



Climate Health WA Inquiry

Inquiry into the impacts of climate change on health in Western Australia

**Inquiry Lead:
Dr Tarun Weeramanthri**

Witnesses:

**Professor Graham Hall
Deputy Director, Telethon Kids Institute**

**Dr Mitch Hartman
Executive Officer, Strategic Initiatives, Telethon Kids Institute**

Thursday, 17 October 2019, 1.00 pm

HEARING COMMENCED

5 PROF WEERAMANTHRI: Professor Hall, Dr Hartman, I'd like to thank you both for your interest in the Inquiry and for your appearance at today's hearing. The purpose of this hearing is to assist me in gathering evidence for the Climate Health WA Inquiry into the impacts of climate change on health in Western Australia. My name is Tarun Weeramanthri and I've been appointed by the Chief Health Officer to undertake the Inquiry. Beside me is 10 Dr Sarah Joyce, the Inquiry's Project Director. If everyone could please be aware that the use of mobile phones and other recording devices is not permitted in this room, so please make sure that your phone is on silent or switched off.

15 This hearing is a formal procedure convened under section 231 of the *Public Health Act 2016*. While you are not being asked to give your evidence under oath or affirmation, it is important you understand that there are penalties under the Act for knowingly providing a response or information that is false or misleading. This is a public hearing and a transcript of your evidence will be 20 made for the public record. If you wish to make a confidential statement during today's proceedings, you should request that that part of your evidence be taken in private. You have previously been provided with the Inquiry's terms of reference and information on giving evidence to the Inquiry. Before we begin, do you have any questions about today's hearing?

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PROF HALL: No.

DR HARTMAN: No.

30 PROF WEERAMANTHRI: For the transcript, could I ask each of you to state your name and there capacity in which you are here today, and when you do speak through the hearing, if you could briefly state your name just so that the person transcribing knows who's speaking.

35 PROF HALL: My name is Professor Graham Hall, I'm the Deputy Director of Telethon Kids Institute.

DR HARTMAN: Dr Mitch Hartman, Executive Officer, Strategic Initiatives, Telethon Kids Institute.

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PROF WEERAMANTHRI: Professor Hall, would you like to make a brief opening statement?

PROF HALL: No, thank you.

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PROF WEERAMANTHRI: Okay, thank you. So thank you for your very thoughtful and comprehensive written submission. I would like to first focus on a number of areas that may not be covered by other witnesses. Firstly, if you look at the overall impact of climate change on health, what is 50 the relative impact on children compared to adults?

PROF HALL: So I think one of the major issues in terms of the impact of climate change specifically on health in children compared to adults is the magnitude of that impact. So research, for example, has found that children currently suffer approximately 90 per cent of the disease burden associated with climate change. And that usually manifests in two key areas. One is an increased risk of non-communicable diseases, so respiratory diseases, cardiovascular and others, and also an increase in the burden and magnitude of infectious diseases that may be associated with shifts in temperature and other climate patterns that would allow infectious diseases to become more prevalent in a regional area that they're not normally. So they get categorised in terms of impacts relating to weather or climate, that might result from environmental change linked to climate change. So, for example, drying. Or from the consequences associated with economic changes linked to climate change, and they have a cumulative effect, and so the effect on children, who are then cumulatively exposed for a longer period of time to any one individual element, can have a larger impact than, for example, on an adult who has had a shorter cumulative exposure over time.

PROF WEERAMANTHRI: So you talk there about the cumulative exposure. Are there any other specific developmental or physiological reasons that children are vulnerable?

PROF HALL: Yes. So obviously, age and young age is associated with, potentially, the duration of exposure. But a key issue for – and I guess in increasing importance as you go down in age, adolescents, children, young children, and then, of course, is infants, is that their physiological systems, so their heart, their brain, their lungs, their other organs and their immune systems, are still developing. And so anything that that system, as it develops, is being exposed to is going to potentially change that system. So an example would be that we know that if infants and young children are exposed to air pollution of any kind, traffic pollution would be one example, that because of the impact that has both on their immune system and on their respiratory system, they are at increased risk of developing asthma over whatever other risks they may have associated with their own family and genetic risks.

