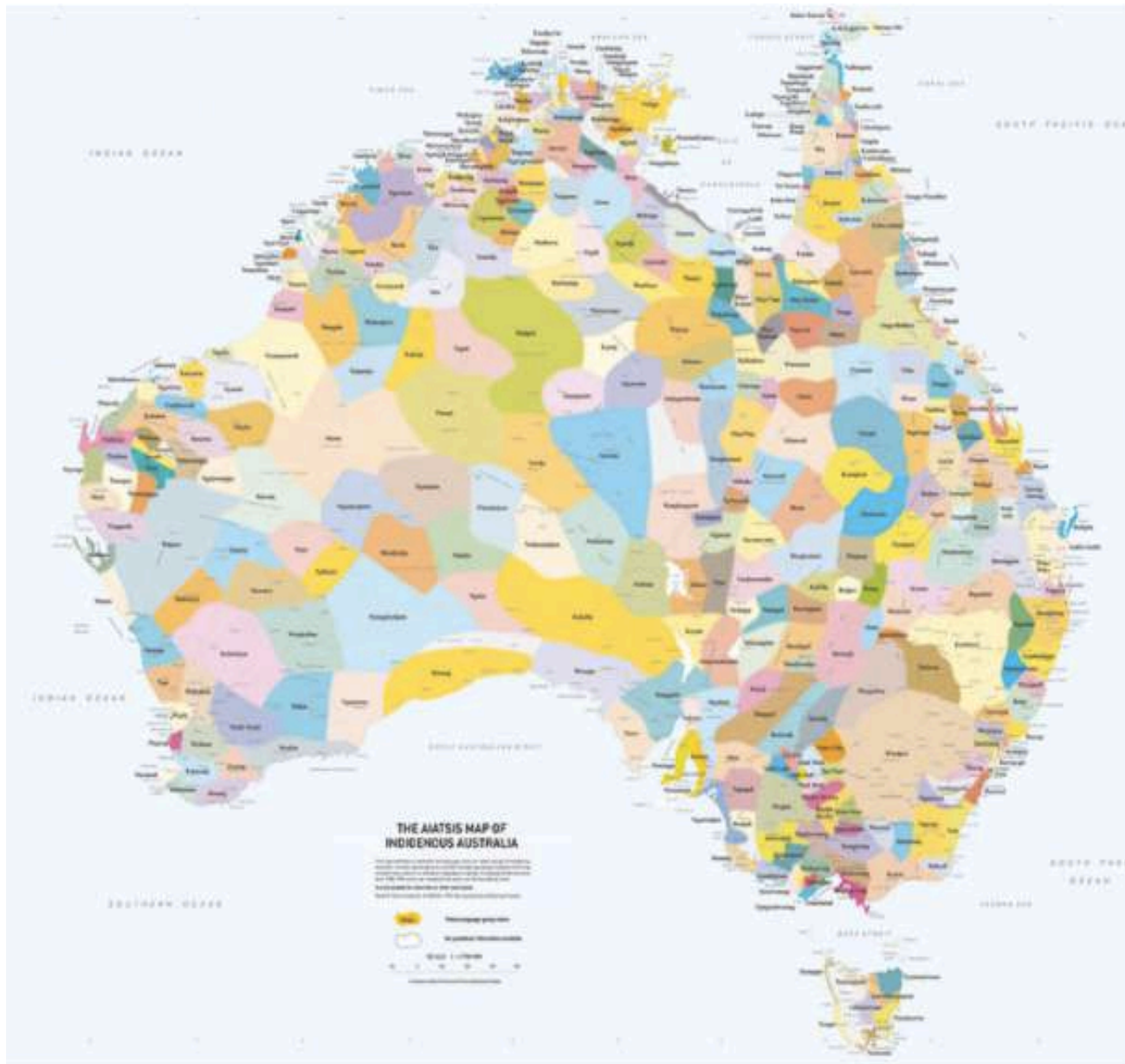


# HIV: The Australian Story

ASHM Optimising the Care of People Living with HIV  
Webinar Series  
Edwina Wright  
September 2020



This map attempts to represent the language, social or nation groups of Aboriginal Australia. It shows only the general locations of larger groupings of people which may include clans, dialects or individual languages in a group. It used published resources from 1988-1994 and is not intended to be exact, nor the boundaries fixed. It is not suitable for native title or other land claims. David R Horton (creator), © Aboriginal Studies Press, AIATSIS, 1996. No reproduction without permission. To purchase a print version visit: [www.aiatsis.ashop.com.au/](http://www.aiatsis.ashop.com.au/)

# Disclosures

## Previously

- **Study drug provided VicPrEP Study**
  - Gilead
- **Receipt of unrestricted research funds**
  - Gilead, Abbott, Janssen Cilag, Boehringer Ingelheim, MSD
- **Receipt of funding for consultancy, lectures & developing educational resources**
  - ViiV, Merck, Gilead and Abbott
- *All funds used for research purposes only*

# Overview

- Brief discussion on natural history and epidemiology of HIV
- Consider Australia's preparedness for and response to a sexually-transmitted, chronic viral illness pandemic
  - Through an examination of the political, social and medical landscapes present in 1981 and how they changed over the past 40 years



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MMWR™

Weekly

June 5, 1981 / 30(21);1-3

Epidemiologic Notes and Reports

## ***Pneumocystis Pneumonia --- Los Angeles***

In the period October 1980-May 1981, 5 young men, all active homosexuals, were treated for biopsy-confirmed *Pneumocystis carinii* pneumonia at 3 different hospitals in Los Angeles, California. Two of the patients died. All 5 patients had laboratory-confirmed previous or current cytomegalovirus (CMV) infection and candidal mucosal infection. Case reports of these patients follow.

Patient 1: A 30-year-old man with a 2-month history of fever associated with elevated liver enzyme levels, leukopenia, and leukocytosis. He had multiple courses of amphotericin B and trimethoprim-sulfamethoxazole for pneumonia.

Patient 2: A 28-year-old man with a 2-month history of fever, weight loss, hematuria, and diarrhea. His illness included multiple courses of amphotericin B and trimethoprim-sulfamethoxazole.

Patient 3: A 30-year-old man with a 2-month history of fever, weight loss, and diarrhea. He was hospitalized in February 1981 for pneumonia. The CMV complement was positive.

Patient 4: A 29-year-old man with a 2-month history of fever, weight loss, and diarrhea. He did not respond to multiple courses of amphotericin B and trimethoprim-sulfamethoxazole.

2-month history of fever associated with elevated liver enzyme levels, leukopenia, and leukocytosis. He had multiple courses of amphotericin B and trimethoprim-sulfamethoxazole. Examination showed residual *P. carinii* and CMV.

and of elevated liver-function tests, CMV immunofluorescence tests. Other features of his latest reports, he continues to have a fever each day.

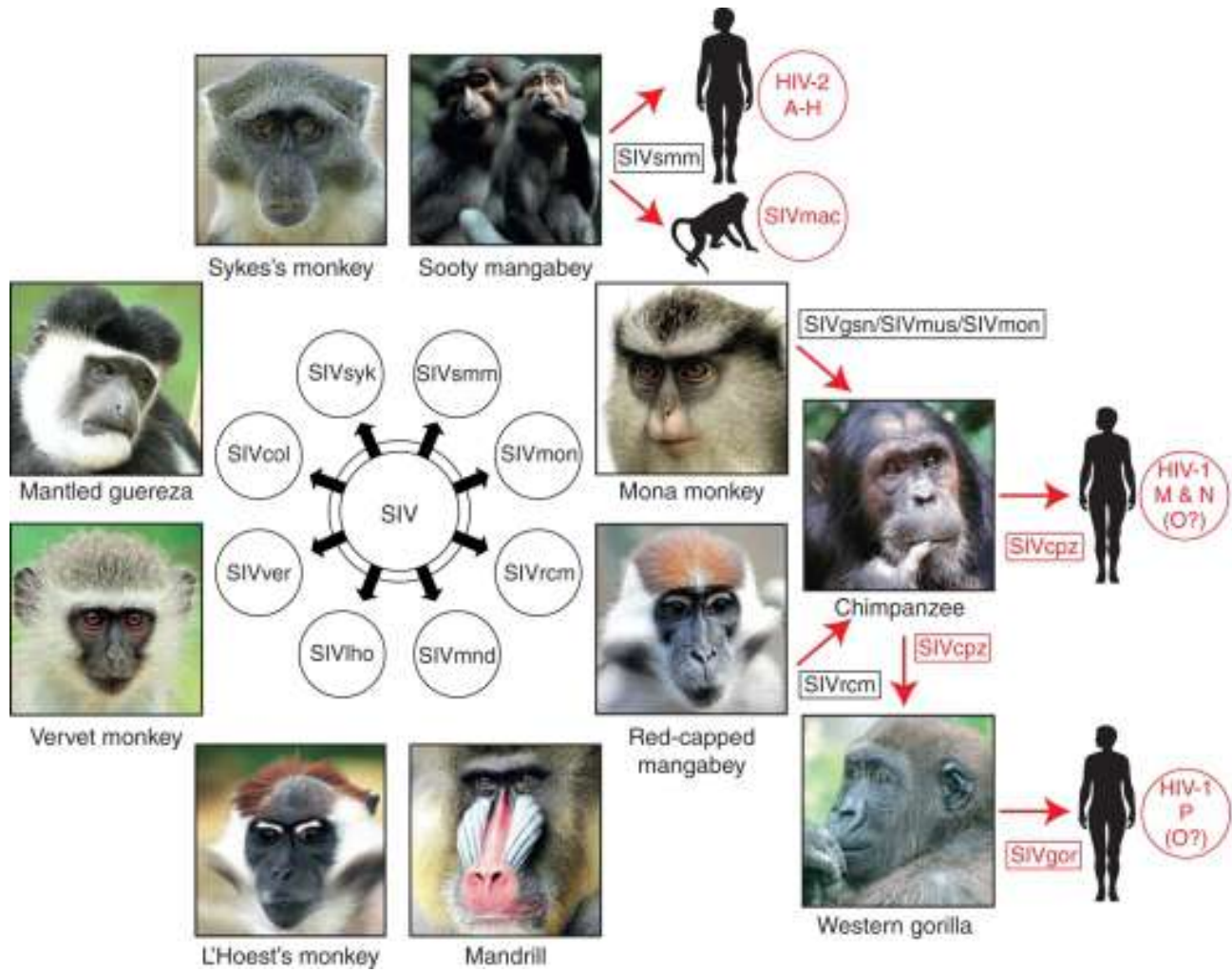
Amphotericin B treatment. He was hospitalized in February 1981 for pneumonia. He was again given Amphotericin B.

He had been successfully treated with radiation therapy for Hodgkins disease, but showed no evidence of Hodgkins disease, but *P.*

***‘In the period  
October 1980- May 1981,  
5 young men,  
all active homosexuals  
were treated for biopsy-confirmed  
Pneumocystis carinii pneumonia  
at 3 different hospitals  
in Los Angeles, California.’***

**June 5<sup>th</sup>, 1981**

# Origins of HIV

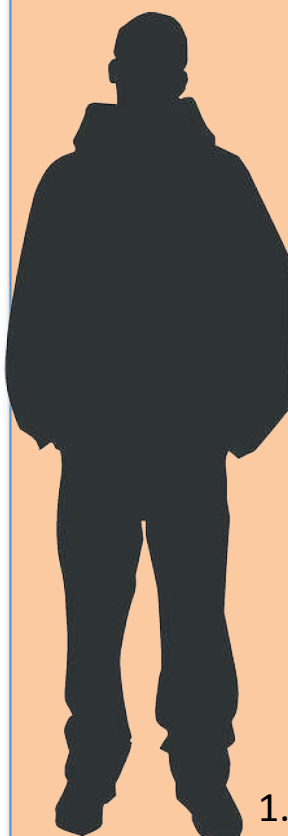




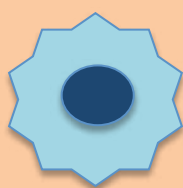

# HIV Infection



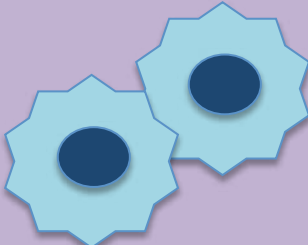
≈ 1 in  
1,000  
Australians  
are HIV+



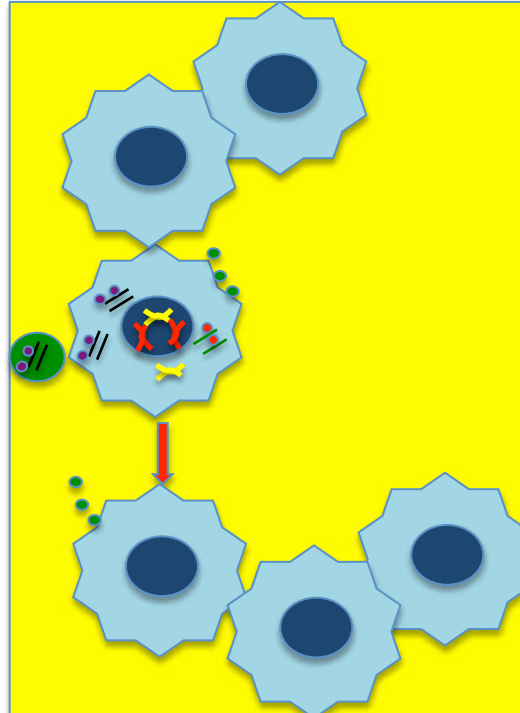
Healthy HIV negative people have a median CD4+ T-cell count of 900 cells/ $\mu$ L



