

check

Independent learning program for GPs

Unit 596
August 2022

Planetary health



Disclaimer

The information set out in this publication is current at the date of first publication and is intended for use as a guide of a general nature only and may or may not be relevant to particular patients or circumstances. Nor is this publication exhaustive of the subject matter. Persons implementing any recommendations contained in this publication must exercise their own independent skill or judgement or seek appropriate professional advice relevant to their own particular circumstances when so doing. Compliance with any recommendations cannot of itself guarantee discharge of the duty of care owed to patients and others coming into contact with the health professional and the premises from which the health professional operates.

Whilst the text is directed to health professionals possessing appropriate qualifications and skills in ascertaining and discharging their professional (including legal) duties, it is not to be regarded as clinical advice and, in particular, is no substitute for a full examination and consideration of medical history in reaching a diagnosis and treatment based on accepted clinical practices.

Accordingly, The Royal Australian College of General Practitioners Ltd (RACGP) and its employees and agents shall have no liability (including without limitation liability by reason of negligence) to any users of the information contained in this publication for any loss or damage (consequential or otherwise), cost or expense incurred or arising by reason of any person using or relying on the information contained in this publication and whether caused by reason of any error, negligent act, omission or misrepresentation in the information.

Subscriptions

For subscriptions and enquiries please call 1800 331 626 or email check@racgp.org.au

Published by

The Royal Australian College of General Practitioners Ltd
100 Wellington Parade
East Melbourne, Victoria 3002, Australia

Telephone 03 8699 0414
Facsimile 03 8699 0400
www.racgp.org.au

ABN 34 000 223 807
ISSN 0812-9630

© The Royal Australian College of General Practitioners 2022

This resource is provided under licence by the RACGP. Full terms are available at www.racgp.org.au/usage/licence. In summary, you must not edit or adapt it or use it for any commercial purposes. You must acknowledge the RACGP as the owner.

We acknowledge the Traditional Custodians of the lands and seas on which we work and live, and pay our respects to Elders, past, present and future.








Planetary health

Unit 596 August 2022

About this activity	3
Case 1 Itsuki is breathless	5
Case 2 Kirra has a febrile illness after the floods	10
Case 3 Kate is concerned following a heatwave	16
Case 4 Ella has decided not to have children	23
Case 5 Al has abnormal pathology results	29
Multiple choice questions	36

The five domains of general practice

-  Communication skills and the patient–doctor relationship
-  Applied professional knowledge and skills
-  Population health and the context of general practice
-  Professional and ethical role
-  Organisational and legal dimensions

illumina

NIPS Webinar Series

Integrating Non- Invasive Prenatal Screening (NIPS) into GP Practice



Non-invasive prenatal screening (NIPS) is the most accurate screening option for fetal aneuploidies. NIPS analyses the cell-free DNA in a pregnant woman's blood to screen for potential chromosomal anomalies during pregnancy. General Practitioners (GPs) are often the first touchpoint for newly pregnant patients. In order to maximize a patient's options for prenatal screening for chromosomal anomalies, GPs should be able to introduce and offer NIPS to their patients and arrange appropriate follow up of results.

Presented by local healthcare professionals, this webinar series will provide insights and expertise on successfully implementing NIPS into clinical practice. Presentations will include the current state of prenatal screening options in Australia including reproductive carrier screening, NIPS beyond the common trisomies, address patient counselling considerations, and present interesting case studies.

For more information or to register visit <https://www.racgp.org.au/online-events/search-events?series=integratingGenomicsintoGPpractice>

SESSION 1

13 September 2022, 7:00PM – 8:00 PM (AEST)

NIPS beyond the common trisomies

Ron Fleischer, Senior Genetic Counsellor



SESSION 2

27 September 2022, 7:00PM – 8:00 PM (AEST)

Experiences with Rare Autosomal Aneuploidies (RAA) NIPS results

Rebecca Dickson, Senior Genetic Counsellor, Genea and Royal Hospital for Women Sydney

SESSION 3

11 October 2022, 7:00PM – 8:00 PM (AEDT)

Reproductive carrier screening: What you should know?

Professor Edwin Kirk, Clinical Geneticist, Sydney Children's Hospital
Genetic Pathologist, New South Wales Health Pathology's Randwick Genomics Laboratory
Conjoint Professor, School of Women's and Children's Health, UNSW

About this activity

Planetary health is 'the health of human civilisation and the state of the natural systems on which it depends'.¹ The Royal Australian College of General Practitioners has recognised climate change as a key public health issue and acknowledges it as 'an urgent, significant and growing threat to health worldwide'.²

The most direct health consequence of climate change is heat-related illness, with extreme heat having the potential to cause a wide range of effects from heat stress to death.³ The increasing temperatures also lead to an increase in bushfires,⁴ which are associated with several respiratory and cardiovascular conditions, especially asthma.⁵

Changes in rainfall patterns, increased temperatures and tidal levels all contribute to increased vector breeding season and vector-borne disease transmission.⁶ Damage to housing and stagnated and polluted water sources also amplify mosquito-borne and gastrointestinal diseases.⁶

There are a number of ways in which climate change can affect mental health, including 'climate anxiety' and other psychological consequences. Direct effects of heat include an increase in interpersonal violence,⁷ self-harm and suicide.⁶

Lifestyle medicine provides a number of 'co-benefits' for certain conditions, with the potential to reverse disease while also benefitting the community and the environment.

This edition of *check* considers the relationship between human health and planetary systems.

References

- Horton R, Lo S. Planetary health: A new science for exceptional action. *Lancet* 2015;386(10007):1921–22. doi: 10.1016/S0140-6736(15)61038-8.
- The Royal Australian College of General Practitioners. The impact of climate change on human health. East Melbourne, Vic: RACGP, 2019. Available at www.racgp.org.au/advocacy/position-statements/view-all-position-statements/clinical-and-practice-management/the-impact-of-climate-change-on-human-health [Accessed 5 July 2022].

- Pendrey CGA, Beaton L, Kneebone JA. General practice in the era of planetary health: Responding to the climate health emergency. *Aust J Gen Pract* 2020;49(8):520–23. doi: 10.31128/AJGP-01-20-5207.
- Lawrence J, Mackey B, Chiew F, et al. Chapter 11: Australasia. In: *Climate Change 2022: Impacts, adaptation, and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Port Melbourne, Vic: Cambridge University Press, 2022. Available at www.ipcc.ch/report/ar6/wg2 [Accessed 6 May 2022].
- Walter CM, Schneider-Futschik EK, Knibbs LD, Irving LB. Health impacts of bushfire smoke exposure in Australia. *Respirology* 2020;25(5):495–501. doi: 10.1111/resp.13798.
- Beggs PJ, Zhang Y, Bambrick H, et al. The 2019 report of the MJA-Lancet Countdown on health and climate change: A turbulent year with mixed progress. *Med J Aust* 2019;211(11):490–491.e21. doi: 10.5694/mja.2.50405.
- Sanz-Barbero B, Linares C, Vives-Cases C, González JL, López-Ossorio JJ, Díaz J. Heatwave and the risk of intimate partner violence. *Sci Total Environ* 2018;644:413–19. doi: 10.1016/j.scitotenv.2018.06.368.

Learning outcomes

At the end of this activity, participants will be able to:

- outline the ways in which asthma care can be optimised while simultaneously reducing the environmental impact of treatment
- discuss the effects of climate change on infectious disease distribution
- outline the management of heat-related illness
- describe the potential impacts of climate change on mental health
- explain the ways in which lifestyle medicine can benefit both patients and the environment.

Authors

Case 1

John Blakey BMedSci (Hons), BM BS, FAPSR, FRACP, FRCP, PhD is a Respiratory Physician at Sir Charles Gairdner Hospital and has adjunct appointments at Curtin University and the University of Western Australia. He has a special interest in asthma and

acts as a medical advisor for Asthma Australia and Asthma WA.

Brett Montgomery (Lead author) MBBS, DCH, FRACGP, MMedSci is a General Practitioner who works clinically in East Fremantle and academically as a Senior Lecturer at the University of Western Australia. His special interests include asthma. He is a member of the guidelines committee of the Australian Asthma Handbook.

Case 2

Scott Abbinga MBBS (Hons), MTPH is an Infectious Disease Registrar at Monash Health and Physician Leader at Healthy Futures.

Jesse Noon (Lead author) MBBS, MPHTM is a General Practice Registrar in Lismore, NSW, and member of RACGP Specific Interests Climate and Environmental Medicine and Doctors for the Environment Australia.

Indigenous cultural guidance was provided by Stuart Cohen, Practice Manager & Wellbeing Services Manager of Rekindling The Spirit Health Service, 'Jullums', Lismore, NSW.

Case 3

William Chow APD is a Dietitian and Professional Chef at Great Ocean Road Health. He has special interests in the provision of food service in healthcare, texture modification and eating disorders.

Campbell Craig MaExPhy, ESSA is an Exercise Physiologist with Great Ocean Road Health. He has special interests in endurance sports and cardiac disease.

Ali Patterson BNutrDiet (Hons) is an Accredited Practising Dietitian and Accredited Sports Dietitian passionate about ensuring the way we eat as a community supports individual health and the health of our planet.

Denise Ruth (Lead author) MBBS, MPH, FRACGP (Life member), FAFPHM (RACP), TAA Cert IV is a General Practitioner (GP), Medical Educator and Clinical and Health Service Researcher. Her current activities include skin cancer prevention and early detection, remote GP supervision and external clinical

teaching visits, planetary health, and GP prevention and management of health impacts of climate change. She is a member of RACGP Specific Interests Climate and Environment Medicine and Doctors for the Environment Australia.

Jacinta M Tobin MBBS, FRACP, PhD, GradCertUniTeach has been a Consultant Paediatrician Researcher and Senior Lecturer for more than 30 years across Australia and UK specialising in paediatric gastroenterology and nutrition with a particular focus on infant nutrition and development, probiotics, functional and inflammatory disorders, and health education. Dr Tobin is currently Associate Professor at James Cook University, Mackay.

Case 4

Anna Seth MBBS, FRACGP, DRANZCOG, DCH is a General Practitioner in private practice in Tasmania. She is a Clinical Lecturer in general practice at University of Tasmania and co-chair of Doctors for the Environment Specific Interest Group for Mental Health. She is a Climate Aware Practitioner registered with Psychology for Safe Climate and Chair of Climate Resilience Network in Tasmania.

Kate Wylie (Lead author) MBBS, BHSci, FRACGP, DCH is a General Practitioner who works in private practice in Adelaide. Dr Wylie chairs RACGP Specific Interests Climate and Environment Medicine and is a board member of Doctors for the Environment Australia.

Case 5

Kristen Hoy (Lead author) BMed (Hon), MSpMed, FRACGP, FALSM is a General Practitioner working in Coffs Harbour and a Lecturer at the University of New South Wales. Her clinical interests are primary prevention and the use of lifestyle medicine at all stages of life. She is passionate that looking after our current and future patients requires looking after the planet and society.

Sam Manger MBBS (MD), BSc, FRACGP, FASLM is a Medical Educator and General Practitioner (GP)

with a focus on lifestyle medicine and mental health, President of Australasian Society of Lifestyle Medicine, Academic Lead in Lifestyle Medicine at James Cook University, Ambassador of Equally Well Australia, The GP Show podcast host and RACGP Queensland GP of the year 2021.

Nicole Sleeman MBBS, DCH, FRACGP, Board Certified Lifestyle Medicine Physician is a General Practitioner in Gimuy country, Far North Queensland. Nicole is passionate about planetary health and raising awareness of the intimate connection between human and planetary ecosystems, lifestyle medicine and the role of health professionals in advocacy and leadership beyond the consulting room. She is an active member of RACGP Specific Interests Climate and Environment Medicine and Doctors for the Environment Australia, is board certified in Lifestyle Medicine and became a board member of the Australasian Society of Lifestyle Medicine in 2021.

This Planetary health check issue was coordinated by Dr Julian Cassar, a General Practitioner working in a community health clinic in Melbourne with an interest in planetary health medical education. He is a member of RACGP Specific Interests Climate and Environment Medicine and Doctors for the Environment Australia.

Peer reviewers

Ben Ewald BMed, PhD is a General Practitioner in Newcastle, is an active member of Doctors for the Environment Australia, and taught epidemiology at the University of Newcastle for many years.

Jessica Kneebone MBBS (Hons), MPH, DRANZCOG, FRACGP is a General Practitioner who works in an Aboriginal health service and headspace clinic in Hobart. She is former Chair RACGP Specific Interests Climate and Environment Medicine.

Abbreviations

CO₂ carbon dioxide
CRP C-reactive protein
CSF cerebrospinal fluid
EAH exercise-associated hyponatremia

FEV1 forced expiratory volume in one second
GP general practitioner
HbA1c glycated haemoglobin
HDL high-density lipoprotein
HEPA high-efficiency particulate absorbing
ICS inhaled corticosteroid
Ig immunoglobulin
IPCC Intergovernmental Panel on Climate Change
IUD intrauterine device
MNT medical nutrition therapies
PCR polymerase chain reaction
pMDI pressurised metered-dose inhalers
SABA short-acting β -agonists
TC total cholesterol

CASE

1

Itsuki is breathless

Itsuki, aged 34 years, is new to you but known to others at the practice from occasional visits for asthma. He has come to see you on a day when the air is thick with smoke haze from bushfires. The practice receptionists identified via screening questions that Itsuki is slightly breathless and has a cough, so they asked him to stay outside the practice for now. Observing Itsuki through a window, you notice him slide his mask aside for a moment to inhale a dose of salbutamol.

Question 1

What further information would you like to know?

Further information

Itsuki tells you he had a negative result for a SARS-CoV-2 rapid antigen test this morning. You have access to appropriate personal protective equipment and a sheltered outdoor zone adjacent to your practice where you can assess Itsuki outside but with reasonable privacy. You note that Itsuki is able to walk around the outside of your practice and speak to you in whole sentences.

Itsuki thinks the bushfire smoke has flared up his asthma. His symptoms, which include wheeze and tightness, are recognisable to him as his typical asthma symptoms. He has had symptoms before on bushfire days, but they have never been as bad as this. He does not have any upper respiratory symptoms to suggest a viral precipitant. He is a lifelong non-smoker.

Itsuki's symptoms increased yesterday as the smoke worsened. Since yesterday afternoon he has needed two puffs of salbutamol every couple of hours, including overnight. This is unusual for him, although he admits to usually requiring his reliever approximately three days per week. Last winter he gave up cycling because exercising in the cold air brought on his asthma.

His file shows that Itsuki had spirometry a few years ago, which showed the typical asthma features of obstruction and reversibility. His file also mentions a fluticasone inhaler, which was prescribed a few months ago. Itsuki recalls this being prescribed for use daily, but he admits he has used it inconsistently. He particularly disliked having to use a spacer device with the inhaler. He is more convinced of the effectiveness of his reliever than his preventer.

Itsuki's technique when using his reliever inhaler is largely appropriate: he shakes it first and can coordinate its actuation with his inhalation. However, he does not use a spacer.

Question 2

What would you look for on examination? What special tests would you consider?

Further information

After his self-administered salbutamol, Itsuki looks quite comfortable, speaking in full sentences and with normal observations including a temperature of 37.1°C, a respiratory rate of 18 breaths/min and oxygen saturation in air of 96%. He has widespread expiratory wheeze but good air entry and no other respiratory sounds.

Despite not having access to spirometry, you feel comfortable that Itsuki's condition is indeed asthma.

Question 3

How would you manage Itsuki's acute presentation?

Question 4 🌿

What are your thoughts on Itsuki’s usual asthma control and management?

Further information

Itsuki is fully vaccinated against COVID-19 and influenza. You educate Itsuki about the importance of inhaled corticosteroids (ICSs) and their slow onset but powerful protective benefits. You begin to outline dry powder inhaler options that would free him from the need to use a spacer.

Itsuki mentions in passing his concern that bushfires will only become more common with worsening climate change. He worries a lot about climate change, feeling somewhat powerless in the face of so much recent bad news.

Question 5 🌿

How do bushfires, climate change and environmental factors influence asthma prevalence?

Question 6 🌿

How are respiratory inhalers relevant to climate change and the environment?

Further information

You discuss these issues with Itsuki. He seems reassured to see his general practitioner taking his concerns seriously. He is open to changing his inhalers.

Question 7 🌿🌍

What plan can you offer for Itsuki’s asthma that respects his environmental values and treatment preferences?

CASE 1 **Answers**

Answer 1

It is important to first consider whether Itsuki may have COVID-19, and how this may affect your ability to help today. For example, does Itsuki have infective symptoms such as fever, aches and upper respiratory symptoms? Has he been recently tested for SARS-CoV-2? Do you have access to personal protective equipment?

If you feel you can safely proceed, the first step is to ask Itsuki what he thinks is happening. You are aware he has a history of being treated for asthma. Are his current symptoms typical for an asthma exacerbation? He also reports a cough and breathlessness; these symptoms are consistent with but not specific to asthma. Wheeze and chest tightness, if present, would be more specific to asthma.

If you assume that Itsuki’s presentation is asthma, it is important to determine when his current exacerbation began and how severe is it. Consider the control of his asthma in recent weeks and now: frequency of symptoms and/or reliever use, symptoms at night and on waking, and interference of symptoms with his usual activities. Standard patient-reported outcome measures such as the Asthma Control Test (<https://asthma.org.au/about-asthma/understanding-asthma/asthma-control-test>) can be helpful in tracking progress.

