anzos
australian & new zealand obesity society

JULY 20-22, 2021

AUSTRALIA & NEW ZEALAND OBESITY SOCIETY CONFERENCE 2021

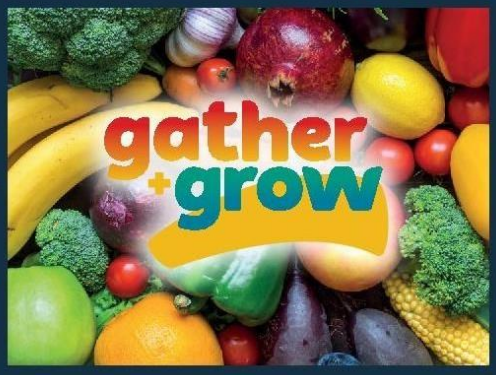
PROGRAM AND FULL ABSTRACTS

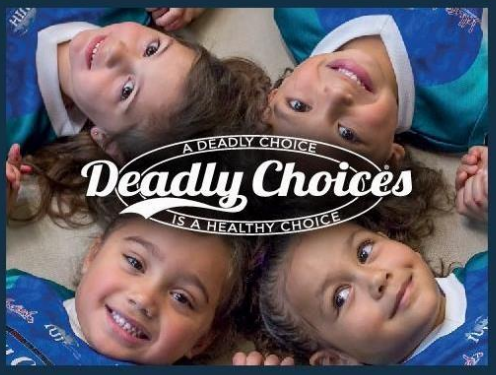
health + wellbeing Queensland

It's not just our name

It's our promise

Whether it's our very own programs, or supporting and funding community-based prevention programs already achieving amazing results – **Health and Wellbeing Queensland** is committed to working together to ***make healthy happen***.





Visit us to find out more, and to #boostyourhealthy.

www.hw.qld.gov.au

Queensland Government

health + wellbeing Queensland

Helping Queenslanders make healthy happen

by partnering with ANZOS to deliver the 2021 Annual Scientific Meeting

Our focus is obesity prevention, so we support all Queenslanders with their physical activity, nutrition and wellbeing needs.

We want to upskill, empower and support clinicians to integrate prevention into their practice through alternative models of care, digital integration, education and training. We are passionate about creating clinical-community linkages and building stronger connections between clinicians and patients in the prevention of obesity and chronic diseases.

Population

Creating environments that support healthier options at all stages of life, especially for those most at risk.

Prevention

Tackling the many issues that affect the health of people and communities, including the economic, social, cultural and political circumstances in which people are born, grow and live.

Partnership

Supporting our community-based prevention partners with the resources and expertise to scale-up and innovate based on evidence and need.

Visit us to find out more, and to #boostyourhealthy.

www.hw.qld.gov.au

Queensland Government

Tuesday 20th July 2021

Welcome Address
8:15AM - 8:30AM
Chairs: Jane Martin & Ainslie Sartori

Plenary 1 - Public Health
8:30AM - 9:30AM
Chairs: Jane Martin & Ainslie Sartori

Boyd Swinburn
What are the implications of *The Global Syndemic of Obesity, Undernutrition and Climate Change* for Australia and New Zealand? *abs# 1*

Morning Tea and Gallery Presentation Viewing
9:30AM - 10:00AM
This break will provide the opportunity to view Gallery Presentations while presenters are online.

Cross-Cutting Symposium 1
10:00AM - 12:00PM
Chair: Leonie Heilbronn
Sleep & Metabolic Health

10:00 AM **Frederic Gachon**
Coordination of mammalian metabolism by the circadian clock: impact on metabolic disease *abs# 4*

10:30 AM **Rachael Taylor**
Is sleep the answer to child obesity? What's new in research? *abs# 2*

11:00 AM **Ron Grunstein**
LOSING SLEEP OVER OBESITY – CAN WE FIX THE PROBLEM? *abs# 3*

Lunch
12:00PM - 1:00PM

COACH Workshop
12:00PM - 12:45PM
Title: An interactive workshop to introduce a framework and e-tools for the CO-creation and evaluation of food environments to Advance Community Health (COACH).

This workshop will guide participants through a framework designed to increase the likelihood of successful adaptation and sustained implementation of healthy food retail interventions into new contexts. The framework was informed by the combined experience of researchers from multiple Universities and practitioners in real-world contexts. The framework is based on a stepped process that allows continuous quality improvement within a co-creation model. The **CO**-creation and evaluation of food environments to **A**dvance **C**ommunity **H**ealth (COACH), framework comprises a six-phase continuous quality improvement process: 1) stakeholder engagement, evidence collection and governance; 2) communication, policy alignment and development; 3) community engagement and co-design of evidence-informed action; 4) implementation 5) feedback and evaluation, and 6) maintaining momentum and quality. This framework guides the establishment of stakeholder engagement and governance and communication processes early in intervention planning. It harnesses adaptive technologies to identify relevant relationships of cause and effect within a system to generate prioritized actions to improve the health of food retail environments. All elements of the framework have been tested separately; and is currently undergoing pilot testing as a wholistic framework. For this workshop we will workshop COACH in 'Coachville' a mock community to demonstrate how COACH can assist stakeholders with the design, implementation, evaluation, and maintenance of a food retail intervention that promotes health.

Speakers: Dr. Jill Whelan, Deakin University and Assoc. Prof. Julie Brimblecombe, Monash University

Concurrent Symposium 1 - Public Health
1:00PM - 3:00PM
Chairs: Katherine Cullerton & Julie Brimblecombe
Working with Aboriginal, Torres Strait Islander and Māori communities to understand and address obesity
Overweight and obesity contributes most heavily to the disease burden affecting Indigenous peoples of Australia and New Zealand. This symposium will hear from Aboriginal, Torres Strait Islander, Maori and non-Indigenous researchers who have worked with Indigenous communities on various health issues in Australia and New Zealand. Speakers will offer a variety of perspectives and real-world examples of how cultural and contextual issues interact with health in Indigenous communities as well as some practical solutions for moving this agenda forward.