1. Le et al, NEJM 2013



CD4+ T-cells regulate response to pathogens and infections through humoral and cellular immune mechanisms



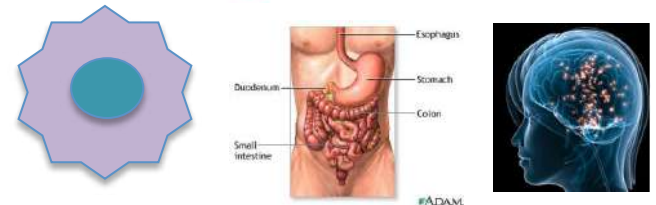
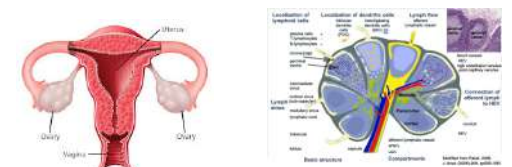
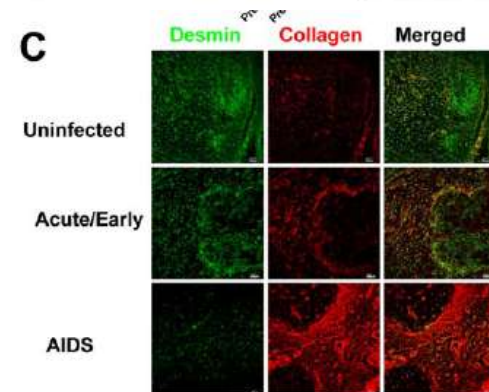
HIV infects and destroys CD4+ T-cells

# Early HIV infection

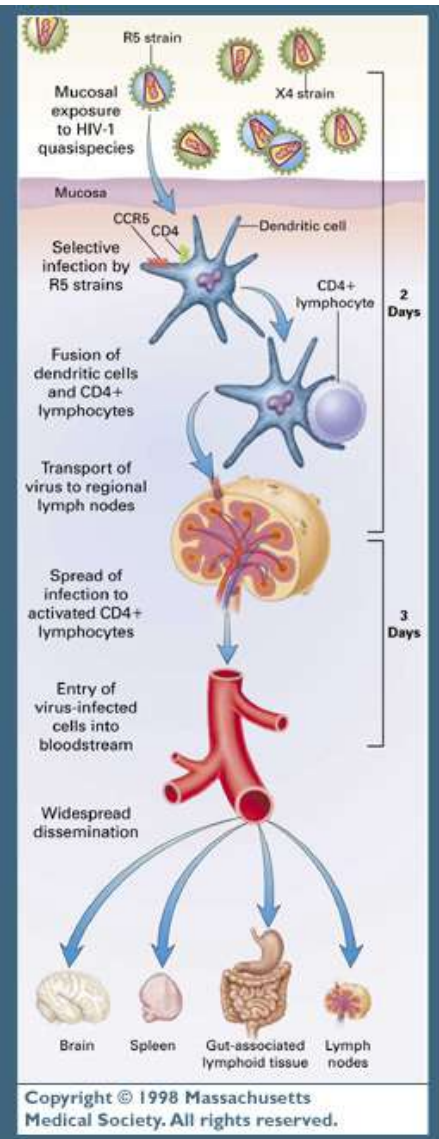
Massive depletion of CD4+ T cells in gut => chronic inflammation<sup>1</sup>

Onset lymph node damage => fibrosis & poor immune function & inflammation<sup>2</sup>

HIV reservoirs established in latent CD4+T- cells and brain, gut, lymph nodes and gonads => challenge for HIV cure<sup>3</sup>



1. Brenchley et al., J Exp Med, 2004. 2 Zeng et al., Plos Path 2012. 3. Lewin, Lancet 2013.



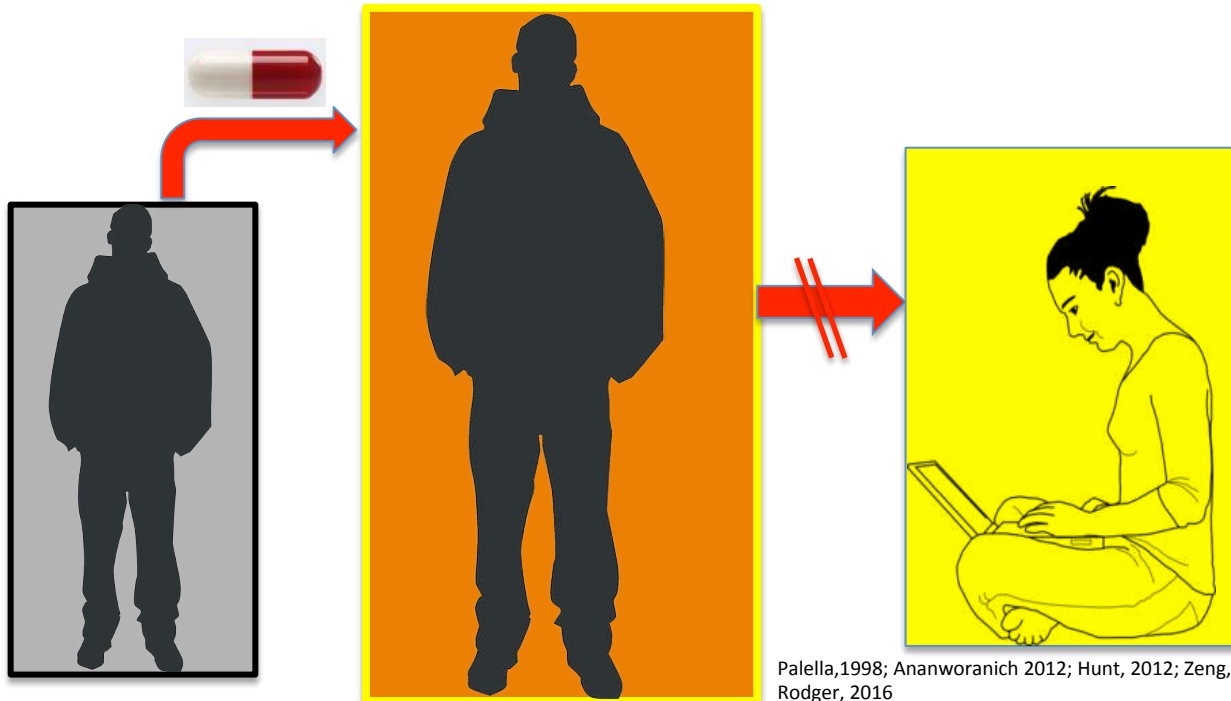


# Antiretroviral Therapy

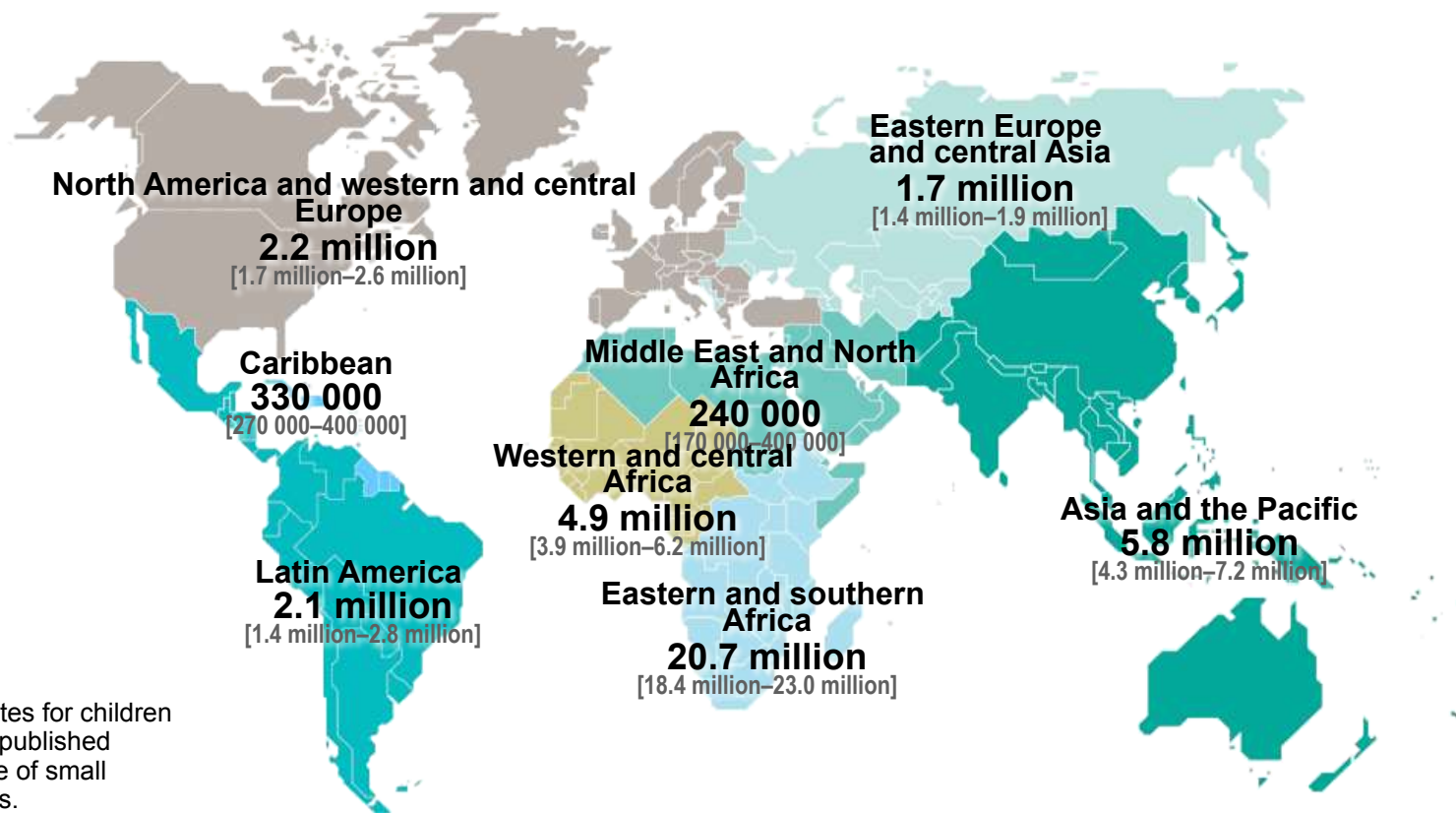
- ↓ Plasma HIV viral load
- ↑ CD4+ cell count and immune health- gut and LN integrity
- ↓ Inflammation and immune activation
- ↓ CD4+ reservoir size
- ↓ Mortality AIDS, non-AIDS
- ↑ Longevity

- ↓ HIV transmission to sexual partners
- ↓ Transmission to injecting partners and neonates

- ↓ Community HIV viral load =>
- ↓ HIV incidence in communities in San Francisco & Africa



# 38,000,000 adults and children estimated to be living with HIV in 2019

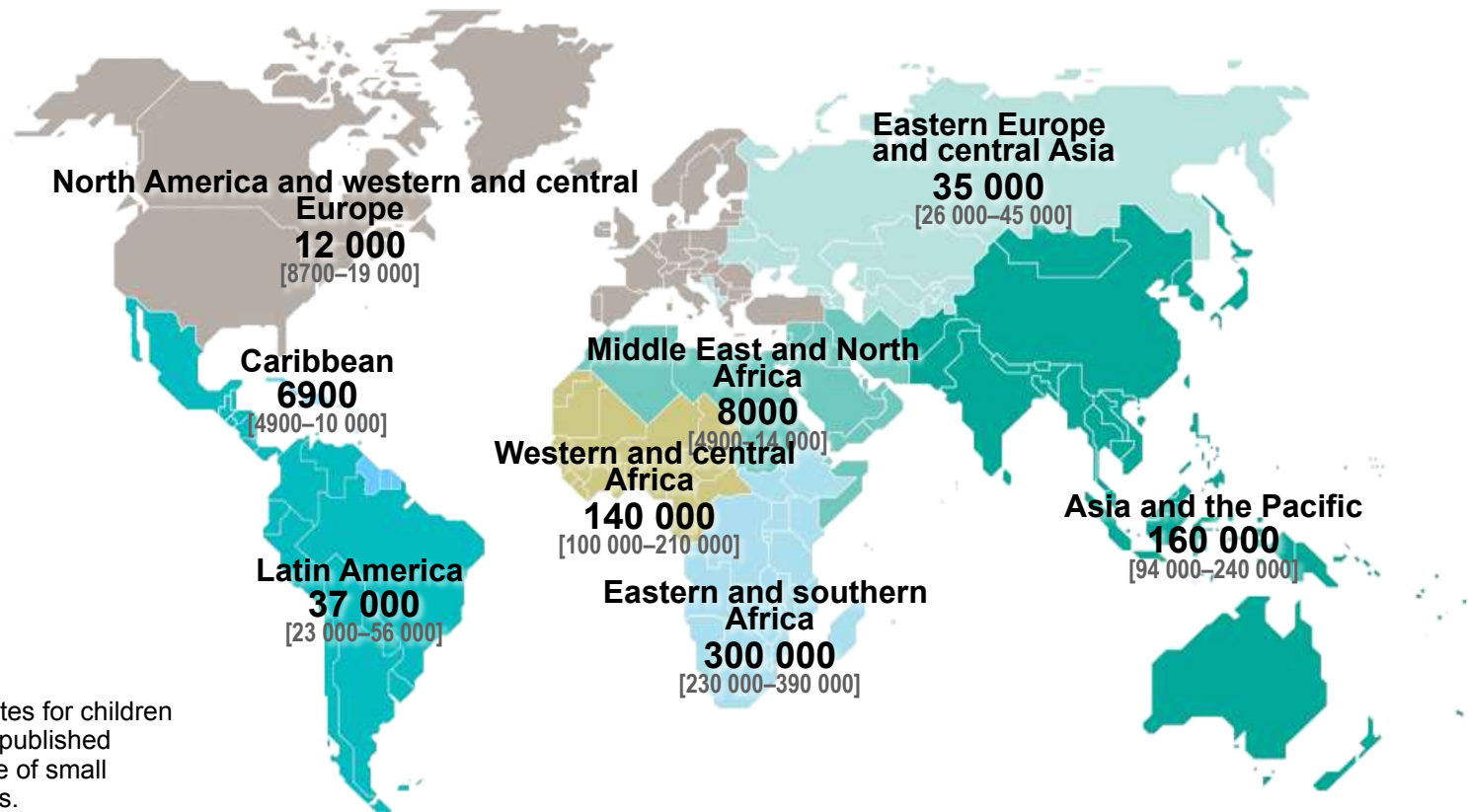


\*Estimates for children are not published because of small numbers.

