







Environmental Sustainability & Healthcare: What do Health Professionals Need to Know?

A/Prof Katherine Barraclough Nephrologist, Royal Melbourne Hospital







Overarching aim



To impart that....

Environmental sustainability is core business for health professionals,

and therefore....

It needs to be a core component of health education

Outline

- 1. The relationship between the environment & human health
- 2. The impact of environmental change on human health
- 3. The impact of **healthcare on the environment**
- 4. Why is **education of health professionals** so important?
- 5. What is already happening in this space in Australia & NZ?

Environment & health – how are they linked?

Nature's goods and services = ultimate foundations oh health & life





- Humans have a fundamental need for
 - Water
 - > Food
 - Clean air
 - > Shelter
 - Relative climatic constancy

Our environment is also responsible for...



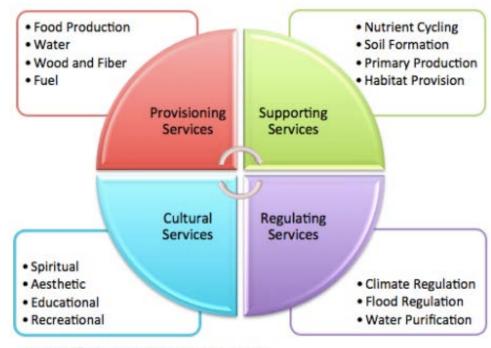
- Nutrient & waste processing & detoxification
- Regulation of infectious diseases
- Recreational opportunities
- Mental, cultural, spiritual enrichment¹

"(The land) is our life. Without the land, we are nothing."

Andrew Johnson, Aboriginal Elder, Lajamanu, NT

Ecosystem services

Ecosystem Services: Categories and Examples



Source: Millenium Ecosystem Assessment, 2005.

Ecosystem Services

- = the benefits people obtain from ecosystems
- Categorization allows us to monitor & monetize them and advocate for their conservation



 Important bc in modern societies, our fundamental dependency on them may be poorly recognized

Vital source of medicines



Cone snails

- Common on coral reefs & in tropical tidal zones
- Venom being developed as an alternative to opioids
- Particular promise in chronic neuropathic pain
- Potentially 100x stronger than morphine, fewer side effects and lower addictive potential

Nature has medicinal potential



Forest Bathing (shinrin-yoku)

- Reduces heart rate and BP
- Reduces cortisol levels, anxiety & depression
- Reduces BNP levels
- Attenuates inflammatory response
- Reduces markers of oxidative stress
- Improves immune function (increased NK cell activity)
- Reduced symptoms of ADHD

Nature has medicinal potential



Royal Children's Hospital, Melbourne

- Set in parkland
- 'Park in a hospital, & a hospital in a park'
- Building designed to reflect colours from surrounding trees & nature
- Almost constant access to natural, direct light
- Almost all rooms have view of outdoors

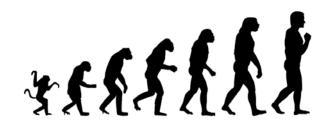
Our environment is changing at an unprecedented rate



The Anthropocene (anthropo = "man" & cene = "new")

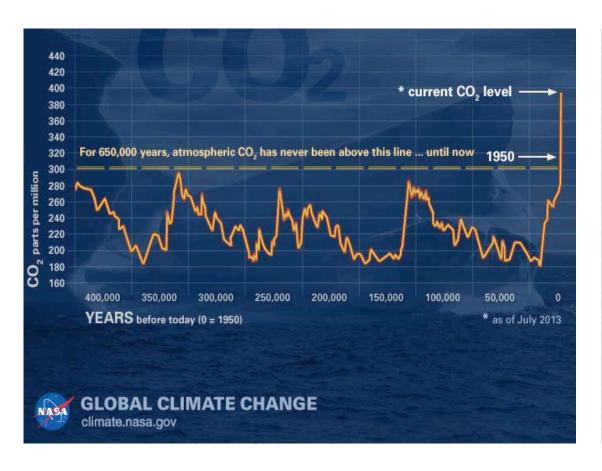
Humans...

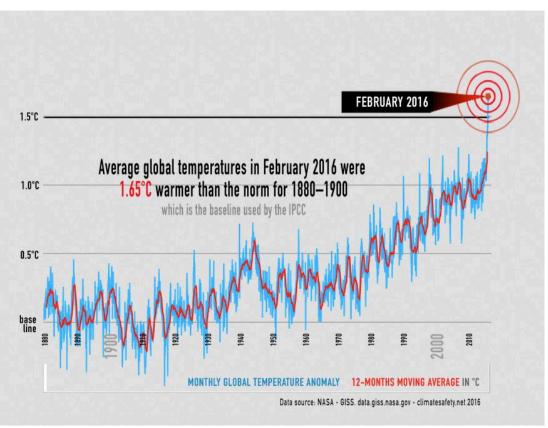
- Live on every continent & have had direct impact on 83% of the earth's surface¹
- Are triggering the rapid loss of terrestrial & marine life²
- Are on course to see more plastic than fish in the sea by 2050²
- Have altered our oceans, the climate, the functioning of ecosystems, the geochemistry of the earth...³



