The Australian and Western Australian HIV Cascade

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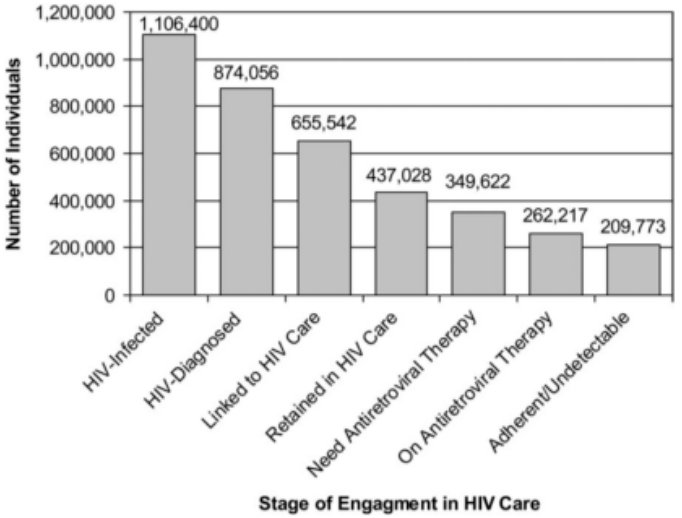
What are cascades and what are their purpose?

- **A diagnosis and care cascade**
  - Considers all people with an infection
  - Focuses on clinical care and treatment post-infection
  - Considers the desired endpoint for individuals with an infection
    - For HIV = suppressed virus

- A cascade is an epidemiological reporting tool shown as a **bar chart**
  - Shows the key steps/stages of care
  - Gives a precise definition of the stages
  - Displays the number or proportion of people in each stage



- Can be used for many diseases: **HIV**, HCV, HBV, and other STIs

- Key tool in UNAIDS reporting of 90-90-90 and 95-95-95 targets

Gardner et al *Clinical Infectious Diseases 2011;*52:793–800.

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What are cascades and what are their purpose?

- Cascades show cross sectional “snapshots” of the number of people in each stage
  - Do not described the movement of individuals through the care pathway or loss to follow-up
  - Everyone living with and infection is counted somewhere in the cascade

- For HIV we estimate the number of people in each stage to see if everyone is achieving viral suppression and if there are any gaps that need addressing

- Requires combining measurements, estimates, and epidemiological, clinical, and treatment data
  - Often use models with assumptions to calculate estimates
  - Each stage can be estimated independently
  - **Inherent uncertainty**
  - New or improved data ⟹ **new estimates (sometimes a large change)**

- We have been developing and reporting cascades for HIV since 2014 (https://data.kirby.unsw.edu.au/hiv)

- The cascade estimates are central indicators of the National HIV Strategy informing the targets for the virtual elimination of HIV transmission (but don’t cover everything)