**Total: 38.0 million** [31.6 million–44.5 million]

**Overall, 76,000,000 people have been infected with HIV**

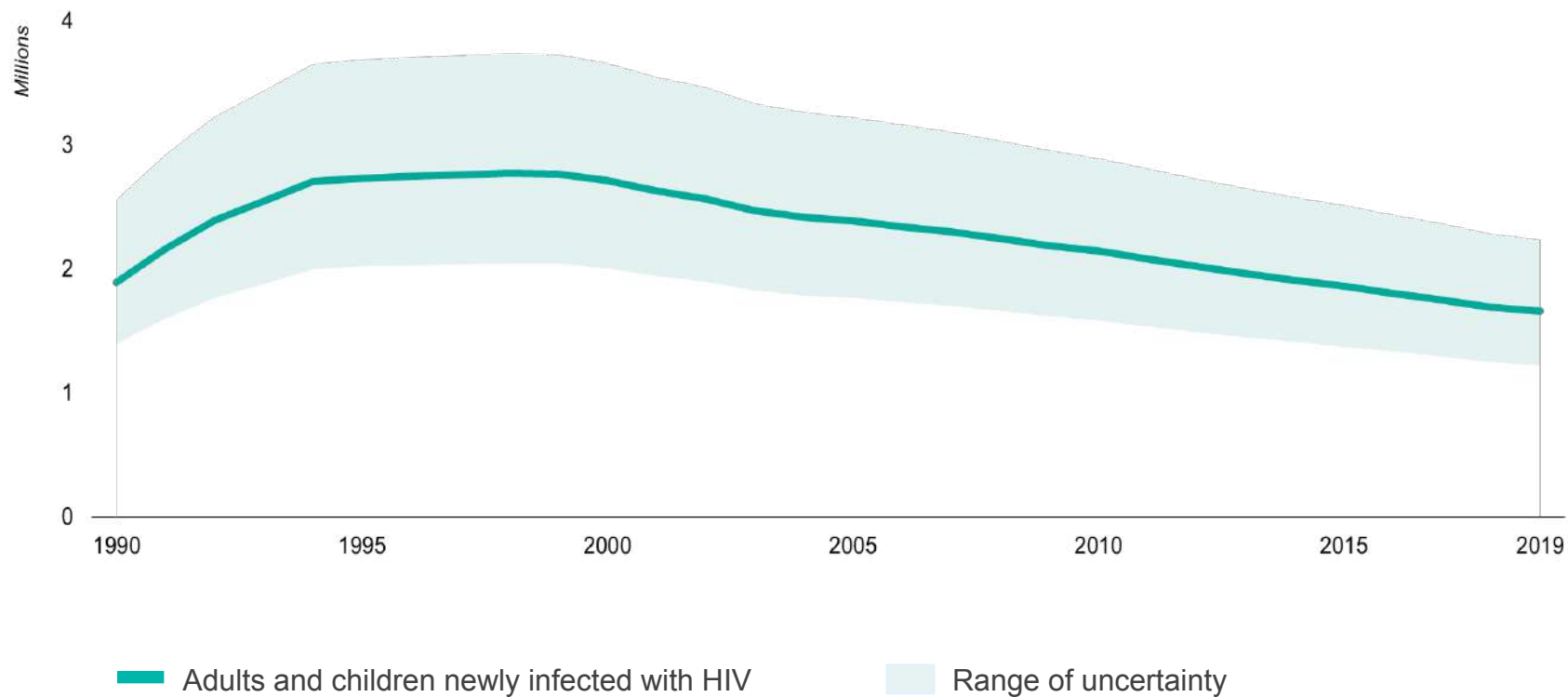
# Estimated 690,000 adult and child deaths from AIDS during 2019



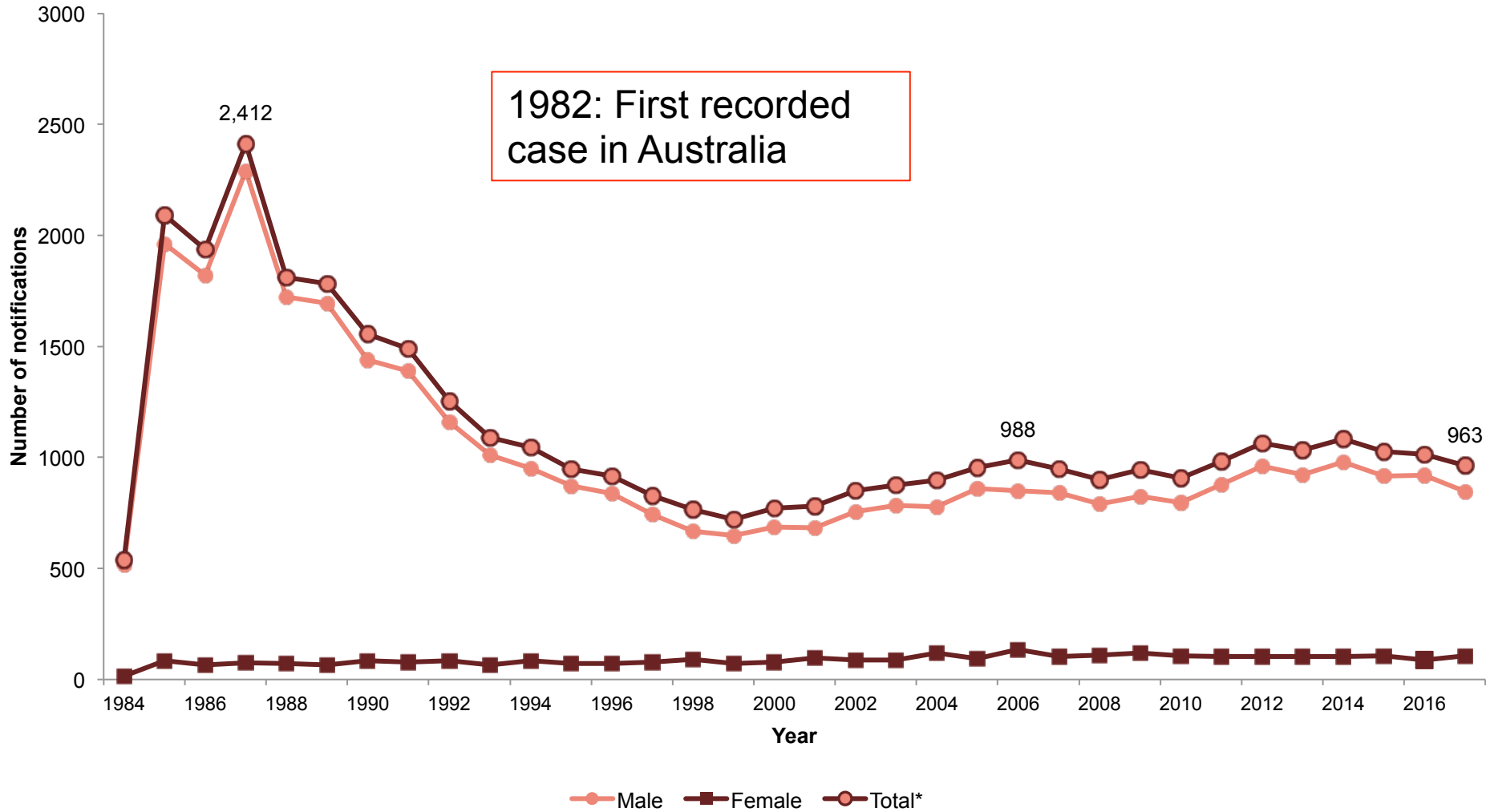
**Total: 690 000** [500 000–970 000]

**Overall, 33,000,000 people have died from HIV**

## Adults and children newly infected with HIV | 1990–2019



# Figure 1.1.1 HIV notifications in Australia, 1984–2017, by sex



\* Includes transgender people and people for whom data on sex was missing.





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## *Pneumocystis Pneumonia --- Los Angeles*

In the period October 1980-May 1981, 5 young men, all active homosexuals, were treated for biopsy-confirmed *Pneumocystis carinii* pneumonia at 3 different hospitals in Los Angeles, California. Two of the patients died. All 5 patients had laboratory-confirmed previous or current cytomegalovirus (CMV) infection and candidal mucosal infection. Case reports of these patients follow.

Patient 1: A 30-year-old man with a 2-month history of fever associated with elevated liver enzyme levels, leukopenia, and leukocyturia. He had had several courses of antimicrobial therapy for presumed pneumonia. He was hospitalized in Los Angeles in October 1980 and February 1981 for pneumonia. The CMV complement was positive.

Patient 2: A 28-year-old man with a 2-month history of fever, weight loss, and night sweats. He had had several courses of antimicrobial therapy for presumed pneumonia. He was hospitalized in Los Angeles in October 1980 and February 1981 for pneumonia. The CMV complement was positive.

Patient 3: A 30-year-old man with a 2-month history of fever, weight loss, and night sweats. He had had several courses of antimicrobial therapy for presumed pneumonia. He was hospitalized in Los Angeles in October 1980 and February 1981 for pneumonia. The CMV complement was positive.

Patient 4: A 29-year-old man with a 2-month history of fever, weight loss, and night sweats. He had had several courses of antimicrobial therapy for presumed pneumonia. He was hospitalized in Los Angeles in October 1980 and February 1981 for pneumonia. The CMV complement was positive.

2-month history of fever associated with elevated liver enzyme levels, leukopenia, and leukocyturia. He had had several courses of antimicrobial therapy for presumed pneumonia. He was hospitalized in Los Angeles in October 1980 and February 1981 for pneumonia. The CMV complement was positive.

and of elevated liver-function tests, CMV immunofluorescence tests. Other features of his latest reports, he continues to have a fever each day.

Amphotericin B treatment. He was hospitalized in Los Angeles in October 1980 and February 1981 for pneumonia. The CMV complement was positive.

He had been successfully treated with radiation therapy for Hodgkins disease, but P.

***'In the period  
October 1980- May 1981,  
5 young men,  
all active homosexuals  
were treated for biopsy-confirmed  
Pneumocystis carinii pneumonia  
at 3 different hospitals  
in Los Angeles, California.'***

**June 5<sup>th</sup>, 1981**

# Preparedness for a Chronic Infectious Disease Pandemic: HIV

- Prior pandemics in 20<sup>th</sup> century
- Consider Landscapes
  - Political
  - Social
  - Medical

# Prior pandemics in 20<sup>th</sup> century

- **Cholera pandemics**
  - 1899-1923
  - 1961-1975
- **Third Plague pandemic**
  - 1855 China and seen in San Francisco, 1900-1904
- **Influenza plagues**
  - 1918-19, H1N1, Spanish flu
  - 1957-58, H2N2, Asian flu
  - 1968-69, H3N2, Hong Kong flu
- **Tuberculosis pandemic**
  - Treated with triple therapy since 1955