- Sanderson. Bioscience 2002
- World Economic Forum Report 2016
- UN IPCC 5th Assessment Report 2014

Climate change – a wicked problem



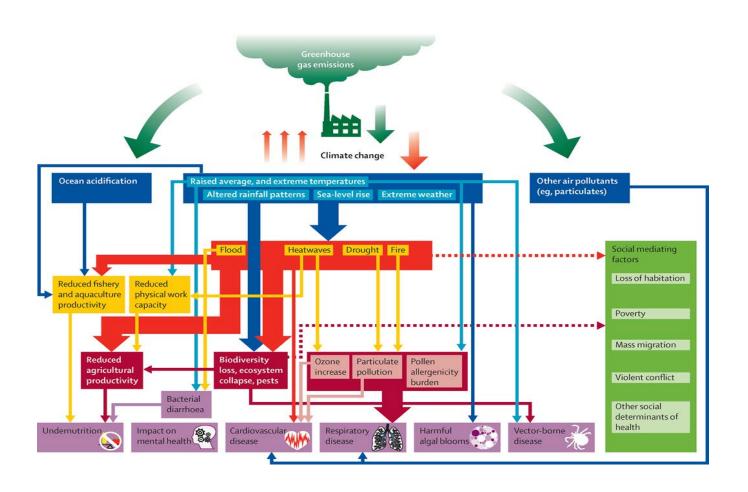


2009 Lancet-UCL Commission on Climate Change & Health¹

- "Climate change is the biggest global health threat of the 21st century"
- "Effects of climate change on health will affect most populations in the next decades & put the lives & wellbeing of billions of people at increased risk"

2015 Lancet-UCL Commission on Climate Change & Health²

- "The effects of CC are being felt today, & future projections represent an unacceptably high and potentially catastrophic risk to human health."
- "Tackling climate change could be the greatest global health opportunity of the 21st century"



Direct effects

- Heatwaves
- Extreme weather events
- Altered air quality

Indirect effects

- Altered infectious disease distribution
- Changes to crop yields and fish stocks
- Altered aeroallergens
- Changes to water quality and flows

Deferred & diffuse risks

- Displacement
- Conflict & social unrest
- Mental ill-health



"Between 2030 & 2050, climate change is expected to cause ~250,000 additional deaths per year."

WHO 2014



Consequences greatest for poorest countries



- Even though they contribute the least to emissions
- Loss of healthy life years predicted to be 500 x greater in poor African vs. European populations ¹

"The rich will find their world to be more expensive, inconvenient, uncomfortable, disrupted and colourless; in general, more unpleasant and unpredictable, perhaps greatly so. The poor will die." ²

"While the poorest and most vulnerable communities might suffer the most, the interconnected nature of climate systems, ecosystems & global societies means that none will be immune." 1



Climate change & health in Australia

Bushfires



2009 - Victoria

- 173 deaths
- 414 public ED presentations
- Increased out of hospital cardiac arrests & CV mortality
- Ongoing mental health impacts4 years after event

Heatwaves



2009 - Victoria

- 374 excess deaths
- 46% 个 in ambulance call-outs over hottest 3 days
- 8-fold ↑ in ED presentations
- 2.8-fold ↑ in cardiac arrests

Floods



2011 - Queensland

- 33 deaths, 3 people still missing
- Reduced overall health and wellbeing in those affected
- 2x risk of psychological symptoms including PTSD

Climate change & health in Australia

We should expect...

- Longer, hotter, more frequent heatwaves 1,2
- An increase in severe fire danger days & longer fire season 1,3
- More heavy rainfall days, extreme rainfall events & severe flooding ⁴

- 1. CSIRO 2016
- 2. Bureau of Metorology 2016
- 3. UN Intergovermental Panel on Climate Change 2014
- 4. CSIRO 2015

Allergies & asthma



- ~1 in 5 Australians has an allergic disease ¹
- 1 in 10 suffers from asthma ²
- † temperatures & atmospheric CO₂ can † production, potency & release of pollens & spores ^{3,4}
- Changes to wind & rainfall patterns due to climate change may also affect allergen production & distribution ⁵

- 1. ASCIA 2013
- 2. AIHW 2011
- 3. Beggs et al. Env Health Perspectives. 2005
- 4. Blando et al. Atmosphere. 2012
- 5. www.dea.org.au

Thunderstorm asthma

Do you have asthma?

Talk to your doctor about what you can do to protect yourself this pollen season





- "One ambulance call every four-and-a-half seconds at the peak — it was like having 150 bombs going off right across a particular part of metropolitan Melbourne" ¹
- Emergency departments overwhelmed
- ~8,500 hospitalised, 10 deaths ²

European Respiratory Society Position Statement

"It is likely that, with climate change, there will be an increase in thunder-storms, which are known to be associated with outbreaks of asthma mediated through allergen exposure, notably pollens and wet-air fungal spora" 3

- Victorian Minsiter of Health, Jill Hennessey
- 2. Thien et al. Lancet Planet Health 2018
- Ayres et al. Eur Respir J 2009



nephrologists sans frontières

www.kidney-international.org

Climate change and kidney disease—threats and opportunities



Kidney International (2017) 92, 526–530; http://dx.doi.org/10.1016/j.kint.2017.03.047

