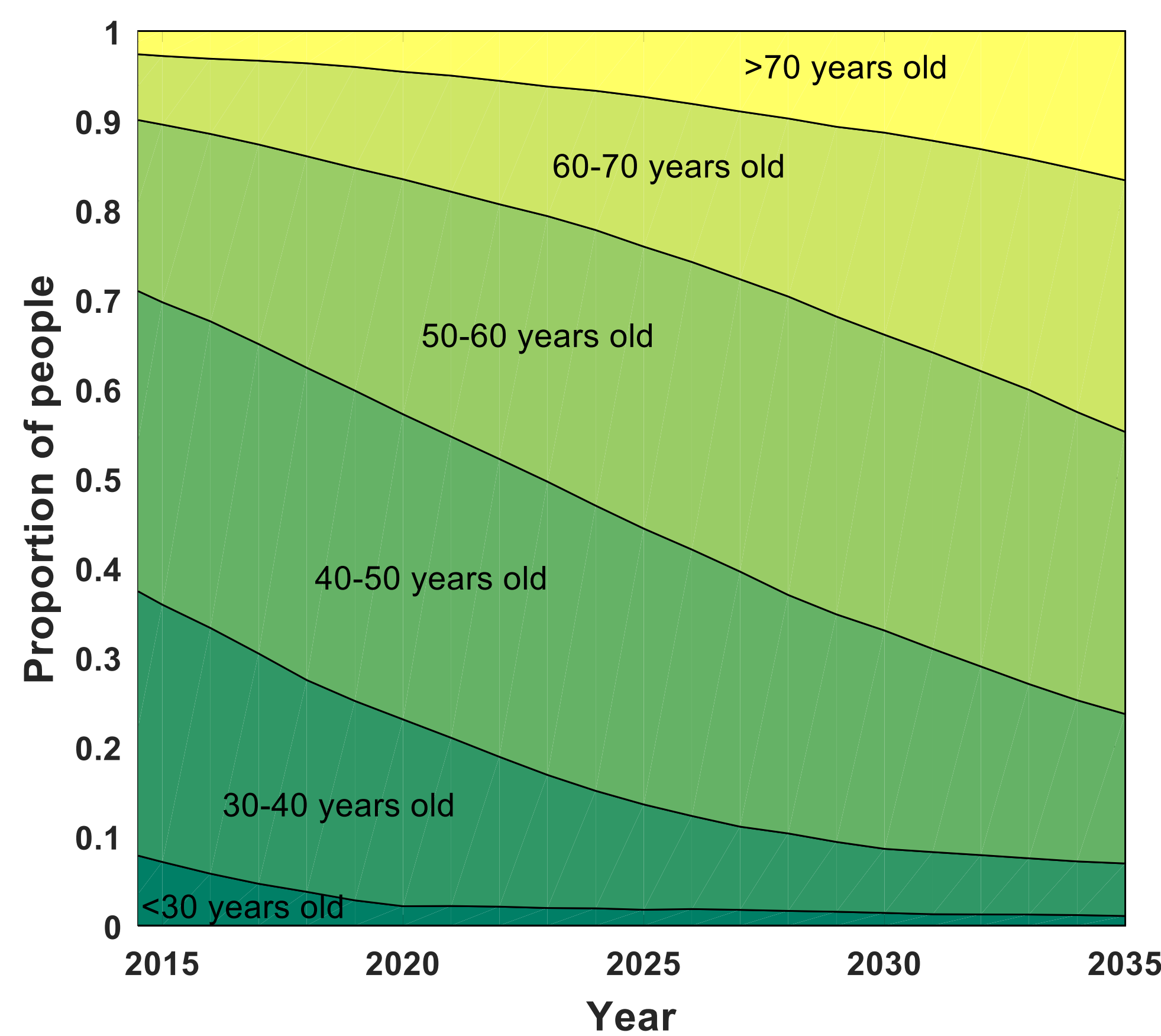


Figure 1. The age distribution of HIV-positive patients on antiretroviral therapy in Italy between 2015 and 2035.

## RESULTS – FUTURE BURDEN OF NCDs

- The proportion of patients on ART with no NCDs will decrease from 36% to 11% between 2015 and 2035 in Italy.
- The proportion of patients on ART with three or more NCDs will increase from 10% to 46% between 2015 and 2035.