**Sexual transmission not the key driver of any of these pandemics**

# 1981- Political Landscape in Australia



ACT

- Paul Everingham

WA

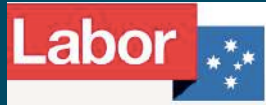
- Sir Charles Court

Victoria

- Rupert Hamer

SA

- David Tonkin



NSW

- Neville Wran

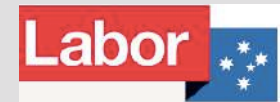
Tasmania

- Doug Lowe



Queensland

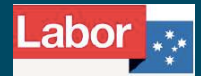
- Joh Bjelke-Peterseon



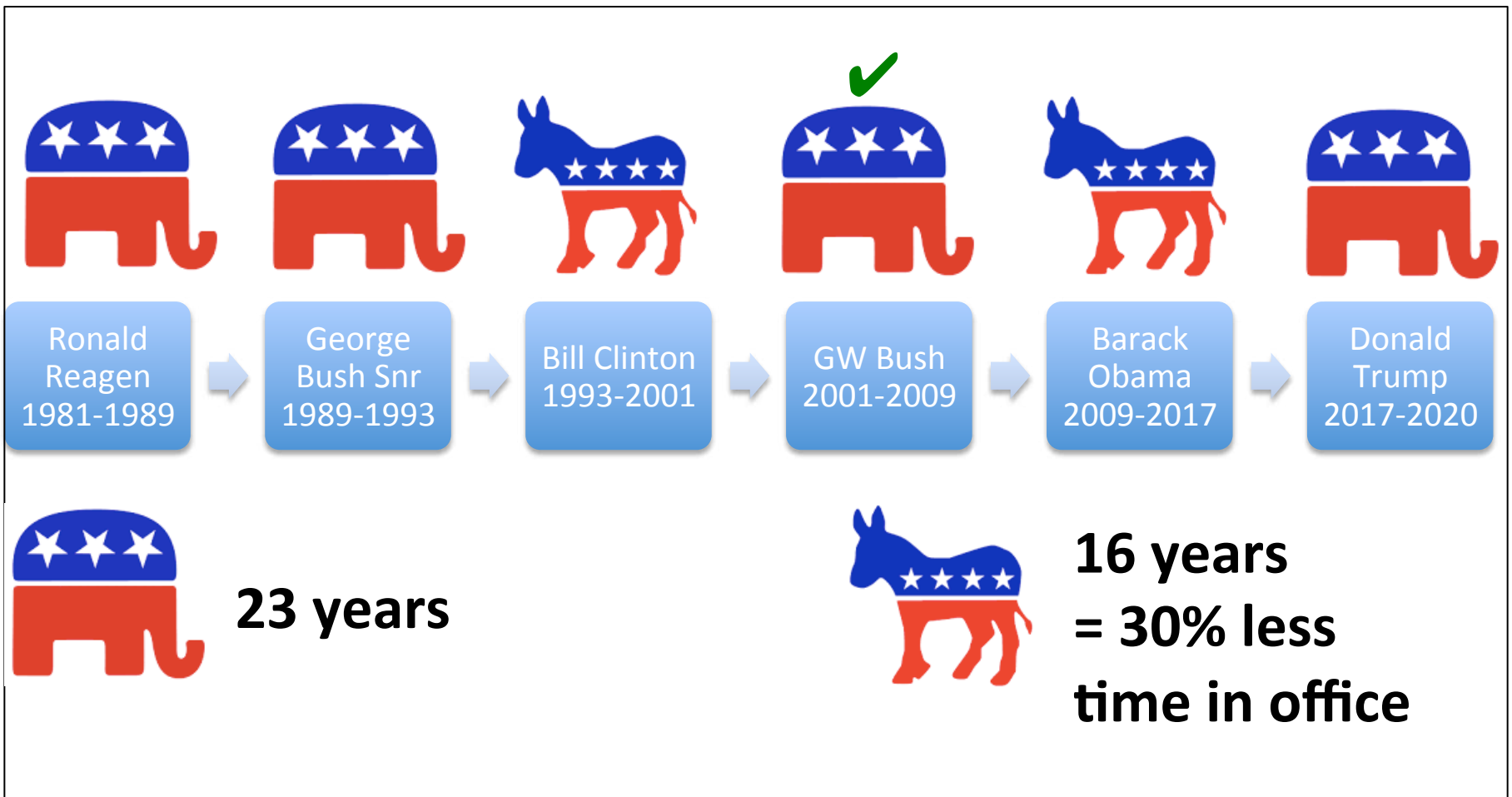
Sir Garfield  
Barwick



Sir Zelman  
Cowen

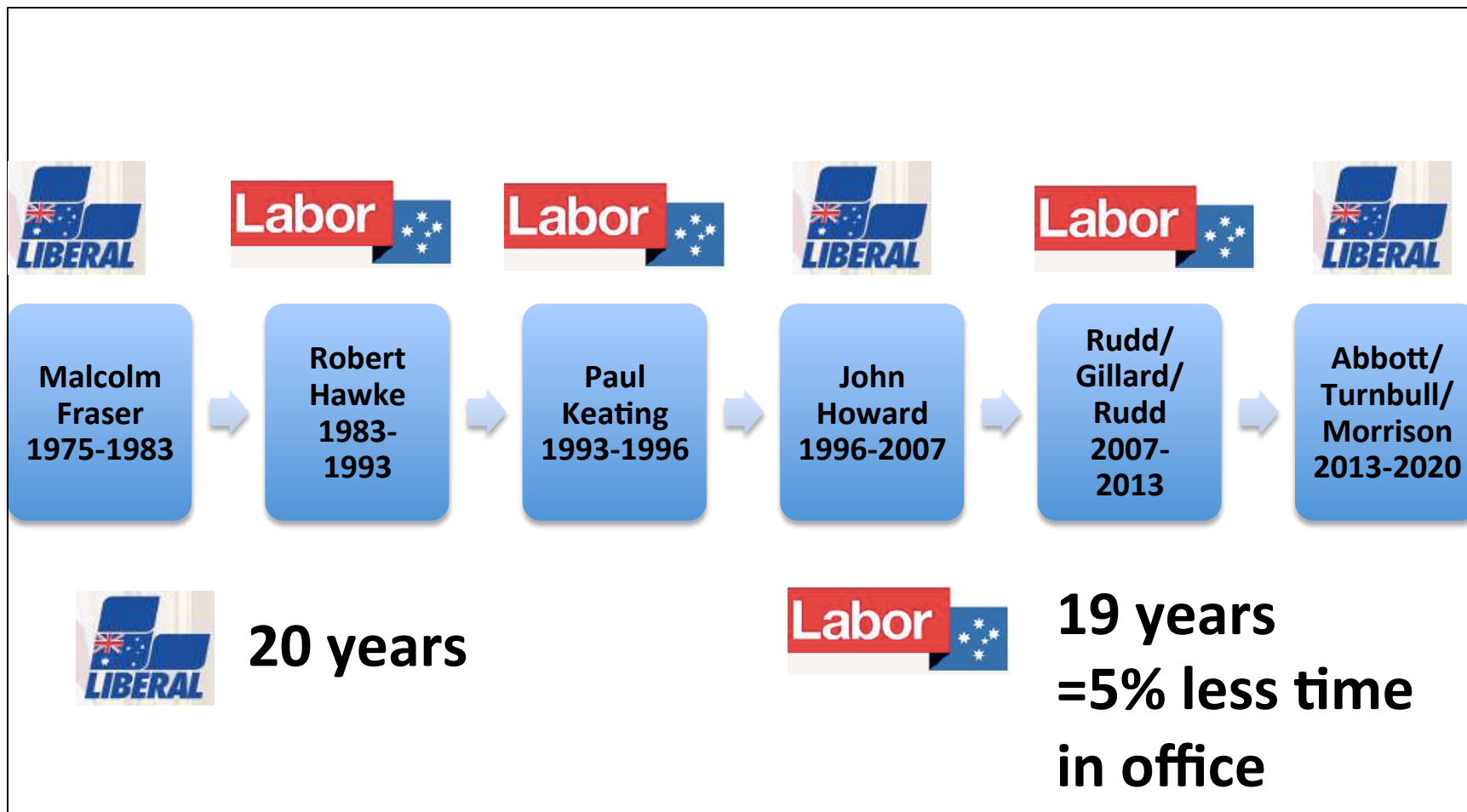


# US Presidents 1981-2020





# Australian PMs 1981-2020



# Social landscape

- Money and Travel
- Homophobia/Homonegativity
- Migration
- Indigenous Australians

# Social Landscape- Money & Travel

One Australian dollar was worth US 87 cents



Average weekly earnings of an adult full-time male \$269.50

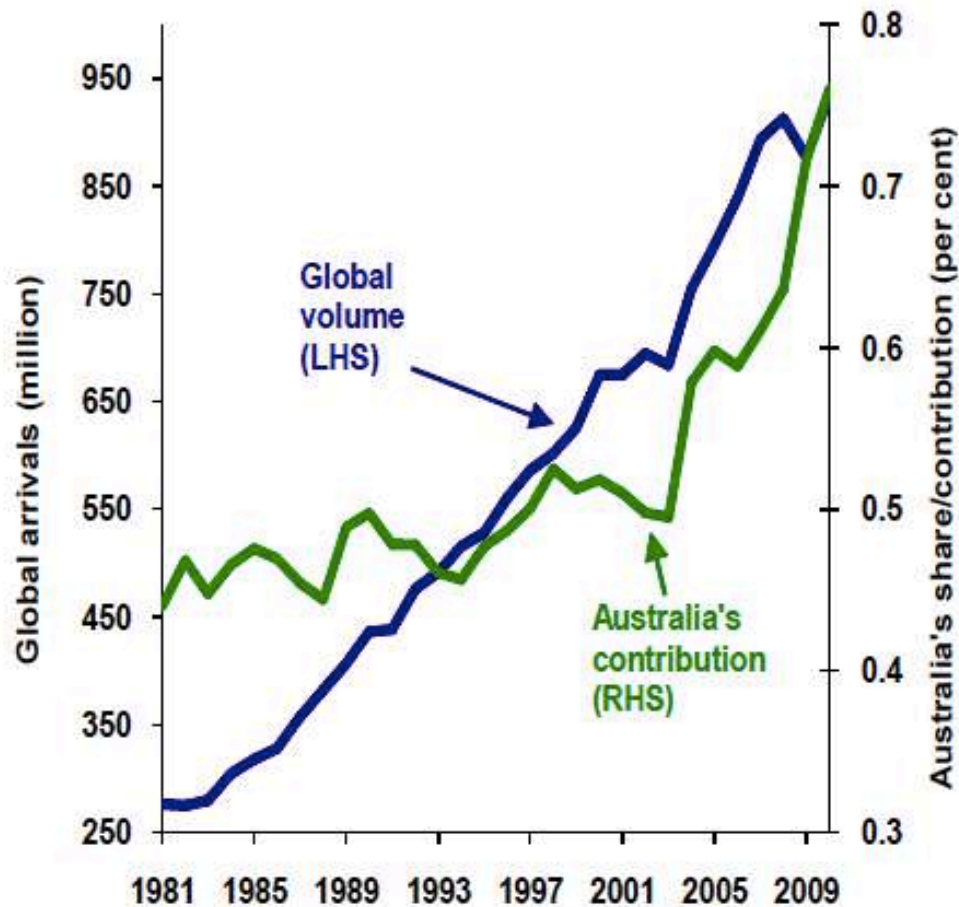
 AUSTRALIAN BUREAU OF STATISTICS Canberra

CATALOGUE NO. 6302.0

NOON 14 SEPTEMBER 1981

AVERAGE WEEKLY EARNINGS, AUSTRALIA  
JUNE QUARTER 1981

**Figure 4: Global tourism**



# Social Landscape- Homonegativity



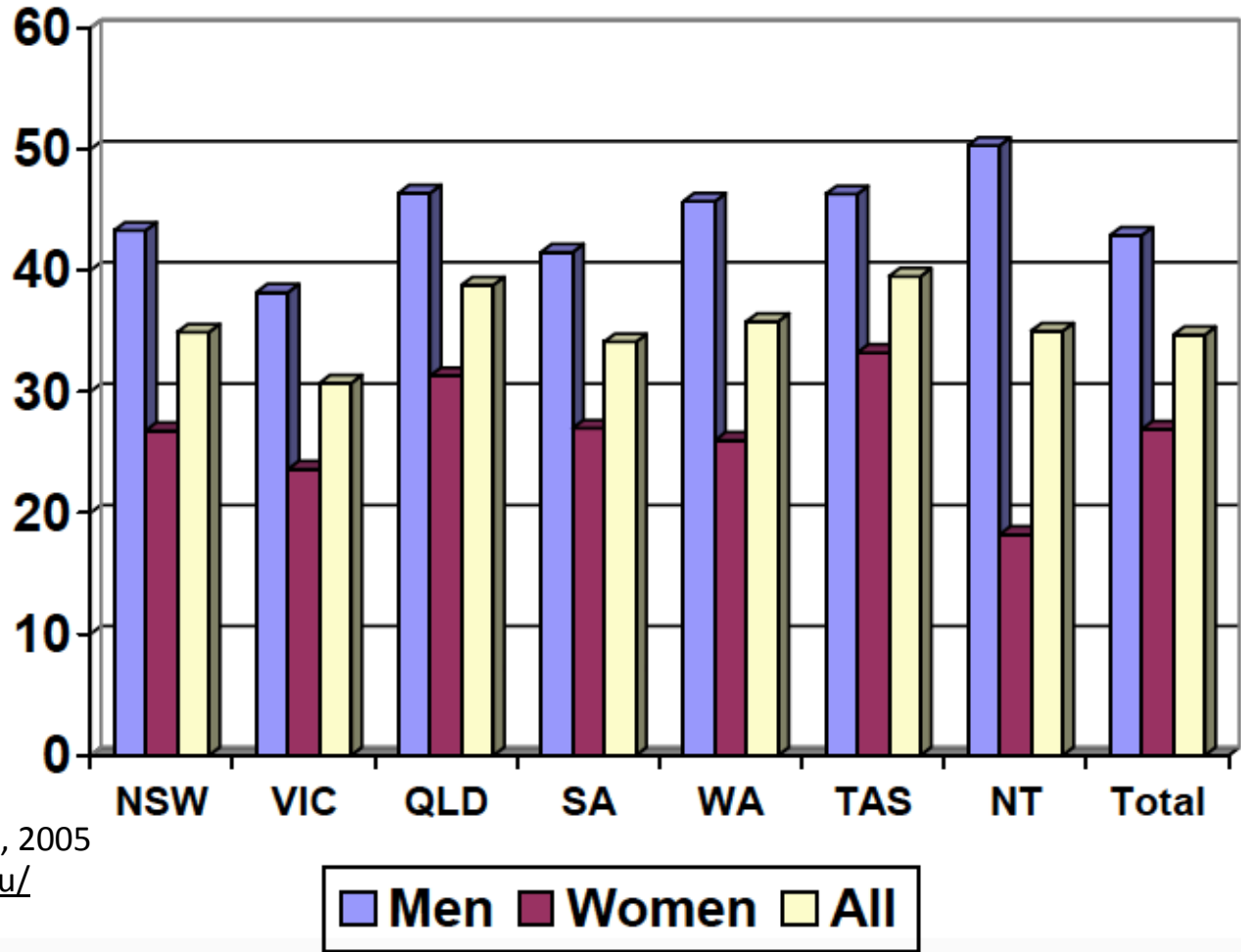
**Mapping Homophobia in Australia**  
Australia Institute Webpaper July 2005  
Michael Flood and Clive Hamilton<sup>1</sup>