HIV cascade - Cheat sheet

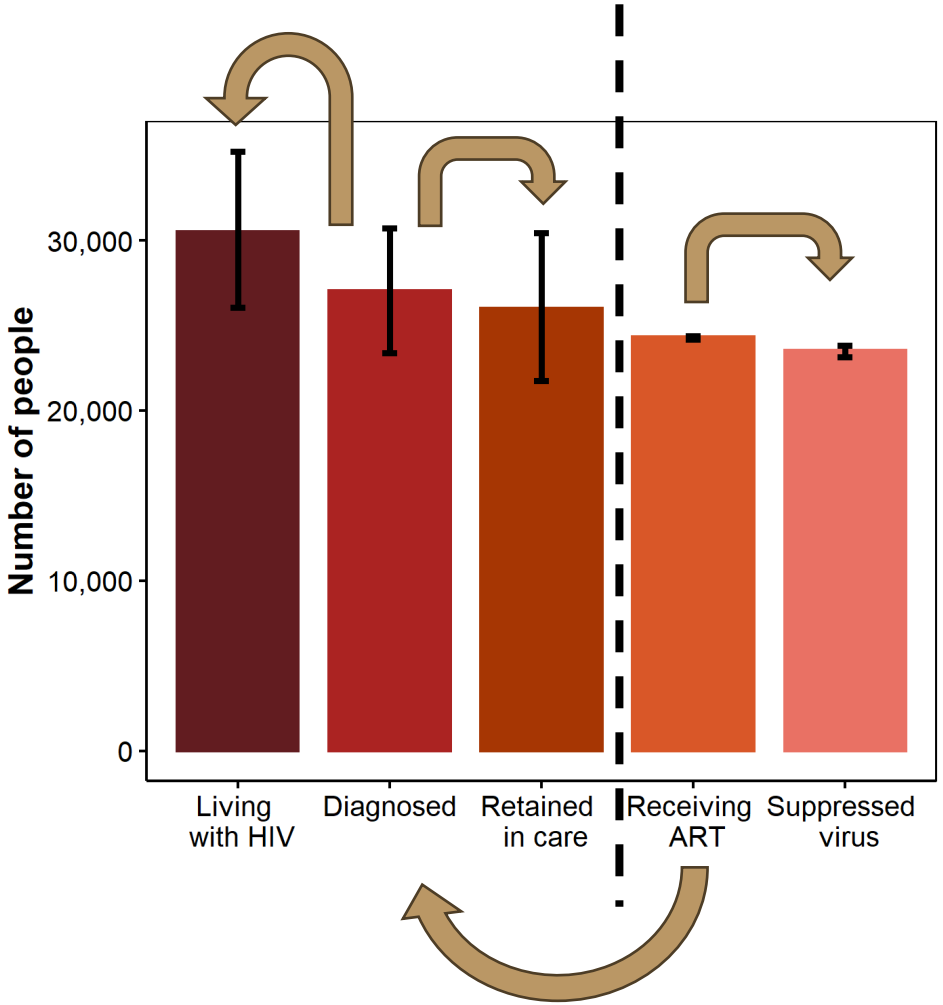
Stage	Definition	Methods
Number living with HIV	Estimated number of people living with HIV in the overall population who were living in Australia/WA in the last calendar year	% undiagnosed from European Centre for Disease Prevention and Control (ECDC) HIV Modelling tool applied to people living with diagnosed HIV (below)
Number living with diagnosed HIV	Estimated number of people with HIV in the last calendar year who have been previously diagnosed with HIV	Cumulative notifications minus duplicates minus deaths minus emigration **plus/minus interstate migration** • Emigration includes post-diagnosis emigration plus long-term emigration • Emigration rate adjusted so that estimated percentage on ART matches the percentage from HIV Linkage Project data
Number of people with HIV retained in care	Number of people with HIV who received at least one CD4 or VL test during the last calendar year	% retained in care from clinical follow-up studies applied to number diagnosed
Number taking ART	Number of people with HIV who received antiretroviral drugs at some stage during the last calendar year	100% Pharmaceutical Benefits Scheme (PBS) data + number of temporary residents taking ART
Number with a suppressed viral load	Proportion of people taking ART in the last calendar year who had a VL less than 200 HIV RNA copies/ml at last test	% with viral suppression at last test applied to number on ART from Australian HIV Observational Database (AHOD)

HIV cascade – Methods summary

No data to provide a direct estimate for number living and diagnosed with HIV

- Rely on modelling or calculations
- Combination of lots of empirical data sources
- Lots of uncertainty

Living with HIV and retained in care estimates depend on the diagnosed estimates



Number on treatment and with a suppressed viral load based on empirical data

- Separate from previous steps
- Less uncertainty

Viral suppression estimate depends on the treated number

HIV Data Linkage Study allows us to link treated & diagnosed

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HIV cascade - Methods

- Annual Surveillance Report HIV Cascade Reference Group
  - Key contributor to HIV cascade estimates for Australia
  - Consists of representatives from national and state/territory departments of health, community organizations (Health Equity Matters, NAPWHA, Positive Life NSW, Scarlet Alliance, AIVL), clinicians, and researchers

- Annual (plus additional) meetings held at Kirby to review and interrogate the methods, data inputs, and estimates