KEYWORDS: acute kidney disease; adaptation; chronic kidney disease; climate change; co-benefits; mitigation

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ver the past few centuries, human activity has fundamentally changed our planet. Indeed, the current epoch has been described as the anthropocene, whereby humans constitute the most potent driver of change to the Earth's systems.1 Human beings now live on every continent and have had a direct impact on at least 83% of the Earth's surface.² Human activities have profoundly altered the functioning of the planet's ecosystems and are triggering the mass extinction of both terrestrial and marine life. Increasingly, leading health journals are referring to the concept of "planetary boundaries" within which humanity can safely operate, highlighting that the crossing of these boundaries risks abrupt and irreversible consequences for global human communities and ecological systems. One planetary boundary that is being rapidly approached is the atmospheric concentration of carbon dioxide that determines our dimate, with substantial implications for human health.

mitigate our impact on the climate, with particular focus on the unique opportunity this presents for stemming the rising tide of lifestyle-related chronic kidney disease among global populations.

Heat-related renal diseases

Acute kidney injury. The increased frequency and intensity of heat waves across continents since 1950 have been clearly documented. Climate models predict that heat waves will become still more frequent, severe, and persistent in a future warmer climate, particularly in the high latitudes of North America and Europe.

This has potential implications for rates of acute kidney injury (AKI), with multiple studies demonstrating increased hospital admissions from AKI during heat waves. During the severe European heat wave of 2003, kidney failure was a prominent cause of excess mortality. Susceptible individuals include those well known to nephrologists: the elderly, those with chronic

More acute kidney injury

- During heatwaves
- From vector-borne diseases
- From water-borne diseases

More chronic kidney disease

Epidemics of "heat stress nephropathy"

More nephrolithiasis

↑ ambient temperature = major risk factor

Extreme weather events → destabilising impact on provision of dialysis

nephrologists sans frontières

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Chest

Volume 143, Issue 5, May 2013, Pages 1455-1459



Special Features

Lungs in a Warming World: Climate Change and Respiratory Health

Aaron S. Bernstein MD a, b & Mary B. Rice MD c

https://doi.org/10.1378/chest.12-2384

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Lungs in a Warming World: Climate Change and Respiratory

PULMONARY PERSPECTIVE



Climate Change

A Global Threat to Cardiopulmonary Health

Mary B. Rice^{1,2}, George D. Thurston³, John R. Balmes^{4,5}, and Kent E. Pinkerton⁶

¹Pulmonary and Critical Care Unit, Massachusetts General Hospital, Boston, Massachusetts; ²Cardiovascular Epidemiology Research Unit, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts; ³Department of Environmental Medicine, New York University School of Medicine, New York, New York; ⁴Division of Environmental Health Sciences, Department of Medicine, University of California, San Francisco, California; Division of Environmental Health Sciences, School of Public Health, University of California, Berkeley, California, and ⁶Center for Health and the Environment and the John Muir Institute of the Environment, University of California Davis, Davis, California

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journal homepage: www.elsevier.com/locate/envint



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Climate change and human infectious diseases: A synthesis of research findings from global and spatio-temporal perspectives



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DEBATE

Climate change and mental health: risks, impacts and priority actions

Katie Hayes^{1*}, G. Blashki², J. Wiseman³, S. Burke⁴ and L. Reifels⁵

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Abstract

Background: This article provides an overview of the current and projected climate change risks and impacts to mental health and provides recommendations for priority actions to address the mental health consequences of climate change.

Discussion and conclusion: The authors argue the following three points: firstly, while attribution of mental health

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RESIDENT CORNER

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Climate Change and Skin Disease

Ashley D. Lundgren, MD

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Climate change is ALSO a health opportunity

2015 Lancet Commission on Climate Change & Health¹

"Tackling climate change could be the greatest global health opportunity of the 21st century"

Acting to reduce GHG emissions

Protects against direct and indirect health impacts of climate change

Can also benefit health through mechanisms quite independent of climate

"Health co-benefits" of climate change mitigation

Energy sector



Fossil fuels responsible for > **75**% of global GHG emissions¹

A transition to "clean" energy will address the

- Health impacts of climate change
- Health impacts of air pollution (kills 7 million annually)²

This will...

- Prevent illness
- Save lives

We need to measure & promote co-benefits

- 1. NZ Environmental Reporting Series. 2018
- 2. Patz et al. JAMA 2014

Transport sector



- Transport industry responsible for 25% global GHG emissions
- Physical inactivity may be responsible for 3.2 million deaths annually

Country	Intervention	Health Benefit
Europe & Asia	Active commuting	11% ↓ CV risk
U. S.	Bike transport	20% ↓ obesity 23% ↓ diabetes
China	Active commuting	48%-44% ↓ colon Ca
Denmark	Commuter cycling	39% ↓ mortality
New Zealand	Shifting 5% vehicle transport to cycling	Avoidance of 122 deaths annually

Agricultural sector



Agriculture & forestry contributes **24%** to global GHG emissions¹

If consumption of meat, dairy & eggs were halved

GHG emissions could be reduced by 25-40%

Saturated fat intake could be reduced by 40%¹

Expected to impact risks of...¹

- Obesity
- Heart Disease
- Diabetes
- Some cancers (e.g. bowel Ca)

Transitioning to a more plant-based diet could reduce global mortality by 6–10%²

- 1. Patz et al. JAMA 2014
- 2. Springmann et al. Proc Nat Acad Sciences 2016

The economics...