Research on people who are being treated for asthma finds that approximately half are treated without initial spirometry to confirm the condition, and approximately one-third do not have objective evidence of the diagnosis (eg bronchial

hyperreactivity) when tested.¹ It is essential to be sure that Itsuki's 'asthma' is not another condition. It is recommended to check if the diagnosis has ever been proven with lung function testing. Spirometry in asthma classically shows obstruction (decreased forced expiratory volume in one second [FEV1]/forced vital capacity) and reversibility (increase in FEV1 after bronchodilation).²

This is also an opportunity to consider Itsuki's usual asthma control and future risk (or to plan a follow-up appointment to do so). Questions to ask regarding Itsuki's asthma may include:

- Is he prescribed a preventer?
- Does he use it as prescribed?
- Is his inhaler technique correct?
- Does he have an existing asthma management plan?
- Does he smoke?
- Does his salbutamol make much difference when he uses it?

Answer 2

On formal examination, it is recommended to check Itsuki's vital signs, including respiratory rate and oxygen saturation. An inability to complete full sentences or a respiratory rate >25 breaths/min would be worrying features demanding rapid intervention.

It is advisable to observe his work of breathing and auscultate his chest. Widespread wheeze would be consistent with Itsuki's suspicion of asthma (though the absence of wheeze does not rule it out). The presence of a fever could suggest infection rather than smoke-induced asthma, while crackles/inspiratory noises would suggest other pathologies.

Before the COVID-19 pandemic, you may have considered spirometry, but this investigation (similar to nebulisers) is aerosol generating and not presently recommended (as at August 2022) for people with escalating respiratory symptoms.³

Answer 3

While Itsuki is clearly having a significant exacerbation of asthma, it is mild enough for him to be managed as an outpatient. Recommendations include:

- oral prednisolone at 37.5–50 mg for 5–10 days
- a high dose of ICS
- inhaled short-acting β -agonists (SABAs) as needed
- education on inhaler technique (especially, for Itsuki, the importance of spacer use)
- an interim asthma management plan including a safety net
- arranging an appointment to review his asthma soon.⁴

Itsuki could also consider measures to minimise his smoke exposure (now and in the future). These could include indoor air high-efficiency particulate absorbing (HEPA) filtration, use of particulate filter masks (P2 or N95), improving his home's

window and door sealing, and remaining indoors on days of low air quality.⁵

Steroids are safe to use, and as important as ever, in the context of the local COVID-19 outbreak.³

Answer 4

Even before the bushfire-associated exacerbation, Itsuki's asthma control was suboptimal: he was symptomatic and required a bronchodilator on three days per week and was restricting his activities because of his asthma. Intermittent use of his ICS is a likely contributing factor.

Major guidelines state that all, or nearly all, adults and adolescents with asthma should take an ICS.^{6,7} This is true for Itsuki. He will need education on why this is important and encouragement to be patient. It may take weeks before its effect is fully apparent, but it will significantly reduce his risk of poor asthma control and serious outcomes such as asthma attacks, hospital admissions, loss of lung function and death from asthma.

Past poor ICS adherence may predict future poor concordance with management plans unless individuals are well supported. Consideration could be given to a single combination inhaler strategy, in which Itsuki will receive both a steroid and a fast-onset long-acting β -agonist with each puff. For patients who rely on symptoms rather than memory to prompt their medicine use, this ensures at least some ICS dosing. For other individuals, once-daily preventer regimens or electronic reminders are potentially helpful.

Itsuki's dislike of spacers is a reason to consider changing to an inhaler that does not require spacer use, such as a dry powder inhaler. This would require education and a revised asthma management plan.

It is important to determine if Itsuki is vaccinated. COVID-19 and influenza immunisations are especially relevant.

You may find the SIMPLES acronym⁸ helpful to ensure key aspects are covered in your review:

- **S**moking
- **I**nhaler technique
- **M**onitoring
- **P**harmacotherapy
- **L**ifestyle
- **E**ducation
- **S**upport.

This approach is a helpful aide-memoire but does not encompass all important aspects. One such aspect is worsened symptoms at work: occupationally aggravated asthma is common.

Answer 5

There are complex links between bushfires, climate change and respiratory diseases including asthma. Itsuki is correct;

bushfires are becoming more common in Australia as global temperatures increase.⁹ Bushfires in Australia are associated with several respiratory and cardiovascular conditions, especially asthma.¹⁰

Aside from bushfires, climate change is expected to increase the burden of asthma as a result of changes in the duration and intensity of pollen seasons.¹¹ In addition, combustion of fuels in vehicles, homes, power stations and wood fires produces not just carbon dioxide (CO₂; a key driver of climate change) but also other air pollutants, such as small particulates and nitrogen dioxide. These pollutants have substantial adverse respiratory and cardiovascular effects, including increasing the prevalence and severity of asthma.¹¹

Reducing fossil fuel and wood combustion would offer important 'co-benefits' – not only mitigating climate change but also creating immediate health improvements.

Answer 6

Australia's healthcare system is responsible for approximately 7% of the country's national carbon footprint; medications account for a substantial proportion of this.¹² All pharmaceuticals have some climate change impact, but pressurised metered-dose inhalers (pMDIs; such as Itsuki's) have a disproportionate impact because of their propellant gases (norflurane in most pMDIs, and apafurane in others). Per gram, these hydrofluorocarbon gases warm the planet over 1000-fold more than CO₂.¹³ Choosing dry powder inhalers in preference to pMDIs can save hundreds of kilograms of CO₂-equivalent pollution per year for the average patient.¹⁴ For example, the annual climate impact of propellant emissions for a patient using 12 preventer pMDIs and two reliever pMDIs per year is equivalent to the tailpipe emissions from driving an average car for over 1000 kilometres.¹⁵

Other ways to reduce the environmental impact of respiratory prescribing include:

- being sure inhalers are only prescribed when they are indicated (this is the case for Itsuki)
- achieving good asthma control with preventer medicines – reducing pollution from overuse of SABAs is another 'co-benefit', good for both patients and the environment
- choosing prescribing regimens that use:
 - fewer total doses (eg a once-daily 400 µg dose of budesonide is as effective as a 200 µg dose twice daily, while potentially halving plastic waste)¹⁶
 - devices with more actuations per device
 - devices for which parts of the inhaler are reused, to reduce production, shipping and landfill impact. This applies, for example, to Respimat devices.

Answer 7

Changing from pMDIs to dry powder inhalers will help mitigate climate change while also freeing Itsuki from the hassle of spacer use. While small children and people with limited inspiratory capacity are better served by pMDIs with

spacers, most adults (Itsuki included) should be able to achieve equivalent asthma control with dry powder inhalers.¹⁷

Itsuki was already prescribed an ICS preventer in addition to a SABA reliever. According to current Australian asthma guidelines, he was at 'step 2' treatment. With poor asthma control at step 2, it is advisable to now change his medicines to 'step 3'.⁶ There are two appropriate prescribing options for him now:

1. an ICS–long-acting β-agonist combination inhaler (with low ICS dose) to be used regularly, with as-needed SABA. Appropriate maintenance-only combination inhalers at step 3 available in dry powder inhaler form include budesonide–formoterol, fluticasone–salmeterol and mometasone–indacaterol.
2. an ICS–formoterol combination inhaler (with low ICS dose) to be used as 'maintenance-and-reliever therapy'. Formoterol is the only long-acting β-agonist appropriate for 'maintenance-and-reliever therapy'; the dry powder inhaler options appropriate at step 3 all contain budesonide–formoterol.

Either strategy is likely to have similar benefits in preventing future exacerbations for Itsuki.¹⁸ For a patient with intermittent preventer use, such as Itsuki, it may be reassuring that should his adherence falter again, he will receive at least some intermittent inhaled steroid when he reaches for symptom relief. Indeed, for patients with mild asthma, new evidence indicates that using budesonide–formoterol combination therapy simply as needed can be an effective choice.¹⁹ However, in Itsuki's case, regular therapy is preferable if he can and will take it.

Conclusion

Together, you and Itsuki consider his options. He favours the second option, as he likes the simplicity of using a single inhaler and the knowledge that he will be getting some extra protection from an ICS when he takes a reliever dose. Budesonide–formoterol is available in a dry powder inhaler, significantly reducing greenhouse pollution when compared with his old inhalers. You make sure Itsuki knows how to use his new device, you use an online template to revise his asthma management plan to support his new 'maintenance-and-reliever therapy' strategy, and you schedule further follow-up.

Six weeks later, Itsuki is feeling much better. For now, he is remembering to take most of his maintenance doses, and he uses an extra reliever dose less than once a week, reflecting a significant decrease in his asthma symptoms. He says he finds the new inhaler easier to use than his old ones.

He thanks you for discussing his concerns about the environment. He explains that he had already been making some lifestyle changes to shrink his carbon footprint, such as eating less meat and holidaying locally. With his improved asthma control, he has started commuting on his bicycle again. Changing his inhaler has not just improved his asthma control but also given him a sense of empowerment, as he has found a new way to tread more lightly on the Earth.

Resources

- Australian Asthma Handbook (national guidelines), www.asthmahandbook.org.au
- National Asthma Council – Selecting & adjusting asthma medication for adults & adolescents (chart), www.nationalasthma.org.au/living-with-asthma/resources/health-professionals/charts/selecting-and-adjusting-asthma-medications
- National Asthma Council – How-to videos (correct use of inhaler devices), www.nationalasthma.org.au/living-with-asthma/how-to-videos
- National Asthma Council – Asthma action plan library, www.nationalasthma.org.au/health-professionals/asthma-action-plans/asthma-action-plan-library
- Green inhaler (a website about the environmental impacts of respiratory inhalers), <https://greeninhaler.org>

References

1. Aaron SD, Vandemheen KL, FitzGerald JM, et al. Reevaluation of diagnosis in adults with physician-diagnosed asthma. *JAMA* 2017;317(3):269–79. doi: 10.1001/jama.2016.19627.
2. National Asthma Council Australia. Australian Asthma Handbook: Assessing lung function to investigate asthma-like symptoms in adults. South Melbourne, Vic: National Asthma Council Australia, 2022. Available at www.asthmahandbook.org.au/diagnosis/adults/initial-investigations/lung-function [Accessed 4 July 2022].
3. National Asthma Council Australia. Australian asthma handbook: Managing asthma during the COVID-19 (SARS-CoV-2) pandemic. South Melbourne, Vic: National Asthma Council Australia, 2021. Available at www.asthmahandbook.org.au/clinical-issues/covid-19 [Accessed 18 April 2022].
4. National Asthma Council Australia. Australian asthma handbook: Managing acute asthma in clinical settings. South Melbourne, Vic: National Asthma Council Australia, 2021. Available from: www.asthmahandbook.org.au/acute-asthma/clinical [Accessed 18 April 2022].
5. Asthma Australia. A look at air purifiers for asthma. Chatswood, NSW: Asthma Australia, 2021. Available at <https://asthma.org.au/blog/air-purifiers-and-asthma> [Accessed 9 June 2022].
6. National Asthma Council Australia. Australian asthma handbook: Managing asthma in adults. South Melbourne, Vic: National Asthma Council Australia, 2021. Available at www.asthmahandbook.org.au/management/adults [Accessed 18 April 2022].
7. Global Initiative for Asthma. Global strategy for asthma management and prevention. Fontana, WI: GINA, 2022. Available at www.ginasthma.org [Accessed 9 June 2022].
8. Ryan D, Murphy A, Ställberg B, Baxter N, Heaney LG. 'SIMPLES': A structured primary care approach to adults with difficult asthma. *Prim Care Respir J* 2013;22(3):365–73. doi: 10.4104/pcrj.2013.00075.
9. Lawrence J, Mackey B, Chiew F, et al. Chapter 11: Australasia. In: *Climate Change 2022: Impacts, adaptation, and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Port Melbourne, Vic: Cambridge University Press, 2022. Available at www.ipcc.ch/report/ar6/wg2 [Accessed 6 May 2022].
10. Walter CM, Schneider-Futschik EK, Knibbs LD, Irving LB. Health impacts of bushfire smoke exposure in Australia. *Respirology* 2020;25(5):495–501. doi: 10.1111/resp.13798.
11. D'Amato G, Vitale C, Lanza M, Molino A, D'Amato M. Climate change, air pollution, and allergic respiratory diseases: An update. *Curr Opin Allergy Clin Immunol* 2016;16(5):434–40. doi: 10.1097/ACI.0000000000000301.
12. Malik A, Lenzen M, McAlister S, McGain F. The carbon footprint of Australian health care. *Lancet Planet Health* 2018;2(1):e27–35. doi: 10.1016/S2542-5196(17)30180-8.
13. Hillman T, Mortimer F, Hopkinson NS. Inhaled drugs and global warming: Time to shift to dry powder inhalers. *BMJ* 2013;346:f3359. doi: 10.1136/bmj.f3359.
14. Janson C, Henderson R, Löfdahl M, Hedberg M, Sharma R, Wilkinson AJK. Carbon footprint impact of the choice of inhalers for asthma and COPD. *Thorax* 2020;75(1):82–84. doi: 10.1136/thoraxjnl-2019-213744.
15. North & East Devon Formulary and Referral. The environmental impact of inhalers. Devon, UK: NHS New Devon CCG, 2022. Available at <https://northeast.devonformularyguidance.nhs.uk/formulary/chapters/3.-respiratory/the-environmental-impact-of-inhalers> [Accessed 9 June 2022].
16. Masoli M, Weatherall M, Holt S, Beasley R. Budesonide once versus twice-daily administration: Meta-analysis. *Respirology* 2004;9(4):528–34. doi: 10.1111/j.1440-1843.2004.00635.x.
17. Brocklebank D, Wright J, Cates C. Systematic review of clinical effectiveness of pressurised metered dose inhalers versus other hand held inhaler devices for delivering corticosteroids in asthma. *BMJ* 2001;323(7318):896–900. doi: 10.1136/bmj.323.7318.896.
18. Cates CJ, Karner C. Combination formoterol and budesonide as maintenance and reliever therapy versus current best practice (including inhaled steroid maintenance), for chronic asthma in adults and children. *Cochrane Database Syst Rev* 2013;(4):CD007313. doi: 10.1002/14651858.CD007313.pub3.
19. Crossingham I, Turner S, Ramakrishnan S, et al. Combination fixed-dose beta agonist and steroid inhaler as required for adults or children with mild asthma. *Cochrane Database Syst Rev* 2021;5(5):CD013518.

CASE

2 Kirra has a febrile illness after the floods

Kirra, aged 35 years, is an Aboriginal woman who presents to your rural clinic with a five-day history of headache and fever.

Kirra is a single mother of three children aged two, five and seven years. She has a history of anxiety and depression but is otherwise well. She is a non-smoker and does not drink alcohol.

Recent major flooding has affected Kirra's town in northern New South Wales, causing severe damage to low-lying houses and displacement. She and her children have been evacuated and are now staying with family members living nearby. Over the past few weeks, she has been helping to clean up the street and neighbouring houses. She noticed that there are big pools of stagnant water, and she was bitten by some mosquitoes, which have increased in number since the flooding.

She is fully vaccinated against COVID-19.

Kirra's examination results are:

- temperature 38.0°C (reference range 36.0–37.5°C)
- heart rate 85 beats per minute (reference range 50–100 beats per minute)
- blood pressure 125/80 mmHg (reference range 90–140/60–90 mmHg)
- respiratory rate 20 breaths per minute (reference range 12–20 breaths per minute)
- oxygen saturation 99% on room air (reference range 94–100%)
- Glasgow Coma Scale score: 15.

Kirra is fully alert, with no neurological deficits on full neurological examination, including a normal cranial nerve examination. There is no objective photophobia or neck stiffness. She has a normal cardiorespiratory examination. No rash is visible. There is no appreciable joint swelling, warmth or tenderness. She has multiple mosquito bites visible on bilateral arms and lower legs, which are mildly inflamed and non cellulitic.

Question 1

What additional history would you seek? What would you look for on examination?

Further information

Kirra tells you that the headache started gradually five days ago. It is generalised, constant and throbbing, and she rates it as seven out of 10 at worst. She reports feeling a little sensitive to bright sunlight, though she does not report any neck stiffness or confusion. She has had no vomiting, arthralgia or myalgia and no other associated respiratory or gastrointestinal symptoms. She took two paracetamol this morning and now rates her headache as three out of 10.

Kirra says that none of the children are sick. The mosquito bites occurred just over a week ago when she was helping clean out a neighbour's garage and garden around dusk. The bites were very itchy but are easing now. She does not think they are infected.

Question 2

What additional investigations would you order?

Further information

You undertake blood tests, which demonstrate the following:

- moderately elevated C-reactive protein (CRP) 85 mg/L (reference range <5 mg/L)
- moderate leucocytosis $18 \times 10^9/L$ (reference range $3.5-10.0 \times 10^9/L$)
- serology positive for Japanese encephalitis immunoglobulin (Ig) M antibody
- serology negative for all other tests.

You make a diagnosis of probable Japanese encephalitis.

Question 3 

How would you confirm your diagnosis?

Further information

Kirra asks what Japanese encephalitis is and how she caught it. She is worried that she may pass it on to her children.

Question 4 

What would you tell her?