1:00 PM **Andrew Goodman**
Available Soon *abs# 5*

1:12 PM **Francis Nona**
Available Soon *abs# 6*

1:24 PM **Katharine Roa**
Available Soon *abs# 7*

1:36 PM **Megan Ferguson**
Available Soon *abs# 8*

Concurrent Symposium 1 - Clinical
1:00PM - 3:00PM
Chairs: John Dixon & Natassja Billich
Diet & Metabolic Health

1:00 PM **Priya Sumithran**
Dietary intervention for type 2 diabetes remission *abs# 9*

1:30 PM **Ingrid Hickman**
Transitioning to a diet quality approach for the management of complex obesity-related cardiometabolic conditions *abs# 10*

2:00 PM **Leonie Heilbronn**
Meal timing in control of body weight and health outcomes. *abs# 11*

2:30 PM **Andrea L Pattinson**
Weight and fat loss following severe versus moderate energy-restricted weight loss diets in postmenopausal women with obesity and recurrent binge eating behaviour: a secondary analysis of The TEMPO Diet Trial *abs# 12*

2:45 PM **Divya Ramachandran**
A cluster analysis of Australians who self-manage their weight loss *abs# 13*

Concurrent Symposium 1 - Basic Science
1:00PM - 3:00PM
Chairs: Amanda Brandon & Brian Drew
Regulators of metabolism and food intake

1:00 PM **Damien Keating**
How gut endocrine cells sense their environment to regulate metabolism *abs# 14*

1:30 PM **Mark Larance**
Unravelling erusiolin function in health and disease *abs# 15*

2:00 PM **Robyn Brown**
Why do we overeat? Harnessing addiction neuroscience to understand overeating *abs# 16*

2:30 PM **Magdalene K Montgomery**
Arylsulfatase A (ARSA) is a novel NASH-regulated hepatokine and potent regulator of glycaemic control *abs# 17*

2:45 PM **Stephanie E Simonds**
Leptin is a key regulator of glucose homeostasis in obesity *abs# 18*

Afternoon Tea and Gallery Presentation Viewing
3:00PM - 3:30PM
This break will provide the opportunity to view Gallery Presentations while presenters are online.

CONCURRENT SESSIONS

Concurrent Oral Abstracts 1 - Public Health
3:30PM - 5:30PM
Chairs: Rachael Taylor & Ashleigh Haynes
The first four speakers of this session are finalists for an ECR award.

3:30 PM **Silke Morrison**
The effect of mild sleep loss on dietary intake in children: a randomized cross-over trial *abs# 19*

3:45 PM **Kylie E Hunter**
Sustainability of effects of early childhood obesity prevention interventions: follow-up of an individual participant data prospective meta-analysis of four randomised controlled trials *abs# 20*

4:00 PM **Jillian Whelan**
An interactive workshop to introduce a framework and e-tools for the CO-creation and evaluation of food environments to Advance Community Health (COACH). *abs# 21*

4:30 PM **Andrea Schmidtke**
Sugars in commercial foods for infants and toddlers in Australia *abs# 23*

4:45 PM **Katherine Cullerton**
How frames can influence public opinion towards nutrition policy options *abs# 25*

5:00 PM **Lauren Humphreys**
Public support for obesity prevention policies in Western Australia *abs# 26*

Concurrent Oral Abstracts 1 - Clinical
3:30PM - 5:30PM
Chairs: Dorit Samocha-Bonet & Alyssa Susanto
The first four speakers of this session are finalists for an ECR award.

3:30 PM **Lijun Zhao**
Time restricted eating alters the 24-hour transcriptomic profile in human adipose tissue *abs# 27*

3:45 PM **Saba Naghipour**
Trimethylamine-N-oxide in obesity and metabolic syndrome: exploring links between diet, the gut microbiome, and disease status *abs# 28*

4:00 PM **Brendan J Nolan**
Intensive management of obesity in people with Prader-Willi syndrome *abs# 29*

4:15 PM **Isabel E Young**
The everyBODY study: Improving weight bias internalisation in young women *abs# 30*

4:30 PM **Zubeyir Salis**
Weight loss reduces the need for total knee replacement: A survival analysis using Osteoarthritis Initiative data *abs# 31*

4:45 PM **Harmanpal Sandhu**
Effect of body composition on bone mineral density in men, pre- and post-menopausal women with complex obesity *abs# 32*

5:00 PM **Kai Liu**
A qualitative exploration of dieting experience among people with overweight or obesity following intermittent fasting or daily calorie restriction *abs# 33*

5:15 PM **Kevin Chan**
Relationship between polypharmacy and clinical disease burden in adults with super-obesity in a tertiary weight management program; A prospective observational study *abs# 34*

Concurrent Oral Abstracts 1 - Basic Health
3:30PM - 5:30PM
Chairs: Hayley O'Neill & Nigel Turner
The first four speakers of this session are finalists for an ECR award.

3:30 PM **Jasmine Banks**
Improved metabolic profile in mice receiving dual pharmacological targeting of NAD^+ biosynthesis and degradation. *abs# 35*

3:45 PM **Sing-Young Chen**
Mitochondrial uncoupler BAM15 restores normal glucose homeostasis in male *db/db* mice *abs# 36*

4:00 PM **Therese Freire**
You are what your mother eats: Maternal macronutrient intake and the effects on offspring metabolism *abs# 37*

4:15 PM **Katina D Hulme**
A history of obesity reduces the immune response to influenza virus in an NLRP3 dependent manner *abs# 38*

4:30 PM **Dylan J Harney**
Intermittent fasting as a sexually dimorphic intervention that can induce interferon-alpha signaling in the liver. *abs# 39*

4:45 PM **Michael F Keating**
The contribution of PSMD9 to the regulation of hepatic lipid metabolism *abs# 40*

5:00 PM **William De Nardo**
Exercise-responsive hepatokines and the role of Syndecan-4 in systemic energy homeostasis *abs# 41*

5:15 PM **Camille Devereux**
Dual inhibition of CD36 and ACC is not a therapeutic approach for non-alcoholic fatty liver disease in mice. *abs# 42*

Wednesday 21st July 2021

Plenary 2 - Basic Science
8:30AM - 9:30AM
Chair: Amanda Page

8:30 AM **Zach Knight**
Gut-brain pathways that drive learning about food *abs# 43*

Morning Tea
9:30AM - 10:00AM

Cross-Cutting Symposium 2
10:00AM - 12:00PM
Chair: Brian Oldfield
Looking into the crystal ball for obesity: where will we be in 20 years from now?