- Concern exists re the costs of climate change mitigation
- Most existing analyses fail to consider averted health costs

Monetized health benefits from air quality improvements are estimated to offset the cost of US carbon policies by **25%-1050%**¹

If active travel in England and Wales could reach the level seen in Copenhagen, costs averted for the NHS would approximate *UK***E17 billion* over a 20-year period*



- Thompson et al. Nature Climate Change 2014
- 2. Jarrett et al. Lancet 2012

The environmental impact of healthcare



Contribution to national carbon footprint¹

United States: 10%

United Kingdom: 4%

Australia: 7%

The carbon footprint of Australian health care

Arunima Malik, Manfred Lenzen, Scott McAlister, Forbes McGain

Summary

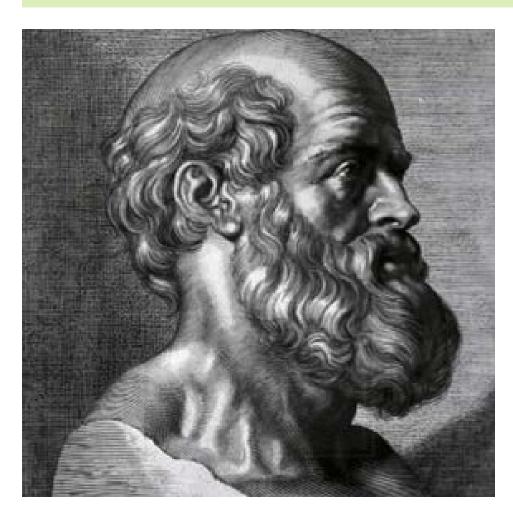
Background Carbon footprints stemming from health care have been found to be variable, from 3% of the total national CO₂ equivalent (CO₂e) emissions in England to 10% of the national CO₂e emissions in the USA. We aimed to measure the carbon footprint of Australia's health-care system.

Methods We did an observational economic input—output lifecycle assessment of Australia's health-care system. All expenditure data were obtained from the 15 sectors of the Australian Institute of Health and Welfare for the financial year 2014–15. The Australian Industrial Ecology Virtual Laboratory (IELab) data were used to obtain CO₂e emissions per AUS\$ spent on health care.

Findings In 2014–15 Australia spent \$161-6 billion on health care that led to CO₂e emissions of about 35772 (68% CI 25 398–46146) kilotonnes. Australia's total CO₂e emissions in 2014–15 were 494930 kilotonnes, thus health care represented 35772 (7%) of 494930 kilotonnes total CO₂e emissions in Australia. The five most important sectors within health care in decreasing order of total CO₂e emissions were: public hospitals (3635 kilotonnes CO₂e), private hospitals (3635 kilotonnes [10%]), other medications (3347 kilotonnes [9%]), benefit-paid drugs (3257 kilotonnes [9%]), and capital expenditure for buildings (2776 kilotonnes [8%]).

Interpretation The carbon footprint attributed to health care was 7% of Australia's total; with hospitals and pharmaceuticals the major contributors. We quantified Australian carbon footprint attributed to health care and identified health-care sectors that could be ameliorated. Our results suggest the need for carbon-efficient procedures, including greater public health measures, to lower the impact of health-care services on the environment.

The environmental impact of healthcare



- Our primary professional mandate... "First, do no harm" 1
- "Healthcare has a responsibility to get its own house in order to avoid the paradox of doing harm while seeking to do good"²

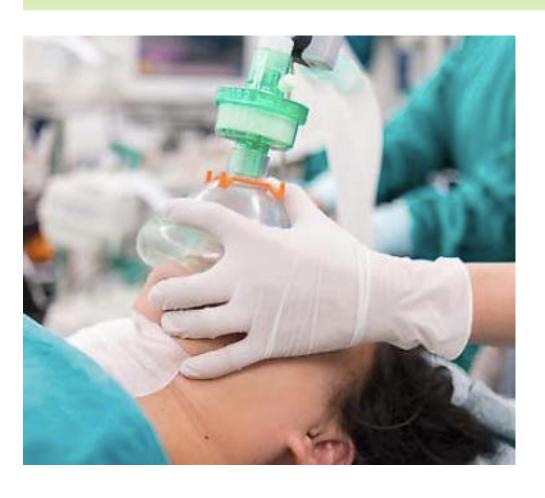
- 1. Hippocrates
- Godlee, BMJ 2014

The environmental impact of healthcare

The paradox...