## Summary

Homophobia refers to the unreasoning fear or hatred of homosexuals and to anti-homosexual beliefs and prejudices. While not a phobia in the literal sense, it is a useful term of social description for everyday emotional tension about sexual identity that is widespread among heterosexuals. While not everyone who is homophobic

# Social Landscape- Homophobia

Figure 1 Percent who consider homosexuality to be immoral, by state



**35% overall**



# Social Landscape-Migration

## Migration Program

Year	Family	Child	Skill	Special Eligibility	Total	Humanitarian Program
1984-85	44 200		10 100	200	54 500	14 207
1985-86	63 400		16 200	400	80 000	11 700
1986-87	72 600		28 500	600	101 700	11 291

1981: 54,500 permanent migrants: migration and humanitarian program visa grants

# Social Landscape- Indigenous Australians

1981

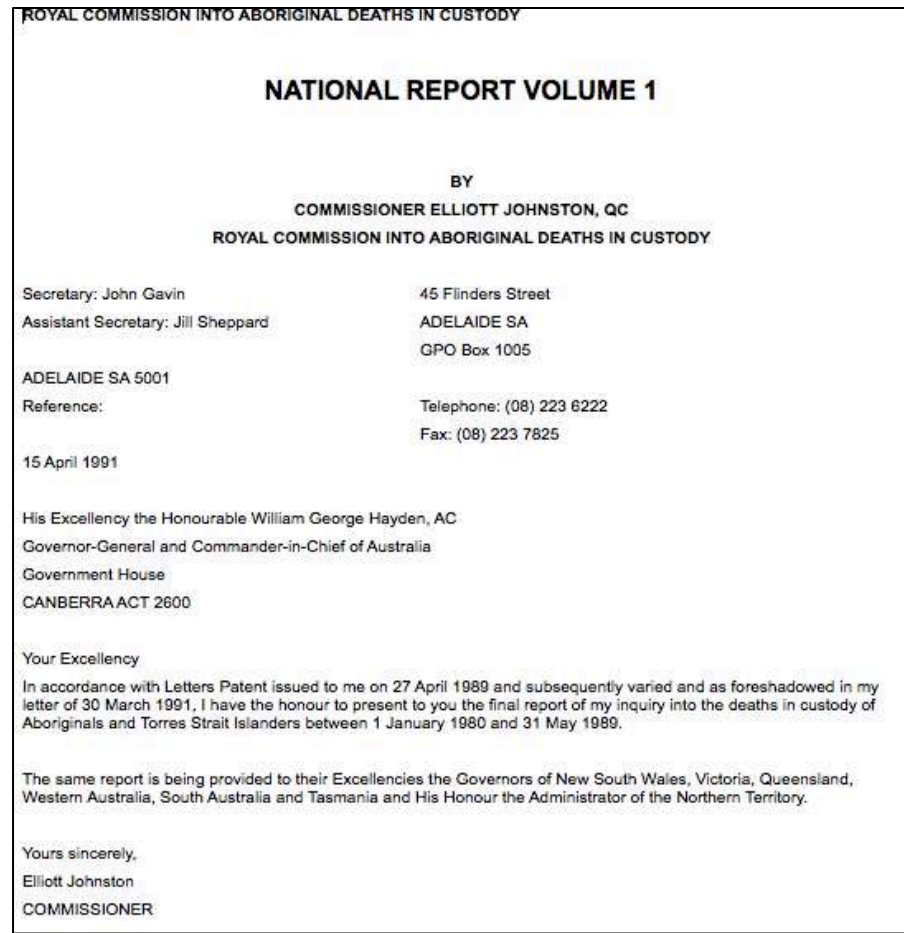
1981	
<b>Bachelor degree and above (%)</b>	
Indigenous	0.3
Non-Indigenous	8.6
Gap	8.3
<b>Unemployment rate (%)</b>	
Indigenous	22.3
Non-Indigenous	5.5
Gap	16.9
<b>Median individual income (\$Aus)</b>	
Indigenous	4,643
Non-Indigenous	10,273
Indigenous % of non-Indigenous	45.2
<b>Population aged 25-29 (no.)</b>	
Indigenous	12,200
Non-Indigenous	1,127,000

**Persons aged 25–29 years**

- **Indigenous vs. non-Indigenous population level outcomes**

# Social Landscape- Indigenous Australians

- January 1<sup>st</sup> 1980 -May 31<sup>st</sup> 1989
  - Was the period examined by the Royal Commission into Aboriginal Deaths in Custody (1987)
  - During this time 99 deaths occurred in police, or prison custody



# Medical landscape

- Health System
- Other chronic viral illnesses, vaccines & available laboratory tests
- Available treatment for Opportunistic Infections
- Available treatment for HIV

# Medical Landscape-Health System



**Repatriation PBS established 1919**

**PBS first made generally available in June 1948 in limited form**

**PBAC established in 1953**



**Medibank established in 1975 by Whitlam**

**Revised by Fraser to Medicare & in 1981 free hospital and medical care was restricted to pensioners, people on sickness benefits & was means tested**

**Clinical experience with Type 1 diabetes-** an incurable illness that affected multiple organs including eyes, nerves, brain, the immune system, the metabolism & required multiple daily medications and **Tuberculosis-** triple therapy



# Medical Landscape-Chronic Viral Illnesses & Vaccines

- **Hepatitis C**
  - Not discovered until 1989
  - No vaccine to date
- **Hepatitis B**
  - Discovered in 1965
  - Vaccine- licensed in 1981
- **Hepatitis A**
  - Discovered- 1973
  - Vaccine- licensed in 1995

# Medical Landscape- Laboratory Tests

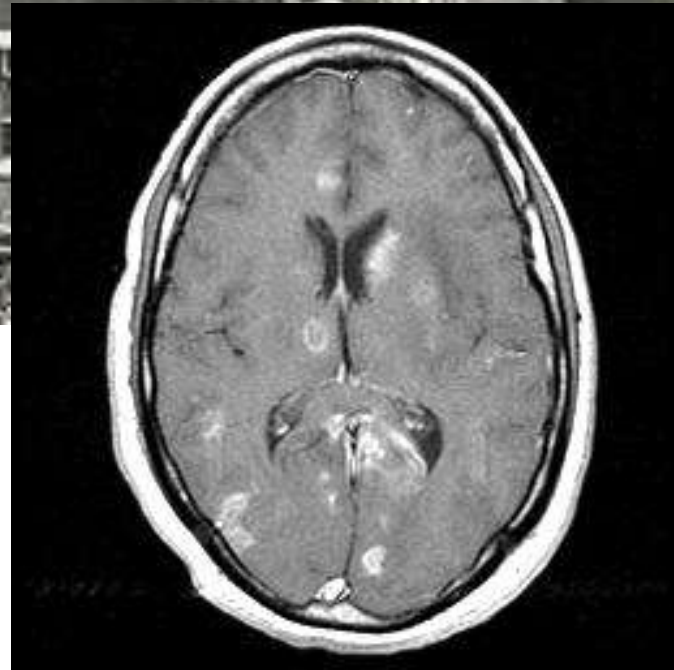
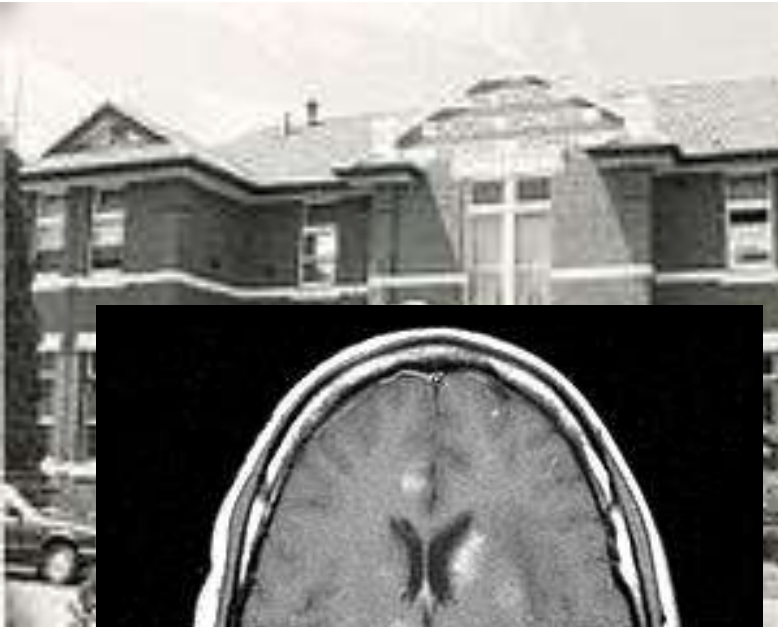
- **Virus culture**
  - First grown in tissue in 1913, but not widely adopted until 1950s for polio vaccine
- **Flow cytometry**
  - Developed in late 1960s and first article detailing CD4+ counts in 15 MSM with immunodeficiency was in 1983 (*Newman et al, AIDS Res 1983*)
- **Reverse Transcriptase Enzyme**
  - Discovered in 1970 by David Baltimore
- **Polymerase chain reaction**
  - Not invented until 1984 by Kary Mullis
- **HIV viral load**
  - First reported in 1988 and detected HIV DNA in PBMCs
  - A test to detect HIV RNA in plasma was reported in 1991 (*Holodni, JID, 2006*)

# Medical Landscape- Treatment for OIs



**Fairfield Hospital, Victoria**

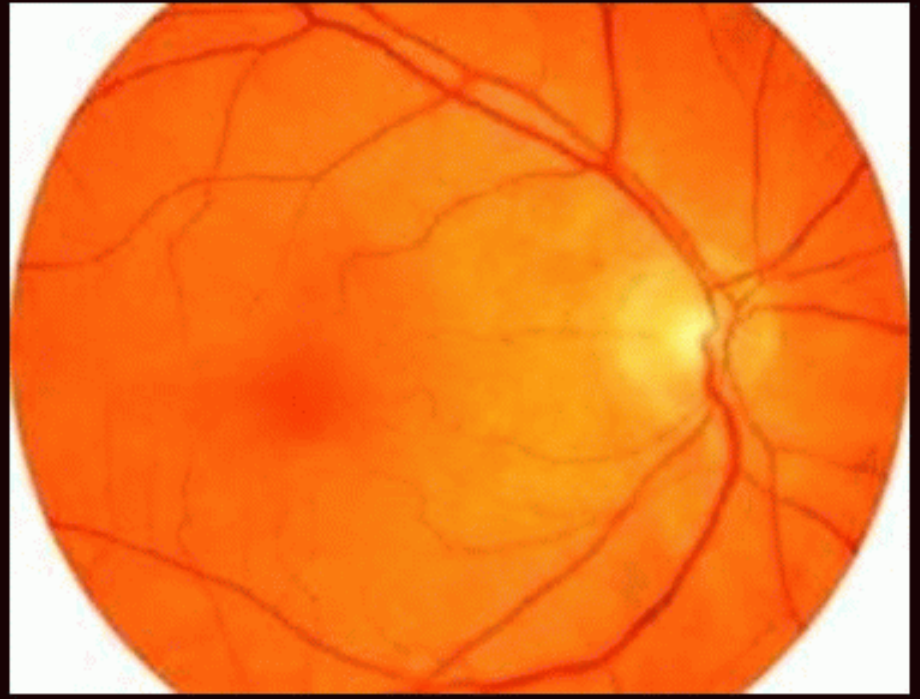
# Medical Landscape- Treatment for OIs



# Medical Landscape- Treatment for Ols



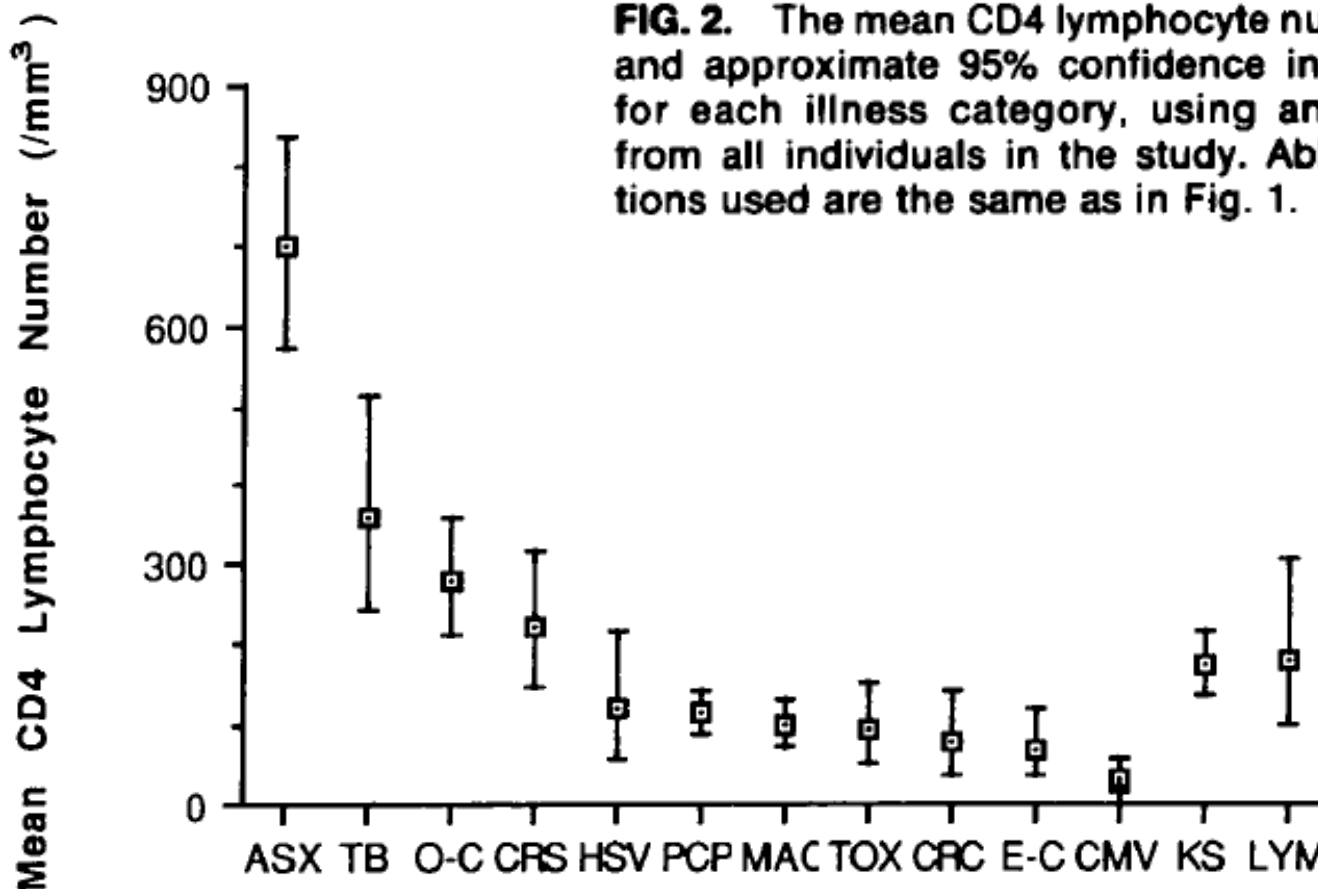




CMV retinitis (left), compared to a normal retina (right)