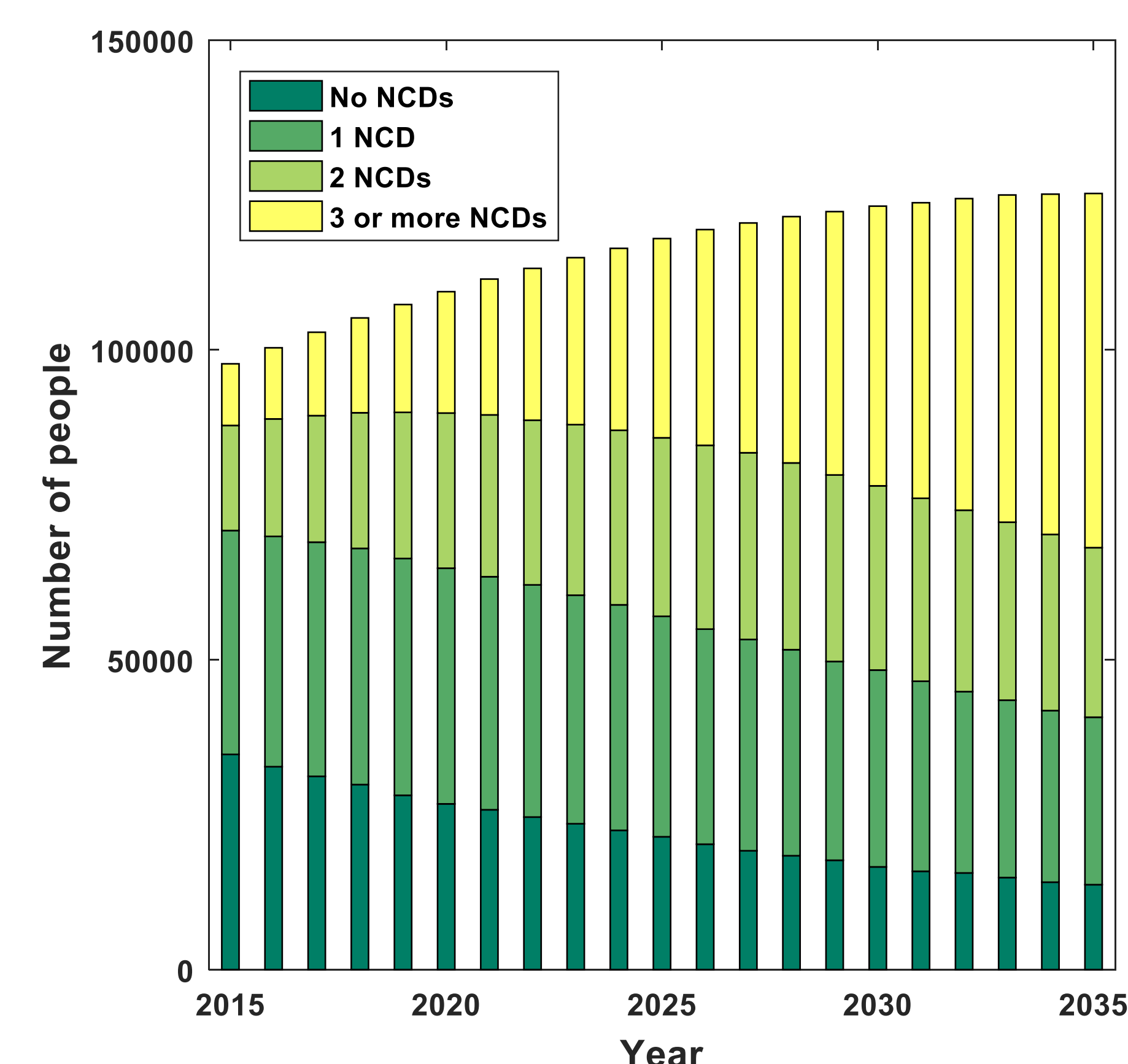


Figure 2. Stacked bar graph of projected burden of NCDs in HIV-positive patients on antiretroviral therapy between 2015 and 2035 in Italy.

## RESULTS – DRIVERS OF NCD

- The rising NCD burden in Italy will be driven by CVD (hypertension, dyslipidaemia, strokes or MIs), diabetes, and CKD.
- CVD will contribute the greatest burden, affecting 57% of patients in 2015 and 85% by 2035.