- Have been held for > 10 years with hundreds of representatives attending

- This engagement is perhaps the most important part of the whole process

Australian HIV cascade – Data sources

- National HIV Registry
- **HIV Data Linkage Study (**National HIV Registry, National Death Index, MBS, PBS)
- ABS migration and population movement data
- NSW Health 6-month post-diagnosis follow-up data
- Clinical follow-up studies (e.g., McMahon et al. PLOS One: e0127726)
- Pharmaceutical Benefits Scheme (PBS)
- Australian Government program providing HIV ART to people who are Ineligible for Medicare
- Australian HIV Observational Database (AHOD)
- Australian Collaboration for Coordinated Enhanced Sentinel Surveillance of Sexually Transmissible Infections and Blood-borne Viruses (ACCESS)

HIV cascade – Number diagnosed

- Calculation based on notifications from the start of the epidemic in 1980
- Number living with **diagnosed HIV** at end of current year =

  Number with diagnosed HIV at end of previous year +

  New notifications (including previously diagnosed overseas) –

  Estimated number of duplicates in new notifications –

  Number who die of any cause during current year –

  Number who emigrate overseas during current year –

  (Number who emigrate interstate during current year +

  Number who arrive from interstate during current year)

- Range/uncertainty in each component used to produce lower and upper estimate
- HIV linkage data for 2015-2022 used to adjust the national emigration rate (the most uncertain component) so % on ART from calculations = % on ART from the linkage data
- We don't have good data for interstate population movement yet and are reliant on general population data from the ABS (which is of relevance to WA)

HIV cascade – Number undiagnosed

- % undiagnosed estimates rely on models and statistical back-projection methods
- We use the European Center for Disease Prevention and Control (ECDC) HIV Modelling Tool: https://www.ecdc.europa.eu/en/publications-data/hiv-modelling-tool
  - Uses CD4 count at diagnosis (> 500, 350-499, 200-349, < 200) to back-project time of infection
- Outputs: new infections, average time to diagnosis, **% undiagnosed**, etc over time

- Recent estimates are prone to change, especially for small numbers
- Main driver of results is the distribution of CD4 count at diagnosis
  - Higher number/proportion of late diagnoses = higher number/proportion undiagnosed

- % undiagnosed applied to number diagnosed = Number people living with HIV

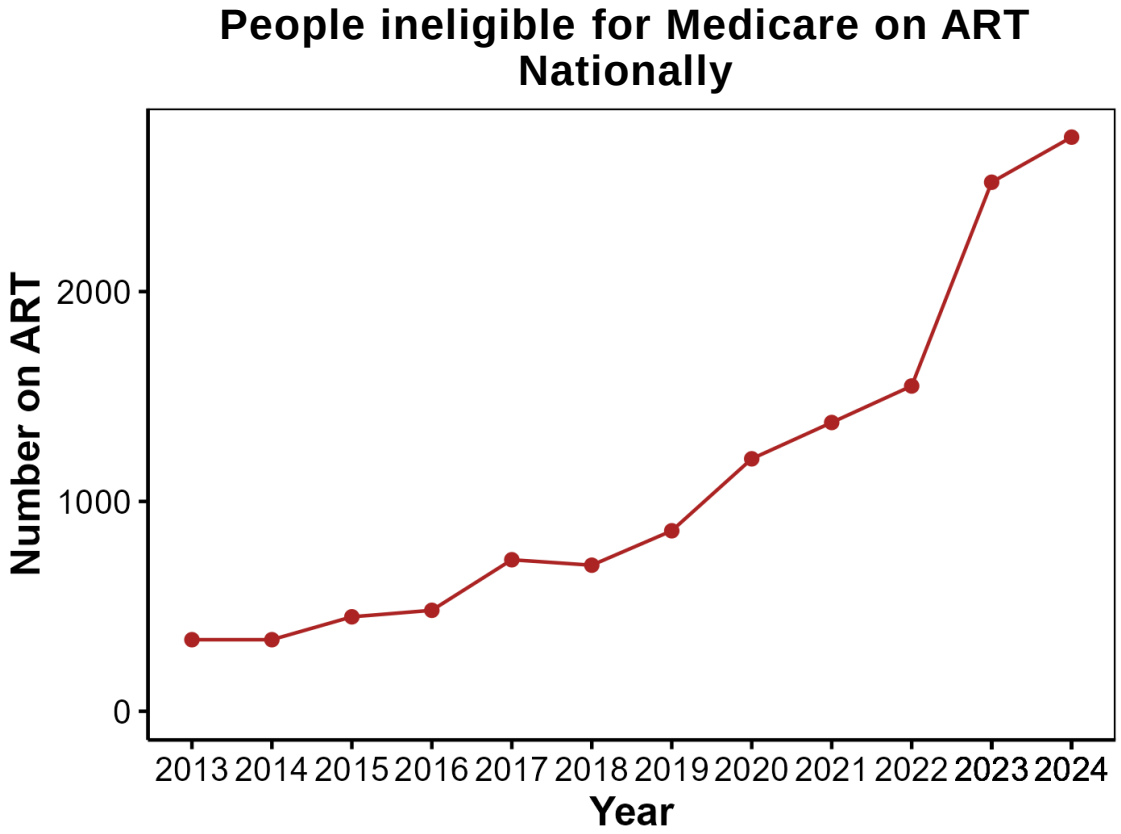
HIV cascade – Number on ART and suppressed