- For a particular US healthcare facility, direct expenses associated with emissions totalled \$2.4 million annually, while indirect societal costs for premature deaths, chronic bronchitis, asthma & more totalled \$23 million¹
- Harmful effects on public health from the US health care sector's direct and indirect pollution emissions estimated at 405,000 to 470,000 DALYs²
- An GHG emission reduction target of 30% rather than 20% from 1990 levels by 2020 in the EU would produce health savings from concurrent decreases in fossil fuel derived air pollutants of between €10.5-€30.5 billion per year³
 - 1. Healthcare Without Harm. https://noharm.org
 - 2. Health and Environment Alliance. https://www.env-health.org
 - 3. Eckelman & Sherman. PloS one 2016.

Clinical decisions in day to day practice



Anaesthetic gases

- Significant & sustained environmental impact
 - Some more than others
- Environmental impact can be ↓ by clinicians
 - Utilising low-flow anaesthesia
 - Using agents with lower environmental impact
 - ↑ use of regional or total IV anaesthesia ¹
- Western Health (Victoria)
 - Anaesthetists switched from desflurane to sevoflurane
 - Yearly savings of ~ \$30,000 and 140 tCO₂ emissions²
 - 1. ANZCA Statement on Environmental Sustainability; available at www.anzca.edu.au
 - 2. Green and Global Health Hospitals. https://www.greenhospitals.net/

Clinical decisions in day to day practice



Drainage of APD effluent

Three methods available

- 1. Drain into plastic drain bag \rightarrow bin
- 2. Use drain line to drain directly into a sink/shower
- 3. Drain into 25L plastic drum with a tap → empty into shower/sink



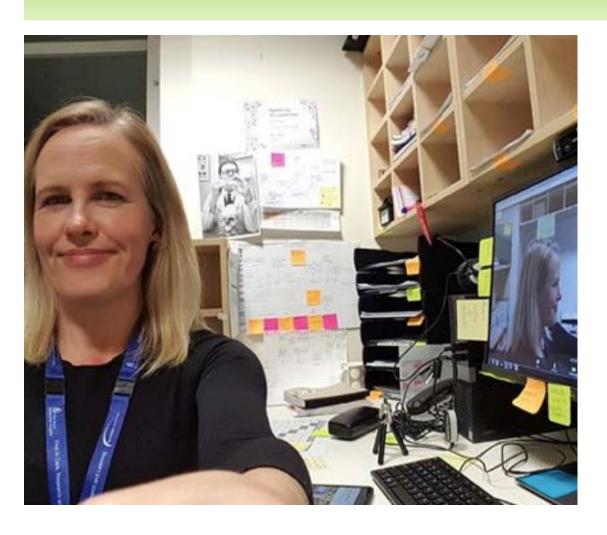




Clinical decisions in day to day practice

Drain Option	Total waste weight/month	Cost/month
Baxter Drain Bag	6 kg	\$401.30
Baxter High Dose Using Drain Bag	12.6 kg	\$936.30
Fresenius Drain Bag	9 Kg	\$420.00
Baxter Drain Line (3.65m)	2.5 kg	\$59.70
Fresenius Drain Line (12.3m)	9.75 kg	\$150.00
Reusable Drum	Nil (1.2 kg when drum no longer required)	1 off cost of \$30-\$40

Models of care



Telehealth

- Offered to RMH kidney transplant recipients since 2016
- 230 reviews (45 patients) to date
- Savings of:
 - > **189,005** km (4.7 trips around the world)
 - > 57.6 tCO2 equivalents (1229 seedling trees grown for 10 yrs)
- Patient feedback universally positive
- No-one has opted to return to in-person reviews
- No patient safety issues observed

Models of care

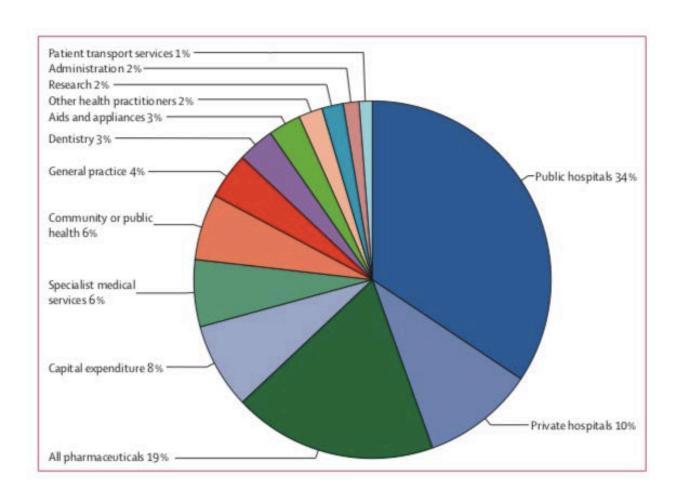
One patient's story

- set alarm for 4.30 am
- arrive at airport at 5.30
- catch morning flight at 6.30
- arrive in Melbourne at 7.50
- taxi in peak hour to RMH by 9
- wait in O/P until seen by clinician for 20 min
- fills in time until taxi back to airport for 1545 flight
- arrive Mildura at 1655
- home approximately 1730

Av cost \$500

= 12+ hours of time for a 20 minute specialist consultation

The environmental impact of healthcare



Contribution to CFP of healthcare

43% Hospitals

4% General practice

6% Public health

"The role of public health in preventing hospital admissions in the first place will be crucial in a carbon-constrained health-care system."