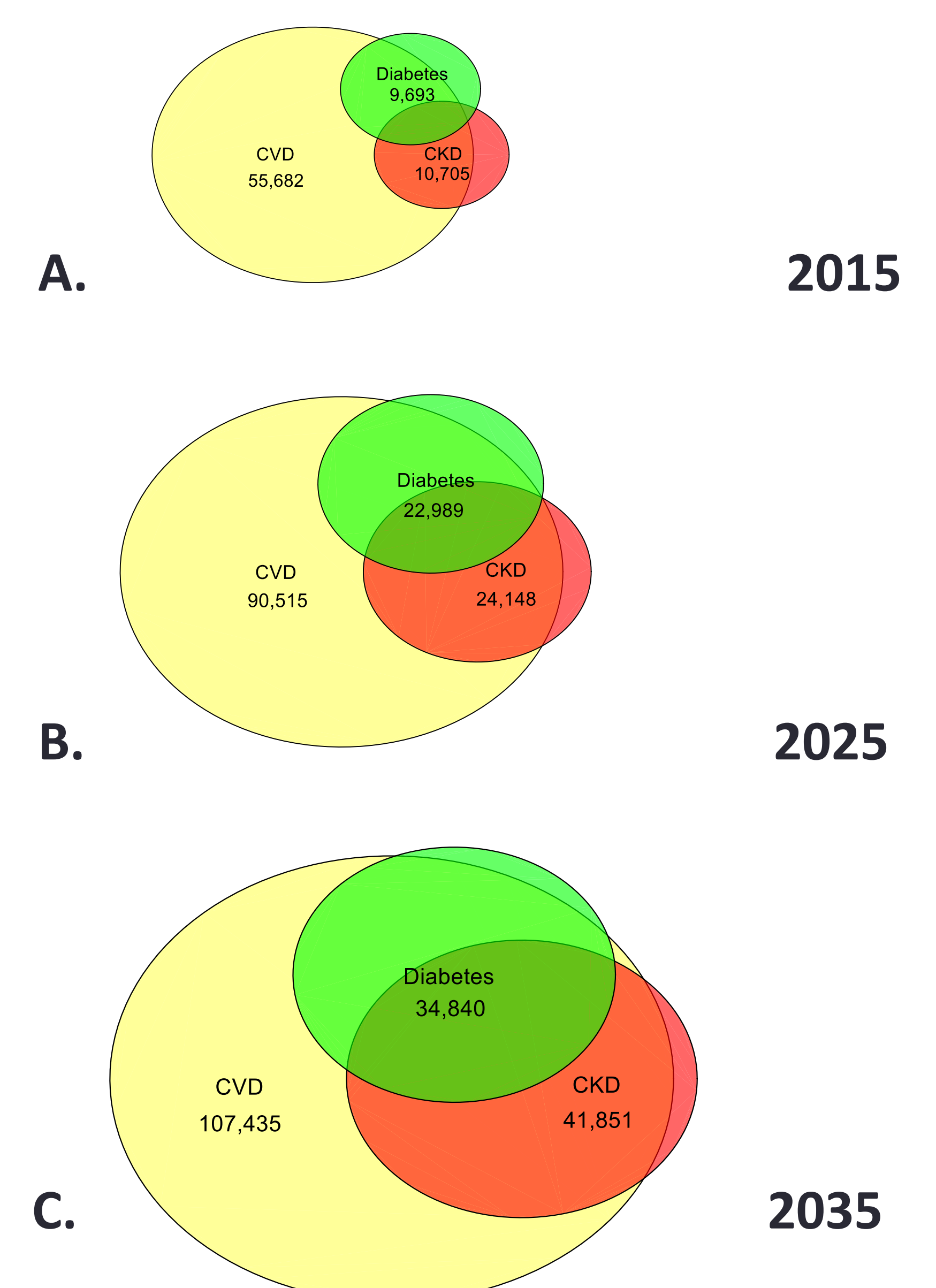


Figure 3. Diagram representing the changes in relative number of patients with specific NCDs and overlap in NCDs in A. 2015, B. 2025, and C. 2035. The area represents the relative number of HIV-patients with NCDs. Abbreviations: Cardiovascular disease (CVD), Chronic Kidney Disease (CKD).

## CONCLUSIONS

- HIV-positive patients in Italy are ageing and will suffer from an increasing NCD burden.
- CVD, CKD and diabetes in particular will contribute to NCD burden.
- Trends were similar to forecasts made for The Netherlands<sup>2</sup> with the exception that CKD is expected to contribute a greater burden by 2035 in Italy (30%) than The Netherlands (in 2030, 14%).
- To ensure the best overall long-term health, optimal selection of ART and co-medication choice is maintained for these populations, multi-disciplinary patient management and enhanced communication between HIV specialists, geriatric medicine and primary care must be developed.

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