- **Number on ART** = number from 100% PBS sample + temporary residents on ART

- Temporary residents on ART
  - Not in PBS as not eligible for Medicare
  - Estimates available from Australian Department of Health program

- **Number with suppressed viral load** = Proportion with a suppressed viral load **(< 200 copies/ml** at last test) x Number on ART

- Proportion from longitudinal cohorts of people living with HIV (AHOD, ACCESS)



	Reported participants 2023-24	Reported participants 2024-25
WA	245	238
Australia	2,521	2,736

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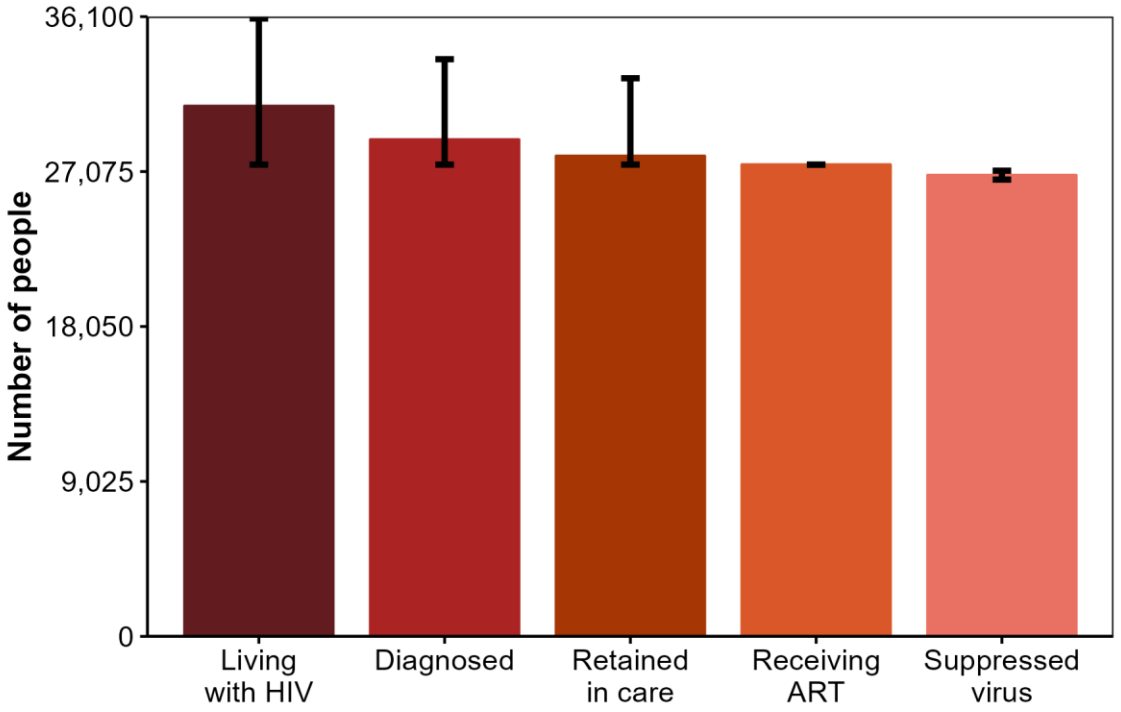
Australia's HIV cascade at end of 2024