And so you get an interaction between the environment and an individual's own inheritable or family risks. So we know, for example, if your mother has asthma, as a baby you're more likely to have asthma. But if you take those individuals, if someone's at risk of asthma and then they're living next to a major road with lots of traffic pollution, they become at a higher risk. And so each of those systems, respiratory, metabolic, how the body copes with temperature changes, skin, the immune system, and also mental health in terms of how our brains grow and develop, can all be influenced and get potentially pushed away from what normal development might be, or may push individuals above the threshold at which they then develop chronic disease, whereas normally they may remain below that threshold.

PROF WEERAMANTHRI: Thank you. What needs to be done to translate the global figures on impacts of climate change on children to figures that are relevant to children in Western Australia? And how are Aboriginal children likely to be affected? So we're facing this issue as an Inquiry. There are quite a lot of global stats, but we want to particularise, or localise, that to Western Australia.

PROF HALL: Okay. So obviously, one of the advantages and issues we have in Western Australia is that we're a rather large state. We span from Esperance all the way through to tropical north. And that means that people living, and children living, in Western Australia can be exposed to vastly different impacts in terms of climate change. So while the global data provides, I think, direction for how we can be looking at those things, we will need to contextualise those and assess the impact of those, our global knowledge at a local level. We could do that in a number of ways. That could include things like data linkage, spatial epidemiology, which is a mathematical and computer-based approach to looking at, for example, how different symptoms in children are affected by their location. And it's quite a sensitive tool for also tracking things like infectious diseases. And I can elaborate on that later if you like.

So I think there are opportunities we have here in Western Australia. I think we have unique skills in Western Australia to be able to do that. So certainly, that's an element that will, I think, have to be done to provide the local implementation – or the local information will need to implement changes at a local level. So, for example, we could take lessons from Europe, and while that will be very informative, we will need to validate those lessons here in WA to ensure that we then choose the right actions at a local level that will have the biggest impact locally to ensure we get the best effect.

In terms of Aboriginal children, obviously they are already a vulnerable group through a range of well-known reasons, and therefore because they are already quite a vulnerable population, the risks in this population are likely to be higher than in non-Aboriginal children. Inequity, we know that social inequity can magnify effects. And so unfortunately, because Aboriginal children are overrepresented in low socioeconomic populations, and also inequity, that that can increase those effects. That could be from minimal resources to help combat change, inadequate housing, poor access to care, which may be influenced not only by their own social circumstances, but if they're living in regional or remote areas. We know that people living in regional or remote areas have poorer control of disease, if they have disease, because of difficulty accessing care. And one element there, I think, will be to ensure that, as we think about the things that might be implemented at a Western Australian level, that Aboriginal people are intimately involved in the co-design and thinking around how those solutions would have to be applied at a local level to maximise opportunities for success.

PROF WEERAMANTHRI: So climate change impacts magnify the existing impacted inequity, is that - - -

5 PROF HALL: Yes.

PROF WEERAMANTHRI: Is that correct?

PROF HALL: That would be a good summary, yes.

10 PROF WEERAMANTHRI: Thank you. In your submission, a particular part describes the voice of children with intellectual disability, the value they place on their environment, and how that impacts their quality of life. Can you talk to that, please?

15 PROF HALL: Yes. So we have a range of research teams at Telethon Kids Institute who have a specific focus on childhood disability, both physical and intellectual disabilities. And some of those teams did some work which was loosely called Nurture our Nature for children with intellectual disability. And this was the researchers engaging with families of children who had intellectual disabilities on their engagement with nature, with the broader environment and the benefit it had, particularly, on their quality of life. And so, for example, we found that in those children, enjoyment of experiences in the natural environment was important to them as individuals, but also that impacts on that environment and their enjoyment of it had a negative impact on their quality of life.

