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In speaking on the theme of pioneer women in medical research, I plan to cover three themes:

- The first is the importance of investing in medical research, and the value of evidence informed public health policies which I thought I'd exemplify by reminding us of some of the highlights of our pandemic year.
- In sharing the achievements of two remarkable Victorian women pioneers of medical research, one in public policy from 100 years ago and the other in virology from 50 years ago, my second theme is about the strong track record of Victorian women in medical research.
- And just like we've learnt that responding to the pandemic requires a range of research from fields as diverse as basic science to communications, I'll end by briefly sharing a little of my own background in a very different field of health, namely adolescent health and medicine.

Last January, none of us anticipated that 2020 would be dominated by virology, public health and the latest medical research findings, let alone have any appreciation of how powerfully these would come to shape our personal and professional lives. In February, the Corona virus study group of the International Committee on Taxonomy of Viruses designated the new virus as severe acute respiratory syndrome coronavirus 2, SARS-CoV-2, and on March 11th, the Director General of WHO declared a global pandemic. The following week, instead of leading a global consultation for WHO in Geneva on Health Promoting Schools, we all had a steep learning curve and led the consultation online. Over this time, the pandemic introduced us to a new language; we learnt to differentiate case numbers from case rates, understood the importance of contact tracing, and appreciated the influence of reproduction rates on 'flattening the curve' which we learnt were critical to maintaining availability of ICU beds. We came to understand the rationale for social distancing and the debates about whether the virus was spread by contact or aerosol droplet, science that later underpinned Victoria's commitment to mask wearing and essential workers wearing PPE. Neither children nor adults have washed their hands so much or been so interested in hand sanitiser.

We've experienced both benefits and downsides of working from home, zoom meetings and telehealth. Perhaps the toughest lesson we have learned is how hard it is to limit community transmission once coronavirus becomes established, and that in Victoria, this was only achieved when we all pulled our weight. We also didn't know how to balance political arguments to maintain economic activity at all costs versus the public health imperative of avoiding overwhelming the health system and limiting deaths. In medicine, many of us talk about the importance of evidence-informed policy, it has been a relief to appreciate how much scientific and public health opinion has informed public policy responses to COVID-19 in Australia. Scientific achievement of 2020 is not simply the extent of knowledge about COVID-19 and its impacts, but that a vaccine – indeed more than one – has been developed so quickly. Yet despite availability of a vaccine, low community confidence will constrain public uptake and limit the achievement of the desired herd immunity.

This past year, our government departments relied on university academics for access to epidemiological capacity. We have been blessed with a number of prominent women scientists as advisors, such as Professor Jodie McVernon from the University of Melbourne who, as the head of epidemiology at the Doherty Institute, leads a national network of pandemic modellers that informed much of the political decisions that have been made in Victoria and nationally.

Yet Australia's capability in public health and virology isn't new, nor is the role of women in leading important initiatives. Nearly 50 years ago, in 1973, Dr Ruth Bishop led a team of researchers that discovered Rotavirus, the most common cause of severe diarrhoea among infants and young children. Prior to Ruth's discovery, acute gastroenteritis was a deadly disease, claiming the lives of half a million children around the world each year and responsible for about 10,000 children being admitted to Australian hospitals annually. Back then, no one had been able to pinpoint the cause. With a PhD in microbiology from the University of Melbourne in 1961, Ruth spent 4 years in the UK on a post-doctoral fellowship. She returned to a job at the RCH Research Institute (now the Murdoch Children's Research Institute) in 1965 and given the prevalence of gastroenteritis in babies and young children, began searching for a cause. Initially, she was searching for a bacterial cause, but by the early 1970s she began to look for a virus. Ruth sent intestinal samples from children with acute gastroenteritis to Ian Holmes at the University of Melbourne for electron-microscopy examination, a newly available technology. They immediately identified a previously unknown wheel-like virus that became known as 'rotavirus'. Subsequently Ruth confirmed rotavirus to be the cause of the severe diarrhoea that took so many young lives around the world. Ruth's scientific discovery began a revolution in public health. Now that the primary cause of acute gastroenteritis was known, the search for a vaccine began. She and her team went on to identify a strain of the virus in children who did not display rotavirus symptoms. They thought that this strain, RV3, had the potential to be developed into a vaccine that could potentially prevent rotavirus from causing gastroenteritis. Ruth thought that it might take five years to develop a rotavirus vaccine; it took almost 35 years. As a result of her efforts, vaccination against 'gastro' has been part of Australia's National Immunisation Program for all infants since July 2007. Now in her 80s, Ruth was awarded the prestigious CSL Florey Medal for her achievements in biomedical science – the

first woman to receive the honour. And the gastroenteritis ward at the RCH, a major feature of my own paediatric training, no longer exists – it isn't needed!

But Australia's leadership in public health is also not new. 50 years before Ruth's efforts, other female doctors in Melbourne were also trying to reduce infant mortality through public health initiatives. Prior to 1917, almost 8% of infants died within a year of their birth, with the chances of an infant surviving its first year even worse in poorer Melbourne suburbs where many families lived and worked in appalling conditions.

In England, America and New Zealand, well before World War I, governments and medical personnel had accepted responsibility for improving infant survival by investing in various infant welfare initiatives. However, despite warnings about the dire consequence for the nation of a falling birth rate and a high infant mortality rate, especially at a time when heavy war losses were decimating a generation of young men, the Victorian government continued to procrastinate about its responsibility for reducing infant mortality and infant welfare services were virtually non-existent. This was in contrast to New South Wales, where the state government had begun taking responsibility for combating high infant mortality rates. In Victoria, Dr Isabelle Younger Ross had expressed concern about the high mortality rate among infants in Victoria for some time. Prior to the war she had visited various services in London and Chicago. On returning to Melbourne, she observed the work of district nurses with the goal of studying the feasibility of adding baby clinic work to their nursing rounds. Her scheme was not supported. In frustration, she took matters into her own hands and in 1917 with a group of colleagues, opened the first baby clinic in Richmond, a highly deprived area of Melbourne.