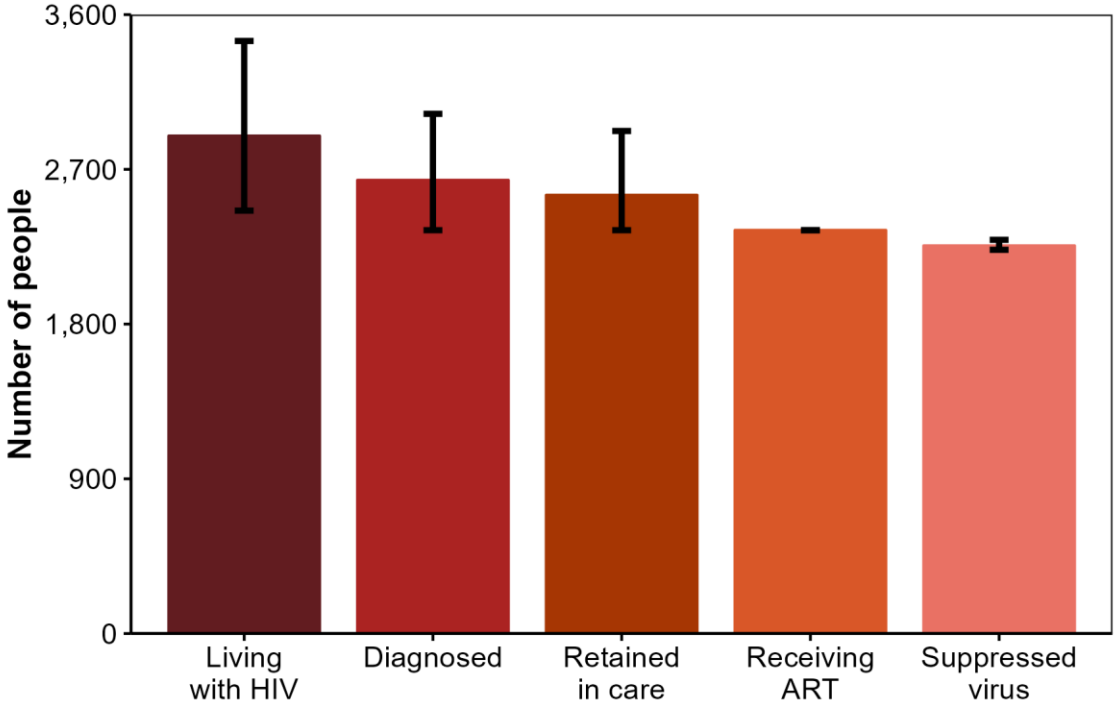


	Estimate	Lower	Upper
Living with HIV	30,890	27,480	35,990
Diagnosed	28,940	27,480	33,620
Retained in care	27,980	27,480	32,510
Number on ART	27,480	27,480	27,480
Suppressed virus	26,870	26,610	27,130

* Rounded to nearest 10

- Corresponding 95-95-95 targets: 93.7%-95.0%-97.8%

Western Australia's HIV cascade at end of 2024



	Estimate	Lower	Upper
Living with HIV	2,890	2,460	3,450
Diagnosed	2,640	2,350	3,020
Retained	2,550	2,350	2,920
Number on ART	2,350	2,350	2,350
Suppressed virus	2,260	2,230	2,290

* Rounded to nearest 10

- Corresponding 95-95-95 targets: 91.1%-89.0%-96.1%
- > 10% on ART are ineligible for Medicare
- **Note**
  - Retained using national %
  - % suppressed using WA data