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35 So if, for example, we have a situation where climate change begins to negatively impact on the local environment, either in a Metropolitan or regional area, such that access is difficult or there is no nature in their local environment, that that will significantly impact on their quality of life. I think it's important to note that nearly 2 per cent of the population have some form of intellectual disability in children, so this is not an isolated issue. There will be a number of children in every school with an intellectual disability. And considering how we can best meet their needs to maximise quality of life is an important element as children, but also their families.

40 PROF WEERAMANTHRI: Would it be true to say that there hasn't been a lot of work done in this area? It struck me as quite novel when I read your written submission. And is there any applicability of the work you've done with children with intellectual disability and their families to other children?

45 PROF HALL: I think it would be safe to say that the benefits that children with intellectual disabilities saw in their local environment, because we had targeted interactions with those children and their families to explore these issues with them, that they would be generally replicated in the broader population. And we see that with other initiatives with, for example, there are a number of primary schools and high schools now

in Western Australia who are reinventing their playground areas to more reflect the natural environment, rather than the steel frame that we may have grown up with, because of the benefits that it has not only for their physical interaction with the environment, but also their mental enjoyment of being in the environment. And we know that if children are – that the benefits of that are significant, not only for their enjoyment at any one particular time, but also their broader quality of life, their mental health, reduces anxiety and depression and other elements. So it can have broad and, I think, big impacts on individuals and their families, not only those children with intellectual disabilities.

PROF WEERAMANTHRI: Thank you. Switching topics, again you mentioned in your submission the value of data linkage, which I know Telethon Kids Institute has a particular expertise in big data, and also the concept of green computing. How are these data initiatives connected to action on climate change?

PROF HALL: So I guess data linkage and big data are perhaps one element of it, and then I might come to the green computing second. So more broadly, data linkage is a method by which the information that is collected in the course of Government doing business with our communities, so whether that's attending the Emergency Department of Perth Children's Hospital, or having your school readiness assessment when you first turn up to school, data linkage allows us to bring all of that data together into a whole across all government jurisdictions, and then to explore how or what might influence that data. So do some children access emergency more than other children? Is that influenced by other factors that are associated with the health of their mother before they were born, or the postcode that they live in, or their school experiences? And it's only when all of those Government data are brought together into one large data set that it has that richness of knowledge.

Obviously, Telethon Kids has a long history in this particular field, as do others in Western Australia. We are, I think, international leaders in this area. One of the benefits with that is it then becomes a very powerful tool for any future recommendations that might come out of this Inquiry, to look at specific questions about impact of environment or other elements of climate change. But then, perhaps more importantly, if new policies or procedures or practices are implemented, to actually then evaluate the impact of those later on, at a population level scale. So that provides Government and community with a really important way of saying, "Well, yes, we have evidence that this element is affecting children's health, or the health of the community", to implement potential changes, but then to look in one, two, three and five years and say, "And how have those practices changed that?" So that's data linkage.

Big data is really, probably, going another step and then collecting all of the information that is available. And broadly, that can include Government data, it can include Federal Government data, it can include things like the Bureau of

Meteorology and how they track climate, as well as digital health and other wearables, the information that we upload willingly or unwillingly to Facebook and other social media. And so all of those can be integrated. And I think in Western Australia, we're quite well-placed in some of those areas. The Health Department and others in Western Australia are part of, for example, a cooperative research collaboration in digital health. There is work within the Government to try to expand that more broadly. But also, we have, for example, at Curtin University, the Cisco Centre of the interconnectedness of everything, for want of a better term. And so there are opportunities to bring in those different sources of data, to answer questions that Government and the community may have, but also to use those sources to evaluate the effectiveness of any interventions that may occur, or just changes that may occur over time as a result of climate change.

15 PROF WEERAMANTHRI: I got a sense from your submission, as well, that there was an efficiency about using already collected data, if you like, multiple times for multiple purposes, rather than just going out and collecting, you know, new data sets all of the time, with researchers just coming along and collecting their own data set, and that there was much less environmental footprint of actually using already-collected data as well as you can possibly use it.