10:00 AM **David James**
Obesity Research in 20 years will look very different to now. *abs# 46*

10:30 AM **Louise Baur**
Obesity and clinical care: where will we be in 20 years from now? *abs# 45*

11:00 AM **Boyd Swinburn**
Obesity in populations: 20 years on *abs# 44*

Lunch and Gallery Presentation Session
12:00PM - 1:30PM

EPOCH Special Symposia
12:00PM - 1:15PM

The NHMRC Centre of Research Excellence in the Early Prevention of Obesity in Childhood (EPOCH CRE) aims to reduce the prevalence of obesity and obesity-related behaviours in the first five years of life, and their future impact. Led by Professor Louise Baur, the CRE brought together a diverse team of experts primarily from the University of Sydney, Deakin University, Flinders University, Queensland University of Technology, the University of Otago and several state health departments.

The first 2000 days (pregnancy to 5 years) of life is a time when many obesity related behaviours that track into adulthood are established, and biology is most amenable to change. Australia and New Zealand are leading the field internationally on research on effective early life interventions to prevent childhood obesity.

EPOCH CRE conducted substantial research across broad discipline areas that addressed the key knowledge gaps in research, policy and practice to improve weight-related outcomes for children. As the CRE is concluding, it would be timely to present the outcomes from this substantial body of work at the ANZOS 2021 meeting.

Title: Understanding childhood obesity prevention interventions using NextGen evidence synthesis methodologies
Speaker: Kylie Hunter, University of Sydney

Title: New rapid assessment tools to measure obesity related behaviours in 0-5 year olds
Speakers: Dr Dorota Zarnowiecki, Flinders University and Dr Rebecca Byrne, Queensland University of Technology

Title: Economic evaluation of early childhood obesity prevention interventions
Speaker: Anagha Killedar, University of Sydney

Title: Translational research: Lessons learnt from two early obesity prevention initiatives
Speaker: Dr Penny Love, Deakin University

Title: State and territory eclectic approaches to obesity prevention policy
Speaker: Emma Esdaile, University of Sydney

Panel Discussion: Key lessons in designing effective early prevention of childhood obesity trials that is cost effective and can be translated for population health impact.
Facilitator: Professor Louise Baur, University of Sydney

Kylie Hunter
Understanding childhood obesity prevention interventions using NextGen evidence synthesis methodologies *abs# 250*

Dorota Zarnowiecki
New rapid assessment tools to measure obesity related behaviours in 0-5 year olds *abs# 251*

Anagha Killedar
Economic evaluation of early childhood obesity prevention interventions *abs# 252*

Penny Love
Translational research: Lessons learnt from two early obesity prevention initiatives *abs# 253*

Emma Esdaile
State and territory eclectic approaches to obesity prevention policy *abs# 254*

CONCURRENT SESSIONS

Concurrent Symposium 2 - Public Health
1:30PM - 3:30PM
Chair: Bronwyn Clark
Advances in physical activity monitoring for Public Health

1:30 PM **Stewart Trost**
Device-based measures of movement behaviour. Is it time to say goodbye to cut-point methods? *abs# 47*

2:00 PM **Tom Stewart**
Activity recognition models for quantifying movement behaviours in children and adults. *abs# 48*

2:30 PM **Nicola Ridgers**
Assessing activity patterns in youth using device-based measures *abs# 49*

3:00 PM **Maree Scully**
Adherence to 24-hour movement guidelines among Australian adolescents: results from the NaSSDA survey, 2009-10 to 2018 *abs# 50*

Concurrent Symposium 2 - Clinical
1:30PM - 3:30PM
Chairs: Moe Thuzar & Leila Fathi
Modulators of Energy Expenditure & Intake

1:30 PM **Jeff Coombes**
Low Volume Interval Training for Cardiometabolic Health *abs# 52*

2:00 PM **Ken Ho**
Diet-induced thermogenesis: fake friend or foe *abs# 53*

2:30 PM **Michael Cowley**
Available Soon *abs# 54*

3:00 PM **Alyssa Susanto**
Do women lose more weight on *ad libitum* Mediterranean diets? *abs# 56*

Concurrent Symposium 2 - Basic Science
1:30PM - 3:30PM
Chairs: Magdalene Montgomery & Benjamin Weger
Adipose Tissue Metabolism

1:30 PM **Brian Drew**
A role for Trim28 in Regulating Sex Differences in Obesity and its Complications *abs# 57*

2:00 PM **Jenny Gunton**
Browning human fat *abs# 58*

2:30 PM **Jacqueline Stoeckli**
Insulin Regulation of Lipolysis in Adipocytes *abs# 59*

3:00 PM **Lai Yue Chan**
Rational design and evaluation of multi-functional white adipose tissue-targeting peptides anti-obesity effects *abs# 60*

3:15 PM **Chenkai Ma**
Inflammatory adipose tissue is a potential stratification biomarker for metabolic unhealthy obesity. *abs# 61*

Afternoon Tea
3:30PM - 4:00PM

CONCURRENT SESSIONS

Concurrent Oral Abstracts 2 - Public Health
4:00PM - 6:00PM
Chairs: Caroline Miller & Christina Zorbas

4:00 PM **Megan Ferguson**
Strengthening evidence-informed healthy store policy in remote Indigenous Australia *abs# 62*

4:12 PM **Yan Jun Michelle YJM Chen**
Associations between food purchasing practices in various retail settings and dietary intake among Australian adolescents *abs# 63*

4:27 PM **Julie Brimblecombe**
Impact on business outcomes of restricted promotion of unhealthy food in a retail food setting: A randomised controlled trial *abs# 64*