The environmental impact of healthcare

There is a need for **structural changes** to our health system

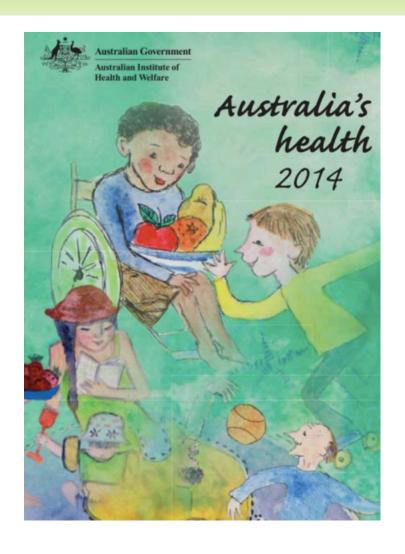
- Illnesses that produce largest disease burden are largely preventable
- YET, we currently allocate less than 2% of overall health budget to public health^{1,2}

Clear evidence that a strong **primary health care orientation** is associated with²

- ↓ costs
- † efficiency
- ↓ rates of potentially preventable hospitalisations
- better population health outcomes²

^{2.} Doctors for the Environment Australia. 2018. www.dea.org.au

The environmental impact of healthcare



"A strong & readily accessible primary health care system is ... vital in reducing pressure on public hospitals through access to advice & services in the early stages of disease & a broader geographic distribution of suitably skilled health professionals compared to the concentration of specialists in urban areas" 1

The impact of the environment on healthcare

- → Environmental change impacts health
- → This impacts healthcare

This adds to an already stressed healthcare system

- We have an aging population
- Burden of NCDs is rapidly growing
- Medical technology continues to advance
- Climate change will increasingly threaten health & wellbeing

"The future of expanding, high quality health care relies on it being delivered in ways that are both financially and environmentally sustainable." ¹

Education of health professionals

Why is this so important?

Workforce preparedness

Health system adaptation

Advocacy

Workforce preparedness



Tomorrow's health professionals need to...

- Be familiar with regional climate-health risks
- Be able to identify vulnerable patients
- Engage in health promotion & screening
- Address risk factors
- Diagnose & manage climate-related mental & physical illness

Healthcare sustainability

- → Healthcare is part of the problem
- → Health professionals need to contribute to solutions

We must consider...

- The impact of our day to day practice
- Opportunities for innovative, more sustainable models of care

We have a long (and proud) history of taking action against health threats



Slavery abolition Bill, 1983



Cholera: Broad St. Pump, 1854



Smoking & tobacco



Nuclear Proliferation



HIV/AIDS



Alcohol



Obesity



Climate Change & Sustainable Development



We are a powerful voice

- We are (generally) trusted and respected
- Health puts a human face to an abstract concept
- Health concerns attract political & public attention

"The health & well-being of our families, communities and countries...
These concepts are far more tangible & visceral than tonnes of atmospheric CO2, & and are understood and prioritized across all populations irrespective of culture or development status." 1



We have an obligation

We must speak out for the health of those with less of a voice

- More vulnerable populations
- Future generations

Climate change also raises the issue of intergenerational justice. The inequality of climate change - with the rich causing most of the problem & the poor initially suffering most of the consequences - will be source of historical shame to our generation if nothing is done to address it."1



We are faced with an opportunity

Appropriate action will bring substantial benefits to human health

"In our hand is the substantial health dividend of more active, sustainable lower carbon lifestyles: lower rates of obesity, heart disease, diabetes & cancer."

The need for health professional education is well recognized



Called for "mainstreaming climate change & health topics into medical and public health training." 1

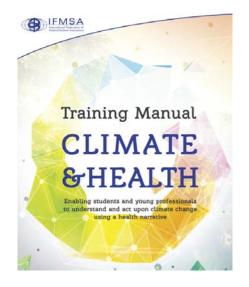


Encouraged "educational institutions and educators to integrate (education on climate change challenges and solutions) in their teaching activities from the pre-school to university levels." ²

- 1. WHO Second Global Conference on Health & Climate Change, 2016
- 2. UNESCO. Declaration of Ethical Principles in Relation to Climate Change, 2017



Code Green: Climate Health Short Course



Australian Medical Students Association

- E-course with 4 modules
 - Climate change
 - > Health effects
 - > Impact on vulnerable populations
 - Advocacy for change

International Federation of Medical Students Associations

 Training manual for students & young professionals full of information, resources, tools, ideas

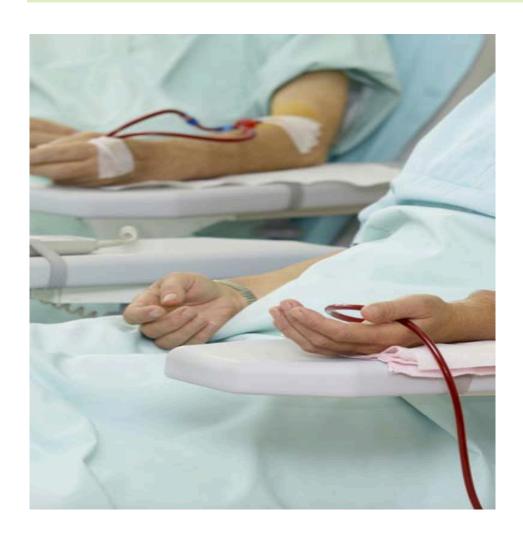


3 position statements

- Climate Change & Health
- Environmentally Sustainable Healthcare
- Health Benefits of Mitigating Climate Change