Question 5 

What treatment options can you offer Kirra? What red flags would necessitate urgent review or presentation to hospital?

Question 6 

What broader prevention and public health actions can be taken against Japanese encephalitis?

Question 7 

Who is eligible for vaccination against Japanese encephalitis?

Question 8 

How does climate change affect infectious disease distribution in Australia?

Further information

Kirra tells you there is significant damage to her family's house, all their belongings and furniture, and she is not sure when they can move back home. She feels that the stress of living in a crowded house with two other families, their children and pets is getting to her.

Kirra has a history of anxiety and depression and takes 20 mg escitalopram daily. She had recently started a new job at a cafe in town, which she enjoyed and appreciated as it was helping to relieve financial stressors. However, now the cafe is closed because of flooding, and she is unsure how she will support her three children.

Kirra and her sisters are feeling sad about the destruction they have seen in their town. Uncle Barry has seen four big floods during his lifetime but says this is the worst. Kirra says she is finding it difficult to get to sleep; she is frequently waking and worrying about her children's futures if the floods continue.

Question 9 

What are your concerns for Kirra? What cultural considerations should you take into account?

Question 10 

How do extreme weather events and climate change more broadly affect mental health?

Question 11 

Who is most vulnerable to the impacts of extreme weather events in Australia?

Question 12 

What are some positive actions that Kirra could take to empower herself and her community in the face of climate change?

CASE 2 Answers

Answer 1

A thorough history should be taken, with care to elucidate the characteristics of headache and associated symptoms. This includes taking a thorough exposure history and systems screen for sources of infection, including environmental exposures such as tick bites (*Rickettsiae*) or exposure to animals such as rats (*leptospirosis*), cattle (*Q fever* and *brucellosis*), or pigs and piggeries (*Japanese encephalitis*). As a result of her mosquito bites, Kirra is at risk of arboviruses. It is important to ask if Kirra has any cuts or abrasions that have been exposed to flood water, which may be infected, and to enquire about Kirra's vaccination status, in particular COVID-19, and if she has close contacts with a similar illness. You note that malaria is not endemic to this region, and no previous dengue transmission has previously occurred this far south on the east coast of Australia.

It is recommended to ask about the duration of Kirra's illness and the presence of associated fevers, chills, rigors, arthralgia, myalgia or rash.

Screening for meningoencephalitis can be done by asking about photophobia, neck stiffness or confusion.

It is also important to screen for associated respiratory or gastrointestinal symptoms, which could be related to a systemic

viral illness such as influenza or infections such as Q fever or leptospirosis, which can cause pneumonia or liver pathology.

Answer 2

It would be recommended to request blood tests including a full blood examination, electrolytes, liver function tests and CRP looking for systemic inflammatory response, associated renal impairment and electrolyte or liver derangement.

It is recommended to undertake serology for the following arboviruses:

- Ross River virus
- Barmah Forest virus
- Murray Valley encephalitis
- dengue
- Japanese encephalitis.

Serology for leptospirosis and rickettsial infections should also be considered. It is important to note that most serology will take at least one week to become positive. If Kirra is presenting in the first few days of illness, acute and convalescent samples, 2–4 weeks later, may be required in order to capture seroconversion.¹

Answer 3

The Japanese encephalitis IgM antibody is produced 3–8 days from symptom onset and will persist for up to three months. As with many other IgM tests, there is considerable cross-reactivity between flavivirus serology, which may cause false-positive IgM results. Diagnosis can be confirmed with a second serology test at 2–4 weeks, showing new IgG positivity, or with polymerase chain reaction (PCR) testing. PCR testing of urine, blood and cerebrospinal fluid (CSF) is more specific and should be performed if encephalitis symptoms are present.^{1,2}

Answer 4

Japanese encephalitis is a mosquito-borne flavivirus endemic to parts of Asia, the Western Pacific and the Torres Strait region of Australia.³ It is the most common vaccine-preventable cause of viral encephalitis in Asia.¹ Recent expansion of geographical distribution of Japanese encephalitis in Australia is attributable in part to climatic changes, including increased rainfall and peak temperatures affecting vector distribution.⁴ Japanese encephalitis is a zoonotic virus transmitted from amplifying hosts, pigs and birds, to humans by infected mosquito bites of the *Culex* species.¹ Humans are an incidental host, and transmission does not occur from human to human, so Kirra cannot transmit it to her children.¹ People particularly at risk are those from rural areas living near amplifying hosts (eg those living near piggeries), those exposed to mosquitoes and individuals with high occupational exposure.^{2,5}

While for most people infection with Japanese encephalitis is asymptomatic or clinically mild, Japanese encephalitis can cause severe disease including acute encephalitis in a minority (<1% of cases).¹ Typical symptoms include fever, headache, vomiting, focal neurological symptoms, reduced level of consciousness and seizures.¹ Symptoms typically occur between five and 15 days after an infected mosquito bite.¹

Answer 5

Treatment for mild Japanese encephalitis is supportive with analgesia, antipyretics, good hydration and rest.¹ It is important to identify and refer any patients with severe symptoms or signs of acute encephalitis to the nearest hospital for higher-level care. Red flags for higher-level care include decreased level of consciousness, seizures, focal neurological signs, delirium or severe headache.¹ Hospital-based investigations include neuroimaging, typically magnetic resonance imaging, and lumbar puncture for CSF serology and PCR. Of those patients who develop encephalitis, there is a 20–30% fatality rate.² Up to 50% of survivors will have ongoing neurological, cognitive or psychiatric sequelae,¹ including motor paresis, spasticity, movement disorders, chronic seizures and developmental delay in children.³

Answer 6

Japanese encephalitis is a notifiable disease in both humans and animals in Australia.² Following reports of only five cases in the Torres Strait between 1995 and 1998, there were no further cases reported until an outbreak in 2022 across multiple southern states of Australia in both pig and human populations.² In March 2022, the Chief Medical Officer declared this as a communicable disease incident of national significance because of the unprecedented nature and the associated health implications.⁶ Previous mitigation was achieved by moving piggeries away from residential areas and improving drainage of water to reduce mosquito breeding and amplification.^{2,5} Currently, public health measures include targeted vaccination, surveillance of mosquito populations and host animals, vector-control measures and personal protective measures such as repellents, covered clothing, coils and vaporisers.⁵

Answer 7

Japanese encephalitis vaccination is a safe and effective vaccination and can be given from two months of age.² Live attenuated (Imojev) and inactivated (JEspect) formulations are available with 1–2 dose regimens (refer to Table 1) and with a cost of \$250 and \$120, respectively.⁶ They are not covered by the Pharmaceutical Benefits Scheme. Localised injection site reactions and minor systemic reactions are common following these vaccinations.² The vaccine confers long-term protection; however, a booster may be needed beyond five years if there is a risk of ongoing exposure.²

Japanese encephalitis vaccination is recommended for:^{2,5}

- people working at or residing near piggeries or pig abattoirs, including farmworkers and family members, transport workers and veterinarians
- laboratory workers and environmental health officers at risk of contact through surveillance monitoring, field or laboratory work, either directly or indirectly
- travellers spending ≥ 1 month in endemic areas during peak seasons of transmission
- people who live or work in particular regions of the Torres Strait (subject to constant update and revision under current circumstances).

Answer 8

Climate change alters the distribution of vector-borne infectious diseases, especially mosquito-borne illnesses such as dengue, malaria, Ross River virus, Murray Valley encephalitis, chikungunya, Japanese encephalitis, kunjin and Barmah Forest virus.^{7,8} Altered rainfall patterns, increased temperatures and tidal levels are all factors contributing to increased vector breeding season and disease transmission.⁹ There are also predicted increases in gastrointestinal food- and water-borne diseases caused by bacteria such as *Campylobacter*, *Shigella* and *Salmonella* spp. due to increased maximal temperatures and flooding events.^{4,9,10} Such mosquito-borne and gastrointestinal diseases are amplified in climate-related disasters, floods or cyclones, with damage to housing, stagnated and polluted water sources and compounded morbidity and mortality due to inevitable disruption of health service provision and access.⁹

Answer 9

Kirra's current symptoms could be consistent with an acute stress reaction or disorder, adjustment disorder and/or post-traumatic stress disorder (if >1 month) on the background of pre-existing anxiety and depression. She would benefit from psychoeducation, discussion of sleep hygiene and relaxation strategies. She would likely benefit from a Mental Health Care Plan and referral to a psychologist for regular counselling. Additionally, she may prefer referral to an Aboriginal Social and Emotional Wellbeing program through the local Aboriginal Medical Service or Aboriginal Community Controlled Health Organisation.

She also has expressed anxiety specifically about her own and her children's futures and how they will be affected by repeated flooding. This is suggestive of eco-anxiety, a term used to describe distress in response to environmental change and ecological threat.¹¹

Solastalgia – the grief, loss and threat to identity posed by loss of familiar landscapes and environmental change – is also consistent with Kirra's experience.¹² This is particularly pertinent

to Aboriginal and Torres Strait Islander Australians for whom physical, social and emotional wellbeing, identity and capacity for self-determination and to practise culture are intricately interwoven with the health of Country.^{13,14} Changes to the environment due to climate change threaten to disrupt this connection to Country. Extreme weather events, such as floods, can have a significant cultural impact through destruction of places of cultural significance, disrupting relationships to plants, animals and spiritual ancestors.¹⁴ Strength of culture is a foundation and protective factor for Aboriginal and Torres Strait Islander health and wellbeing and has a direct impact on broader socially determined health outcomes.¹³

Answer 10

The short-term effects of extreme weather events include injury, physical trauma and increased transmission of vector-borne disease, while longer-term effects include displacement, loss of income and post-traumatic stress or depression.⁴ Extreme weather events also negatively affect ecosystems, causing damage to critical infrastructure, essential services, food production, the economy and employment.¹⁰

As Australia is predicted to experience an increase in the frequency and severity of extreme weather events due to climate change, it is expected that this burden will grow.^{15,16} Because of high-density living in coastal areas, increasing urbanisation and land degradation, Australia is particularly prone to flooding with increases in climate variability and precipitation events.¹⁵ The very nature of floods (ie low probability with high impact) poses a significant psychological challenge in addition to the destruction of physical and social infrastructure.^{7,15,16}

Answer 11

Extreme weather events stress populations beyond their adaptive capacities,⁷ disproportionately affecting vulnerable individuals and communities such as Aboriginal and Torres Strait Islander populations, the elderly, women and children, people living with comorbidities and individuals with mental illness.⁹ Regional communities are particularly vulnerable to the

Table 1. Recommended doses of Japanese encephalitis vaccines²

≥2 months to <18 years	JEspect	2 doses (28 days apart)	No recommendation	Each dose of JEspect in infants and children aged ≥2 months to <3 years is 0.25 mL. There are no data to inform recommendations for booster doses in infants and children <18 years. Consider a booster if the child needs sustained protection.
≥9 months to <18 years	Imojev	1 dose	1–2 years after primary dose if ongoing risk of JE virus exposure	None
≥18 years	Imojev	1 dose	Not required	Seroprotective antibody levels persist in most adults 5 years after a single dose of Imojev.
	JEspect	2 doses (28 days apart)	1–2 years after primary dose if ongoing risk of JE virus exposure	Adults can receive an accelerated primary course of JEspect (2 × 0.5 mL doses, 7 days apart) if they are at imminent risk of exposure to JE virus.

Reproduced with permission from Australian Government Department of Health, Australian immunisation handbook: Japanese encephalitis, Canberra, ACT: DoH, 2018. Available at <https://immunisationhandbook.health.gov.au/vaccine-preventable-diseases/japanese-encephalitis> [Accessed 6 May 2022].

impacts of climate change when compared with their urban counterparts because of resource limitations and pre-existing mental and physical health vulnerabilities.^{12,16} Aboriginal and Torres Strait Islander Australians are vulnerable to and disproportionately affected by climate change as a result of a multitude of intersecting factors including barriers to accessing services such as healthcare, pre-existing major health inequity, as well as the underlying social determinants of health.¹⁷

Answer 12

Active participation with community-based environmental organisations, land management groups or ranger programs can be empowering for individuals and communities.¹⁸ Such actions not only provide solutions to environmental degradation and build natural disaster resilience but also foster self-determination through strengthening of cultural connections and knowledge.¹⁹

Aboriginal and Torres Strait Islander people have acted as custodians of Country for millennia.¹⁹ In addressing climate change, there is an opportunity to learn from and adopt Aboriginal and Torres Strait Islander ecological knowledge, reinvigorate traditional practices and improve the resilience of Aboriginal and Torres Strait Islander communities.^{14,19} Aboriginal and Torres Strait Islander ways of thinking and relationship to ecosystems, land, rivers and seas can help to provide a solution to current planetary health issues through a mindset shift from domination of the environment to interdependence and custodianship.^{13,14} A holistic conceptualisation of social and emotional wellbeing, which includes the health of the environment, could be adopted more broadly in order to address planetary health issues. Such acknowledgment that human health and wellbeing is critically dependent on the health of the climate and biodiverse ecosystems can inform meaningful future climate action.

Conclusion

Kirra comes to see you three months later and says she is doing well. She has moved back into her home and has joined a local Aboriginal and Torres Strait Islander land management group. Through this group, she has become involved in education and advocating for climate action with her local member of parliament. She has also been having good yarns with one of her Elders about how healing the Country is healing for people. Kirra is finding strength and empowerment through this connection to her culture and community.

References

- Hills SL, Lindsey NP, Fischer M. CDC Yellow Book. Chapter 4: Travel-related infectious disease: Japanese encephalitis. Atlanta, GA: CDC, 2020.
- Australian Government Department of Health. Australian immunisation handbook: Japanese encephalitis. Canberra, ACT: DoH, 2018. Available at <https://immunisationhandbook.health.gov.au/vaccine-preventable-diseases/japanese-encephalitis> [Accessed 6 May 2022].
- Mayer CA, Neilson AA. Japanese encephalitis – Prevention in travellers. *Aust Fam Physician* 2010;39(6):389–94.
- Australian Institute of Health and Wellbeing. Natural environment and health. Canberra, ACT: AIHW, 2020. Available at www.aihw.gov.au/reports/australias-health/natural-environment-and-health [Accessed 6 May 2022].
- Communicable Diseases Network of Australia (CDNA). Japanese encephalitis sub-group. Advice regarding vaccination against Japanese encephalitis virus. Canberra, ACT: CDNA, 2022. Available at www.health.gov.au/sites/default/files/documents/2022/03/cdna-advice-regarding-vaccination-against-japanese-encephalitis-virus_0.pdf [Accessed 6 May 2022].
- Australian Government Department of Health. Health alerts. Canberra, ACT: DoH, 2022. Available at www.health.gov.au/health-alerts/japanese-encephalitis-virus-jev/about [Accessed 28 March 2022].
- McMichael AJ, Woodruff RE, Hales S. Climate change and human health: Present and future risks. *Lancet* 2006;367(9513):859–69. doi: 10.1016/S0140-6736(06)68079-3.
- Zhang Y, Beggs PJ, Bambrick H, et al. The MJA–Lancet countdown on health and climate change: Australian policy inaction threatens lives. *Med J Aust* 2018;209(11):474.e1–474.e21. doi: 10.5694/mja18.00789.
- Beggs PJ, Zhang Y, Bambrick H, et al. The 2019 report of the MJA–Lancet Countdown on health and climate change: A turbulent year with mixed progress. *Med J Aust* 2019;211(11):490–491.e21. doi: 10.5694/mja2.50405.
- Intergovernmental Panel on Climate Change. Sixth Assessment Report. Working Group II – Impacts, adaptation and vulnerability fact sheet – Australasia climate change impacts and risks. Geneva, CH: IPCC, [date unknown]. Available at https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_FactSheet_Australasia.pdf [Accessed 6 May 2022].
- Cunsolo A, Ellis NR. Ecological grief as a mental health response to climate change-related loss. *Nat Clim Chang* 2018;8(4):275–81. doi: 10.1038/s41558-018-0092-2.
- Albrecht G, Sartore GM, Connor L, et al. Solastalgia: The distress caused by environmental change. *Australas Psychiatry* 2007;15(Suppl 1):S95–98. doi: 10.1080/10398560701701288.
- Australian Government Department of Health. National Aboriginal and Torres Strait Islander Health Plan 2021–2031. Canberra, ACT: DoH, 2021.
- Australian Indigenous Doctors Association. Policy statement: Climate change and Aboriginal and Torres Strait Islander people/s health. Parkes, ACT: AIDA, 2020. Available at <https://aida.org.au/app/uploads/2021/01/AIDA-Climate-Change-Final-December-2020-002.pdf> [Accessed 6 May 2022].
- Babcock RC, Bustamante RH, Fulton EA, et al. Severe continental-scale impacts of climate change are happening now: Extreme climate events impact marine habitat forming communities along 45% of Australia's coast. *Front Mar Sci* 2019;6:1–15. doi: 10.3389/fmars.2019.00411.
- Morrissey SA, Reser JP. Natural disasters, climate change and mental health considerations for rural Australia. *Aust J Rural Health* 2007;15(2):120–25. doi: 10.1111/j.1440-1584.2007.00865.x.
- Beggs PJ, Zhang Y, McGushin A, et al. The 2021 report of the MJA–Lancet Countdown on health and climate change: Australia increasingly out on a limb. *Med J Aust* 2021;215(9):390–92.e22. doi: 10.5694/mja2.51302.
- Australian Psychological Society. The climate change empowerment handbook. Psychological strategies to tackle climate change. Melbourne, Vic: APS, 2017 Available at <https://psychology.org.au/getmedia/88ee1716-2604-44ce-b87a-ca0408dfaa12/climate-change-empowerment-handbook.pdf> [Accessed 6 May 2022].
- Australian Government. The Royal Commission into national natural disaster arrangements, Chapter 18: Indigenous Land and Fire Management. Canberra, ACT: Australian Government, 2020. Available at <https://naturaldisaster.royalcommission.gov.au/publications/html-report/chapter-18> [Accessed 6 May 2022].