4:57 PM **Jessica Hardt**
Healthier Together: methodology, results and impact of a co-designed, community-based, childhood overweight and obesity prevention program, culturally tailored to the Māori & Pacific Islander community to tackle health inequity. *abs# 66*

5:12 PM **Stella Boyd-Ford**
Keriba Way: Co-designing a culturally tailored healthy lifestyle program for communities in the outer Islands of the Torres Strait *abs# 67*

5:27 PM **Joanne Dono**
Identifying the most effective on-bottle warning labels to reduce consumption of sugar-sweetened beverages *abs# 68*

5:42 PM **Kerry Ettridge**
The association between knowledge of health effects and consumption of soft drinks among Australian adolescents *abs# 69*

Concurrent Oral Abstracts 2 - Clinical
4:00PM - 6:00PM
Chairs: Priya Sumithran & Kai Liu

4:00 PM **Ruth E Walker**
Shared medical appointments for weight loss in primary care: a systematic review *abs# 70*

4:15 PM **Clare Mullen**
Involving people with lived experience of obesity in policy and service development *abs# 71*

4:30 PM **Annette Macdonald**
Comorbidity and outcomes following bariatric surgery in a public hospital multidisciplinary intensive weight loss program *abs# 72*

4:45 PM **Samantha L Hocking**
Once-weekly subcutaneous semaglutide 2.4mg reduces body weight in adults with overweight or obesity regardless of baseline characteristics (STEP 1) *abs# 73*

5:00 PM **John Dixon**
Semaglutide 2.4 mg and intensive behavioural therapy in subjects with overweight or obesity (STEP 3) *abs# 74*

5:15 PM **Joseph Proietto**
Weight loss maintenance with once-weekly semaglutide 2.4 mg in adults with overweight or obesity reaching maintenance dose (STEP 4) *abs# 75*

5:30 PM **Georgia Rigas**
The medical management of obesity with semaglutide-the first Australian experience *abs# 76*

5:45 PM **Izabela Karpińska**
Predicting diabetes resolution after metabolic - external validation of predictive scores. *abs# 77*

Concurrent Oral Abstracts 2 - Basic Science
4:00PM - 6:00PM
Chairs: Louise Metcalfe & Simon Bond

4:00 PM **Benjamin D Weger**
Disruption of the circadian clock component BMAL1 elicits an endocrine adaption that prevents insulin resistance and nonalcoholic fatty liver disease *abs# 78*

4:15 PM **Joshua Wang**
The neuroinflammation biomarker, translocator protein (TSPO), plays a role in sucrose overconsumption in mice *abs# 79*

4:30 PM **Diana Sketriene**
Intermittent access to high-fat high-sugar food is sufficient to induce compulsive-like eating, increases in visceral fat and glutamatergic dysfunction in the dorsal striatum *abs# 80*

4:45 PM **Saba Naghipour**
Mild chronic stress suppresses cerebral mitochondrial function and hedonic behaviour in mice, effects countered by a Western diet *abs# 81*

5:00 PM **Yi Wang**
Deletion of TRIM28 in the hypothalamus induces obesity but preserves glucose tolerance *abs# 82*

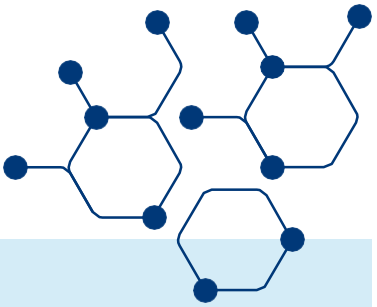
5:15 PM **Arnauld Belmer**
Long-term overconsumption of sugar starting at adolescence produces overweight, persistent hyperactivity and neurocognitive deficits in adulthood *abs# 83*

5:30 PM **Michael D Kendig**
Cognitive, behavioural and metabolic effects of time-restricted access to healthy and unhealthy diets in rats *abs# 84*

5:45 PM **Cait Beddows**
Hypothalamus Extracellular Matrix Remodelling During the Development of Metabolic Disease Promotes Neuronal Insulin Resistance and Whole-Body Metabolic Dysfunction. *abs# 124*

Rethink Obesity®
4FORUMS

Series 2
7 – 28 July 2021



The educational series redefining obesity care is back!

Led by renowned obesity experts, this new series breaks down the process of weight management in four bite-sized forums that shift the focus from problem to patient.

Don't miss this unique opportunity to gain practical skills that will help you forge new pathways towards tailored, targeted and holistic care of people living with obesity.

1 **Four key points every HCP should know about obesity and women's health**
7 July | 8:00–8:40 pm AEST

2 **Four practical points to optimise weight loss in men with obesity**
14 July | 8:00–8:40 pm AEST

3 **Four key insights on the weight loss journey from the patient's perspective**
21 July | 8:00–8:40 pm AEST

4 **Four expert recommendations to simplify the weight management consultation**
28 July | 8:00–8:40 pm AEST

Register now

Scan the QR code or visit:
bit.ly/4Forums2

Also available on-demand
after each event, with additional resources and practical tools for those who have registered.

Series 3 of Rethink Obesity® 4FORUMS will be held in November 2021, featuring four new episodes. You can pre-register using the link supplied above.

SCOPE Strategic Centre for Obesity Professional Education

This educational activity is SCOPE accredited by the World Obesity Federation. It has been developed by an independent Steering Committee in collaboration with the speakers and the education provider Ogilvy Health, and is proudly sponsored by Novo Nordisk.

