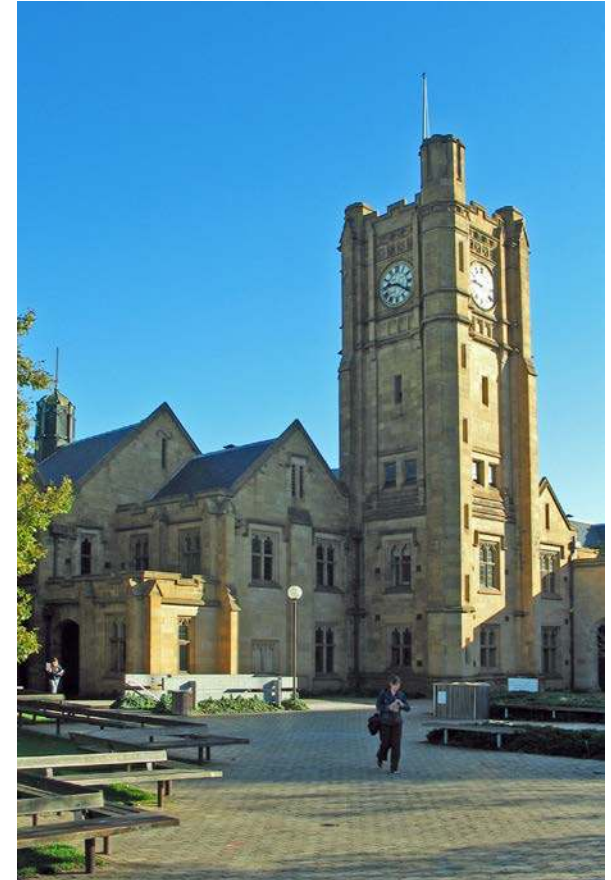


RALPH SLATYER ADDRESS ON SCIENCE AND SOCIETY

Challenges in National and Global Health

Sir Gustav Nossal
Department of Pathology
The University of Melbourne



**CRCA 2013 Conference
15 May 2013**

Melbourne Convention and Exhibition Centre

RALPH SLATYER - TOUCHING POINTS



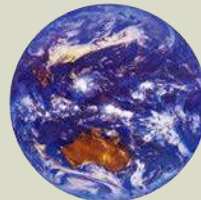
- Australian Academy of Science
- UNESCO
- ASTEC – ARGC - ARC
- CHIEF SCIENTIST - PMSEC
- CRC



AUSTRALIA'S PLACE IN THE SCIENCE WORLD (1)

Gross Domestic Expenditure on R&D as % of GDP

Country	% GDP
Israel	4.25
Finland	3.96
Sweden	3.62
South Korea	3.36
Japan	3.33
USA	2.79
Germany	2.78
OECD	2.33
Australia	2.21
UK	1.82
Canada	1.80
China	1.70
Italy	1.27



AUSTRALIA' S PLACE IN THE SCIENCE WORLD (2)

% of world population 0.3

% of world scientific publications 3.0

11th in world – Scopus-indexed publications

10th in world – citations (4% of global citations)

Commonwealth applied versus basic research : 1992 – 36 to 64

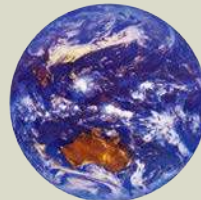
: 2009 – 50 to 50

NHMRC funding : 2002 – \$330 million

: 2012 – \$790 million

NHMRC success rates : 2000 – 30%

: 2011 – 23%



THE HEALTH R&D CONTINUUM (after Alain Beaudet)

- “Blue sky” research feeds the innovation pipeline



- Translational research generates new products and procedures



- Implementation research and health services research drive practice change

BUT TODAY

- Less than one half of clinical actions are evidence-based
- 30% of interventions are at best useless and at worst harmful



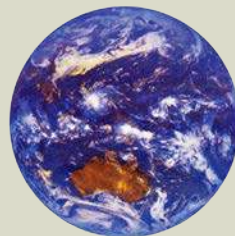
THRUST OF McKEON REVIEW – 10-YEAR FRAMEWORK