CASE

3 | **Kate is concerned following a heatwave**

Kate, aged 32 years, and her daughter, Alicia, aged eight months, attend a double appointment at your Victorian coastal town clinic on a hot summer morning in February (36°C) following several days of hot weather above 30°C.

Kate is on maternity leave and lives with her husband and baby. Her pregnancy, birth and postpartum period were uncomplicated.

After going for a run yesterday afternoon, Kate felt tired and sweaty with a racing heart, nausea and muscle cramps. She is also concerned that Alicia is listless and breastfeeding less, pulling off and crying after two minutes. Kate says she runs for fitness, completed a half marathon prior to pregnancy and resumed running two months ago. She has been running 5 km four days/week but pushed herself yesterday to run 10 km in 38°C heat when her sister visited to mind Alicia.

Question 1

How would you approach initial assessment? What would you look for on history and examination?

Further information

Since her run, Kate says she drank small amounts up to approximately 2 L of water, and Alicia had an extra 50 mL of water and some sloppy solids. Kate feels she is not producing enough milk to settle Alicia and is tired and less confident in her ability to look after her baby and herself. She and Alicia did not sleep well (especially when the air conditioner stopped during a two-hour power outage overnight) and they cooled down by wearing less clothing. Kate has no medical conditions and is not taking any medications.

Kate’s sweating has reduced, and she has passed small amounts of dark urine. Examination findings include:

- tympanic temperature – 37.3°C (reference range 36.0–37.5°C)
- heart rate – 110 beats per minute (reference range 50–100 beats per minute)
- oxygen saturation (pulse oximetry) on room air – 99% (reference range 94–100%)
- blood pressure – 110/70 mmHg sitting, 105/68 mmHg standing (small postural drop)
- weight is 64 kg, compared with 66 kg on the morning before her last run
- dry mouth, slightly reduced skin turgor, otherwise normal
- urine sample is dark but lighter colour than last night, high osmolarity and otherwise normal on dipstick.

Alicia has had fewer (three) wet nappies and looks lethargic. Examination findings include:

- tympanic temperature – 37.0°C (reference range 36.0–37.5°C)
- heart rate – 160 beats per minute (reference range 105–165 beats per minute at age 3–12 months)
- respiratory rate – 50 breaths per minute (reference range 25–55 breaths per minute at age 3–12 months)
- oxygen saturation (pulse oximetry) on room air – 99% (reference range 94–100%)
- bare weight is 400 g down from the 8000 g recorded by the child health nurse one week ago (50th percentile)
- dry mouth, slightly reduced skin turgor, otherwise normal.

Question 2

How is severity of heat illness classified?

Question 3 

What are the diagnoses for Kate and Alicia? What are the contributing factors?

Question 4 

What is your treatment advice for mild heat illness?

Question 5 

What advice would you give Kate to prevent heat illness while maintaining breastfeeding and running training for a half marathon?

Further information

Since her experience with heat illness, Kate has become interested in climate action. She brings you a recent article from the *Lancet* about health risks of hot weather and heat

extremes. She is concerned about the data, both for her family and for her community, and she wants to know what general practice is doing to better prepare patients to deal with heat-related illness.

Question 6  

What is the relationship between climate change and heat-related illness?

Question 7 

What could general practice do to reduce the risk of heat-related illness, particularly for vulnerable populations?

CASE 3 **Answers**

Answer 1

Based on Kate’s story, she and Alicia most likely have heat-related illness and associated dehydration. Infants, breastfeeding mothers and recreational runners are vulnerable to heat illness in hot weather.

The priority is to assess the pattern and severity of recent symptoms, likely causes and need for treatment. If consultation time allows, exploring potential contributing factors can help tailor advice.¹

Points to cover in history and examination

Kate:

- pattern of symptoms and response to treatment tried
- fluid and food intake, type and timing including extra around times when breastfeeding, before, during and after the 10 km run in heat
- how she assesses fluid intake is adequate (thirst, urine frequency/colour)
- how she adjusts for hot environment (clothing, shade, cooling) and sun ultraviolet exposure (hat, sunglasses, sunscreen)
- medical conditions, medications that could limit thermoregulatory response, home situation and supports
- on examination, check temperature, heart rate, blood pressure sitting and standing, skin turgor/rash/sweat; weight, urine colour and osmolarity. Exclude infection if raised temperature or unwell.

Alicia:

- changes in breastfeeding pattern, food and fluid intake; recent hypertonic/hypotonic fluids
- change in urine (darker colour, fewer or less wet nappies) and fluid output (sweating, vomiting, diarrhoea)
- actions taken to keep Alicia cool (light clothing, bathing, cool environment)
- changes in sleep, alertness, behaviour, childcare, playgroups

- on examination, check responsiveness, temperature, respiratory rate, heart rate, pulse oximetry. Assess hydration status – bare weight (compared with most recent weight, growth chart) and clinical signs. Recent weight loss is the most accurate measure of severity of dehydration, while other clinical signs are less precise.² Check urine colour, osmolarity, white cell count if urine sample can be collected.

Answer 2

Severity of heat illness is a continuum from heat stress with normal temperature and minor symptoms such as heat rash, muscle cramps, fatigue, dizziness and syncope; to heat exhaustion with raised temperature 37.5–40°C; to heat stroke with a core temperature above 40°C and altered mental status (eg encephalopathy, seizures, coma), with risk of multi-organ failure and death. Features of heat illness are listed in Table 1.^{3,4}

Morbidity and mortality are related to the degree and duration of hyperthermia, defined as a core body temperature above 37.5°C due to a failure of normal body thermoregulation. The primary cause of heat-related death in children is heatstroke from being left in a closed hot vehicle.³⁻⁵ For people who exercise, fatal and life-threatening exertional heat stroke is 10 times more common than serious cardiac events in warm weather endurance events.⁵

Answer 3

Kate has mild heat exhaustion with tachycardia, clammy skin, heat cramps, nausea, 3% dehydration (2 kg weight loss from 66 kg) and reduced breast milk supply. This was triggered by

Table 1. Stages of heat illness severity: Signs, symptoms, investigations and prognosis^{3,4}

Clinical indicator	Heat stress	Heat exhaustion	Heat stroke
Temperature	Normal	Elevated 37.5–40°C	Core temperature: >40°C (rectal)
Central nervous system	Normal	Irritable, uncoordinated, confused (resolved by rest, cooling)	Altered mental state, delirium, convulsion, reduced Glasgow Coma Scale score, ataxia, blindness
Skin temperature	Normal, sometimes heat rash	Normal or cool, clammy	In 50% of cases, skin is hot and dry
Sweat rate	Increased	Increased or decreased	Increased
Cardiovascular system	Tachycardia	Tachycardia	High-output heart failure, hypotension, arrythmia
Gastrointestinal	Thirst	Nausea +/- vomiting	Nausea and vomiting or diarrhoea
Other	Heat cramps, heat oedema (mild)	Heat cramps, oedema, muscle aches	Disseminated intravascular coagulation (purpura), acute respiratory distress syndrome, tetany, thrombocytopenia
Investigations	None	Electrolytes and creatinine for hypo/hyponatremia	For renal failure, liver failure, rhabdomyolysis
Prognosis	Usually self-limiting. Full recovery with oral rehydration fluids, rest and cooling	Can quickly progress to heat stroke if not treated. Usually, full recovery with oral or intravenous fluids, rest and active cooling	Life-threatening emergency. Stabilise using advanced life support protocols and active cooling. Transfer to hospital, high risk of multi-organ failure and death

1) increasing exercise too quickly and running 10 km in extreme heat, 2) fluid and salt depletion from increased sweating and 3) inadequate fluid/electrolyte replacement.

Two major factors combine to predispose Kate to heat exhaustion in a heatwave. Breastfeeding mothers require additional fluids, energy (600 kcal/day) and nutrients for breastmilk to support infant growth,^{1,6} and the demands of exercise and daily living require matching increases in fluid, energy and nutrient intake to increasing endurance training loads. Adults lose most heat by radiation. However, in hot conditions, evaporation is the main mechanism for thermoregulation through increased blood flow to skin and sweating, the effectiveness of which can be limited in high humidity or extreme heat.⁵ Dehydration can further reduce sweating and lead to a rise in body temperature.

Alicia has 5% dehydration (400 g weight loss from 8000 g, dry mouth and mildly reduced skin turgor). Trigger factors for Alicia were breastfeeding less because of her mother's reduced breastmilk supply and change in taste of milk (lactic acid) after exercising in the heat; followed by inadequate compensation (supplemental fluid intake and cooling).

Factors predisposing infants to heat illness are physiological and behavioural.⁵ Physiological factors include a high body surface area-to-mass ratio that absorbs heat by convection quickly in hot conditions, combined with reduced capacity to dissipate heat due to an immature thermoregulatory system and sweat response. Behavioural factors include infants' inability to change clothing, move from heat and low air flow, and communicate thirst.⁵

Answer 4

Kate and Alicia can recover fully with cooling, oral rehydration fluids and rest.^{2,3}

General practitioner (GP) reassurance and brief advice about breastfeeding can overcome difficulties and increase confidence.⁶ If Kate replenishes her fluids with water, milk or oral rehydration fluid, and expresses after inadequate feeds, her milk supply should improve within 24–48 hours.

For Alicia:

- Breastfeed more often; offer additional regular small amounts of cool water or oral rehydration fluids/icy poles; cool oral food as per dietary guidelines;⁷ and monitor wet nappies (4–5/day with colourless urine).
- Wear light cotton clothing, sleep in nappy only in good air flow; regular tepid wash; do not use antipyretics (ineffective).
- Replace strenuous activity with passive stimulation such as reading books in an air-conditioned location, flat/gentle stroller walks outside when cooler; avoid heat and sun until asymptomatic.
- GP review of symptoms and dehydration in 24 hours.

For Kate:

- Rest; avoid strenuous activity and exercise until asymptomatic.

- Drink cool oral fluids for thirst (water, rehydration solution or milk)⁸ until urine is pale straw colour, avoid hot/sugar/alcohol drinks. Intravenous fluids (normal saline) may aid recovery if available.

- Wear light loose clothing; have tepid showers.

Cooling strategies for individuals, even in low-resource settings, effectively relieve heat strain and dehydration and reduce the risk of hospitalisation and death.⁹ Electric or battery fans are cheaper than air conditioning and effective for adults up to 40 years of age in temperatures up to 39°C. Frequent tepid sprays/washes (every 10 minutes) effectively cool in temperatures up to 47°C. Loose-fitting, single-layered cotton clothing is recommended. Ten-minute rest breaks reduce metabolic heat production and lower body temperature.⁹

Strategies to cool the house include insulation, fans, air conditioning and closing windows/curtains and internal doors to reduce heat transfer. Patients can be advised to stay in the coolest room in the house, go outside if cooler or go to an air-conditioned place.

Fact sheets can be provided to support treatment advice on heat illness, dehydration and breastfeeding in warm weather (refer to Resources for patients).

Answer 5

Kate should be encouraged to adjust her approach to running to meet the additional requirements of breastfeeding and exercising in heat for fluids, energy and nutrition. Table 2 shows recommended strategies for hot conditions.

This will help support her through the postpartum adjustments to bodily changes, social roles and re-establishing pre-pregnancy activities.^{1,6} Postpartum exercise improves physical health and mental health (emotional wellbeing, symptoms of anxiety and depression).¹

Answer 6

Industrial use and burning of fossil fuels (methane gas, oil and coal) have increased global greenhouse emissions (mainly methane and carbon dioxide) into the Earth's atmosphere; these trap heat and cause global warming (increase in mean temperature), which changes the global climate and affects the environment and human health.^{10–12}

Climate change with higher and rising mean temperatures is increasing the frequency, intensity and duration of extreme heat, putting more individuals, communities and health systems at risk.^{5,10–12}

Heat-related illness is the most direct health impact of climate change and causes more deaths than all other natural disasters.^{5,10,11} In the summer of 2009, there were more than twice as many deaths due to the preceding heatwave than from the Black Saturday bushfires in Victoria. Maximum temperatures were 12–15°C above normal across much of Victoria for five days, with Melbourne hotter than 43°C for three consecutive days. This resulted in a 62% increase in all-cause mortality, with 374 excess deaths when compared with the

Table 2. Recommended strategies to prevent heat illness and dehydration when running in a hot environment^{1,3,16,17}

Strategy	Recommendations
Heat health plan	<ul style="list-style-type: none"> Provide salient education with fact sheets to prepare for heatwaves, minimise extreme heat exposure and prevent heat illness (available in Resources for patients).
Exercise adjustment	<ul style="list-style-type: none"> Graded training programs that increase average weekly running time or distance by no more than 10%. This enables tissues to adapt to the increased load of running and can help acclimatise to running in a hot environment (eg graded walk/run programs, Couch to 5 km or Couch to 10 km programs). In hot weather, adjust running pace (minutes/km) to balance the increased running effort – for every 1°C above 15°C air temperature, the running pace should be reduced by four seconds; at 30°C, reduce pace by 60 sec/km (eg from 6 min/km to 7 min/km). This will compensate for blood flow being redirected to the skin and reduced to working muscles, and therefore reduce the risk of increased strain on the heart and degree of dehydration. Use light clothing, shade, cooling and sun/ultraviolet protection. In a heatwave, avoid running outdoors, take a rest day or do alternative exercise in a pool or air-conditioned gym.
Adequate hydration	<ul style="list-style-type: none"> Start run adequately hydrated. There is no evidence that deliberate over-hydration prior to exercise is beneficial. During exercise, ensure adequate hydration with a 'drink to thirst' approach sufficient to prevent >2% loss of body weight.³ Thirst levels can be useful to guide fluid intake; however, in prolonged exercise, thirst perception can vary between individuals. Exercise-associated hyponatremia (EAH) due to overhydration has been reported to occur in 13% of marathon runners, with higher prevalence among female runners.¹⁶ Recent research suggests that endurance athletes who drink <700 mL/hr during exercise have a decreased risk of EAH. After running, rehydrate with water until urine returns to a pale straw colour. Electrolyte-containing fluids (eg rehydration solution or milk) can promote rapid rehydration particularly in hot weather.¹⁷
Referrals	<ul style="list-style-type: none"> For further guidance on running training programs for endurance events, refer to a sports physician, exercise physiologist or sports physiotherapist. Consider referral to an Accredited Sports Dietitian (www.sportsdietitians.com.au/find-an-accredited-sports-dietitian) for an individual fluid intake plan if repeat presentation for heat illness, or for further assistance with endurance training fluid, energy and nutritional requirements to meet demands.¹

same period over the previous five years. There were another 170 deaths from the Black Saturday bushfires a week later.¹³

The morbidity and mortality due to heatwaves create considerable burden on health services.¹¹ During the 2009 Victorian heatwave: ambulance emergency caseload increased by 25% (34-fold increase in direct heat-related conditions, and 2.8-fold increase in cardiac arrest cases); deputising GP service home visits increased fourfold for heat-related conditions and doubled for deceased persons; there were 12% more emergency department presentations, with an eightfold increase in direct heat-related presentations and a threefold increase in patients dead on arrival.¹³

General practice can help reduce the health impacts of climate change through preventive and public health actions.^{10,12} Most heat-related impacts should be preventable with improved preparedness and avoidance of exposure.⁵

Answer 7

GPs should be aware of extreme heat as a potential cause of presentations.^{10,12} Physical health impacts include direct heat illness, dehydration, gastroenteritis, exacerbation/ decompensation of pre-existing conditions, adverse pregnancy and birth outcomes, increased occupational and sports illnesses and injuries and increased all-cause mortality, particularly cardiac arrest, acute myocardial infarction and heart failure.^{5,9,12} Elevated cardiovascular strain from extreme heat causes more deaths in older adults than nearly all other

heat-related causes of death combined.⁹ Mental health impacts include anxiety and increased self-harm, suicide and interpersonal violence.

Anyone can be affected by extreme heat; however, vulnerable patients include people:^{9,10,12}

- who are older than 65 years, very young children, pregnant and breastfeeding women (irrespective of income level or geographical region)
- with cardiopulmonary and other chronic diseases (cardiac, renal, respiratory, diabetes, Parkinson's disease, muscular sclerosis)
- with chronic conditions, cognitive impairment, immobility, mental illness, alcohol and drug dependency
- taking medications or drugs that increase heat production or compromise thermoregulation, such as alcohol, α -adrenergic agonists, amphetamines, anticholinergics, antihistamines, antipsychotics, benzodiazepines, β -blockers, calcium channel blockers, clopidogrel, cocaine, diuretics, laxatives, neuroleptics, phenothiazines, thyroid agonists, tricyclic antidepressants³
- who are socially or economically disadvantaged, such as those living alone, socially isolated, homeless, in poor housing, in hot treeless urban environments, with no air conditioning
- who are active outdoors in sport or work in hot environments.