PROF HALL: Yes. Certainly, that's one of the benefits of data linkage and big data, in that there are a number of mechanisms where we can use existing data to answer specific questions. The limitation can be that you can only use the data that you have available. And so if the question requires you to have a certain data set that isn't collected as part of normal practice, for want of a better term, then that remains a limitation in the ability to answer that question. And that may be where we then do need to say, well, we know from the data we already have available, which is there and can be easily accessed and analysed, that A equals B, but we will need to go out and specifically collect information to have a more nuanced understanding of that issue. It allows that, then, to be more targeted.

35 I think one of the other opportunities we have here in Western Australia is the ORIGINS Project, which is a partnership between Telethon Kids and Joondalup Health Campus and the Ramsay Foundation, that is aiming to involve 10,000 women and families over a 10-year study looking at how health in children is impacted by a whole range of things. And that includes families consenting into data linkage, or ability for their data to be used for data linkage, all the way down to families consenting into longitudinal answering of questions, assessment of health of their babies, collection of samples for bio-banking. And so as that develops over time, if there are specific questions relating to climate change and the environment that can be answered in the ORIGINS Project, then we have a very rich data source already there and available to answer. And that goes through from physiology all the way through to mental health of children, but also health and well-being of their families. So it offers a very comprehensive picture in that regard.

PROF WEERAMANTHRI: Do you wish to talk about green computing?

5 PROF HALL: Yes. So green computing, I guess, is perhaps not new in other jurisdictions, but I think is less commonly practiced in Western Australia, at least in my understanding of it. And effectively comes up with a way that the large computing and digital resources that we all now
10 rely on are created and networked in such a way we can actually impact – reduce and minimise the energy that’s required. So we know that, for example, supercomputers require extensive air-conditioning, all sorts of other environmental controls, and they are very energy-intensive. There are now
15 new and emerging ways that they can be minimised, not only through the use of sustainable energy, but through the development of approaches that just minimises their environmental footprint in terms of energy.

The jurisdictions where they have happened allows a sharing of resources and it can really minimise that impact. And, of course, that can happen as
20 individual organisation, at a network of organisations, or at a government level. And the other opportunities to share what are high-end intensive computing and biological platforms across multiple organisations so that you don't have five organisations all owning a particular piece of equipment, but rather you have five organisations sharing a pooled resource, which is then going to be
25 utilised more, have a lower footprint, but also then, coincidentally, allows for increased collaboration between different entities that perhaps may not have happened. So it promotes collaboration and would hopefully mitigate against silos.

30 PROF WEERAMANTHRI: Which is a nice lead into the next question on research and evaluation. And it's about how such research and evaluation on the impacts of climate change and health could be supported, or better supported, in Western Australia. And I'm just picking up on your issue of multiple academic and other institutions working on a common resource such as supercomputing, is that collaborative model applicable in this space?

35 PROF HALL: Definitely. I think Telethon Kids Institute has worked tirelessly over the last five to 10 years to take a very open and collaborative approach to addressing questions that the West Australian community care about in terms of child health and well-being of young people,
40 children and young people. And so I don't think that is any different in, you know, helping and working with government and other relevant organisations to answer questions around the impact of climate change on the health of the West Australian community. Diversity around the table always leads to better outcomes, and that's no different in this particular case.

45 PROF WEERAMANTHRI: Okay. I'm interested in whether Dr Hartman’s got any specific insights into the innovation challenge here.

DR HARTMAN: The innovation challenge is similar across not just climate change, but all industries. Innovation can be seen as a, I guess, a tool to fix a problem. But it's the judicious use of innovative approaches, whether it's big data or data linkage, to actually making sure that we are
5 addressing problems that are important to the community, and are going to be able to affect policy at a whole of government level to deliver a benefit in the whole population, not just people who are interested in the innovation space.

PROF WEERAMANTHRI: You've picked up on this a little already, but why is Western Australia particularly well suited, if it is, to do this kind of
10 work?

DR HARTMAN: I guess the collaborative nature of WA and roles like the Data Innovation Hub based out at Curtin are really bringing
15 people together, not just across health, but all industries, to see the benefits that can be brought, I guess, from the oil and gas industry, that they put a lot of work into data visualisation, data analysis tools, and that's work that we can share as a health organisation, and as a health system more widely, to apply those learnings and tools to the systems that we use. Obviously, oil and gas is
20 very different to health, but the fundamental tools and skills that are used can be applied, with the appropriate assessment and for the right reasons, quite effectively.