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Thursday 22nd July 2021

Plenary 3 - Clinical and Awards
8:30AM - 9:30AM
Chair: Leonie Heilbronn

8:30 AM **Leanne Redman**
The intergenerational transmission of obesity: are the cards stacked against us? *abs# 85*

ANZOS YIA Presentation
9:30AM - 10:00AM

Morning Tea
10:00AM - 10:30AM

CONCURRENT SESSIONS

Concurrent Oral Abstracts 3 - Public Health
10:30AM - 12:30PM
Chairs: Helen Dixon & Jessica Hardt

10:30 AM **James JSC Stevens-Cutler**
'Don't treat junk food as everyday food': Development of a new healthy weight campaign *abs# 86*

10:45 AM **Ashleigh Haynes**
Quantifying Australian advertising relating to weight, physical activity and diet: Expenditure on public health, unhealthy product and commercial diet/weight loss advertising, 2016-2018 *abs# 87*

11:00 AM **Georgina Trapp**
Children's exposure to unhealthy food and beverage advertising near schools in Perth, Western Australia *abs# 88*

11:15 AM **Claudia Gascoyne**
Is food and drink marketing across various settings associated with dietary choices and intake among Australian adolescents? Findings from a national cross-sectional survey *abs# 89*

11:30 AM **Tanita Northcott**
Attenuating the harms of ultra-processed food consumption for healthy and sustainable food systems: is Australia's national food regulatory system fit for purpose? *abs# 90*

11:45 AM **Christina Zorbas**
Lifting the silence on lived experiences with food and low incomes during COVID-19 *abs# 91*

12:00 PM **Lauren Humphreys**
Evaluation of the population-level impact of the LiveLighter® healthy lifestyle campaign on knowledge and dietary behaviours *abs# 92*

12:15 PM **Ainslie Sartori**
Unhealthy promotion on the Instagram pages of WA's elite sports teams: a picture of health? *abs# 93*

Concurrent Oral Abstracts 3 - Clinical
10:30AM - 12:30PM
Chairs: Shirley Alexander & Kevin Chan

10:30 AM **Leila Fathi**
i-PATHWAY: A co-design of clinical decision-making guides to support a childhood obesity prediction tool in practice *abs# 94*

10:45 AM **Oliver J Canfell**
i-PATHWAY: Development and validation of a clinical prediction model for childhood obesity in Australia *abs# 95*

11:00 AM **Natassja Billich**
Increasing medical and psychosocial complexity of young people attending Victoria's specialist paediatric weight management service. *abs# 96*

11:15 AM **Oliver J Canfell**
"It would put a rocket up me": a qualitative study of parent and clinician attitudes towards predicting childhood obesity in practice *abs# 97*

11:30 AM **Jacqueline Cotugno**
Precision support for preventing and managing childhood obesity (PRECISE): Co-design methodology of clinical resources for primary health care professionals *abs# 98*

11:45 AM **Emma E Schwartzkoff**
Tackling childhood obesity in clinical settings - Exploring clinicians' experiences and perceptions of implementing routine growth assessments in the Mid North Coast Local Health District *abs# 99*

12:00 PM **Jessica Hardt**
Healthy Kids Club: implementation of a multidisciplinary, systemic, evidence-based, holistic, culturally appropriate and family-centred service, empowering children and their families to tackle the challenges of childhood obesity. *abs# 100*

12:15 PM **Sarah Lang**
Exploring adolescents and families' experiences of attending a specialist paediatric weight management service: opportunities for innovation *abs# 101*

Concurrent Oral Abstracts 3 - Basic Science
10:30AM - 12:30PM
Chairs: Jacqueline Stoeckli & William De Nardo

10:30 AM **Haressh Sajiir**
A Novel Role of Endogenous Interleukin-22 as a Regulator of Glucose and Lipid Metabolism *abs# 102*

10:45 AM **Louise K Metcalfe**
A role for the CREBRF^{R457Q} "obesity variant" in the regulation of metabolism during fasting *abs# 103*

11:00 AM **Amanda Brandon**
A model to investigate the effects of fasting in calorie restriction *abs# 104*

11:15 AM **Natassia Rodrigo**
Metabolic and Kidney health in Obese Mothers and Offspring are Influenced by Pre-conception Weight Loss With Liraglutide. *abs# 105*

11:30 AM **Alyce M Martin**
Understanding the complex bidirectional relationship between the gut microbiome and gut-derived serotonin, and its impact on host metabolism. *abs# 106*

11:45 AM **Sophie Lucic Fisher**
Effect of Maternal Dietary Glycaemic Index on Offspring Metabolic Phenotype in Mice *abs# 107*

12:00 PM **Simone Rehn**
Sucrose intake by rats affected by both intraperitoneal oxytocin administration and time of day *abs# 108*

12:15 PM **Garron Dodd**
Intranasal Targeting Hypothalamic PTP1B and TCPTP Reinstates Leptin and Insulin Sensitivity and Promotes Weight Loss in Obesity *abs# 123*

Lunch
12:30PM - 1:30PM

CONCURRENT SESSIONS

Concurrent Symposium 3 - Public Health
1:30PM - 3:30PM
Communication and Framing around obesity

1:30 PM **Mark Chenery**
Framing childhood obesity: how to increase policy support while reducing stigma *abs# 109*

2:00 PM **Louise Baur**
Addressing weight stigma in clinical practice *abs# 125*

2:30 PM **Tiffany Petre**
We need to change the narrative around obesity *abs# 111*

3:00 PM **Helen Dixon**
Experimental assessment of potential unintended impacts of healthy weight and lifestyle campaigns among Australian adults *abs# 112*

Concurrent Symposium 3 - Clinical
1:30PM - 3:30PM
Chairs: Samantha Hocking & Zubeyir Salis
Metabolic Complications of Obesity

1:30 PM **Anthony Russell**
Obesity and Diabetes: what is the relationship? *abs# 113*

2:00 PM **Helen L Barrett**
Impacts of maternal obesity on pregnancy *abs# 114*

2:30 PM **Gary Wittert**
The effect of testosterone treatment on body composition glucose metabolism in men with visceral obesity at risk of, or with newly diagnosed type 2 diabetes: a double-blind placebo-controlled trial. *abs# 115*

3:00 PM **Houston Xue**
Associations of reproductive hormones and glucose homeostasis with metabolic-associated fatty liver disease measured by transient elastography in a super-obese population *abs# 116*

3:15 PM **Matthew Tran**
Advanced liver fibrosis in adults with obesity is associated with alterations in cardiac structureand function *abs# 117*

Concurrent Symposium 3 - Basic Science
1:30PM - 3:30PM
Chairs: Stephanie Simonds & Michael Kendig
Novel aspects of obesity: causes, complications and treatments

1:30 PM **Kirsty Short**
A High-Fat Diet Increases Influenza A Virus-Associated Cardiovascular Damage *abs# 118*

2:00 PM **Matthew Watt**
Linking NAFLD, hepatokine secretion and metabolic dysregulation in obesity *abs# 119*

2:30 PM **Sumaira Hasnain**
Development of Liver-Targeted Interleukin-22 for Fatty Liver Disease *abs# 120*

3:00 PM **Simon T Bond**
Investigating the Potential of Silencing PSMD9 to Treat Obesity and Non-Alcoholic Fatty Liver Disease *abs# 121*

3:15 PM **Romana Stark**
Modulating olfactory function affects behavior and metabolism *abs# 122*

Would a custom diet tailored to your project improve your research?