- Embed research in the health system
- Manage and support research workforce (23,000 people)
- Promote and support research by clinicians to drive evidence-based clinical practice
- Enhance public health research
- Enhance health services research
- Within 10 years bring total health and medical research investment to \$11 billion per annum or 3-4% of total health system expenditure



TEN FRUITS OF AUSTRALIAN MEDICAL RESEARCH

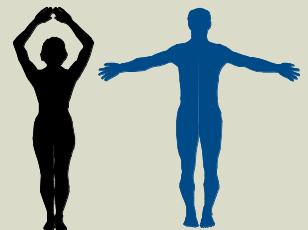
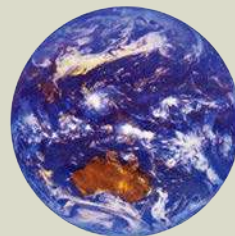
- Lithium controls mania – Cade
- Cochlear implant for profoundly deaf – Clark
- Device for sleep apnoea – Sullivan
- Colony-stimulating factors in cancer – Metcalf
- Dietary folate prevents spina bifida – Stanley
- Thymus masterminds immunity– Miller, Mitchell, Doherty
- Relenza for influenza prophylaxis and treatment – Colman, von Itzstein
- PBT2 very promising for Alzheimer' s – Masters, Bush
- Helicobacter pylori causes peptic ulcers – Warren, Marshall
- Human papilloma virus vaccine prevents cervical cancer – Frazer



LIFE EXPECTANCY AT BIRTH IN YEARS

	1960	2012
Sweden	73	81
Australia	71	82
USA	70	78
Japan	68	82
India	42	66
South Africa	49	49
Zambia	45	39
Angola	33	38

2012 worst to best: 46%



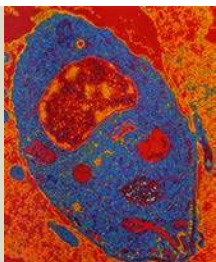
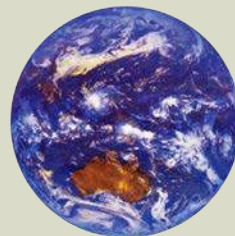
DEATHS UNDER FIVE YEARS PER 1,000 LIVE BIRTHS

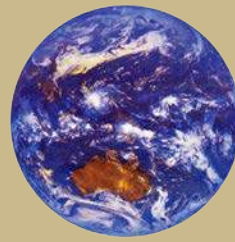
	1960	2011
Singapore	29	3
Japan	26	3
Australia	20	5
USA	25	8
Angola	200	158
Zambia	127	83
India	140	61
Nigeria	164	124