PROF WEERAMANTHRI: And is there any, kind of – so you're talking about other sectors there in terms of innovation? And you've also
25 mentioned digital strategies previously. So, obviously, health is actively constructing a digital strategy that is consistent with the, say, Government's way forward on digital strategies for the State. I'm sensing a link between organisations and approaches that use digital tools wisely, and an ability to see
30 some benefits in the environmental space as well. I know that some of the leading environment organisations, such as Princess Alexandra Hospital in Queensland, are also leaders in digital innovation. I'm not quite sure how that works together, but I sense there's some connection there.

PROF HALL: I would guess that – and I think the best
35 examples for some of this are probably out of the UK – but where you have hospitals and health systems that take innovative approaches to how they tackle any one issue, by creating a culture of innovation within that environment, whether that's a single hospital, whether that's a health system or whether that's
40 health at a state-wide level, to use health as an example, creating a culture of innovation, it doesn't then get limited to the one area that commenced that innovation. It actually then spills into every other area. And so organisations that become innovative around how they apply digital health become innovative around how they apply something as simple as patient workflows in
45 an emergency department, or how they manage the community, or how they enrol children, in particular, into clinical trials. And we know, for example, out of the UK, that those hospitals that have the highest number of participants in clinical trials have the best patient outcomes, even in those patients who are not

enrolled in a clinical trial. So a system that's involved in innovation, critical appraisal and thinking and improving becomes a self-learning system, and therefore continually improves, even in areas unrelated to targeted activities.

5 PROF WEERAMANTHRI: Thank you. So this is a specifically
Western Australian Inquiry, and so we've deliberately collected place-based
stories. So we've gone around the regions and want to know the particular
environmental health impacts of climate change in different areas of Western
10 Australia. So what is the importance of place-based analysis and solutions, and
how can the use of spatial tools and spatial epidemiology contribute to an
understanding of place?

PROF HALL: Yes. So I might comment first on the
15 place-based approach, and then I'll let Mitch talk about spatial analysis. So,
children and families live in an environment which can be characterised by
their house, their street, their local suburb, their broader local government area.
And then, of course, you can go broader to that metropolitan, regional, and
rural and remote. And they all differ in a number of ways. There's work at
20 Telethon Kids, UWA and other places, for example, that at a local government
level, how that area is developed and designed can increase things like
walkability, which has a beneficial impact on children's mental health, but also
the incidence of children who are overweight and obese. So they become more
physically active, improves their mental health and well-being, and it reduces
the number of children who become more overweight.

25 So those place-based analysis of looking at walkability, design of suburbs in
the metropolitan area, but in regional areas development of where you might
put parks, playgrounds, but also where you would put open spaces that, you
know, are nature-based, if we reflect on some of the findings and reflections
30 from children with intellectual disabilities, can provide really rich information,
not only for families, potentially, if they're choosing where they might want
to live, but also for local governments and the State as a whole, to design and
develop areas that will promote engagement with the environment, and also the
ability then to mitigate, potentially, changes in the climate that may have on
35 that environment. So it allows a detail of analysis and understanding down to
the community in which people live, how you can mitigate or promote against
some of the impacts that potentially climate change might have.

40 I think Health has an opportunity to be a leader in this space, given that often
the data we collect is around health and well-being. And that's often held by
the Health Department, or the health jurisdictions more broadly, but to then
engage with other government and local government. And federally as well, of
course, opportunities to provide that information to influence other policies and
practice, I think, is important in the context of a state like Western Australia
45 which spans such a large geographical area.