You may not know that we already make over 2,000 different diets, if one of those isn't suitable we'll make you one that is.
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1

What are the implications of *The Global Syndemic of Obesity, Undernutrition and Climate Change* for Australia and New Zealand?

Boyd Swinburn[1]

1. University of Auckland, Auckland, New Zealand

The 2019 Lancet Commission report on The Global Syndemic showed how obesity, undernutrition and climate change constituted a synergy of pandemics which negatively interact with each other and which have common underlying drivers. These macro-system drivers are the food system, transport, land use and urban design along with the policy, economic, and social norm settings they are based upon. The corollary of The Global Syndemic concept is that there are double- and triple-duty actions that can influence all three pandemics. What are the implications of this joined-up thinking for Australia and New Zealand?

The first major implication is that 'malnutrition in all its forms' is by far the biggest risk for health loss in all countries and this is widely under-recognised. Food insecurity should be viewed as the main undernutrition problem in Australia and New Zealand.

The second implication is the understanding that the 'policy inertia' that is stalling action on implementing WHO-recommendations for reducing obesity is caused by the power imbalance of: dominant opposition by the ultra-processed food industry; reluctance by governments to do battle with this industry lobby, and; the low level of demand for policies from civil society.

Thirdly, lifting the level of demand from civil society for action is the only plausible way to redress the power imbalance creating policy inertia. Joining forces with the climate change movement or with advocates for action on other harmful commodities (tobacco, alcohol) is one pathway to action. Another is implementing the 'Bloomberg approach' of targeted funding for mobilising civil society, which has seen food policy successes in several Latin American countries.

Other implications include; taking systems approaches to research and community action; focusing on key triple-duty actions (eg healthy sustainable dietary guidelines, national food systems strategy), and; increasing monitoring for accountability.

2

Is sleep the answer to child obesity? What's new in research?

Rachael Taylor[1]

1. University of Otago, Dunedin, New Zealand

Strong observational evidence demonstrates that sleep of short duration, and to a lesser extent sleep of poorer quality, increases the risk of obesity in children. However, the mechanisms that explain this well-established and consistent finding are not well understood. While it is feasible that being tired makes children less physically active, existing research has been limited by study design and analysis chosen. The more likely reason is that being tired changes what, why, or how children eat. This talk will summarise current knowledge regarding the links between sleep and obesity in children, and highlight ongoing research in this relatively new and intriguing area.

3

LOSING SLEEP OVER OBESITY – CAN WE FIX THE PROBLEM?

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3. Sydney Local Health District, Sydney, NSW, Australia

Sleep and obesity have a bi-directional interaction. Central adiposity is a critical cause of disturbed sleep, mainly by driving obstructive sleep apnea (OSA) pathogenesis. We live in a society where there are many challenges to the length, depth and scheduling of our sleep. There is increasing evidence that abnormal sleep duration, poor sleep quality, inappropriate timing of sleep and even OSA are obesogenic and promote metabolic syndrome in children and adults. This is based on a large body of animal, epidemiological and experimental research. However, clinical intervention studies, on the other hand, can provide information on a causal effect of sleep loss and sleep disturbance on weight

gain: energy intake and energy expenditure. Such studies include sleep extension, circadian realignment and OSA and other sleep disorder treatment trials. Here, the evidence is to some extent more fragmentary and limited by methodological issues. Delineating the extent that poor sleep as a risk factor for obesity requires a focused collaborative research approach.

4

Coordination of mammalian metabolism by the circadian clock: impact on metabolic disease

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Almost all organisms are subjected to daily changes in their environment with light-dark cycles that are caused by the Earth's rotation around its own axis. To anticipate these changes, organisms possess an evolutionary conserved endogenous oscillator, the circadian clock, that drives daily rhythms in behavior and physiology with a 24 h period. In mammals, these pacemakers regulate most physiological processes such as sleep-wake cycles, body temperature, heartbeat, and many other aspects of the physiology. Consequently, the mammalian circadian clock plays a fundamental role in the orchestration of metabolism and allows a timely controlled regulation of fatty acid, glucose and drug metabolisms in an anticipated manner. While mechanisms allowing these controls by the molecular oscillator and feeding rhythms are not completely understood, it is accepted that they involved rhythmic transcriptional and posttranscriptional regulation of genes encoding enzymes implicated in different aspects of animal physiology. However, perturbation of the natural environment is a hallmark of our modern society. For example, approximately 600 million people are exposed to shift work around the world, the main cause of circadian disruption in the population. Because of the central role of the circadian clock in the regulation of physiology, its disruption is associated with a wide range of physiological and pathological conditions including obesity and type 2 diabetes, Alzheimer's disease and cancer. In this context, it is essential to understand the causal relationship between altered circadian rhythms and pathological conditions.

9

Dietary intervention for type 2 diabetes remission

Priya Sumithran[1]

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Type 2 diabetes is characterised by insulin resistance and beta cell dysfunction. It has been regarded as inevitably progressive, and current management approaches are primarily aimed at delaying progression and preventing end-organ complications. There is increasing interest in remission of diabetes as a treatment goal of lifestyle, medication and surgical weight loss interventions. Dietary interventions associated with remission of type 2 diabetes will be discussed.