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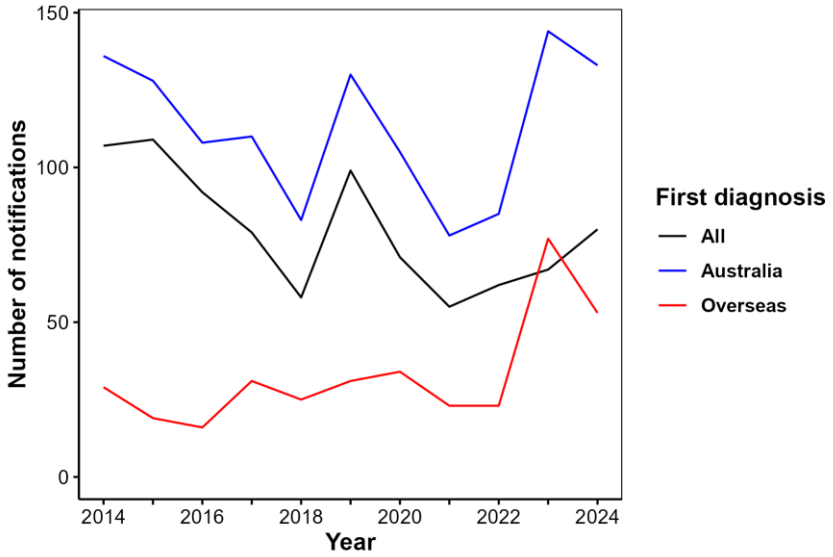
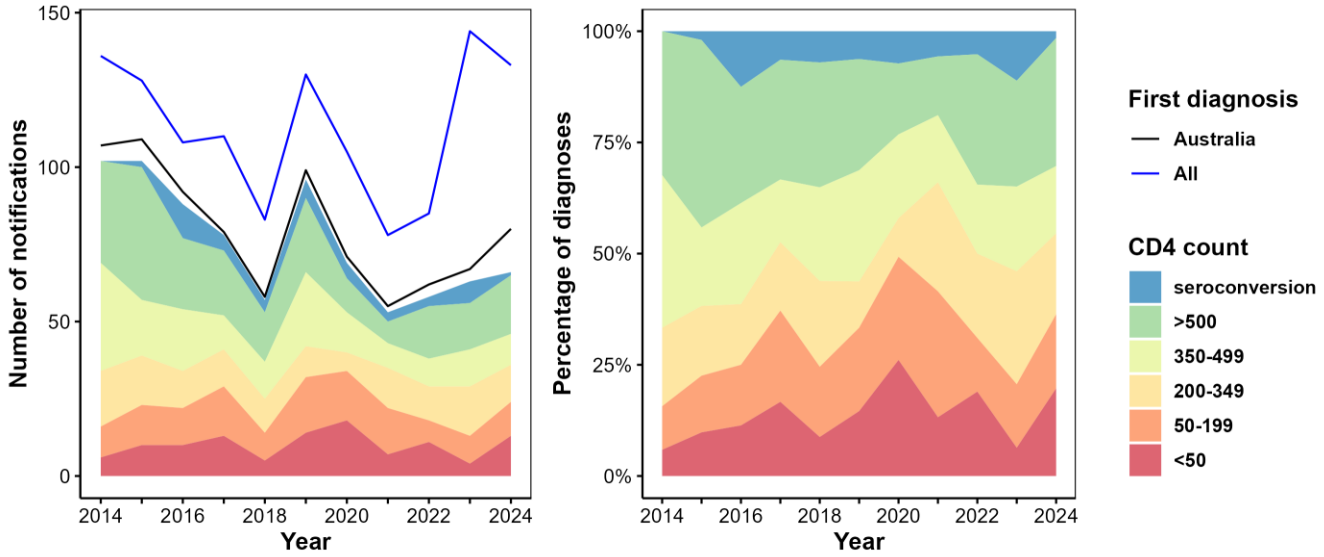
Western Australia's HIV cascade – 2024

- Why the diagnosis and treatment gaps?