2011 mortality worst to best: 53

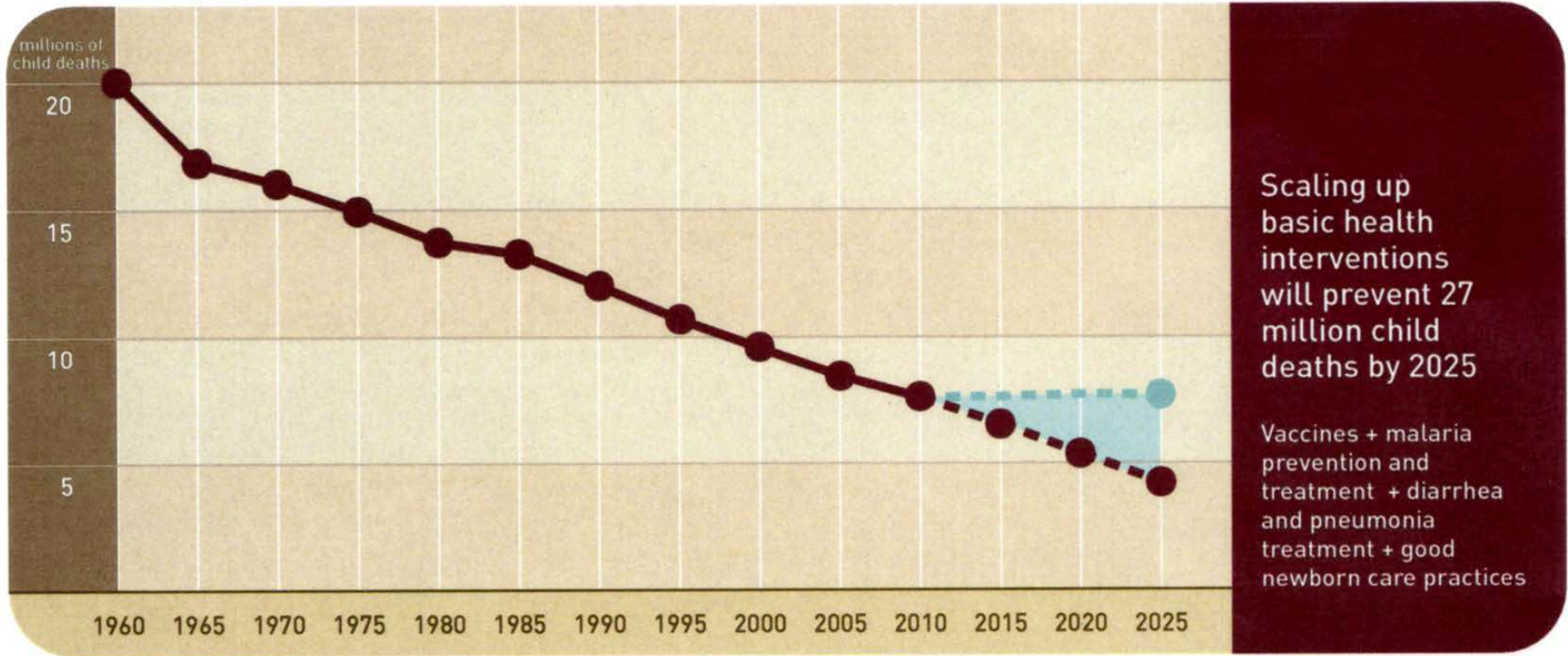
Last decade world improvement: 2.8% per annum

Pneumonia 1.5 million; Diarrhoea 740,000; Malaria 670,000





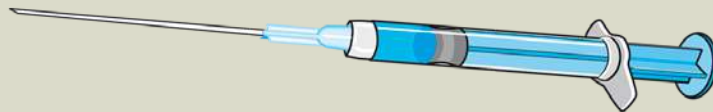
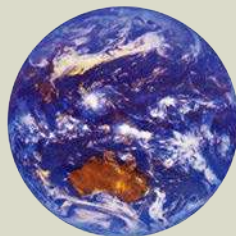
Aid Has Helped Reduce Child Deaths Dramatically, and Can Continue to Do So



Sources: Johns Hopkins Bloomberg School of Public Health, Bill & Melinda Gates Foundation estimates

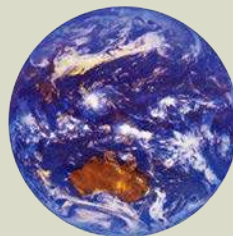
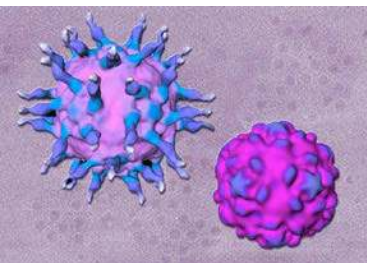


GLOBAL ERADICATION OF SMALLPOX, CERTIFIED 1980, SAVES FIVE MILLION LIVES PER YEAR



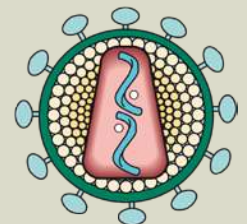
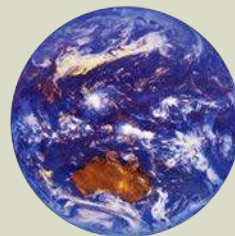
GLOBAL ERADICATION OF POLIOMYELITIS