10

Transitioning to a diet quality approach for the management of complex obesity-related cardiometabolic conditions

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Transitioning away from single nutrient interventions and implementing 'food as medicine' for obesity-related chronic conditions is complex. It requires multipronged interactions across individuals, teams and entire health systems in order to provide the capability and workforce capacity to deliver interventions with a focus on diet quality and whole dietary patterns that are appropriate for diverse patient groups. Incorporating the voices of consumers in co-design and evaluation of diet quality interventions adds considerable value and needs to be formally embedded into the scientific process. Utilising technologies to better deliver dietary services within a tertiary hospital setting is critical to innovating the resource intensive approach to lifestyle interventions in high paced, complex clinical environments. Generating high quality evidence for the benefit of dietary management of complex chronic conditions is important and implementing the translation of this evidence equitably across the health system will be key to achieving health impacts.

11

Meal timing in control of body weight and health outcomes.

Leonie Heilbronn[1]

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Circadian timekeeping allows for the appropriate temporal regulation of metabolism to anticipate and respond to recurrent daily changes in the environment. Dysregulation of this system is increasingly recognised as a contributing factor in the development of chronic diseases associated with aging. Current dietary guidelines emphasise the importance of consuming a variety of foods from core food groups, and promote energy restriction (ER). However, recommendations on *when* to eat are not included in public health advice, or in the clinical management of individuals at risk of, or with, type 2 diabetes or obesity. This is a significant omission to address. While moderate, daily ER delays the onset of aging-related pathologies in mice, what researchers haven't considered is that mice placed under ER eat their entire daily food allowance within 2 - 4 hours. As such, they have not distinguished the benefits of ER from those of time restricted eating (TRE) patterns, self-imposed by the animals. Meanwhile, recent studies by our group, and others, have established that ER restores circadian variation, protecting mice from the metabolic consequences of aging and obesity, without reducing food intake. In humans, pilot studies suggest that TRE improves glycaemic control, but modest weight losses are usually co-observed. Eating earlier in the day is also associated with greater weight loss and improvements in glucose control. However, late or early TRE protocols are both showing promise to improve metabolic health, albeit with greater weight effects when meals are consumed earlier in the day. Macronutrient timing may also be important in this response.

12

Weight and fat loss following severe versus moderate energy-restricted weight loss diets in postmenopausal women with obesity and recurrent binge eating behaviour: a secondary analysis of The TEMPO Diet Trial

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5. School of Human Sciences, Faculty of Science, The University of Western Australia, Western Australia, Australia

Introduction: Severely energy-restricted diets have been shown to result in greater weight and fat loss compared to moderately energy-restricted diets [1-3] however, it is not known if such diets are effective in individuals with recurrent binge eating. This study assesses the impact of recurrent binge eating on changes in body weight and fat mass following severe versus moderate energy-restricted weight loss diets in individuals with obesity.

Methods: 97 postmenopausal women with obesity were randomised to either a moderately energy-restricted food-based diet for 12 months or a severely energy-restricted total meal replacement diet for 4 months, followed by the moderate diet until 12 months. Body weight and whole-body fat mass (by dual energy X-ray absorptiometry) were assessed at baseline and 12 months, and a two-way ANOVA was used to investigate the impact of dietary intervention on change in body weight taking into account interaction with binge eating.

Results: 53% of 47 participants in the severe group reported recurrent binge eating behaviour compared to 36% of 50 participants in the moderate group. There was no interaction between dietary intervention and the presence or absence of binge eating ($p>0.05$). However, an effect was observed in the severe group with a mean (SD) loss of weight and fat mass of -13.5 (4.8) kg and -9.8 (3.2) kg, respectively, in individuals with binge eating compared to -17.3 (7.0) kg and -13.4 (5.7) kg in individuals without binge eating ($p=0.050$ and $p=0.02$). There was no difference in weight and fat mass loss between individuals with and without binge eating in the moderate group ($p>0.05$).

Conclusion: Individuals with recurrent binge eating lost less weight and fat mass following the severely energy restricted diet than individuals without recurrent binge eating, highlighting a likely importance of addressing binge eating in conjunction with dietary weight loss interventions.

1. Seimon RV, Wild-Taylor AL, Keating SE, McClintock S, Harper C, Gibson AA, et al. Effect of Weight Loss via Severe vs Moderate Energy Restriction on Lean Mass and Body Composition Among Postmenopausal Women With Obesity: The TEMPO Diet Randomized Clinical Trial. JAMA Netw Open. 2019;2(10):e1913733.
2. Seimon RV, Wild-Taylor AL, McClintock S, Harper C, Gibson AA, Johnson NA, et al. 3-Year effect of weight loss via severe versus moderate energy restriction on body composition among postmenopausal women with obesity - the TEMPO Diet Trial. Heliyon. 2020;6(6):e04007.
3. Anderson JW, Konz EC, Frederich RC, Wood CL. Long-term weight-loss maintenance: a meta-analysis of US studies. Am J Clin Nutr. 2001;74(5):579-84.

13

A cluster analysis of Australians who self-manage their weight loss

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Many people self-manage their weight-loss without accessing formal weight-loss programs. However, there is little understanding about who self-manages their weight loss and if they are successful.
Australian adults who were about to begin self-managed weight-loss were recruited through Facebook, to complete an online survey at baseline and 12-weeks follow-up which collected, socio-demographic, behavioural, attitudinal, and health data. Two-step cluster analysis(1, 2) was applied using gender, age-range English-speaking, IRSD, health status, initial BMI, self-management type, and presence of stress eating. Weight outcomes among identified clusters were compared.
Only 102 of 205 participants completed the follow-up survey and complete data was only available on 97 for cluster analysis. There was an over-representation of females (87.3%), married / partner (72.5%), and English speaking (85.3%). A majority (88%) had overweight (23%) or obesity (65%), and most were completely "unassisted" in their weight loss (85%). Fifty-three (52.9%) percent had a chronic illness (including diagnosed depression -27.5%). Participants had a mean weight loss of 2.07 kilograms at follow-up (2.07, SD 4.89, p =<.001), and a third (33, 32.4%) were successful in losing 3% or more of their initial body weight. Four clusters were identified among self-managed weight losers *i) the elderly, ill and stressed* (29.9%), *ii) younger aged and healthy, but poor and stressed* (28.9%), *iii wealthy but ill and stressed* (26.8%) and *iv wealthy, relaxed and healthy* (14.4%). The *wealthy, relaxed and healthy group* had the highest proportion of successful weight losers (42.9%) whereas the *younger aged and healthy, but poor and stressed* had the least (28.6%). While the findings are limited by sample size, it is evident that self-managed weight losers are not a homogenous group. Cluster analysis is a useful technique to segment populations of interest useful for further research and can inform obesity management strategies to support self-managed weight-loss.