Preventive care involves working with the patient, as well as using the practice team and digital and physical environment.¹⁴

Practice-based strategies to prevent health impacts of extreme heat

Identify vulnerable patients and work with them and their families to reduce risk.^{10,11}

Heat health plans can reduce risk and prevent deaths.^{5,9,10} GPs can develop individualised heat health action plans with patients for primary and secondary prevention.^{10,11,15}

Tailor patient education and advice to the person's medical conditions, personal circumstances and health literacy.¹⁵ Give specific information that is salient for the particular purpose:¹⁰ reduce exposure to heat, minimise factors affecting response to heat, reduce health effects of heat exposure, prepare for heatwave.

Collect and use patient resource materials for heat health in:

- health assessments (eg 75+ health assessment, child/postnatal health check); identify heat and other environmental risk factors in history-taking
- preventive care (eg lifestyle advice, pregnancy care, skin cancer checks)
- chronic disease management (eg cardiovascular disease care plans, mental health plans, home/resident medication reviews); adjust medications to reduce risk.^{10,11}

Adapt the practice environment for cooling and to reduce carbon footprint, using methods such as outdoor canopies, trees and gardens for shade and to reduce ground heat; indoor insulation, window glazing/shading, fans, air conditioner, water fountain.⁹ Use waiting room posters (eg 'survive the heat' and 'climate change is worsening extreme heat').

Link with state and local heat health plans. All Australian states now have heat health action plans that incorporate early warning and response systems to inform health professionals and the public.^{10,12,15} **Monitor weather bureau and state health department alerts, and develop a practice heatwave plan, linked to the state heat health plan and local community resources.**¹²

Contribute to local disaster planning, frontline emergency responses and community recovery for extreme heat events (heatwaves, bushfires).¹⁰ Add local heat health registers and resources for vulnerable people to referral database.

Advocate for mitigating greenhouse gas emissions as primary prevention of global heating and climate change.

Conclusion

Heat-related illness is the most direct health impact of climate change. Heatwaves in Australia have caused more deaths than any other natural disaster in the past 200 years.

GPs have an important role in supporting mitigation of and adaptation to the health impacts of climate change.

Heat affects people differently throughout their life course, depending on lifestyle, socioeconomic circumstances, location and medical conditions.

The heat effects of climate change are diagnosable, treatable and preventable.

Resources for doctors

Heat health

- Royal Children's Hospital Melbourne – Clinical practice guidelines: Dehydration, www.rch.org.au/clinicalguide/guideline_index/Dehydration
- Expert Group for Wilderness Medicine. Heat-related illness. In: eTG complete [Internet]. Melbourne, Vic: Therapeutic Guidelines Limited, 2021.
- Victoria Department of Health – Extreme heat – Information for clinicians, www.health.vic.gov.au/environmental-health/extreme-heat-information-for-clinicians

Waiting room posters

- Victoria Department of Health – Survive the heat, <https://content.health.vic.gov.au/sites/default/files/migrated/files/collections/policies-and-guidelines/s/survive-the-heat-poster---january-2016---pdf.pdf>
- The Royal Australian College of General Practitioners – Climate change is worsening extreme heat, <https://dea.org.au/racgp-climate-health-impact-posters-free-to-download-and-use-in-clinic-waiting-rooms>

Resources for patients

Heat health

- NSW Health – Heat is a health risk – Beat the heat, www.health.nsw.gov.au/environment/beattheheat/Pages/default.aspx
- Australian Breastfeeding Association – Breastfeeding through warmer weather, www.breastfeeding.asn.au
- Royal Children's Hospital Melbourne, Kids health information – Dehydration, www.rch.org.au/kidsinfo/factsheets/Dehydration
- Better Health Channel – Heat stress and heat-related illness, www.betterhealth.vic.gov.au/health/healthyliving/heat-stress-and-heat-related-illness
- South Australia Health – Heat-related illness signs symptoms and treatment, www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/healthy+living/protecting+your+health/environmental+health/healthy+in+the+heat/heat-related+illness+signs+symptoms+and+treatment
- NSW Health – Heatwave preparation checklist, www.health.nsw.gov.au/environment/beattheheat/Pages/heatwave-checklist.aspx

Exercise safely

- Couch to 5k Running Program, Couch to 10K Running Program, <http://c25k.com/mobile>
- Sports Medicine Australia – Preventing running injuries factsheet, <https://sma.org.au/resources-advice/running>
- Sports Dietitians Australia (SDA) factsheets, www.sportsdietitians.com.au/factsheets

References

1. Inge P, Orchard JJ, Purdue R, Orchard JW. Exercise after pregnancy. *Aust J Gen Pract* 2022;51(3):117–21. doi: 10.31128/AJGP-09-21-6181.
2. Royal Children’s Hospital Melbourne. Clinical practice guidelines: Dehydration. Parkville, Vic: RCH, 2021. Available at www.rch.org.au/clinicalguide/guideline_index/Dehydration [Accessed 19 May 2022].
3. Lipman GS, Gaudio FG, Eifling KP, Ellis MA, Otten EM, Grissom CK. Wilderness Medical Society clinical practice guidelines for the prevention and treatment of heat illness: 2019 update. *Wilderness Environ Med* 2019 ;30(4S):S33–S46. doi: 10.1016/j.wem.2018.10.004.
4. Brighton and Sussex University Hospitals. Paediatric clinical practice guideline: Heat illness. West Sussex, UK: Brighton and Sussex University Hospitals NHS Trust, 2021. Available at www.bsuh.nhs.uk/library/wp-content/uploads/sites/8/2021/01/Paediatric-guidelines-Heat-Illness.pdf [Accessed 19 May 2022].
5. Ebi KL, Capon A, Berry P, et al. Hot weather and heat extremes: Health risks. *Lancet* 2021;398(10301):698–708. doi: 10.1016/S0140-6736(21)01208-3.
6. Ball L, de Jersey S, Parkinson J, Vincze L, Wilkinson S. Postpartum nutrition: Guidance for general practitioners to support high-quality care. *Aust J Gen Pract* 2022;51:123–28. doi: 10.31128/AJGP-09-21-6151.
7. National Health and Medical Research Council. Infant feeding guidelines: Summary. Canberra, ACT: NHMRC, 2012. Available at www.eatforhealth.gov.au/sites/default/files/content/The%20Guidelines/170131_n56_infant_feeding_guidelines_summary.pdf [Accessed 19 May 2022].
8. James LJ, Stevenson EJ, Rumbold PLS, Hulston CJ. Cow’s milk as a post-exercise recovery drink: Implications for performance and health. *Eur J Sport Sci* 2019;19(1):40–48. doi: 10.1080/17461391.2018.1534989.
9. Jay O, Capon A, Berry P, et al. Reducing the health effects of hot weather and heat extremes: From personal cooling strategies to green cities. *Lancet* 2021;398(10301):709–24. doi: 10.1016/S0140-6736(21)01209-5.
10. Tait PW, Allan S, Katelaris AL. Preventing heat-related disease in general practice. *Aust J Gen Pract* 2018;47(12):835–40.
11. Pendrey CGA, Beaton L, Kneebone JA. General practice in the era of planetary health: Responding to the climate health emergency. *Aust J Gen Pract* 2020;49(8):520–23. doi: 10.31128/AJGP-01-20-5207.
12. Parise I. A brief review of global climate change and the public health consequences. *Aust J Gen Pract* 2018;47(7):451–56. doi: 10.31128/AJGP-11-17-4412.
13. Victoria Department of Health. Heatwave in Victoria. Melbourne, Vic: Victorian Government, 2015. Available at www.health.vic.gov.au/health-officer/heatwave-in-victoria [Accessed 29 June 2022].
14. The Royal Australian College of General Practitioners. Putting prevention into practice: Guidelines for the implementation of prevention in the general practice setting (Green book). 3rd edn. East Melbourne, Vic: RACGP, 2018.
15. Victoria Department of Health. Heat health plan for Victoria. Melbourne, Vic: Victorian Government, 2021. Available at www.health.vic.gov.au/publications/heat-health-plan-for-victoria [Accessed 19 May 2022].
16. Upadhyay A, Jaber BL, Madias NE. Incidence and prevalence of hyponatremia. *Am J Med* 2006;119(7 Suppl 1):S30–35. doi: 10.1016/j.amjmed.2006.05.005.
17. Armstrong LE. Rehydration during endurance exercise: Challenges, research, options, methods. *Nutrients* 2021;13(3):887. doi: 10.3390/nu13030887.

CASE

4 | **Ella has decided not to have children**

Ella, aged 24 years, works in hospitality and is studying environmental science. She presents asking about her options for surgical infertility as she has decided not to have children. She would like you to refer her for a bilateral salpingectomy or a tubal ligation as she has read that these are the most effective long-term options.

Question 1 

How would you approach Ella’s decision not to have children?

Further information

Ella tells you that she has decided not to have children because of the climate crisis. As an environmental science student, she knows that the planet is facing catastrophic global warming. Ella discloses that she never wants to have children, saying: ‘I could never bring a child into this world, I think it would be irresponsible given what’s happening to the climate. Any child born today faces a really scary and unsafe future and it wouldn’t be fair to the child to do that to them.’

Question 2 

What are the projections for global warming, and how does global warming have an impact on human health?

Question 3 

In what ways can climate change have an impact on mental health?

Question 4 

How might you explore this further with Ella?

Further information

Ella says she thinks about climate every day, often staying up late reading news articles and analyses online. She feels sad and sometimes tearful about it, and often feels angry about the state of the world and betrayed by those in power. She occasionally has trouble sleeping because of her concerns. She has always cared about the environment but became more concerned after her parents lost their home, where she grew up, in the 2019 bushfires. Her feelings intensified after the Intergovernmental Panel on Climate Change (IPCC) sixth assessment report was published in February 2022. She describes feeling a profound sense of loss that the future she imagined as a child, in which she herself might have children, has been lost. She has not had any thoughts of suicide but discloses feeling little hope for the future. In her teens she saw a counsellor for anxiety and was briefly treated with sertraline in year 12, which she self-ceased after approximately six months.

Ella’s partner is sympathetic, but she suspects he thinks she is overreacting. She thinks some of her friends have started to find her boring as she tends to talk about climate change a lot. She is vegan, cycles to work and chooses not to travel by aeroplane. She is aware that children have a significant carbon footprint. She describes feeling frustrated that she has little impact as an individual but feels unsure of what more she can do.

Question 5 

What would you do next?

Question 6  

What strategies could you suggest for Ella that would help her?

Question 7  

How would you counsel Ella about her decision not to have children?

CASE 4 **Answers**

Answer 1

It is important to respect a woman's choice regarding reproduction. Voluntary childlessness is a highly emotive issue, and clinicians need to be cautious about bringing their own beliefs and expectations into the consultation. It is advised to keep patients' rights to autonomy and decision making in mind.¹

It is recommended to approach Ella's request by sensitively exploring her reasons for her decision. For some women, this is a long-held viewpoint and is an inherent part of their psyche. For others, there are underlying factors that clinicians should consider.

Women's choices regarding reproduction may be linked to previous trauma, and that should be approached respectfully.² Many women are choosing voluntary childlessness because of concerns about climate change and global warming, with Australian research indicating that '33.4% of women under 30 are reconsidering having children or more children because of concern about an unsafe future from climate change'.³

It is recommended to take a gynaecological history, including menstrual, obstetric and contraceptive history. This is an opportunity to explore Ella's awareness of the range of contraceptive options available and provide information to support her decision making. The high efficacy rate of hormonal intrauterine devices (IUDs) compares favourably to that of tubal ligation (99.8% efficacy, compared with 99.5% efficacy, respectively) and may provide additional benefits including a reduction in bleeding, which should be discussed.⁴ Bilateral salpingectomy reduces the rates of ovarian cancer,⁵ which is an important consideration, especially if there is a personal or family history of cancers associated with the *BRCA* gene. Although some women do experience regret after surgical infertility procedures, many women remain content with their decision.⁶

Ultimately, Ella must be fully informed of her options, and her choice should be respected.

Answer 2

Earth has undergone 1.2°C of global warming since the pre-industrial age.⁷ This warming is due to increased concentrations of greenhouse gases in the atmosphere caused by using fossil fuels for energy and modern agricultural practices.⁸

The IPCC advises that global warming must be limited to 1.5°C to avoid catastrophic impacts on human infrastructure and protect human health. To achieve this requires an immediate global response of ceasing fossil fuels use and transitioning to renewable energy sources. Under current governmental policies, it is expected that global warming will reach 1.5°C by the mid-2030s and reach >3.0°C by the end of the century.⁹

Figure 1 illustrates how global warming affects human health in multiple and diverse ways.¹⁰

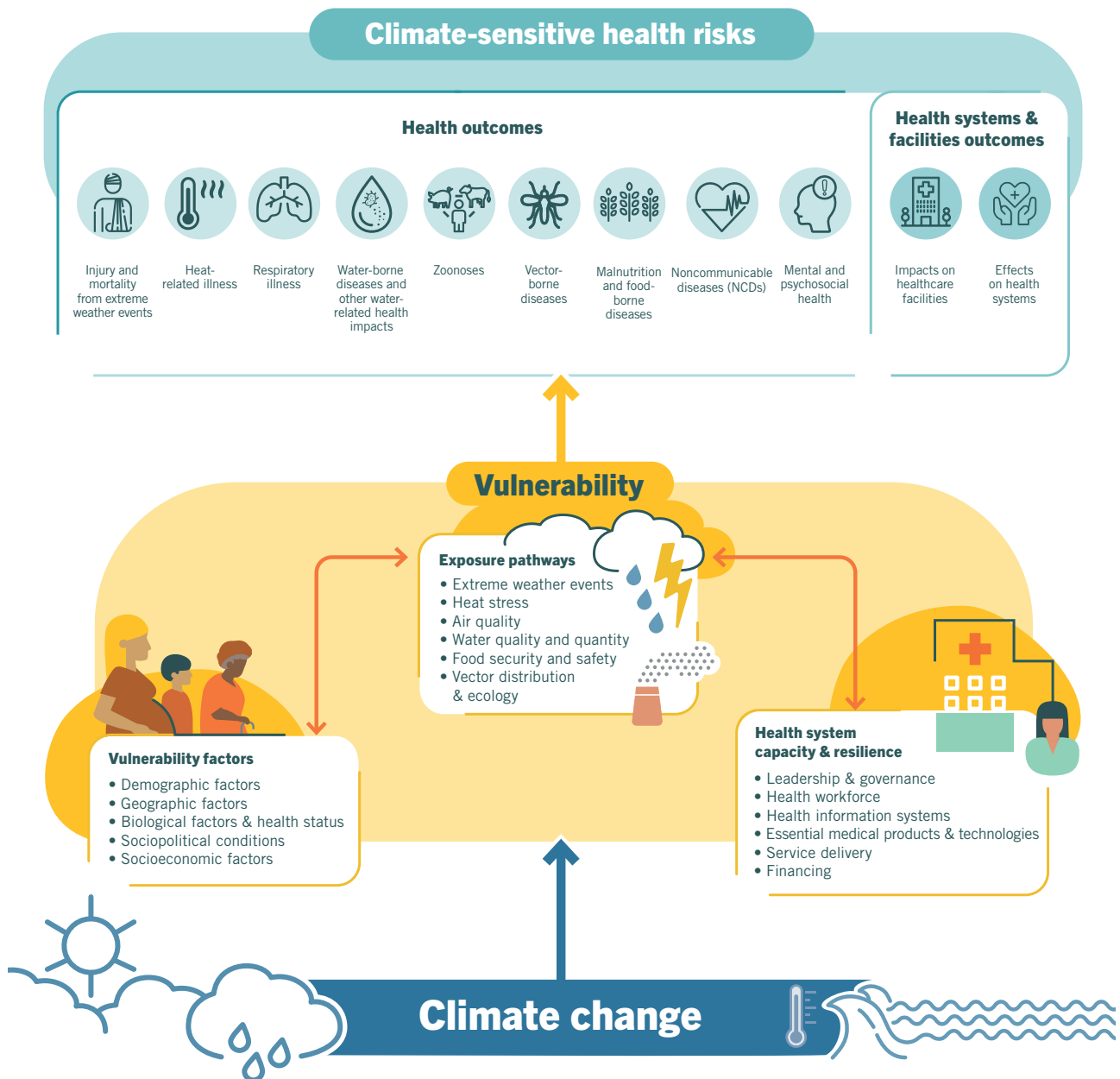


Figure 1. An overview of climate-sensitive health risks, their exposure pathways and vulnerability factors. Climate change affects health both directly and indirectly, and is strongly mediated by environmental, social and public health determinants.