- Partnership between Rotary International, WHO, UNICEF and others launched in 1988.
- Depends critically on Sabin oral poliomyelitis vaccine, optimal routine infant immunisation, national immunisation days, good surveillance and laboratory confirmation of polio attacks.
- Polio cases reduced by over 99%. Total confirmed cases 2010 - 874; 2011 - 650; 2012 - 222; 2013 (to 10 April) -18. Nigeria 11, Pakistan 6, Afghanistan 1.
- Post eradication must control vaccine-derived polioviruses and residual stocks of virulent viruses.
- May need five years of immunisation with inactivated injectable poliomyelitis vaccine (Salk).



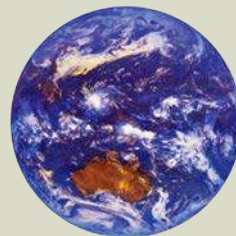
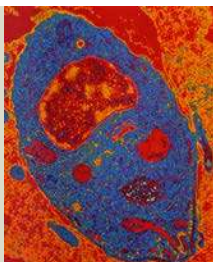
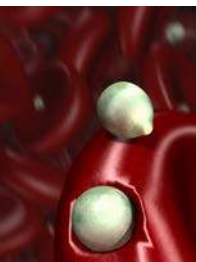
THE FIGHT AGAINST AIDS

- Surprisingly, Sanofi-Pasteur's RV144 HIV/AIDS vaccine gives 31.2% protection in 16,000 Thai volunteers. Not good enough to deploy, trials of improved version in planning phase. Many other vaccines in early clinical trial.
- Two large programmes, the Global Fund to Fight AIDS, TB and Malaria, and PEPFAR, the President's Emergency Program for AIDS Relief, provide anti-retroviral therapy to 9.3 million people in poor and middle-income countries at cost of about \$8 billion per year. However, 15 million people need ART. Cost of one year's treatment year 2000 = \$10,000; year 2012 = \$100.
- The pandemic has peaked. 1.7 million deaths in 2011 is 24% less than 2005.
- Prevention of mother to child transmission is working well. PEPFAR believes 230,000 infant HIV infections per year are being prevented.



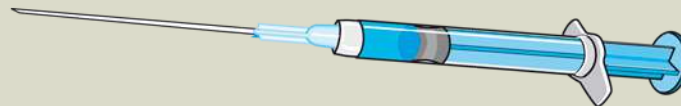
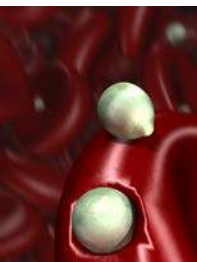
NEW PERSPECTIVES IN MALARIA CONTROL

- Global Malaria Action Plan, endorsed by UN 2008, seeks to co-ordinate global effort with the (over-ambitious) goal of eliminating deaths by 2015.
- Situation is improving, 2010; 655,000 deaths from 216 million cases, but half the world's population is still at risk.
- Vector control: long-lasting insecticide-treated mosquito nets are helping to control mortality, 300 million distributed so far. Indoor residual spraying also important. New attractants and repellents coming on stream through research.
- Treatment with artemisinin combination therapy highly effective – at least 300 million treated via Global Fund.
- Intermittent prophylactic therapy (IPT) recommended for pregnant women (2nd and 3rd trimester) using sulfadoxine/pyrimethamine, also 3 doses for infants alongside routine immunisation.
- For Sahel, seasonal malaria chemoprevention with amodiaquine plus sulfadoxine/pyrimethamine recommended monthly for all children under 5 during high transmission season.