Position Statement on Environmental Sustainability in Anaesthesia and Pain Medicine Practice



The ANZ renal community

- Convened a working group in 2015
- Representing medical, nursing & consumer groups
- Work to date
 - Position statement
 - Educational segments in annual meetings
 - Research prizes







Medical education

Preparing medical graduates for the health effects of climate change: an Australasian collaboration

Building a medical workforce that understands the impact of climate change

when an urgent and scaled response to mitigate and adapt to climate change is required if society is to avoid the most harmful consequences. Medical degrees (primary medical programs) in Australia and New Zealand are responsible for preparing doctors for entry into clinical practice and to care for patients and their communities. In response to the health threats posed by climate change, Medical Deans of Australia and New Zealand (MDANZ) has formed a working group, representing medical schools and medical student associations across both countries, to work collaboratively to develop curricula and resources to address this within primary medical programs. This article summarises this initiative.

Climate change already affects the health of millions of people around the world. This is described in the Larcet Change Conference (COP-23) held in November 2017. An Australian policy brief, prepared jointly by The medical school. Laucet, the Royal Australasian College of Physicians and the Australian Medical Students' Association

■ he Lancet has described action to address climate 2015, called for "mainstreaming climate change change as the greatest public health opportunity and health topics into medical and public health before us.1 However, to grasp this opportunity, training". On 13 November 2017, UNESCO adopted health professionals, including doctors, must the Declaration of Ethical Principles in Relation to understand the impact of climate change on health. Climate Change.6 Article 11 of the Declaration and be competent to take action and advocate for encourages educators to prepare the professions to be change. Otherwise it will be a missed opportunity informed about climate change and to be able to play their part to engage with the current challenges and build a more environmentally sustainable future.

While educational interventions focusing on environmental sustainability in health systems are being developed, this work is not yet widespread. For example, in the United Kingdom, the General Medical Council consulted widely in the development of sustainability learning objectives," which have been identified in a recent best-evidence medical education guide⁸ as providing an appropriate framework for health professions' education. An international collaboration developed learning outcomes and activities for an environmentally accountable curriculum, and a recent Delphi study has also developed learning outcomes 9,10 Despite this, there are few examples in the literature where climate change Countdown report on health and climate change,2 and health has been integrated into medical curricula. an international collaboration coordinated by The At workshops convened by the authors in 2017 at Lancet to track progress on 40 health and climate the Australian and New Zealand Association for Health change indicators. The report was published online Professional Educators Conference and the Global immediately before the United Nations Climate Climate and Health Summit in Bonn, no perticipant identified a substantial curriculum response by their

> In light of this vacuum, student organisations have taken the initiative to advocate for climate change to

on health and health services and will create change

Graeme L Horton

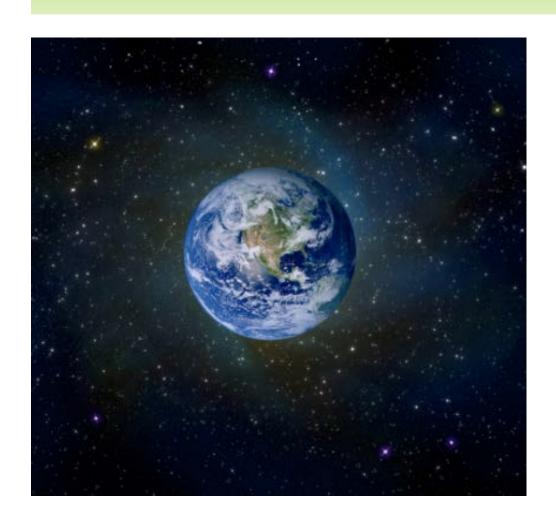
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doi:10.5694/mja17.01172

Medical Deans of Australia & NZ

- Membership = Deans of 18 Australian & 2 NZ medical schools
- Recognised the need for medical school collaboration
- In 2016, formed a Climate Change & Health Working Group