# CD4+ cell counts and OIs



# Medical Landscape- Treatment for OIs

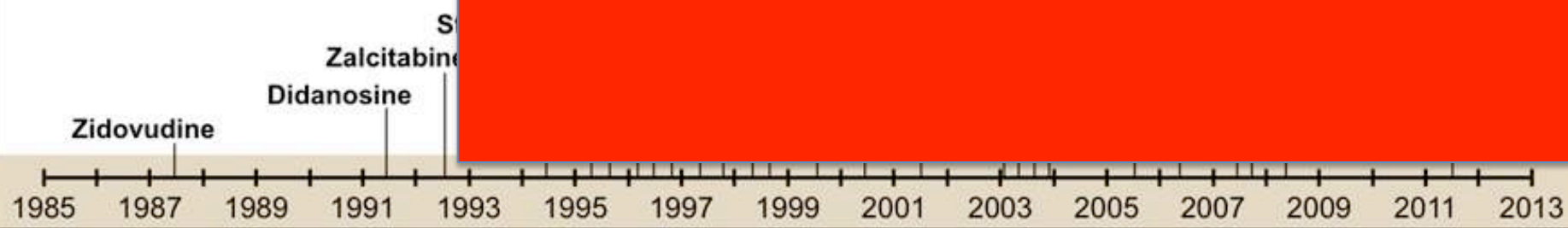
## Available in 1981 for use

- Pentamidine- since 1937
- Sulphadiazine- since 1940s
- Pyrimethamine- since 1960s
- Co-trimoxazole- since 1974
- Amphotericin-B- since 1958
- Radiotherapy

## Subsequently available

- Topical Acyclovir- 1982
- Clofazimine-1986
- Ganciclovir-1988
- Clarithromycin-1990s
- Fluconazole-1990
- Vinca alkaloid- 2000s

# Treatment for HIV



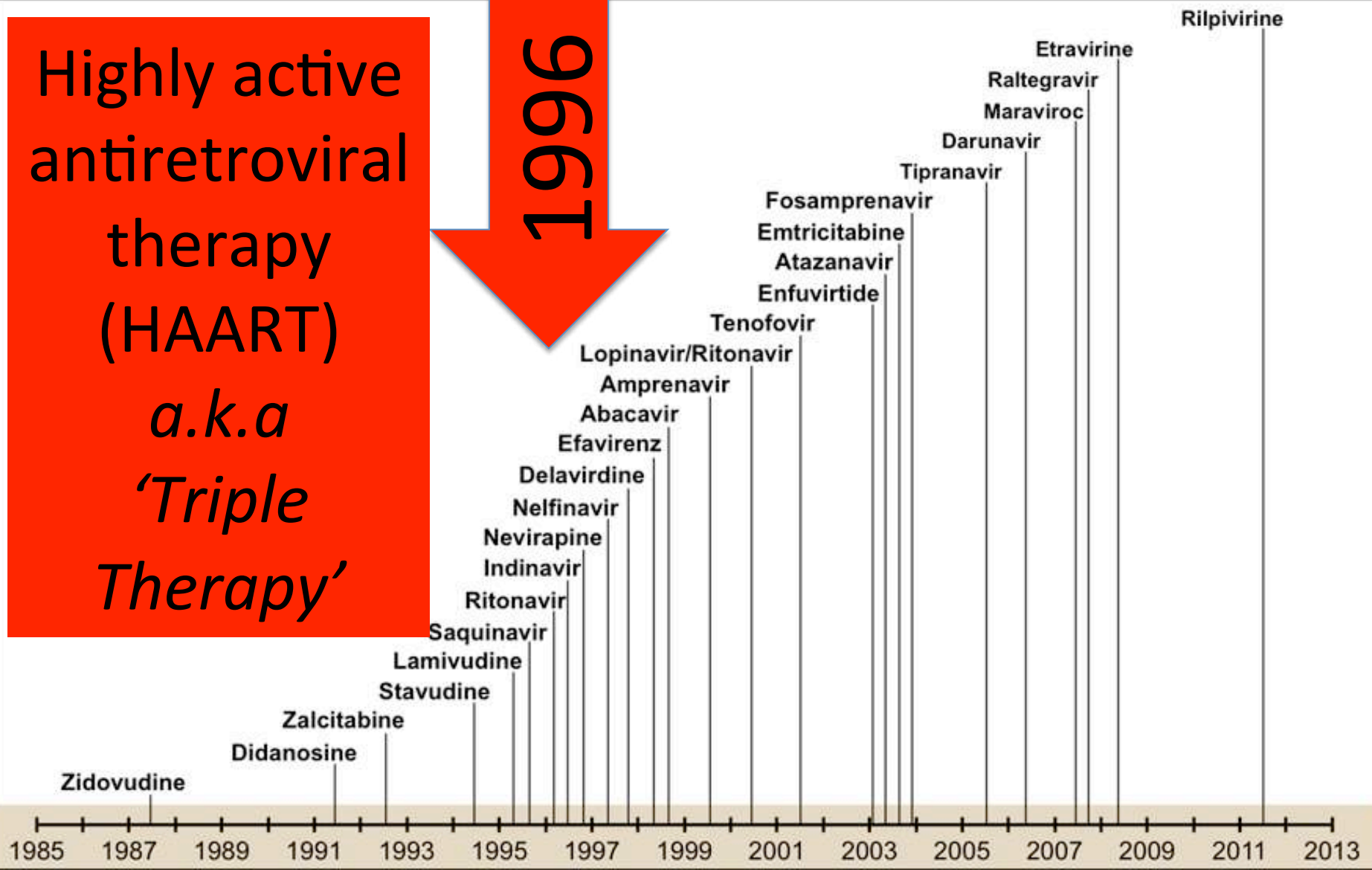
**Antiretrovirals approved by US FDA**

# Interim Summary of 1981 Landscape

- Conservative political landscape
- Widespread homonegativity
- Low migrant intake
- Poor SES and health outcomes in Indigenous Australians
- Subsidised healthcare
- Diabetes and Tuberculosis – clinical models of care
- Key laboratory techniques were in place
  - Viral culture, RT enzyme discovery & flow cytometry
- Treatment for several common OIs available

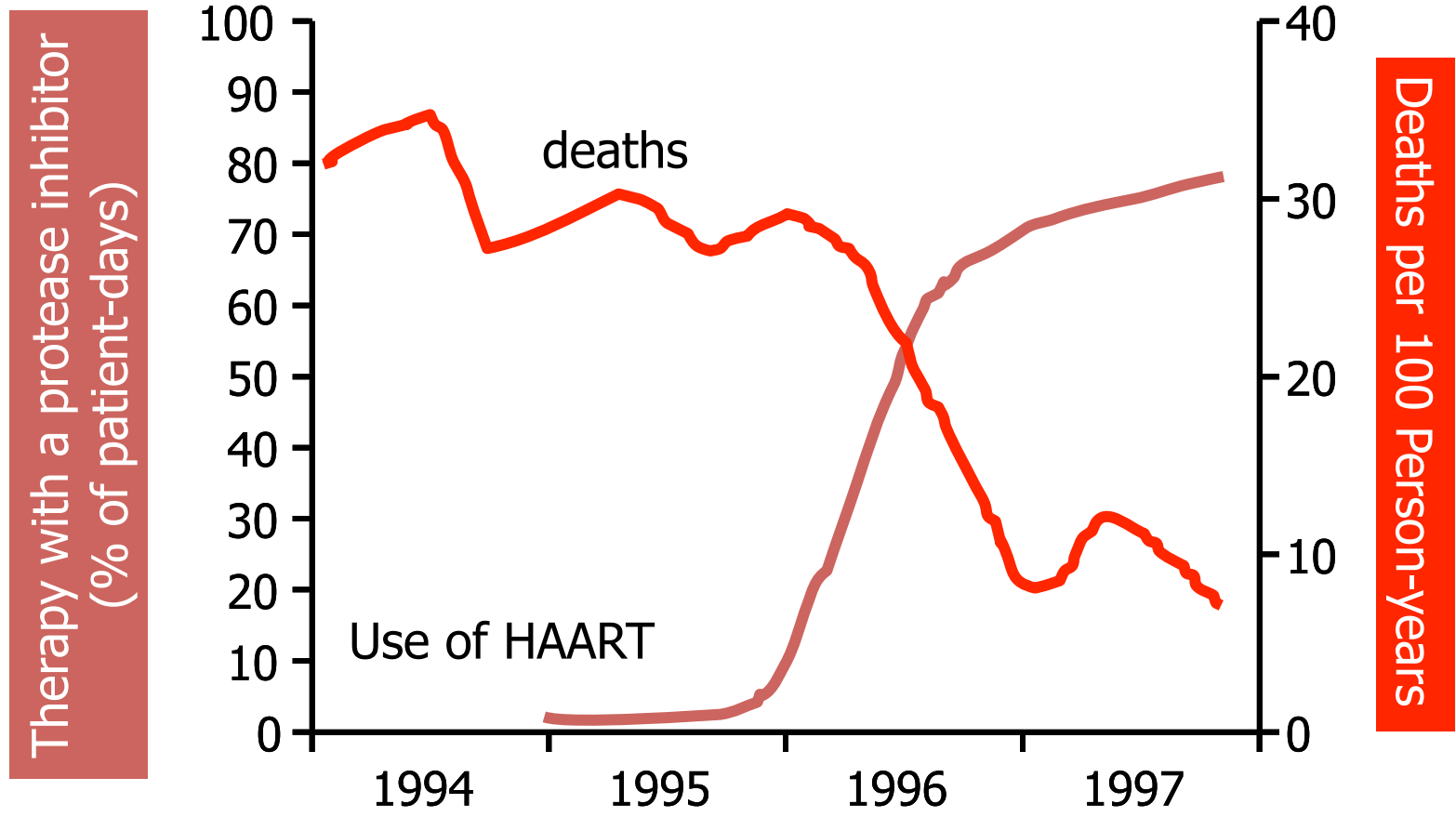
Highly active  
antiretroviral  
therapy  
(HAART)  
*a.k.a*  
*'Triple  
Therapy'*