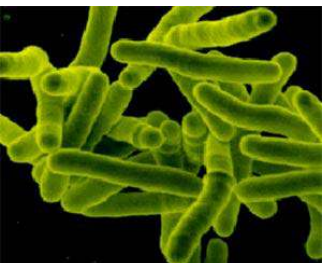
RTS,S MALARIA VACCINE (GlaxoSmithKline)

- Circumsporozoite antigen of *Plasmodium falciparum* in AS01 adjuvant
- ~50% protection in toddlers but only ~30% in infants
- Recognition that other antigens will be required as well
 - liver stage
 - blood stage
 - sexual stage



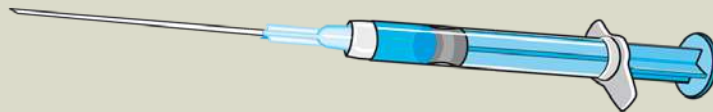
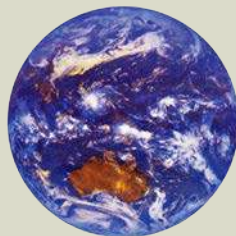
STOP TB PARTNERSHIP

- Founded in 2001, hosted by WHO, 1,000 partners, aims to bring prevalence and deaths down by 50% by 2012, and global incidence to <1 per million by 2050. Today, 8.8 million new active cases per year of which 1.1 million also have HIV and 1.4 million deaths yearly.
- Key treatment is DOTS, 6-month course of 4 antimicrobial drug cocktail. Since 1995, 46 million people treated with DOTS, 7 million lives saved.
- Special emphasis on TB + HIV; MDR TB; XDR TB. MDR: resistant to isoniazid and rifampycin; XDR resistant also to fluoroquinolones and at least one injectable drug. MDR: 3.3% of all new TB cases. XDR, 9% of these. Still rare but in 77 countries.
- Active research: E.g. first novel regimen trial NC001, a new combination of a novel TB candidate, PA 824; an antibiotic not yet approved for TB, moxifloxacin and an existing TB drug, pyrazinamide. Kills >99% TB bacteria in 2 weeks, 4 month course under trial. NC002 will be a 2-month course.



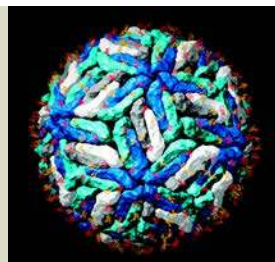
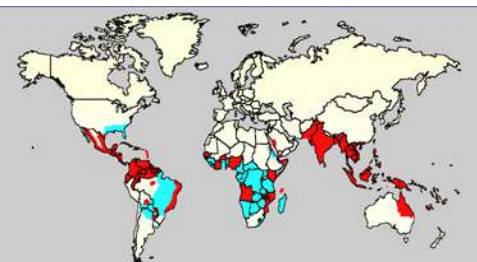
THE GAVI ALLIANCE

- Launched in 2000, this seeks to bring vaccines to the 72 poorest countries in the world.
- 370 million additional children immunised.
- Over 5.5 million deaths averted. Coverage 82% (up from 66%).
- Beyond the basic six vaccines (diphtheria, whooping cough, tetanus, poliomyelitis, measles, BCG) highest priorities are: hepatitis B; Haemophilus influenzae b; yellow fever; Streptococcus pneumoniae; rotavirus; human papilloma virus; rubella.
- Budget over \$1 billion per year, needs to rise. Still 19 million children unimmunised each year.



THERE ARE HIGH TECH SOLUTIONS OTHER THAN VACCINES

- Dengue is a mosquito-borne viral disease that occurs in over 100 countries, 50-100 million cases per year, 40,000 deaths.
- *Aedes aegypti* is the mosquito carrier. *Wolbachia* bacteria, transferred from fruit flies, strongly reduce the ability of the mosquito to support and transmit dengue virus.
- Scott O' Neill, Ary Hoffmann and colleagues, experiment with *Wolbachia* MEL first with caged mosquitoes, then through release of infected mosquitoes in Cairns. The *Wolbachia* spread rapidly through the mosquito population such that within three months 80-100% of mosquitoes carried *Wolbachia*. Field trials began in Vietnam 4 April and soon in Indonesia and Brazil.
- In principle, the approach could work for *Anopheles* as well.