Reproduced with permission from COP26 Special report on climate change and health: The health argument for climate action, Geneva, CH: World Health Organization, 2021. Licence: CC BY-NC-SA 3.0 IGO

Answer 3

Climate change has wide-ranging impacts on mental health best conceptualised as a continuum of direct, indirect and overarching effects.¹¹

Direct effects refer to the psychological impacts of extreme weather events, which are now more frequent and intense because of climate change.^{12,13} These include a wide array of mental health effects from mild, transient distress to long-term mental illness such as post-traumatic stress disorder.¹⁴

Direct effects also include the impacts of heat, which increases interpersonal violence,¹⁵ self-harm and suicide.¹⁶

Indirect effects refer to the flow-on social, economic and cultural consequences of extreme weather events and more chronic environmental changes such as drought and sea-level rise. An example of indirect effects is the multigenerational ramifications of forced migration and conflict due to drought.¹⁷

Overarching impacts refer to the psychological consequences of awareness of climate change. This

includes 'climate anxiety' but also encompasses a broad diversity of other emotional experiences. It should be noted that emotional distress in response to climate change is not inherently pathological and can be considered a rational response to a significant global threat. Nonetheless, it may cause substantial distress and lead to functional impairment and clinically significant anxiety and depression for some people.^{18,19}

Individuals and communities can be affected anywhere across this continuum over time, and it should be noted that people are increasingly experiencing compound events across this spectrum. For example, exposure to repeated flooding and bushfires over the past few years for people in the eastern states of Australia, along with increasing public awareness of recent dire scientific consensus reports such as *Climate change 2022: Impacts, adaptation and vulnerability*,¹² combines both direct and overarching impacts.

Answer 4

It is important to validate Ella's feelings of concern and acknowledge that climate change is a serious threat about which many people share her concern.^{20,21} People concerned about climate change have often experienced previous dismissal of their concerns and fear they will not be taken seriously.¹⁹ Regardless of a general practitioner's (GP's) own personal awareness of the issue, the foundation of a therapeutic relationship should include validating the patient's experience.

It is important to explore Ella's personal experiences and understanding of climate change. This includes her perception of environmental and climate issues across her life course and her cultural environmental attitudes. Ask about exposure to climate change information through formal education, peers or media. Discuss her exposure to impacts of climate change via direct experience of extreme weather events or chronic environmental changes such as drought or coastal erosion. Explore if there was a particular event or cumulative events that increased Ella's level of concern. People will often describe a 'climate awakening' or a moment when they became aware of the scale and seriousness of the issue. This is often a highly emotional, profound and transformative event.

Sadness, anxiety, anger, powerlessness, helplessness and guilt are all commonly experienced emotions. A 2021 international study of 10,000 children and young people aged 16–25 years reported that 84% of respondents were at least moderately worried about climate change, >50% reported each of the emotions above and >45% reported these feelings negatively affected daily life and functioning.¹⁹ There can also be a sense of betrayal, which has been shown to correlate with inadequate government responses.¹⁹ Many people will also describe feelings of grief, both for current and future losses. The grief associated with climate change has been described as disenfranchised grief, in that it is not widely recognised and legitimised by society and lacks accepted practices or rituals to address. The term 'solastalgia' is sometimes used to describe the sense of loss associated with the negative transformation of a loved environment.²²

Once people become aware of climate change, there may be significant behavioural re-orientation. This may include increasing personal pro-environmental behaviour such as dietary change, reducing household waste and using active forms of transport, and public pro-environmental behaviour such as climate advocacy, protest or other political and community engagement. For some, this can be associated with feelings of guilt about previous behaviours and the environmental impact of these. It also may result in frantic or unsustainable efforts that the person is unable to maintain, compounding feelings of guilt and failure. For many, a significant challenge can be deciding on what course of action to take out of a plethora of options. It can be difficult for people to know what to focus on and how to get started, and this may add to the experience of overwhelm and distress, sometimes referred to as 'eco-paralysis'.²³

GPs are well placed to support patients such as Ella through this process and provide evidence-based information about the impacts of particular actions. It is helpful to stress that the scale of the issue is such that no one person can be said to have caused this issue, and similarly no one person can solve it.

Answer 5

It would be recommended to undertake a mental health assessment for Ella. It is important to assess the severity of her symptoms, determine her functional status and ascertain whether she meets criteria for a mental health diagnosis. GPs are advised to perform a mental state examination,²⁴ enquire further about her history of mental illness and ask about comorbidities.

It is essential to explore her risk of suicide,²⁵ and if this is identified, provide support, including appropriate follow-up and referral and the development of a collaborative safety plan.²⁶

Answer 6

First, it is important to validate Ella's feelings of climate distress and reassure her that they are rational responses to a real threat.²⁰ She can be reassured that the global medical community shares her concerns and that climate health emergency declarations have been made by the Australian Medical Association²⁷ and multiple other medical colleges, including The Royal Australian College of General Practitioners.²⁸

GPs can suggest ways that Ella can manage her climate distress. Multiple coping strategies are available.^{18,29} These include:

- emotions-focused coping – strategies include talking about these emotions, employing relaxation strategies and taking 'time out' from ecological distress.
- problem-focused coping – strategies focus on taking action to try to solve the issue. This is challenging, considering the scale and complexity of the problem, but it is important to validate an individual's climate actions, and clinicians should recognise the power of collective action.

- meaning-focused coping – this involves connecting with sources of authentic hope and trust, such as the myriad groups working to transform to a carbon-neutral world, and it involves connecting to a personal sense of purpose. This allows a buffer to the detrimental effects of climate distress on personal wellbeing.

Overall, while all coping strategies can be usefully employed, meaning-focused coping is associated with higher behavioural engagement and increased positive affect, and these strategies can be emphasised in providing care.³⁰

A useful framework that can be employed in a general practice setting is the ACTIVATE acronym developed by the Australian Psychological Society (<https://psychology.org.au/getmedia/b2304d9c-64d4-40a6-b063-3014128ec740/activate-climate-change.pdf>).³¹

Climate distress can be addressed individually and collectively. Ella can be provided with specific information about ways she can connect with like-minded people, both to take meaningful action and as a source of support. She can be directed towards supportive therapy in a group setting such as a climate cafe, Good Grief Network or a workshop offered by Psychology for a Safe Climate, either locally or online. For individual therapy, GPs can consider referring patients to a Climate Aware Practitioner (www.psychologyforasafeclimate.org/cap-directory) who has undergone specific additional training in this field.

Answer 7

It is important to respect Ella's choice and offer her appropriate contraception and referral, allowing her the option of time for further consideration and discussion should she wish.

For people choosing not to have children because of concerns about climate change, there may be multiple dimensions to that choice, which you may seek to explore. For some, the primary concern is the carbon footprint and other environmental impact (waste etc) created by having a child. For others, the primary concern may be fear for the safety and wellbeing of future children in a world profoundly altered because of climate change. Both these aspects may be present and should be respected.

In considering the carbon footprint and environmental impacts of children, it may be relevant to discuss with Ella the burden of responsibility of individuals versus governments and corporations, as well as considering the relative impacts of different mitigation activities. Worldwide, education and empowerment of women and girls, and supporting access and choice in family planning, have been shown to have significant positive environmental impacts.³²

In considering the wellbeing of future generations, while the evidence indicates that reaching 1.5°C of warming is all but inevitable, there is still hope that with concerted global action these impacts may be mitigated and further temperature rises could be avoided.¹² Although the global effort required for this to occur is enormous and daunting, it is considered by many not to be impossible.

Conclusion

Ella feels validated and grateful for this information, and she feels connecting with others who share her concerns would be very helpful. She is interested in any further resources you can recommend.

Resources for doctors and patients

- Australian Psychological Society – The climate change empowerment handbook, <https://psychology.org.au/getmedia/88ee1716-2604-44ce-b87a-ca0408dfaa12/climate-change-empowerment-handbook.pdf>
- Australian Conservation Foundation, The Climate Reality Project Australia, Australian Psychological Society, Psychology for a Safe Climate – Coping with climate change distress, https://psychology.org.au/getmedia/cf076d33-4470-415d-8acc-75f375adf2f3/coping_with_climate_change.pdf
- Psychology for a Safe Climate, www.psychologyforasafeclimate.org
- Climate and Health Alliance – Mental health resources, www.caha.org.au/mental_health_resources
- Good Grief Network – 10-steps to personal resilience and empowerment in a chaotic climate, www.goodgriefnetwork.org

References

1. Varkey B. Principles of clinical ethics and their application to practice. *Med Princ Pract* 2021;30(1):17–28. doi: 10.1159/000509119.
2. Romito P, Crisma M, Saurel-Cubizolles M-J. Adult outcomes in women who experienced parental violence during childhood. *Child Abuse Negl* 2003;27(10):1127–44. doi: 10.1016/j.chiabu.2003.09.003.
3. Australian Conservation Foundation. What do women think about climate change? Summary of a survey of 6500 women by the Australian Conservation Foundation and 1 Million Women. Carlton, Vic: ACF, [date unknown]. Available at https://d3n8a8pro7vnm.cloudfront.net/auscon/pages/10649/attachments/original/1549598020/4pp_women_and_climate_change.pdf?1549598020 [Accessed 10 May 2022].
4. Marie Stopes Australia. Tubal ligation – Contraception. East Melbourne, Vic: Marie Stopes Australia, 2018. Available at www.contraception.org.au/methods/tubal-ligation [Accessed 10 May 2022].
5. Anggraeni TD, Al Fattah AN, Surya R. Prophylactic salpingectomy and ovarian cancer: An evidence-based analysis. *South Asian J Cancer* 2018;7(1):42–45. doi: 10.4103/sajc.sajc_187_17.
6. The Faculty of Sexual and Reproductive Healthcare of the Royal College of Obstetricians & Gynaecologists. FSRH clinical guideline: Male and female sterilisation (September 2014). London, UK: FSRH, 2014. Available at www.fsrh.org/standards-and-guidance/documents/cec-ceu-guidance-sterilisation-cpd-sep-2014 [Accessed 10 May 2022].
7. Copernicus Climate Change Service. Climate indicators: Temperature. Reading, UK: C3S, [date unknown]. Available at <https://climate.copernicus.eu/climate-indicators/temperature> [Accessed 10 May 2022].
8. NASA Global Climate Change: Vital Signs of the Planet. The causes of climate change. Washington, DC: NASA, [date unknown]. Available at <https://climate.nasa.gov/causes> [Accessed 21 June 2022].
9. Intergovernmental Panel on Climate Change. Climate change 2021: The physical science basis summary for policymakers.

- Geneva, CH: IPCC, 2021. Available at www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf [Accessed 10 May 2022].
10. World Health Organization. Climate change and health. Geneva, CH: WHO, 2021. Available at www.who.int/news-room/fact-sheets/detail/climate-change-and-health [Accessed 10 May 2022].
 11. Imperial College London: Grantham Institute – Climate change and the environment. The impact of climate change on mental health and emotional wellbeing: Current evidence and implications. Briefing paper no. 36. London, UK: Grantham Institute, 2021. Available at www.imperial.ac.uk/grantham/publications/all-publications/the-impact-of-climate-change-on-mental-health-and-emotional-wellbeing-current-evidence-and-implications-for-policy-and-practice.php [Accessed 10 May 2022].
 12. Intergovernmental Panel on Climate Change. Climate change 2022: Impacts, adaptation and vulnerability. Summary for policymakers. Geneva, CH: IPCC, 2022. Available at https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_SummaryForPolicymakers.pdf [Accessed 10 May 2022].
 13. Bureau of Meteorology. State of the climate 2020. Canberra, ACT: BOM, 2020. Available at www.bom.gov.au/state-of-the-climate [Accessed 10 May 2022].
 14. Bryant RA, Waters E, Gibbs L, et al. Psychological outcomes following the Victorian Black Saturday bushfires. *Aust N Z J Psychiatry* 2014;48(7):634–43. doi: 10.1177/0004867414534476.
 15. Sanz-Barbero B, Linares C, Vives-Cases C, González JL, López-Ossorio JJ, Díaz J. Heatwave and the risk of intimate partner violence. *Sci Total Environ* 2018;644:413–19. doi: 10.1016/j.scitotenv.2018.06.368.
 16. Beggs PJ, Zhang Y, Bambrick H, et al. The 2019 report of the MJA–Lancet Countdown on health and climate change: A turbulent year with mixed progress. *Med J Aust* 2019;211(11):49–91. e21. doi: 10.5694/mja2.50405.
 17. International Committee of the Red Cross. When rain turns to dust: Understanding and responding to the combined impact of armed conflicts and the climate and environment crisis on people's lives. Geneva, CH: ICRC, 2020. Available at www.icrc.org/sites/default/files/topic/file_plus_list/rain_turns_to_dust_climate_change_conflict.pdf [Accessed 10 May 2022].
 18. Clayton S. Climate anxiety: Psychological responses to climate change. *J Anxiety Disord* 2020;74:102263. doi: 10.1016/j.janxdis.2020.102263.
 19. Hickman C, Marks E, Pihkala P, et al. Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. *Lancet Planet Health* 2021;5(12):e863–73. doi: 10.1016/S2542-5196(21)00278-3.
 20. The Royal Australian & New Zealand College of Psychiatrists. The mental health impacts of climate change. Melbourne, Vic: RANZCP, 2021. Available at www.ranzcp.org/news-policy/policy-and-advocacy/position-statements/the-mental-health-impacts-of-climate-change [Accessed 10 May 2022].
 21. Cunsolo A, Harper SL, Minor K, Hayes K, Williams KG, Howard C. Ecological grief and anxiety: The start of a healthy response to climate change? *Lancet Planet Health* 2020;4(7):e261–63. doi: 10.1016/S2542-5196(20)30144-3.
 22. Hayes K, Blashki G, Wiseman J, Burke S, Reifels L. Climate change and mental health: Risks, impacts and priority. *Int J Ment Health Syst* 2018;12:28. doi: 10.1186/s13033-018-0210-6.
 23. Johnstone C. Is the climate crisis affecting your mental health? *Ecohostler*. 10 October 2019. Available at <https://ecohustler.com/culture/is-the-climate-crisis-affecting-your-mental-health> [Accessed 10 May 2022].
 24. The Royal Children's Hospital Melbourne. Clinical practice guidelines: Mental state examination. Melbourne, Vic: RCH, 2018. Available at www.rch.org.au/clinicalguide/guideline_index/Mental_state_examination [Accessed 10 May 2022].
 25. Gordon M, Melvin G. Risk assessment and initial management of suicidal adolescents. *Aust Fam Physician* 2014;43(6):367–72.
 26. Beyond Blue. Beyond now – Suicide safety planning. Hawthorn, Vic: Beyond Blue, [date unknown]. Available at www.beyondblue.org.au/get-support/beyondnow-suicide-safety-planning?gclid=CjwKCAjw9e6SBhB2EiwA5myr9qAM4F3GO5JxBeJ40zy2Q3S7C4wOEJk1bCbJKowFyn9gzntUnUn8tRoCt3sQAvD_BwE [Accessed 10 May 2022].
 27. Australian Medical Association. Climate change is a health emergency. Media release. 3 September 2019. Available at www.ama.com.au/media/climate-change-health-emergency [Accessed 10 May 2022].
 28. Hendrie D. Climate change is a health emergency. *newsGP*. 19 December 2021. Available at www1.racgp.org.au/newsgp/racgp/climate-change-is-a-health-emergency-racgp-declare [Accessed 10 May 2022].
 29. Dooley L, Sheats J, Hamilton O, Chapman D, Karlin B. Climate change and youth mental health. Venice, CA: See Change Institute, 2021. Available at <https://seechangeinstitute.com/wp-content/uploads/2022/03/Climate-Change-and-Youth-Mental-Health-Report.pdf> [Accessed 10 May 2022].
 30. Ojala M. How do children cope with global climate change? Coping strategies, engagement and well-being. *J Environ Psychol* 2012;32(3):225–33. doi: 10.1016/j.jenvp.2012.02.004.
 31. Australian Psychological Society. ACTIVATE – 8 Psychological strategies from psychology to tackle climate change. Melbourne, Vic: APS, 2016. Available at <https://psychology.org.au/getmedia/b2304d9c-64d4-40a6-b063-3014128ec740/activate-climate-change.pdf> [Accessed 10 May 2022].
 32. Project Drawdown. Health and education. San Francisco, CA: Project Drawdown, [date unknown]. Available at www.drawdown.org/solutions/health-and-education [Accessed 10 May 2022].

CASE**5****AI has abnormal pathology results**

AI, aged 65 years, is a man from Kiribati who presents for review of his pathology results. He is well known to you for presentations with knee osteoarthritis, and you have had several brief discussions over the years regarding his weight, which has continued to increase. AI had an elevated fasting glucose test result four months ago, so you asked him to repeat some fasting blood tests, with additional testing (Table 1). He is a non-smoker and non-drinker with no other substance issues.

Question 1 

What do AI's test results show (Table 1)? What further history would you take?

Further information

AI is a recently retired primary school teacher. He was born in Kiribati and moved to Australia with his young family. He returned regularly to Kiribati until the COVID-19 pandemic; he is now feeling down and misses his extended family. He is also worried as Kiribati is one of the most vulnerable countries to the effects of climate change and rising sea levels (Kiribati is a collection of coral atolls 2 m above sea level).

AI's pain from knee osteoarthritis means he drives everywhere. He has also been buying less fresh fruit and vegetables as the cost has gone up. He acknowledges he could ride his bicycle and be more active in the vegetable garden. His brother in Kiribati is diabetic but has no complications; he has been eating more vegetables and going for a daily swim. Both brothers are motivated as their cousin has developed chronic renal failure secondary to his diabetes.

AI lives at home with his wife, one of his three adult children and two grandchildren. He states his children and grandchildren are very important to him, as is staying healthy and independent, and caring for the planet is important to him for himself and for his family.