- Not sure about the robustness of the ART gap (seems a bit large?)
  - Could be an issue with population movement assumptions
  - HIV linkage data will improve estimates for number of people with HIV moving between states and territories

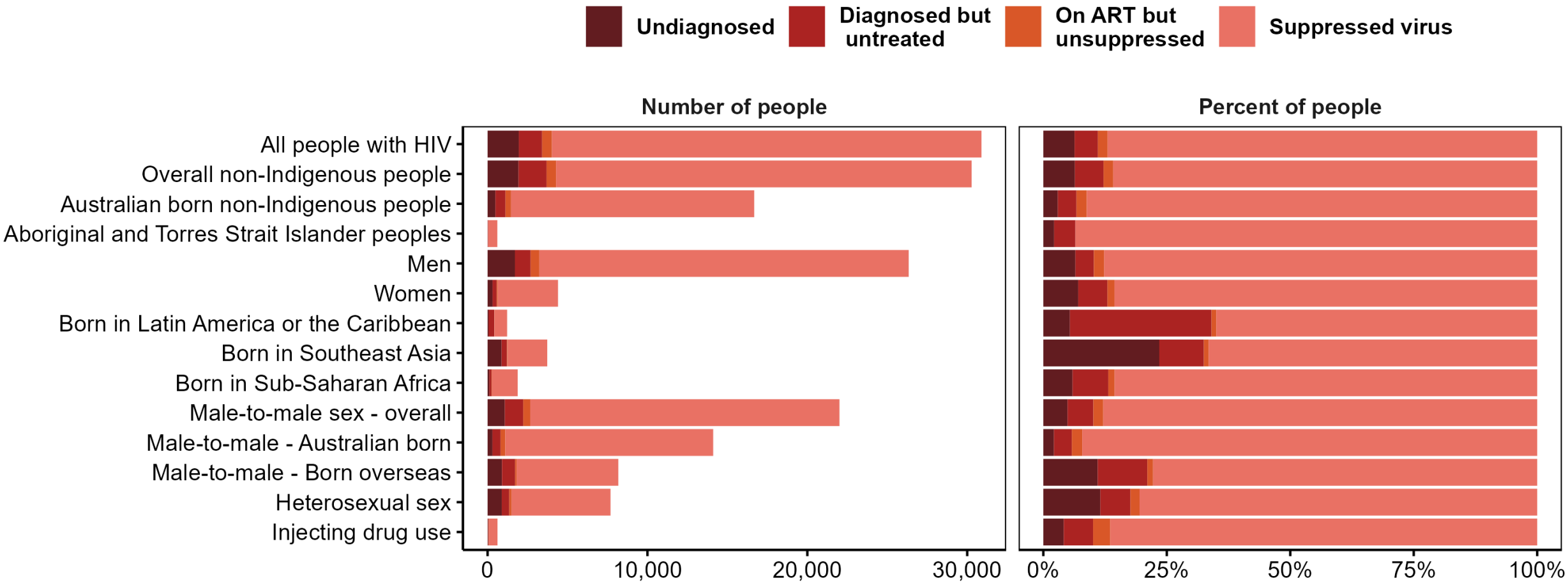
What are the cascades telling us?

- Australia overall passed 90-90-90 during 2018 and has passed the 2nd and 3rd 95 targets
- **But** currently not on track to achieve 95% diagnosed by 2025 if current trends continue
- There will still be > 30,000 people living with HIV in Australia who will require ongoing care and support even if we eliminate transmission by 2030

- Gaps in the HIV diagnosed step for Australia overall and WA remain with people still being diagnosed late
  - Need to address gaps among priority and other populations
- Treatment gap in WA needs to be verified
- The process of putting cascades together is very valuable and helps inform the response

- The cascades don't tell us everything but with other surveillance metrics they are a useful tool for improving our understanding of the HIV epidemic

National HIV cascades for priority and other populations



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- The Australian Department of Health and Aging and the State/Territory health departments
- https://www.kirby.unsw.edu.au/sites/default/files/documents/Acknowledgments%202023.pdf

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Thank You!

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