1996



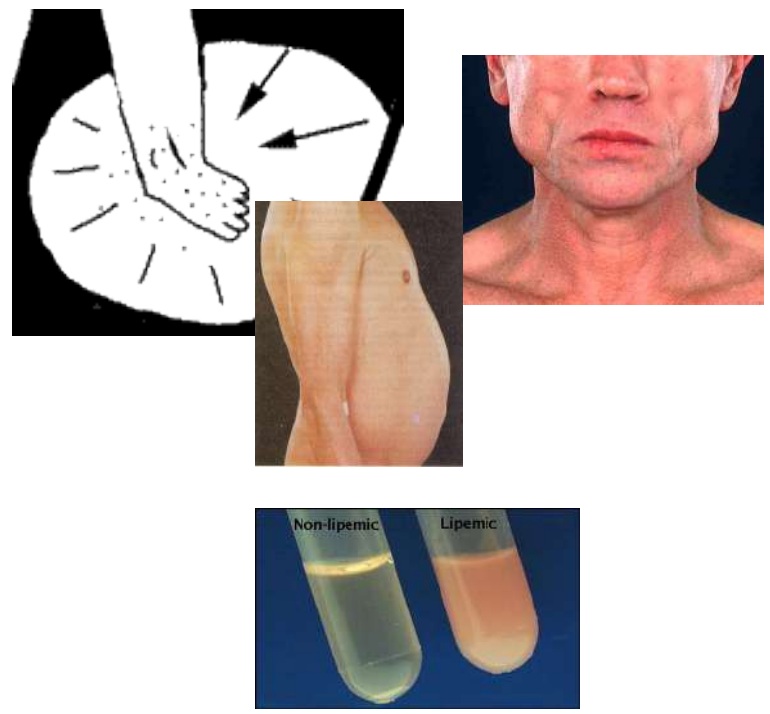
Antiretrovirals approved by US FDA

# Major reduction in death after introduction of HAART



# Toxicity: challenges

Toxicity  
*plus/-* stigma



⇒ *plus*  
high  
pill burden



**Poor adherence**

*plus*  
ART with  
low barrier to  
resistance

New ART  
regimen

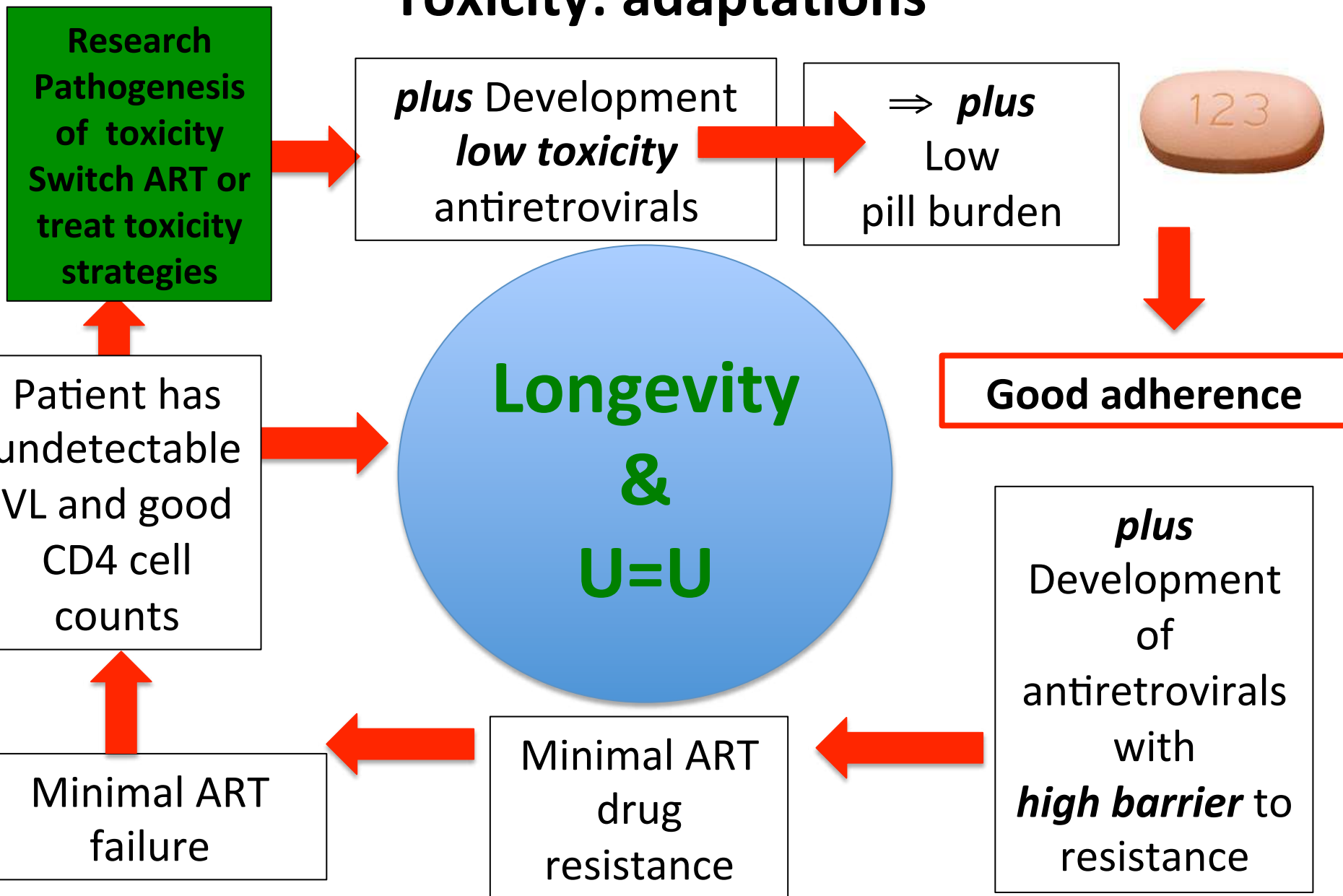
ART  
failure

ART drug  
resistance





# Toxicity: adaptations



'85-'89

- 1987- **Zidovudine**

'90-94

- 1991- **Didanosine**, 1992- **Zalcitabine**, 1994- **Stavudine**

'95-'99

- 1995- **Lamivudine** & **Saquinavir**, 1996- **Indinavir**, **Nevirapine**, **Ritonavir**, 1997- **Combivir**, **Delavirdine**, **Nelfinavir**, 1998- **Abacavir**, **Efavirenz**, 1999- **Amprenavir**

'00-'04

- 2000- **Didanosine EC**, **Kaletra**, **Trizivir**, 2001- **Tenofovir DF**, 2003- **Atazanvir**, **Emtricitabine**, **Enfuvirtide**, **Fosamprenavir**, 2004- **Kivexa**, **Truvada**

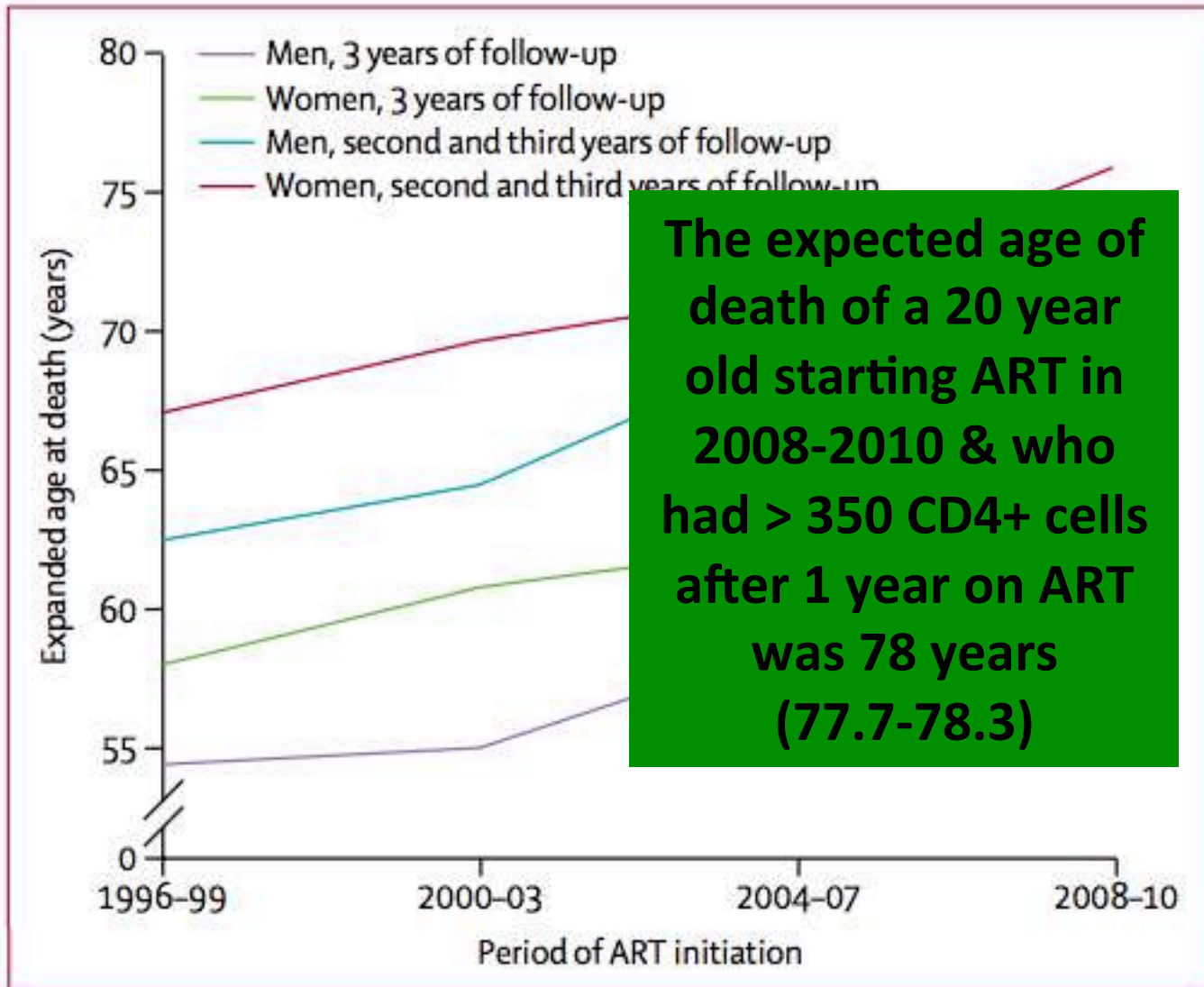
05-'09

- 2005- **Tipranavir**, 2006- **Atripla**, **Darunavir**, 2007- **Maraviroc**, **Raltegravir**, 2008- **Etravirine**

'10-'20

- 2011- **Rilpivirine**, 2012- **Stribild**, 2013- **Dolutegravir**, 2014- **Cobicistat**, **Elvitegravir**, **Triumeq**, 2015- **Genvoya**, **Prezcobix**, 2016- **Descovy**, **Odefsey**, 2017- **Juluca**, 2018- **Biktarvy**, **Symtuza**, 2019- **Dovato**, 2020- **Fostemsavir**

**ALL available in Australia**



*The Antiretroviral Therapy Cohort Collaboration, Lancet HIV, 2017*

**Figure 3: Expected age at death of men and women living with HIV starting antiretroviral therapy (ART) aged 20 years, by period of initiation**  
Estimates of life expectancy were based on mortality during the first 3 years of follow-up and the second and third years of follow-up. Data are for all regions.

# Non-AIDS Comorbidities Among Older Patients With HIV

- Cardiovascular disease
- Cardiovascular risk factors
- Metabolic disorders
  - Diabetes
  - Dyslipidemias
- Neurocognitive abnormalities
- Liver and renal problems
- Bone disorders
  - Osteopenia
  - Osteoporosis
- Frailty
- Malignancies

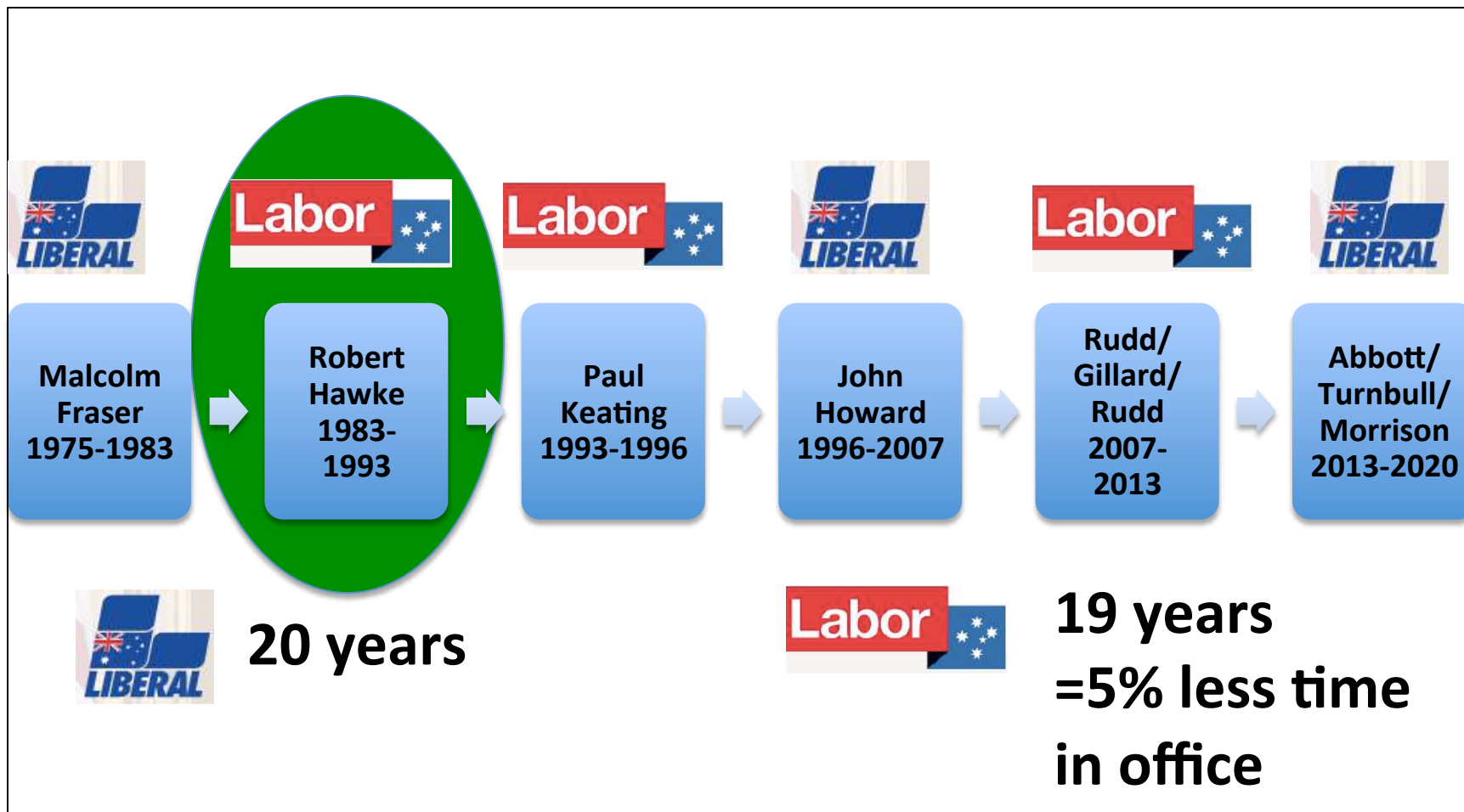
**I made this slide in  
2012!**

**228 PLWHIV+ in S100 GP clinics  
& Hospitals in Australia, 2017**

- Heart disease: 20%
- Hypertension: 43%
- Diabetes: 15%
- Depression: 37%
  - Use of ACE inhibitors: 15%
  - Use of anti-diabetic drugs: 13%