Table 1. AI's pathology results

Test	Result in March	Result in July
Sodium (reference range 135–145 mmol/L)	135 mmol/L	137 mmol/L
Potassium (reference range 3.5–5.4 mmol/L)	3.7 mmol/L	4.3 mmol/L
Creatinine (reference range 45–90 µmol/L)	60 µmol/L	65 µmol/L
Estimated glomerular filtration rate (reference range >90 mL/min/1.73m ²)	90 mL/min/1.73m ²	79 mL/min/1.73m ²
Urate (reference range 0.14–0.36 mmol/L)		0.41 mmol/L
Fasting glucose (reference range 3.6–6 mmol/L)	7.1 mmol/L	7.3 mmol/L
Bilirubin (reference range <15 µmol/L)	12 µmol/L	11 µmol/L
Aspartate transaminase (reference range <35 U/L)	27 U/L	28 U/L
Alanine transaminase (reference range <30 U/L)	31 U/L	33 U/L
Gamma-glutamyl transferase (reference range <35 U/L)	38 U/L	42 U/L
Glycated haemoglobin (reference range <48 mmol/mol or <6.5%)		51 mmol/mol (6.8%)
Total cholesterol (TC) – fasting (reference range <5.6 mmol/L)		7.6 mmol/L
Triglycerides (reference range <2.1 mmol/L)		3.1 mmol/L
High-density lipoprotein (HDL; reference range >1.09 mmol/L)		1.44 mmol/L
TC/HDL ratio (reference range <4.5)		5.3
Low-density lipoprotein (reference range <4.1 mmol/L)		4.7 mmol/L
Non-HDL (reference range <3.81 mmol/L)		6.16 mmol/L
Urine albumin mg/L (reference range <30 mg/L)		21.6 mg/L
Urine creatinine mmol/L (reference range required 2–32 mmol/L)		9.9 mmol/L
Albumin:creatinine ratio (reference range <2.5)		2.2

You undertake a physical examination of AI. Your examination findings are:

- height 179 cm
- weight 128 kg
- body mass index 40.1 kg/m²
- waist circumference 120 cm
- blood pressure 145/94 mmHg
- visual acuity normal, normal sensation testing with feet, easily palpable pulses, acanthosis nigricans
- urinalysis – glucose only.

Your impression is that AI has metabolic syndrome and type 2 diabetes with no current complications.

Question 2 📖

What would be your initial approach to management for AI?

Further information

Given the concern AI has raised about climate change, you consider the bidirectional interaction between climate change and type 2 diabetes burden (Figure 1).¹ This is one example of the importance of planetary health to the population and the individual.

Question 3 🌍🗣️

Given AI's concerns about climate change, how might knowledge of the carbon and environmental footprint of potential treatment interventions influence your plan?

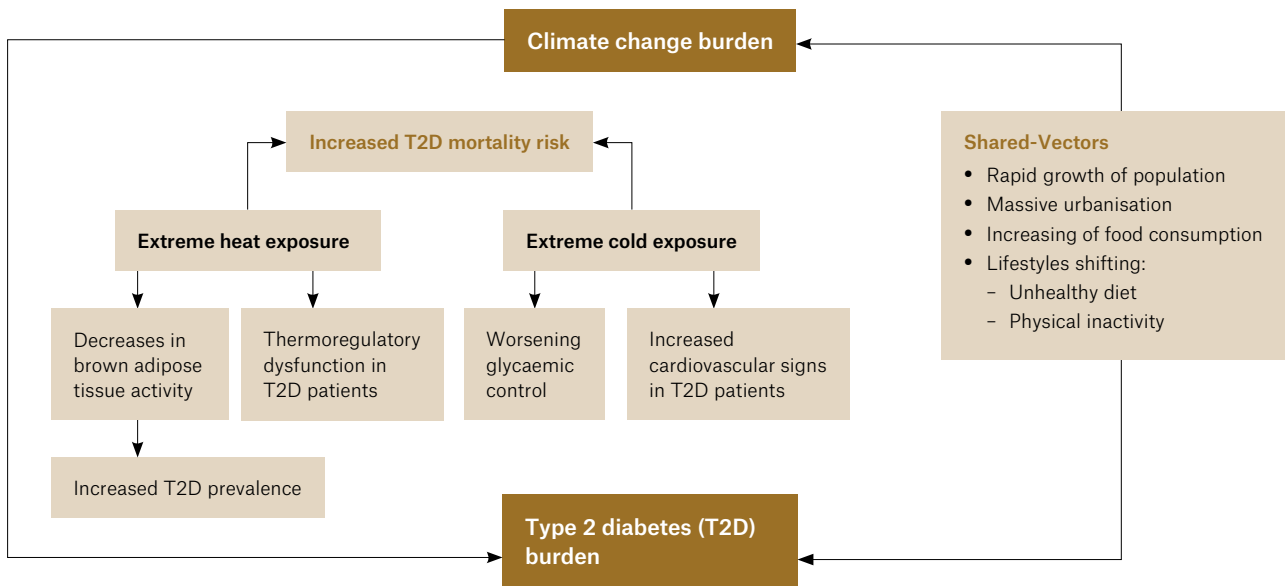


Figure 1. Illustration of the bidirectional impacts of climate change burden, type 2 diabetes burden and mortality

Adapted from Yudhani RD, Sholikhah EN, Nugrahaningsih DAA, Pramaningtyas W, The bidirectional interaction between climate change and type 2 diabetes burden, IOP Conf Ser: Earth Environ Sci 2022;1016:012054, doi: 10.1088/1755-1315/1016/1/012054; licensed under the CC BY 3.0 license (<https://creativecommons.org/licenses/by/3.0>)

Question 4 

What are the barriers to good health outcomes for AI? What factors would you consider? Are there barriers for healthcare practitioners to achieving this?

Further information

As well as concerns regarding his health, AI as made very clear his concerns regarding the health of the planet, particularly the impacts of climate and sea level on Kiribati and the future of his family. As a general practitioner (GP), you are aware of the health impacts of climate change.

Question 5 

What do you see as the role of climate advocacy in general practice?

Further information

In collaboration with AI, you decide to commence a lifestyle approach that minimises the effect on the planet while meeting all treatment goals. You decide to review AI’s progress in three months.

Question 6  

What would your plan entail?

CASE 5 Answers

Answer 1

AI’s results are consistent with type 2 diabetes, with hypercholesterolaemia, elevated urate and mild elevation of liver function testing. His results are consistent with a common presentation of metabolic syndrome.

On further history, it would be recommended to ask about symptoms and factors that will affect management, using a biopsychosocial approach. This would include lifestyle and social needs/determinants:

- symptoms of diabetes – including recurrent infections, thirst, weight change, visual changes, frequent urination
- symptoms of complications and systems review – including vision, burning in feet, erectile dysfunction
- understanding of what diabetes is and what this means to him
- what his biggest concerns are, as well as beliefs regarding diabetes
- what he eats and drinks, when he does this, why he does this, who prepares/buys the food
- physical activity he enjoys; consider factors that limit and encourage this
- smoking, alcohol and other substances
- family history of diabetes and any impact this has had on their health (blindness, amputations, acute myocardial infarction, trigger of change in lifestyle, etc)
- who he would like to include in his health journey, and what will support him
- what he sees as the biggest barriers.

Answer 2

Management for AI might involve a combination of lifestyle and pharmaceutical approaches, including addressing the social determinants of health.

Lifestyle

- Nutrition
- Movement
- Psychological support – looking at chronic stress/mental wellbeing practices, connection to family/friends/community, social isolation, culture and identity
- Interdisciplinary approach as required (eg cultural health worker, practice nurse, diabetes educator, dietitian, exercise physiologist, health coach, family, social worker)

Pharmaceutical

- Metformin
- Statin
- Angiotensin converting enzyme inhibitor/angiotensin receptor blockers
- Discussion of the risks of nonsteroidal anti-inflammatory drug use for knee osteoarthritis given they are available over the counter. These include peptic ulcer disease, renal failure and stroke/myocardial infarction.

Address social determinants

- Involvement of social worker
- Encouragement of consideration of eligibility for concession card
- Safety nets, such as family, financial counsellor
- Assessment of health literacy

Answer 3

It is important to remember that the goals of AI's health and reducing complications of diabetes are compatible with low-carbon healthcare.²

Healthcare contributes approximately 7% of Australia's carbon emissions; the breakdown of this 7% is as follows: hospitals are responsible for 44%, pharmaceuticals 19%, community and public health 6% and general practice 4%.³ There has been modelling into the carbon footprint of primary care practices.⁴

The suggested way forward for sustainable healthcare⁵ is by:

- reducing the need for healthcare by optimising health – prevention of disease, minimising deterioration of medical conditions (ie avoiding hospitalisations), curing or reversing disease
- matching the healthcare services with demand – avoiding the use of low-value care (ie ordering tests that are not required)⁶
- considering deprescribing/home medicines review or alternative options to prescribe, as pharmaceutical prescriptions are the largest contributor in general practice⁷
- reducing greenhouse gas emissions by healthcare services – decarbonisation of healthcare delivery.

For AI, the best way forward is remission of type 2 diabetes,⁸ followed by management of diabetes and, finally, prevention of complications. Remission can be obtained through intensive lifestyle changes and will need close support and follow up.⁹

Deterioration of AI's medical conditions could mean more medications, hospitalisations, medical appointments and testing. This could include complications such as chronic renal failure requiring dialysis multiple times a week or vascular disease requiring amputation. This is not only the worst outcome for AI but very carbon intensive. Better health for AI also uses fewer resources, so it is better for the rest of the population and the planet. In discussion with AI, better health includes empowering him to make best lifestyle choices with support and education on nutrition, exercise and mental wellbeing. This can be facilitated with care plans and allied health supports. Clear and structured information should be provided on planned review conducted both face to face and by telehealth (to reduce travel), when and how to do pathology testing (to reduce unnecessary tests), and when and how to take medication (to reduce side effects and improve efficacy). Practitioners can also discuss using My Health Record to reduce duplication of investigations and other services by improving communication between the people in AI's health team.

Answer 4

Patients

- Beliefs
- Values
- Resources – physical/financial/social support
- Previous experiences
- Culture
- Education

Healthcare practitioners

Healthcare practitioners can unconsciously limit the treatment options they offer on the basis of what they think is likely to be successful, and their beliefs about what is successful are based on their education. Large systematic reviews of nutrition teaching and lifestyle medicine in medical schools^{10,11} and speciality training such as cardiology¹² consistently show these are not taught, and hence minimal effective clinical implementation occurs, with rather significant reliance on medication (eg Australian Institute of Health and Welfare and Bettering the Evaluation and Care of Health studies report >85% of clinical presentations end with provision of a script, compared with <8% with lifestyle interventions).¹³

This can involve biases in the assessment of the patient as well as previous experiences with patients and with their own health behaviours. There is evidence that healthcare professionals who are physically active are more likely to recommend physical activity.¹⁴

Health system

Barriers include the cost of access to allied health practitioners and GPs as well as the availability of these services – some areas have long waiting times to be seen, and length of time between appointments can mean potential loss of momentum with behaviour change or delays in recognising and treating complications.¹⁵

The structure of primary healthcare in Australia, with federally funded Medicare Benefits Schedule-supported fee-for-service general practice and allied health and state-funded hospital and community health services, as well as some primary health network services,¹⁶ can increase the complexity of communication regarding the range and availability of services and treatment options and increase the chance of duplication of services and treatments that have been offered.

Social determinants of health

As well as the health services that are available nearby, location has an impact on the cost of and access to healthy food, access to culturally appropriate services, access to green space and opportunities for active transport among many other factors. For more information, please refer to the Australian Institute of

Health and Welfare website (www.aihw.gov.au/reports/australias-health/social-determinants-of-health).

Answer 5

In December 2019, The Royal Australian College of General Practitioners (RACGP) joined other medical colleagues in declaring that climate change is a health emergency.¹⁷ GPs have key roles in identifying, reducing and managing adverse health effects of climate change for their patients and communities.

Intrinsically, climate change is an issue of health equity and of justice, amplifying health inequities. Populations at greatest risk are typically those who contribute least to the problem and include children, the elderly, low-income and other marginalised communities, people experiencing homelessness or disability and people with chronic disease. Indigenous peoples worldwide are disproportionately affected.¹⁸ In Australia, climate change will widen the already existing health gap between Aboriginal and Torres Strait Islander people and non-Indigenous Australians.

Health professionals have long been involved in leadership and advocacy outside of the consultation room. Embedded in the community, health professionals understand that individual and collective health is largely a product of social

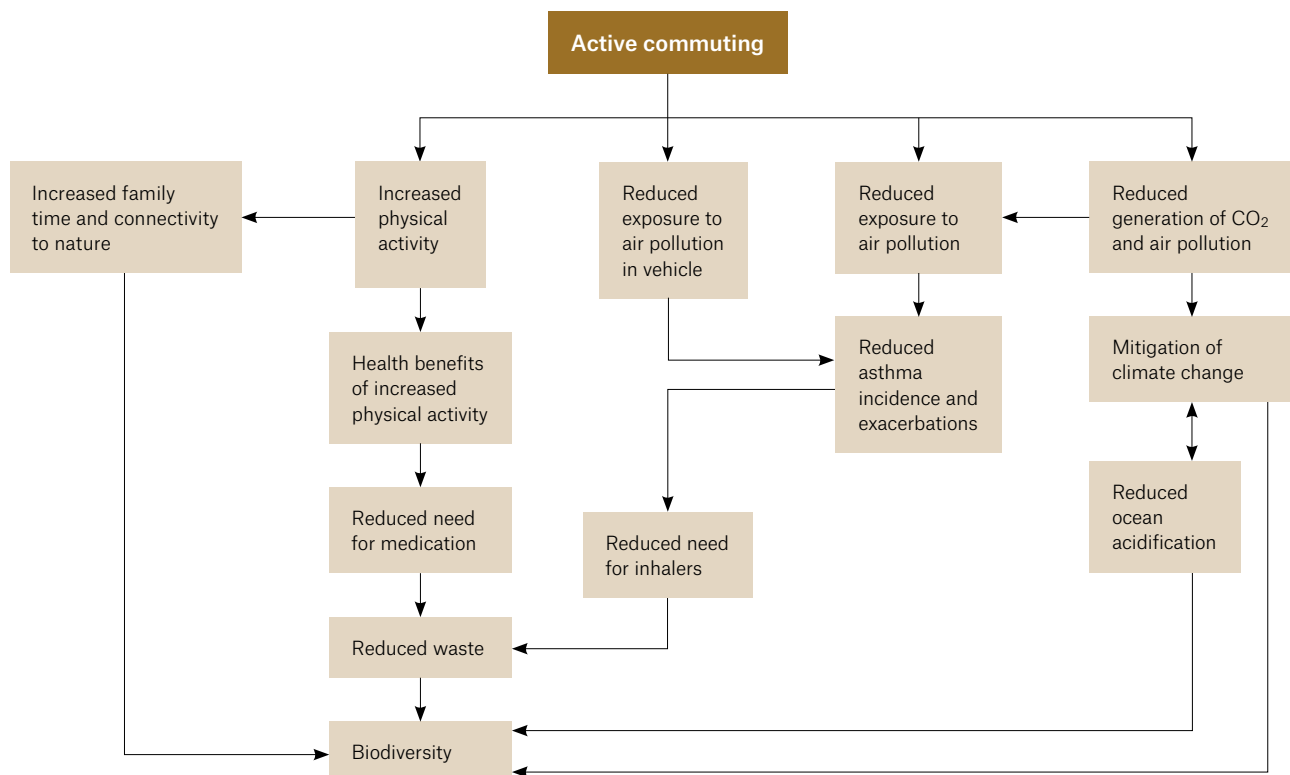


Figure 2. Flow chart of the climate and health benefits of active commuting

Adapted from Georgie Sowman, licensed under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

and environmental determinants. GPs are in a position to educate their patients on 'co-benefits' of low-carbon treatments options (eg lifestyle intervention to reverse type 2 diabetes), which negate the carbon and environmental cost of pharmaceuticals, regular pathology tests and hospital admissions while improving quality of life by restoring health through nutrition, physical activity and social connection. GPs can also advocate in their workplace and local community, educating on climate health impacts, leading or being involved in the greening of health services, and being part of low-carbon models of care, such as lifestyle medicine initiatives.¹⁹

Joining groups such as the RACGP Specific Interests Climate and Environment Medicine, Doctors for the Environment Australia, the Australasian Society of Lifestyle Medicine, the Climate and Health Alliance and the global Planetary Health Alliance allows GPs to be part of a greater movement of health professionals who are advocating for urgent climate action to protect human health through needed policy and structural change.²⁰

In the case of AI, discussing 'co-benefits' of lifestyle intervention as the primary treatment for his reversible chronic disease and the benefits to him personally, as well as his local and global community, is appropriate and should be considered part of his immediate management (Figure 2).

Answer 6

The lifestyle approach would cover the following factors.

- Nutrition – the best plan is one that the patient can follow that meets their nutritional needs, improving diabetes control and health. This may include moving towards a wholefood plant-rich diet with cultural adaptation (eg Mediterranean, Nordic). There is much information on the health and climate impacts of diet in the *EAT-Lancet* Commission Summary Report.²¹ More intensive medical nutrition therapies (MNT) may be required.⁹ The term MNT is used to differentiate meal replacement and very low-calorie diet supplements that are medically evaluated to be nutritionally replete from those that are not.