DR HARTMAN: I think picking up from the span that WA
has, the idea of spatial analysis, which is a relatively new field in public health,

which has largely come about from the increased granular data we have on population characteristics, so from things like the census and also health outcomes, the more data we collect, that actually references the level of household, neighbourhood, local government area, or even, let's say, a local health service. It allows us to then link that, in a way, to climatic conditions and using some – there's new methods in statistics, geography, and it's jumping on the big data movement, as well, using computing power to bring those, sort of, three things together to get an understanding of how a geographical variation in both disease, prevalence, climate patterns, and also other local factors can be brought together to create a great future of what might be happening now, but also when future strategies are put in place, so from an evaluation perspective.

This has been an area that we've identified as an institute that we needed to move into and have recruited someone from Oxford who has been Professor Peter Gething, who's been instrumental in assessing the distribution and changes of malaria throughout Africa with the World Health Organisation initiative. So he's bringing his team and expertise to WA to, I guess, continue to work in malaria, but also to look at how we can bring the newer tools, new ideas in geospatial to other areas of paediatric health as well.

PROF WEERAMANTHRI: Thank you, Dr Hartman. First of all, I'm interested in drawing on your expertise in respiratory health. The links between climate change, air pollution, health, for me, they're quite complex. There's lots of different factors. And there's a difference between ongoing levels of air pollution and then the effects you get with episodic fires, whether bush fires or prescribed burns, et cetera. Have you thought about those links? Can you give me a framework to help approach understanding how climate change over here then leads to health impacts over there?

PROF HALL: Yes.

PROF WEERAMANTHRI: I haven't given any advance notice.

PROF HALL: No, no, I'm just ordering it in my head. So if I specifically just restrict myself to talking about the respiratory system and the impact, potentially, on chronic respiratory disease, we know that the lungs start developing almost at the time of conception, that over the first 16 weeks of pregnancy, all of the airways in the lungs are developed, beyond which then the peripheral lung starts to grow, and continues to grow and develop until two or three years of age, in terms of increasing the surface area within the lung that's available to take in oxygen and expel carbon dioxide. So that means that anything that that baby, both during pregnancy but immediately after, is exposed to, will impact on the way that the lungs develop. The easiest example to give is women who might smoke during pregnancy. We know that that reduces how the baby breathes during pregnancy and that changes the way the lungs develop. But also, we know that if you grow up in an environment with very high air pollution, so if a pregnant woman is living in an

environment with very high air pollution, that affects her own body and her own immune system, and that is translated to the environment in which that baby is then growing and developing, which moves that baby's lung development in a trajectory that might not reflect what would be optimal.

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When that baby is then born, if they are then also living in a high pollution environment, then that continues to have an effect. So that can be around specific components in air pollution. So, for example, if you live in an environment where you're next to a major road where you're being exposed to a lot of diesel truck fumes, they are directly linked to increased risk of asthma, or if you have asthma, increased severity of asthma. And so that child will then be exposed to high degrees of, in that case, diesel fumes. So that's a chronic exposure that may be either low or very high, depending on where we live. In Western Australia, generally, we're quite lucky. Our air pollution levels are, at a national level, certainly, compared to some other capital cities, at the low end. And certainly compared to some of the cities, for example, in Southeast Asia, our air pollution is quite good.

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Individual events can have an effect, and they can have an effect in a range of ways. And so if I give some – prescribed burns are an obvious example that most people in Western Australia would be familiar with, because of the way our climate works, smoke from prescribed burns in the southwest are blown offshore. The sea breeze brings that back in and north, and so we have these events every year in Perth where we're exposed to bush fire smoke, or smoke from prescribed burns in the southwest. We know that, when that happens, that increases the number of presentations to both primary care GPs, but also emergency, both for children and for adults. And in those individuals who are susceptible, for example children with asthma or adults with chronic lung disease, that they are more likely to then be admitted to hospital during those events.

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There are new apps and mechanisms by which individuals can be informed about those events, so that they can appropriately plan, and can have discussions with their own primary care provider about, "Okay, well, if I know that one of these smoke events is about to occur, how can I prepare myself?" And with their GP, can plan that. And, for example, I know that the Asthma Foundation of Western Australia is working with DFES and the Bureau of Meteorology to provide some apps and information for the general public in that space, which is based on work that's happening primarily in Tasmania, but in other states as well.