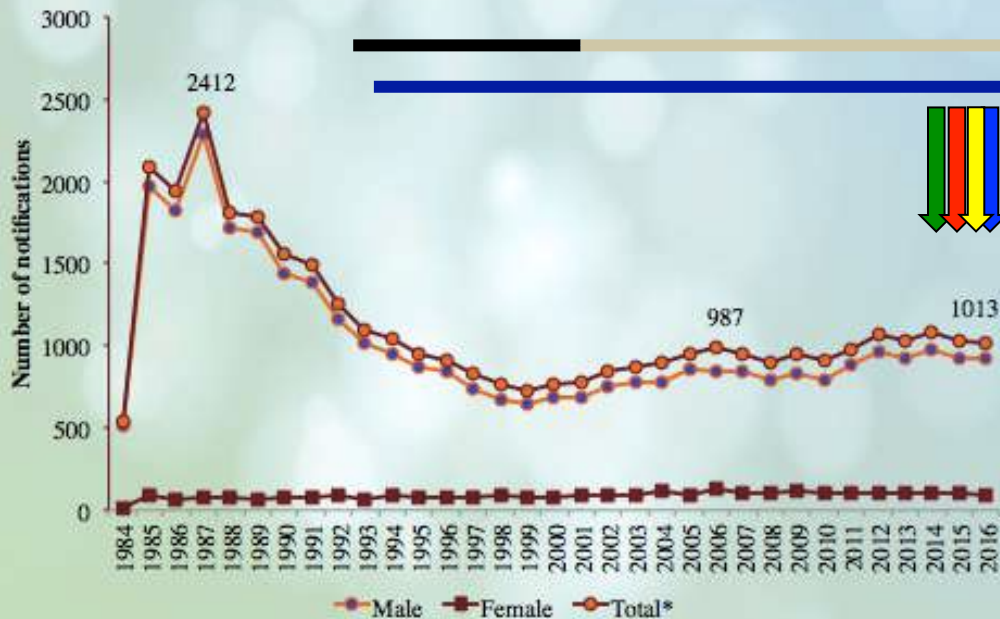
*Petoumenos et al, PLOS One 2017*

# Australian PMs since 1981



# THE HIV RESPONSE IN AUSTRALIA HAS BEEN A PARTNERSHIP RESPONSE

Activists, Community Peak Organisations, Clinicians, Scientists, Researchers and Allied Health practitioners  
Eighth National HIV Strategy in place



\* Includes transgender people and people for whom data on sex was missing.

**1991-2000: \$130M** Needle syringe exchange programs- 25,000 HIV infections averted<sup>4</sup>: **ongoing but less \$**

**PBS subsidised ART- ongoing**

**2014:** ASHM-led PBAC submission: CD4+ ART restriction removed

**2014:** First PrEP trial: 15,000 in trials, 2018

**2015:** START & TEMPRANO studies

**2015:** TDF+FTC TGA registered PrEP

**2018:** April- PBS subsidised PrEP

2018

# PBAC Community Submission Team & Acknowledgments

**ASHM**

Assoc Prof Levinia  
Crooks (CEO)



**NAPWHA**

Bill Whittaker



**Prof David Wilson**



**ASHM**

Anna Roberts



**AFAO**

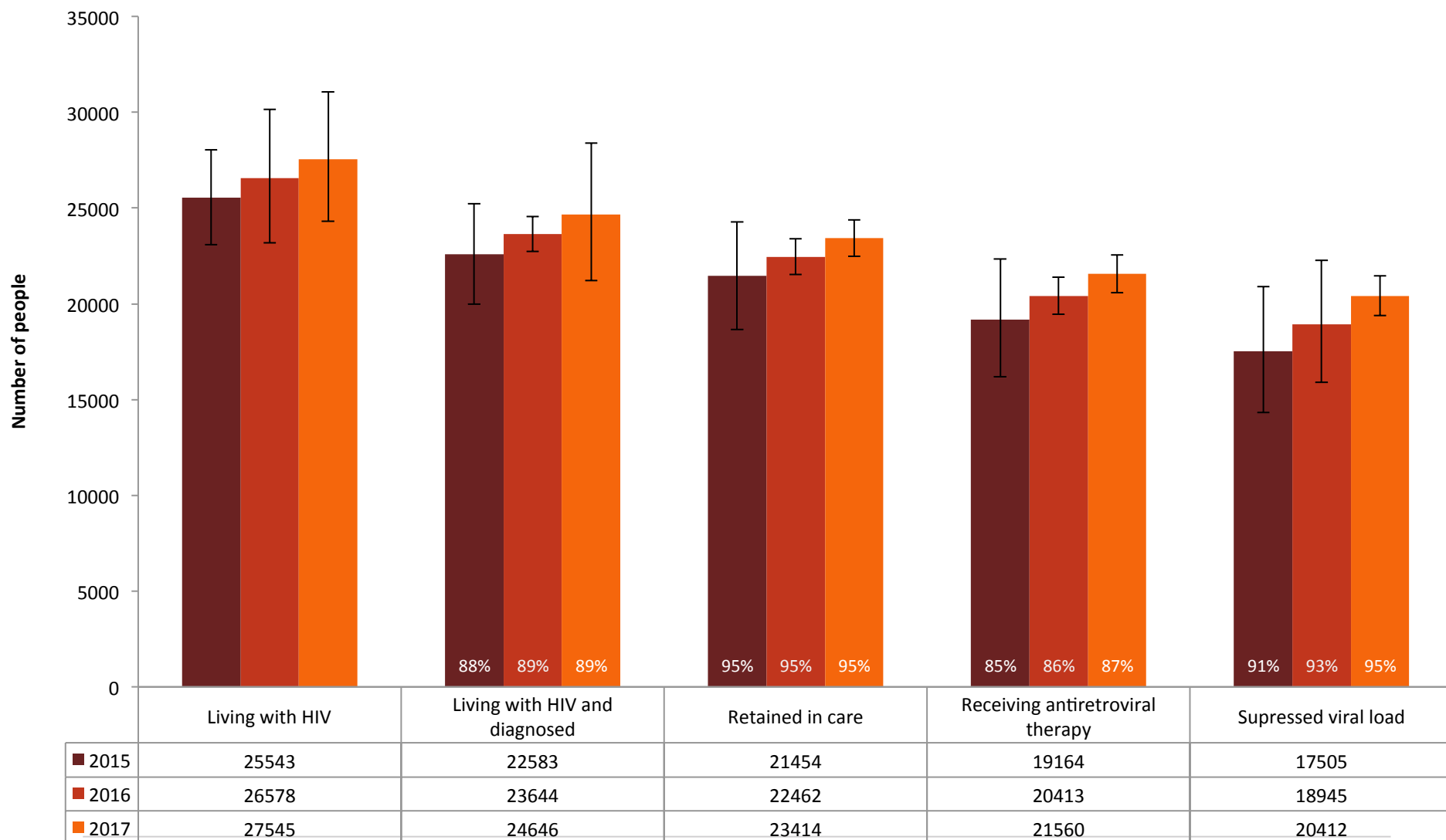
Rob Lake (CEO)



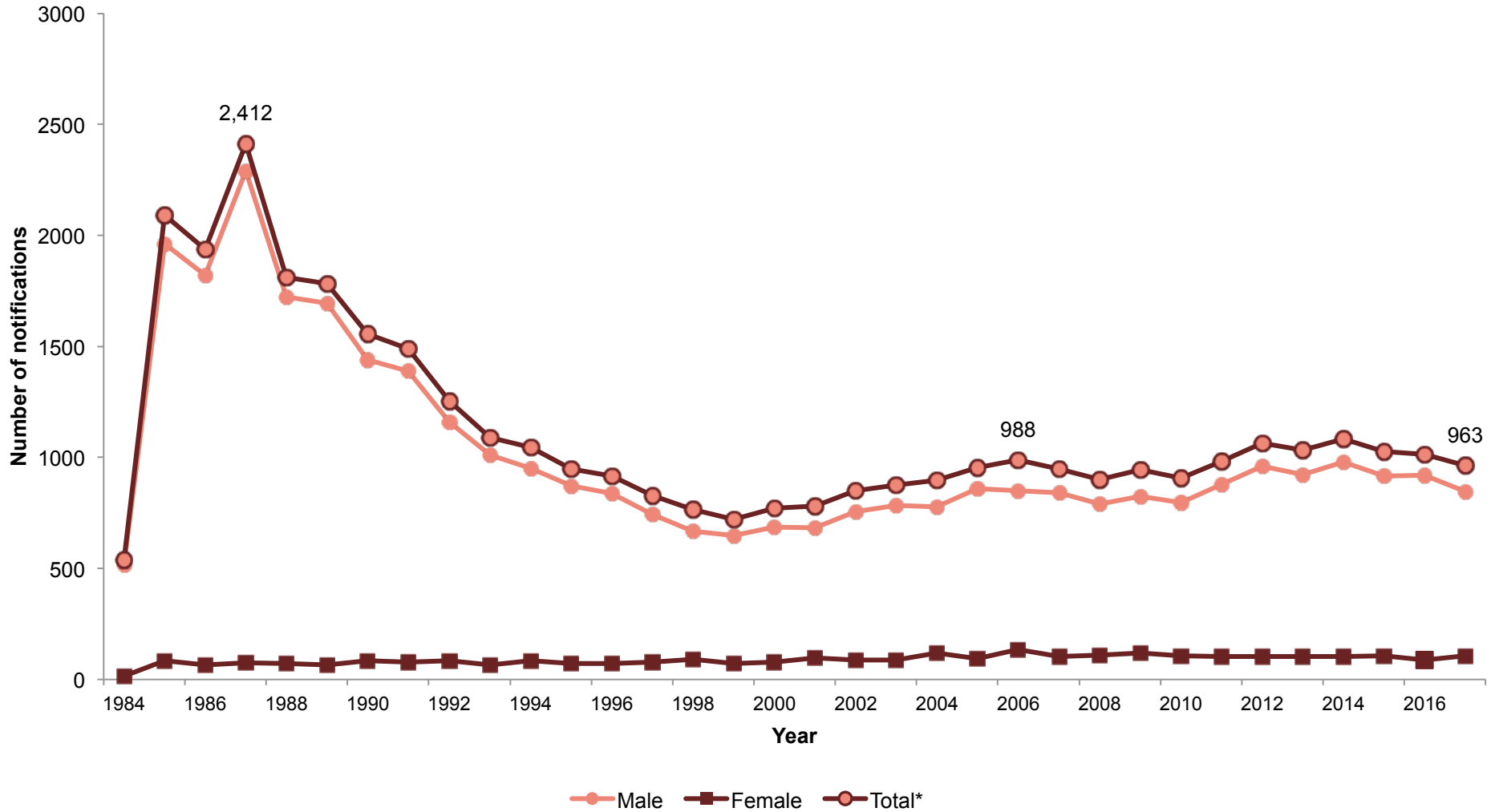
- ViiV Healthcare
- Janssen
- PBS- fee waiver
- Vic, NSW, Qld, WA, Tas, ACT Governments
- Prof Sunil Ahuja
- Covance



**Figure 1.4.1** The HIV diagnosis and care cascade, 2015–2017



# Figure 1.1.1 HIV notifications in Australia, 1984–2017, by sex



\* Includes transgender people and people for whom data on sex was missing.

# 2020- Australia

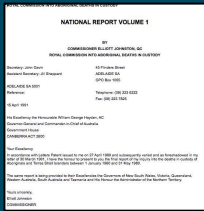


- Flights grounded
- AUD\$1.00= US\$ 0.72
- Avg weekly wage= \$1,714



## Indigenous Australians

- 438 Indigenous deaths in custody
- HIV rates ↑41% vs 12% ↓ in Australian-born non-Indigenous, 2013-17



## Multicultural society

- 2015: 189,770 total migrants- HIV notifications in this group not declining overall with late presentations
- HIV notifications in Australian-born heterosexuals not declining



## MSM

- Gay marriage, 2017
- HIV rates ↓ in Australian-born MSM
- MSM still report high rates of stigma



Susan Mary Kiefel



David Hurley

# Summary

- **Australia was in a good place in 1981 because of its healthcare system plus key laboratory techniques and OI treatments were broadly available**
- **Key features of HIV response in Australia**
  - Australia's healthcare system's provision of ongoing access to the emerging scientific advances in HIV
    - Clinical and laboratory monitoring
    - ARVs for the treatment & prevention of HIV
  - The adoption of a harm minimisation approach following transition to a Labour Government in 1983
  - A strong partnership response throughout
  - Strong local basic science, clinical and social research response

# Summary

- **Key populations are still not benefitting from the science of HIV prevention and treatment**
  - ⇒Therefore Australia's SOCIAL health needs to improve to catch up to the high standards of Australia's Healthcare system
- **Decline in comorbidities may require**
  - ⇒Societal change to reduce cardiovascular & cancer risk factors
  - ⇒Vaccine uptake against oncogenic viruses, screening HBV/HCV
  - ⇒Scientific advances in early cancer detection and vaccines

Thank you!