Individuals can best achieve improvements in their health and reduction in their carbon footprint by:

- reducing consumption of ultra-processed foods^{22,23}
 - eating more vegetables – including a variety of types and colours²⁴
 - being aware of the quantity, quality and origin of the protein they consume. There are conflicting studies, particularly regarding the health/planet effects of animal products, so it is hard to control for processed food when compared with whole foods. It also depends on where individuals live in the world, as there may be local and cultural flexibility (eg regenerative agriculture). Most information recommends a reduction of processed meat and reduced consumption of red meat.²³
- Movement – Australia's physical activity and sedentary behaviour guidelines for adults recommend 2.5–5 hours per week of moderate physical activity or 1.25–2.5 hours

per week of vigorous physical activity and reducing sedentary behaviour.²⁵

- More intensive and tailored physical activity and movement plans can be provided, which may include riding, walking, gardening and movement in nature. It is useful to explore ways to make this consistent with values. Involvement of an exercise physiologist can help to achieve these goals.
- Stress management/mental health – this includes psychologists, peers, community groups, health coaches, mindfulness, meditation, breathwork, positive psychology practices, connection with the natural world. These can be culturally adapted.
- Social connection – linking with family in Kiribati, community groups, and small group appointments.
- Sleep – screen for obstructive sleep apnoea, sleep duration, frequency of waking, energy on waking.

Conclusion

AI makes a telehealth appointment with an accredited practicing dietitian with a particular interest in reversal of diabetes and wholefoods. He is planning to reduce his red meat intake, increase his vegetable intake, and reduce his processed food intake by learning how to prepare and cook, and reduce food waste using wholefoods for himself and his family.

AI decides that he will walk his grandchildren to and from school most days and ride to the fruit and vegetable shop, as well as start preparing ground for a vegetable garden. This will increase his movement as well as reducing his use of fossil fuels, while doing activities he does anyway. Once he can do this, he would like to start doing a body weight exercise program, as he would love to get fit enough that the family can manage with one car.

AI catches up with his brother on Skype and they motivate each other in their healthcare and climate goals.

You follow up with AI in three months' time. He has eaten his first home grown lettuce and cherry tomatoes; his portions are much smaller, and he has removed most processed food from his diet. His walking has become faster as he has become fitter, and his knee pain is improving. He has lost 8 kg with the changes so far in his life, and his glycated haemoglobin (HbA1c) today is 6.3%. He would like more help with not overeating, and you organise a referral to a health psychologist, and make an appointment for a review in three months with repeat HbA1c testing. He has recalculated his personal carbon footprint and is pleased that it has fallen since he started to drive less and changed his diet.

Resources for doctors

- The Royal Australian College of General Practitioners' Specific Interests Climate and Environmental Medicine – Ph: 1800 090 588; email: gpsi@racgp.org.au
- Doctors for the Environment Australia – National sustainable healthcare unit proposal, www.dea.org.au/national-sustainable-healthcare-unit-proposal

- Doctors for the Environment Australia – Fact sheet, www.dea.org.au/food-for-healthy-people-healthy-planet-fact-sheet
- Doctors for the Environment Australia – Nutrition webinar, www.dea.org.au/after-hours-webinar-series
- Australasian Society of Lifestyle Medicine – The evidence for lifestyle medicine, www.lifestylemedicine.org.au/content/the-evidence-for-change
- Australasian Society of Lifestyle Medicine – Explanation on lifestyle medicine and planetary health aimed at medical and health students, www.lifestylemedicine.org.au/content/an-introduction-to-lifestyle-medicine-and-planetary-health
- Doctors for Nutrition – Type 2 diabetes, www.doctorsfornutrition.org/type-2-diabetes
- Diet Doctor – Six ways to stay environmentally friendly on a low-carb or keto diet, www.dietdoctor.com/low-carb/six-ways-to-help-the-environment
- Climate and Health Alliance, www.caha.org.au
- Planetary Health Alliance, www.planetaryhealthalliance.org/planetary-health
- Carbon footprint calculator, <https://carbonpositiveaustralia.org.au/calculate>

References

1. Yudhani RD, Sholikhah EN, Nugrahaningsih DAA, Primaningtyas W. The bidirectional interaction between climate change and type 2 diabetes burden. *IOP Conf Ser: Earth Environ Sci* 2022;1016:012054. doi: 10.1088/1755-1315/1016/1/012054.
2. Fordham R, Dhataria K, Stancliffe R, et al. Effective diabetes complication management is a step toward a carbon-efficient planet: An economic modeling study. *BMJ Open Diabetes Res Care* 2020;8(1):e001017. doi: 10.1136/bmjdr-2019-001017.
3. Malik A, Lenzen M, McAlister S, McGain F. The carbon footprint of Australian health care. *Lancet Planet Health* 2018;2(1):e27–35. doi: 10.1016/S2542-5196(17)30180-8.
4. Nicolet J, Mueller Y, Paruta P, Boucher J, Senn N. What is the carbon footprint of primary care practices? A retrospective life-cycle analysis in Switzerland. *Environ Health* 2022;21(1):3. doi: 10.1186/s12940-021-00814-y.
5. MacNeill AJ, McGain F, Sherman JD. Planetary health care: A framework for sustainable health systems. *Lancet Planet Health* 2021;5(2):e66–68. doi: 10.1016/S2542-5196(21)00005-X.
6. Barrat AL, Bell KJ, Charlesworth K, McGain F. High value health care is low carbon health care. *Med J Aust* 2022;216(2):67–68. doi: 10.5694/mja2.51331.
7. Manger S, Sleeman N. Let's get practical: How we can heal the planet and our patients. *InSight*. 15 February 2021. Available at <https://insightplus.mja.com.au/2021/4/lets-get-practical-how-we-can-heal-the-planet-and-our-patients> [Accessed 12 May 2022].
8. Diabetes Australia. Type 2 diabetes remission. Position statement October 2021. Brunswick, Vic: Diabetes Australia, 2021. Available at www.diabetesaustralia.com.au/wp-content/uploads/2021_Diabetes-Australia-Position-Statement_Type-2-diabetes-remission_2.pdf [Accessed 27 March 2022].
9. Lean ME, Leslie WS, Barnes AC, et al. Primary care-led weight management for remission of type 2 diabetes (DiRECT): An open label, cluster-randomised trial. *Lancet* 2018;391(10120):541–51. doi: 10.1016/S0140-6736(17)33102-1.
10. Crowley J, Ball L, Hiddink GJ. Nutrition in medical education: A systematic review. *Lancet Planet Health* 2019;3(9):e379–89. doi: 10.1016/S2542-5196(19)30171-8.
11. Radenokovic D, Aswani R, Ahmad I, Kreindler J, Robinson R. Lifestyle medicine and physical activity knowledge of final year UK medical students. *BMJ Open Sport Exerc Med* 2019;5(1):e000518. doi: 10.1136/bmjsem-2019-000518.
12. Devries S, Agatson A, Aggarwal M, et al. A deficiency of nutrition education and practice in cardiology. *Am J Med* 2017;130(11):1298–305. doi: 10.1016/j.amjmed.2017.04.043.
13. Britt H, Miller GC, Henderson J, et al. General practice activity in Australia 2015–16. General practice series no 40. Sydney, NSW: Sydney University Press, 2015.
14. Lobe F, de Quevedo IG. The evidence in support of physicians and health care providers as physical activity role models. *Am J Lifestyle Med* 2016;10(1):36–52. doi: 10.1177/1559827613520120.
15. Jin J, Sklar GE, Min Sen Oh V, Chuen Li S. Factors affecting therapeutic compliance: A review from the patient's perspective. *Ther Clin Risk Manag* 2008;4(1):269–86. doi: 10.2147/tcrm.s1458.
16. Wiese M, Jolley G, Baum F, Freeman T, Kidd M. Australia's systems of primary healthcare: The need for improved coordination and implications for Medicare Locals. *Aust Fam Physician* 2011;40(12):995–99.
17. Hendrie D. Climate change is a health emergency, RACGP declares. *newsGP*. 19 December 2019. Available at www1.racgp.org.au/newsgp/racgp/climate-change-is-a-health-emergency-racgp-declare#:~:text=The%20college%20has%20joined%20other,and%20consequences%20of%20climate%20change [Accessed 18 June 2022].
18. US Department of Health and Human Services. Climate change and health equity. Washington, DC: US Department of Health and Human Services, 2022. Available at hhs.gov/climate-change-health-equity-environmental-justice/climate-change-health-equity/index.html#:~:text=Climate%20change%20poses%20current%20and,creating%20new%20public%20health%20challenges [Accessed 18 June 2022].
19. Pathak N, McKinney A. Planetary health, climate change, and lifestyle medicine: Threats and opportunities. *Am J Lifestyle Med* 2021;15(5):541–52. doi: 10.1177/15598276211008127.
20. Lee HR, Pagano I, Borth A, et al. Health professional's willingness to advocate for strengthening global commitments to the Paris climate agreement: Findings from a multi-nation survey. *J Clim Chang Health* 2021;2. doi: 10.1016/j.joclim.2021.100016.
21. Soil Association. Ultra-processed planet. The impact of ultra-processed diets on climate, nature and health and what to do about it. Bristol, UK: Soil Association, 2020. Available at www.soilassociation.org/media/23032/ultra-processed-planet-final.pdf [Accessed 5 February 2022].
22. EAT-Lancet Commission. Food Planet Health: Healthy diets from sustainable food systems. Summary Report. Oslo, NO: EAT, 2019. Available at https://eatforum.org/content/uploads/2019/01/EAT-Lancet_Commission_Summary_Report.pdf [Accessed 22 June 2022].
23. Willet W, Rockström J, Loken B, et al. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *Lancet* 2019;393(10170):447–92. doi: 10.1016/S0140-6736(18)31788-4.
24. National Health and Medical Research Council. Australian dietary guidelines. Canberra, ACT: NHMRC, 2013.
25. Australian Government Department of Health. Physical activity and exercise guidelines for adults (18 to 64 years). Canberra, ACT: DoH, 2021. Available at www.health.gov.au/health-topics/physical-activity-and-exercise/physical-activity-and-exercise-guidelines-for-all-australians/for-adults-18-to-64-years [Accessed 6 April 2022].

ACTIVITY ID 354353**Planetary health**

This unit of *check* is approved for six CPD Activity points in the RACGP CPD Program. The expected time to complete this activity is three hours and consists of:

- reading and completing the questions for each case study
 - you can do this on hard copy or by logging on to the RACGP website (www.racgp.org.au), clicking on the My Account button and selecting the *gplearning* link from the drop-down
- answering the following multiple choice questions (MCQs) by logging on to the RACGP website (www.racgp.org.au), clicking on the My Account button and selecting the *gplearning* link from the drop-down
 - you must score $\geq 80\%$ before you can mark the activity as 'Complete'
- completing the online evaluation form.

You can only qualify for CPD points by completing the MCQs online; we cannot process hard copy answers.

If you have any technical issues accessing this activity online, please contact the *gplearning* helpdesk on 1800 284 789.

If you are not an RACGP member and would like to access the *check* program, please contact the *gplearning* helpdesk on 1800 284 789 to purchase access to the program.

Case 1 – Jim

Jim, aged 19 years, is an Aboriginal man who presents to your rural clinic with a four-day history of fevers and myalgias. On examination, his temperature is 38.1°C, heart rate is 90 beats per minute, blood pressure is 119/77 mmHg and Glasgow Coma Scale (GCS) score is 15. You note multiple mosquito bites on his arms. Considering recent flooding in the area, you include Japanese encephalitis as a differential diagnosis.

Question 1

Which one of the following is the incubation period of Japanese encephalitis virus?

- A. 1–2 days
- B. 5–15 days
- C. 21–28 days
- D. 2–3 months

Question 2

Which one of the following is the most appropriate diagnostic test for Japanese encephalitis?

- A. Acute and convalescent serum serology testing for Japanese encephalitis (2–4 weeks apart)

- B. Nasopharyngeal polymerase chain reaction (PCR) testing for Japanese encephalitis
- C. Full blood examination with blood film
- D. Magnetic resonance imaging (MRI) of the brain

Question 3

Japanese encephalitis vaccination is recommended for which one of the following populations?

- A. Veterinarians
- B. Laboratory workers
- C. Farmers working at piggeries
- D. People travelling to Japan

Case 2 – Omar

Omar, aged 46 years, is an environmental scientist who presents for a heart health assessment. He has no past or family history of cardiovascular disease. On examination, he weighs 98 kg and is 170 cm tall (body mass index 30 kg/m²), with a waist circumference of 102 cm. His blood pressure is 139/89 mmHg, and heart rate is 90 beats per minute and regular. Omar's lipid profile demonstrates a total cholesterol (TC) of 6.0 mmol/L, high-density lipoprotein (HDL) of 1.44 mmol/L, low-density lipoprotein of 3.8 mmol/L and triglycerides of 3.0 mmol/L, with a TC/HDL ratio of 4.2. His glycated haemoglobin (HbA1c) is 6.1%. His overall cardiovascular disease risk score is 4%.

Question 4

Which one of the following is an appropriate intervention with co-benefits that could be recommended to Omar at this time?

- A. Start statin and ezetimibe combination therapy
- B. Routine lipid profile every six months
- C. Order genetic testing for familial hypercholesterolaemia
- D. Encourage a whole-food, plant-based diet

Further information

You also recommend Omar increases movement to most days.

Question 5

Which one of the following is the duration of physical exercise Omar should aim to achieve per week?

- A. 2.5–5 hours of moderate physical activity
- B. 1.25–2.5 hours of vigorous activity
- C. Both A and B
- D. A or B

Case 3 – Damian

Damian, aged 18 years, presents with increased feelings of sadness and anger. He is concerned about global warming and feels overwhelmed by the enormity of the problem and the inadequacy of the global response. Last summer bushfires burned in the hills behind his home, and some of his friends lost their homes in the fire. This year his family has been affected by

major flooding and were cut off from support services for several days while waiting for flood waters to recede.

Since the floods, Damian's anxiety and feelings of hopelessness have increased, and he has stopped going out with friends and has been missing work.

Question 6

Which one of the following is **true** in relation to the mental health impacts of climate change?

- A. Climate anxiety is the most significant mental health impact of climate change.
- B. Exposure to heat has been shown to increase interpersonal violence, self-harm and suicide in some populations.
- C. Indirect mental health effects of climate change are generally mild and self-limiting.
- D. Climate anxiety is generally a sign of an underlying mental illness.

Further information

You go through a complete mental health assessment with Damian. He has no history of mental illness, and he shows no indications of suicidality. You reassure him that his feelings are rational responses to a real threat and discuss ways to help him cope with his emotions.

Question 7

In describing various coping strategies, which one of the following is **true**?

- A. Emotion-focused coping could include distraction and denial of feelings about climate change in an effort to reduce their emotional impact.
- B. Reflecting on historical examples of communities working together to collectively overcome a significant challenge is an example of meaning-focused coping.
- C. Meaning-focused coping is the only effective coping strategy to address climate-related distress.
- D. Problem-focused coping is best utilised at an individual level, where the person seeks to minimise their own environmental impact.

Further information

Damian is also concerned about the likelihood of developing heat-related illness because of extended periods of hot weather. You consider the stages of heat illness severity.

Question 8

Which one of the following signs would indicate a diagnosis of heat stroke rather than heat stress or exhaustion?

- A. Hypertension
- B. Heat rash
- C. Core temperature >40°C
- D. Sweat rate decreased

Case 4 – Jelena

Jelena, aged 22 years, comes to see you reporting intermittent shortness of breath, cough and a feeling of tightness when she exhales. This previously happened when she caught a cold, but in recent months she feels it often, including after exercising in cold air, but also most nights for no apparent reason. She has obtained salbutamol over the counter at a pharmacy, which seems to help. She has been taking this on waking every morning for approximately the past six weeks. Her symptoms are stable of late, with no recent escalation and no symptoms suggesting an acute respiratory infection.

Question 9

Regarding the diagnosis of asthma, which one of the following is **true**?

- A. Spirometry is absolutely contraindicated during the COVID-19 pandemic.
- B. Spirometric features suggestive of asthma include decreased forced expiratory volume in one second (FEV1)/forced vital capacity (FVC) and increase in FEV1 after bronchodilation.
- C. Jelena's apparently typical symptoms and feeling of relief after salbutamol rule asthma in, so spirometry is unnecessary.
- D. Jelena's feeling of tightness on exhalation is unusual for asthma, as people with asthma usually struggle with inhalation.

Further information

Lung function tests confirm asthma. Jelena clearly has poor asthma control on salbutamol alone. You consider changing her treatment.

You mention to Jelena some of what you have recently learned about asthma and the environment. She is keenly interested, as she is studying environmental science at university.

Question 10

Regarding asthma and the environment, which one of the following statements is **true**?

- A. Dry powder inhalers are potentially less polluting but are best avoided because their use is associated with substantially worse asthma control in adults.
- B. Pressurised metered-dose inhalers contain propellants twice as potent as greenhouse gas when compared with carbon dioxide.
- C. Climate change is expected to reduce asthma prevalence and severity due to a reduction in severity and length of pollen seasons and of cold, damp weather.
- D. Burning of petrochemical fuels in cars, coal in power stations, and gas and wood in homes increases asthma prevalence and instability, and therefore also the use of potentially polluting inhalers.

check

Independent learning program for GPs