A decade later, Dr Vera Scantlebury Brown began to systematize Victoria's approach to infant welfare services, antenatal care and pre-school programs through her pioneering role as first director of infant welfare in Victoria, the first woman appointed to head a government department in the state. Indeed, from 1926 until her death in 1946, she put into place the universal structure of maternal and child health services and pre-schools we have in Victoria today. Born in 1889, Vera graduated from medicine at University of Melbourne in 1914, living as a resident in Janet Clarke Hall (JCH). Indeed, I first heard her name when as a first-year medical student I lived in the Scantlebury wing of JCH. I confess that at the time, I failed to appreciate the extent of her achievements! Following graduation, Vera had training positions at the Melbourne Hospital and then in 1915 joined the resident staff of the Children's Hospital. For the next three years she performed the herculean task of coping with major staff shortages and other difficulties due to wartime conditions before she herself sailed to England in 1917 to be attached to the Royal Army Medical Corps where she was an assistant surgeon. Returning to Victoria in 1919, the next 6 years saw her with a series of appointments at the Queen Victoria Hospital for Women and Children, the Women's and Children's Hospitals, the Victorian Baby Health Centres Association and the Free Kindergarten Union of Victoria. In 1926, she was appointed as the director to the newly established section of infant welfare in the Health Department - this was a part time position as she had married, which brought expectations of part-time work. Under her guidance and inspiration, the sphere of infant welfare work expanded. She introduced compulsory training for nursing sisters at infant welfare centres, with the goal of them disseminating that knowledge to pregnant women, a feature now recognized as central to lowering infant mortality. She was a creative manager and effective administrator and established a wide variety of innovative services. In 1944, 2 years prior to her death, her pioneering efforts to broaden infant welfare to include pre-school children, resulted in the establishment of government child care centres and responsibility for pre-schools being added to the Health Department's responsibilities.

100 years ago, Vera Scantlebury Brown was a Victorian pioneer in public health as Ruth Bishop was a pioneer in virology 50 years later. Both focussed on very young children, whereas my interest in paediatrics has been in adolescents. This was despite my early training as a medical student and a paediatric trainee being bereft of any teaching about adolescent health and development. I first became interested in adolescents during my training as a respiratory paediatrician, when I cared for young people with cystic fibrosis (CF) who for the first time were starting to survive through adolescence. As one of the first Australian women to train in the Department of Respiratory Medicine at the Royal Children's Hospital, a group of teenage girls with CF cornered me on the ward with a series of questions about their fertility status, as they had become aware that men with CF were infertile. These questions changed the direction of my medical career, as my doctoral studies focused on the new morbidities that affected adolescents with CF now that they were expected to survive through adolescence. I was supervised by Professor Glenn Bowes, a respiratory physician who had recently been appointed to lead the new Centre for Adolescent Health at the RCH - which is how, after a few years of training at Harvard, I found myself back at the RCH and the University of Melbourne, working with Glenn to develop adolescent medicine services at the RCH with George Patton, his head of research.

I've been director of the Centre for the past 15 years, and in that time, the work that George Patton and I have done has helped change global thinking about adolescence from being a brief period of risk, to new understandings of adolescence as a critical period in which the assets and capabilities of future health, employment, relationships and parenting are established. We have worked to expand the age of definition of adolescence from 10-19 years up to 24 years of age, in the context of new knowledge of the continued brain maturation that occurs across the 20s. Adolescent health is now on the agenda of global health, with each of the major UN agencies publishing a report on adolescents in the past decade. Adolescents were completely missing from the MDGs, but are now part of global policy, with the previous 'Every Woman, Every Child' policy that drove global maternal and child health efforts renamed within the SDGs as the Global

Policy for Women's, Children's and Adolescents' Health. Adolescent health is now considered a field of research and clinical practice. All medical students at Victorian universities now learn about adolescent health, and at the University of Melbourne, the 10 weeks of study called 'paediatrics' is now known as 'child and adolescent health'. Indeed, when The Lancet, decided to expand its stable of publications to include a specialist journal on the young, rather than the title of Lancet Paediatrics, they named it 'Lancet Child and Adolescent Health'. The Department of Adolescent Medicine is now a large medical department at the RCH led by Dr Michelle Telfer, and the Centre for Adolescent Health is a highly regarded centre of excellence that is among the most recognised in the world. In Australia, I was pleased to lead advocacy efforts within the Royal Australasian College of Physicians which resulted in both paediatric and adult medicine trainees now being able to train in Adolescent and Young Adult Medicine that since 2017 is an accredited area of specialist practice, one of few countries internationally in which it is available.

To end with the pandemic: while the oldest in our community have been at greatest risk of death, the longer term impacts of the pandemic are being most keenly felt in the young, as seen by the huge toll on adolescents' mental health this year. I have concerns that just like my generation is relegating the responsibility to young people to address the climate emergency that we have created, so we are leaving a huge intergenerational debt for the current generation of young people to inherit, at a time when there has also been greatest impact on their educational engagement.

Investing in the future capabilities of today's young people has never been more important, something that our mothers have surely long known - just as they wisely exhorted us to wash our hands.