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Other acute events like large thunderstorms, which are going to increase with climate change, we saw in Melbourne a few years ago now, the thunderstorm epidemic that unfortunately resulted in a number of deaths. They were primarily in individuals who didn't realise that they had asthma, so they were probably subclinical, but resulted in a very large number of people presenting to the Emergency Department. So while thunderstorm asthma seems to be restricted to Melbourne currently, because of its unique geographical location

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and the way its storms come through, shifts in climate and how thunderstorms develop and occur, as we see changes in temperature and other climatic activity, those events may increase in frequency and duration and in location. Other elements that we know of in Australia was the Latrobe coal mine fires that occurred. The Victorian Government is investing a large amount of money understanding the impact of that work.

And we know that, in some research being led out of the University of Tasmania, but for which Telethon Kids was also involved as a collaborative partner, that those babies whose mothers were exposed to the coal fire smoke, which occurred over a six-week period, that at two or three years of age, those children now have lung function that's different to children that weren't exposed in utero. So we have evidence, both internationally and in Australia and locally, that both the long-term effects, the acute but short-lasting events can have an impact, not only on how children or adults feel now, but potentially also on their risk of developing asthma or other chronic disease later in life.

So the imperative, I think, to both understand, to help individuals mitigate against those risks, and make choices for themselves and their families, I think are going to be quite important. And Health and Government will play a central role in providing that information to community, but also to help mitigate against some of those events. And I think the evidence in respiratory is replicated in other systems and chronic diseases. So that's an example that I think plays out around asthma and wheezing in young children and older children and adults, but is replicated in other chronic diseases as well.

PROF WEERAMANTHRI: I'm glad I asked you that question, that was very helpful, thank you. We've just got a couple of minutes. So you talked about patients monitoring their own symptoms and providing that as an app, or something like that, as part of an early warning, early response system that's been developed in Tasmania, with also some links in here to Western Australia.

PROF HALL: Yes.

PROF WEERAMANTHRI: So we have been made aware of that. And I have got a submission from Fay Johnston to the Inquiry, which is great. But also, is there anything further the health system should be doing in terms of environmental data? So I'm thinking that there's a broader issue about the integration of environmental data with health data. And specifically on this question, the issue of, should we have more monitoring of air pollutants as an environmental data input to the system?

PROF HALL: Yes. So we obviously have, in Perth, some environmental monitoring stations. They're reasonably dispersed, with a fairly limited – some capture, but limited capture, and certainly we have less outside of the Metropolitan area. So that relates to things like sulphur dioxide

and other air pollutants. We do not have a good way of monitoring pollens in Western Australia, and obviously they are quite a specific trigger for some individuals, and they will change over time as the climate changes. The impact the climate might be having on pollen counts in Western Australia, we would
5 have no data to support that at a way that would be meaningful. And so monitoring of those types of triggers – I think if we know we have chronic diseases that are triggered by environmental factors, whether that be pollution, temperature, pollens or other triggers for other diseases, then knowing about changes to those triggers, so that individuals can get access to that information
10 in a timely fashion that is meaningful and purposeful for them, is going to allow individuals to have better control of their own disease and disease management, and that will mitigate against the number of individuals who unexpectedly turn up to primary care emergency departments and hospitals. And that can only lead to better outcomes, not only for those individuals and
15 their families, but also, more broadly, the community health, well-being and, of course, productivity and everything else that feeds into.

PROF WEERAMANTHRI: We'll close there. Thank you both for your attendance at today's hearing. A transcript of this hearing will be sent to
20 you so that you can correct minor factual errors before it is placed on the public record. If you could please return the transcript within 10 working days of the date of the covering letter or email, otherwise it will be deemed to be correct. While you cannot amend your evidence, if you would like to explain particular points in more detail or present further information, you can provide this as an
25 addition to your submission to the Inquiry when you return the transcript, noting that you've already given us a very comprehensive written submission. Once again, thank you both very much for your evidence.

PROF HALL: Thank you.
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DR HARTMAN: Thank you.

HEARING CONCLUDED