CLOSING THE GAP IN INDIGENOUS HEALTH – THE (REASONABLY) GOOD NEWS

- Gap in life expectancy has come down from 17 years to 10.6 years
- 90.6% fully immunised at two years versus 93.2%
- 35% abstain completely from alcohol versus 14%
- Health services are improving, but poor in small remote communities and not optimally accessed in cities



CLOSING THE GAP IN INDIGENOUS HEALTH – REMAINING BIG PROBLEMS

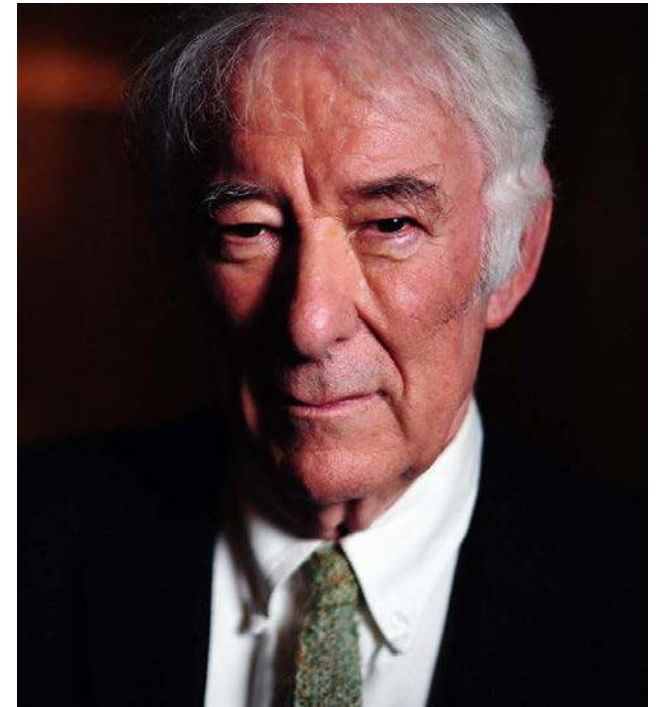
Indicator	Times Higher than total Australian Population
Age-standardised death rates	1.9
Low birth weight	2.0 (12% versus 6%)
Maternal mortality	2.7
Diabetes rate	3.4
End stage renal disease	7.2
Low vision	2.8
Tuberculosis	11.1
Invasive pneumococcal disease	7.3
Tobacco use	2.3





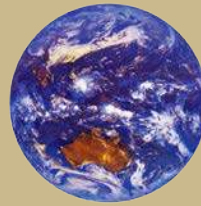
“Once in a lifetime, the longed for tidal wave of justice can rise up, and hope and history rhyme.”

Nobel Laureate Seamus Heaney on learning of Nelson Mandela’s release from prison

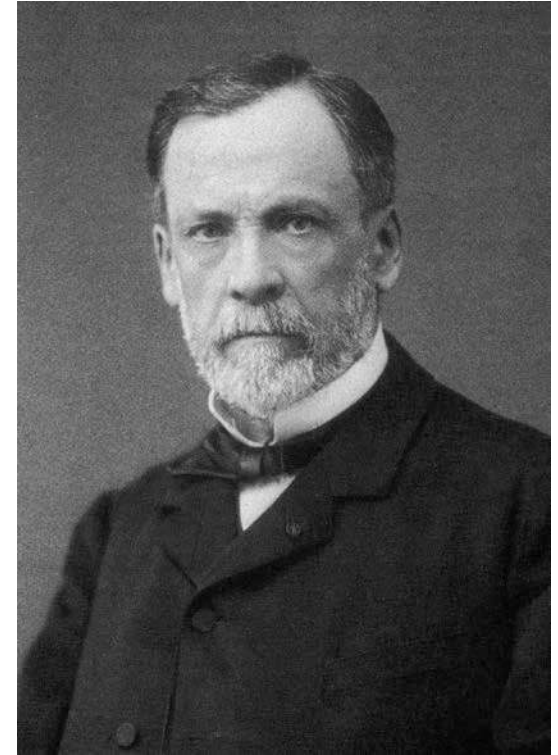


Seamus Heaney





*“Science knows no country,
because knowledge belongs to
humanity, and is the torch which
illuminates the world.”*



Louis Pasteur