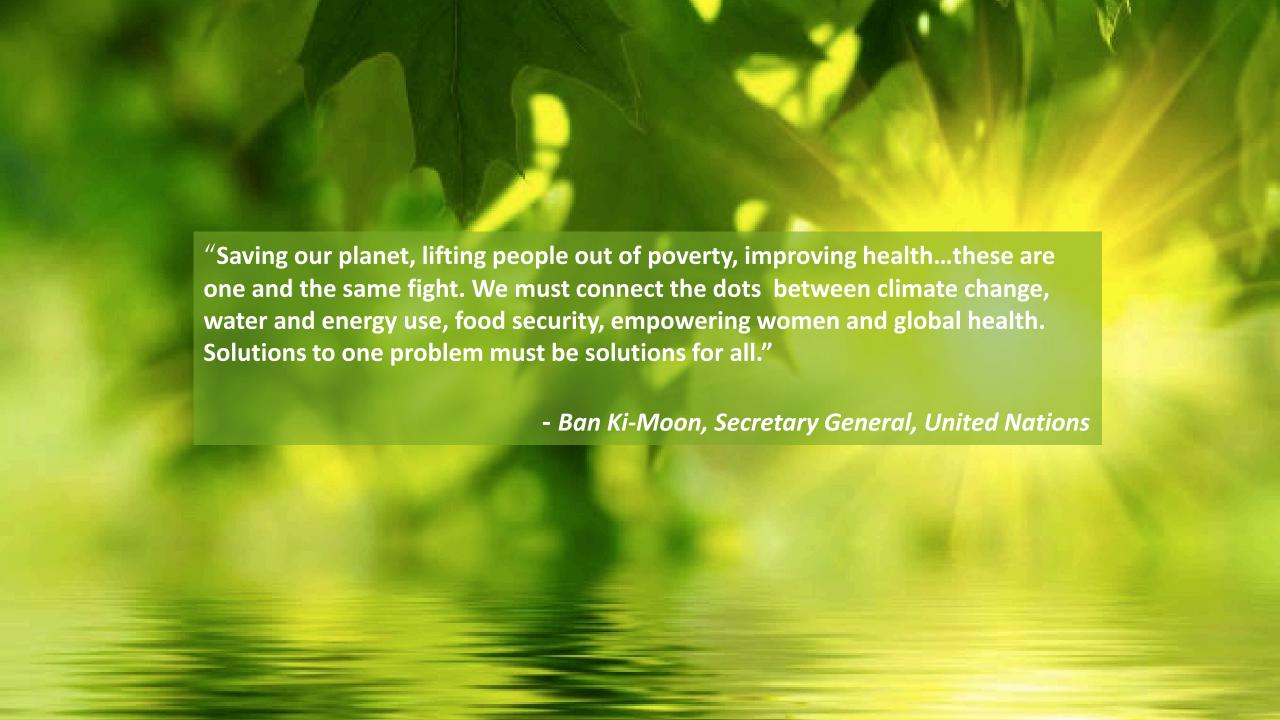


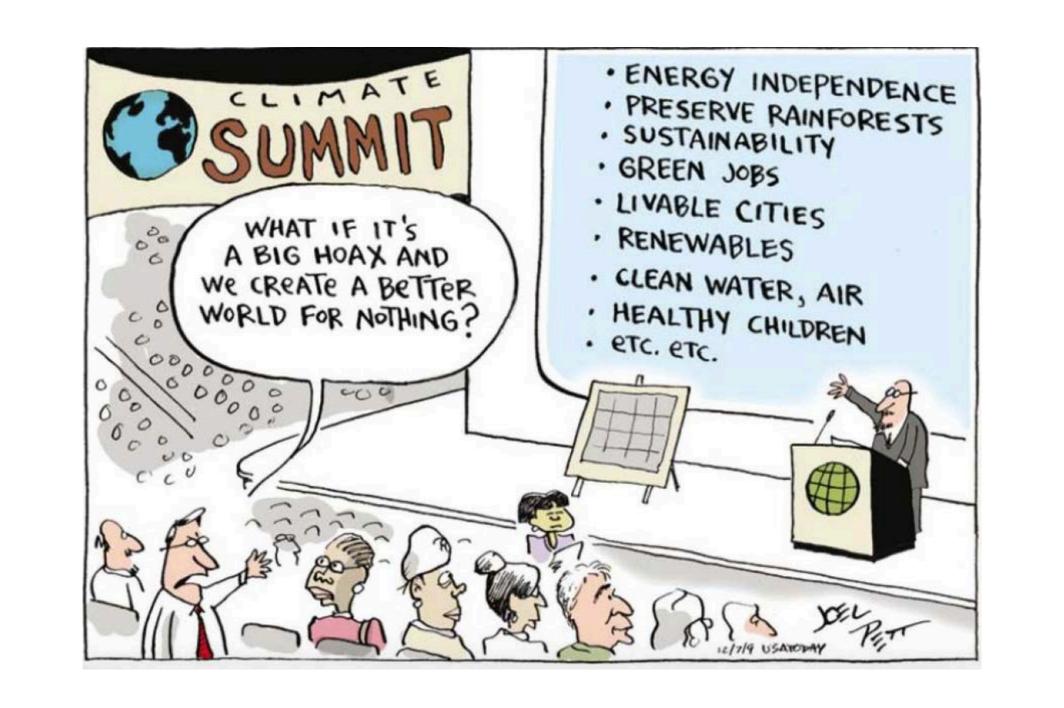
....Many good things

- But, we have come to this late
- Our response must be expanded and accelerated
- There is **just one planet** capable of supporting us
- We all have a **responsibility** & an **opportunity**
- Health professionals have critical role to play

Conclusions

- Human health relies on a **healthy planet**
- Anthropogenic environmental change threatens human health in unprecedented ways
- Healthcare itself contributes to the problem
- We need to educate healthcare workers so they
 - Are prepared
 - Can address the impact of their own practice
 - Can advocate for change





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www.dea.org.au

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