1. Kettenring JR. The Practice of Cluster Analysis. Journal of Classification. 2006;23(1):3-30.
2. Tkaczynski A. Segmentation Using Two-Step Cluster Analysis. Singapore: Springer Singapore; 2016. p. 109-25.

14

How gut endocrine cells sense their environment to regulate metabolism

Damien Keating[1, 2]

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Scattered throughout the epithelial lining of the gut wall are hormone-secreting cells, called enteroendocrine cells, which synthesise and secrete over 15 different hormones. Many of these gut

hormones, including GLP-1, PYY and serotonin, have important metabolic roles. Enteroendocrine cells have changing receptor and hormone expression profiles along the length of the gastrointestinal tract, constantly move from the stem cell niche within crypts up to the intestinal villi, and have a high rate of turnover. This has made them difficult to study. Our recent research has demonstrated that enteroendocrine cells can sense and respond to their environment including nutrients [1], immune regulators [2] and clinically relevant drugs such as metformin [3]. Their hormones act in a paracrine manner on other enteroendocrine cells and on nearby nerve endings, and in an endocrine manner to influence various metabolic pathways. The enteroendocrine cell density and function changes in metabolic disorders in humans including obesity [4] and gastroparesis [5], and we are the first to demonstrate in humans that signalling molecules associated with central control of body weight and metabolism, such as MC4R and α-MSH, exist within the human gut as functional systems [6]. In addition, bi-directional signalling also occurs between the gut microbiome and enteroendocrine cells [7] and we have defined one such hormone as being central to the modulation of host metabolism by the gut microbiome [8]. Such complex interactions between enteroendocrine cells and with the gut microbiome are likely of importance to type 2 diabetes and obesity.

1.Sun*, et al*. Diabetes, 2017. 66:2144-2149. **2.**Findeisen*, et al*. Nature, 2019. 574:63-68. **3.**Bahne*, et al*. JCI Insight, 2018. 3 **4.**Young*, et al*. Int J Obes, 2018. 42:1880-89. **5.**Wei*, et al*. Gastroenterology, 2021 **6.**Sun*, et al*. Gastroenterology, 2021 **7.** Ye*, et al*. Cell Host Microbe, 2021. 29:179-196. **8.**Martin*, et al*. PNAS, 2019. 116:19802-19804.

15

Unravelling erusiolin function in health and disease

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Low-abundance small proteins in human plasma (e.g. insulin, GLP-1, chemokines) play key roles in maintaining metabolic homeostasis and are frequently disrupted in diverse disease states. Using our previously developed SPEA protocol (Harney *et. al.* 2019. *Mol. Cell. Proteomics,* 18(9):1899-1915), we can identify and quantify these active low abundance small-protein hormones in plasma. This has allowed us to explore all components in plasma, including potential novel protein factors, using unbiased mass spectrometry-based analysis. Using the SPEA protocol to analyse human plasma, allowed detection of three peptides from the uncharacterised 8 kDa protein. One of these was a highly conserved peptide (erusiolin) that was significantly increased in abundance 10-fold approximately 1-3 hours after a mixed meal test. Absolute quantification showed erusiolin peaked at ~100 nM in plasma after food. The mRNA encoding erusiolin is largely duodenum-specific and immunohistochemistry analysis of human small intestine using an erusiolin-specific antibody, demonstrated a staining pattern consistent with expression in enteroendocrine cells. Co-staining confirmed overlap in expression with previously known enteroendocrine markers and showed significant co-expression of erusiolin and gastric inhibitory polypeptide (GIP). Mouse systems genetics datasets suggested a link to brain transcriptional regulation by erusiolin in appetite regulatory centers. Intraperitoneal injection of erusiolin into mice just prior to the night feeding cycle significantly reduced overnight food intake and body weight compared to either vehicle, or truncated forms of erusiolin. Immunofluorescence analysis of brain neuron activation after erusioin intraperitoneal injection highlighted the area postrema as a key region that is activated. Current work focuses on the identification of the cognate receptor for erusiolin expressed in these neurons that likely mediate the observed changes in feeding behavior.

16

Why do we overeat? Harnessing addiction neuroscience to understand overeating

Robyn Brown[1]

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With >2.8 million deaths/year attributable to overweight/obesity, it is now the 5th leading cause of global deaths and is rapidly surpassing smoking as the number one killer in the industrialized world. It is crucial, therefore, to understand why people overeat and why it is so difficult to resist the urge to eat "junk food" even in the absence of hunger. A growing body of research has identified striking similarities between attributes of addiction and overeating in obesity. This emerging evidence supports the hypothesis that the brain's reward circuitry may be dysregulated in case of obesity. This presentation will explore the extent to which drug addiction and diet-induced obesity share coincident neural underpinnings including identifying endophenotypes underlying this behaviour. Furthermore, for women in particular, negative emotions such as stress, frustration, anxiety, and loneliness have been shown to strongly influence eating behaviour and episodes of overeating yet this area remains unexplored, primarily due to a lack of good animal models and a historical lack of focus on female subjects in scientific studies. Robyn will present a novel model of emotional stress-induced binge eating in mice recently developed in her laboratory and data which demonstrates a distinct thalamo-cortical circuit gates this behaviour. This is the first functional evidence of possible a neural circuit which drives 'emotional eating' in females.

17

Arylsulfatase A (ARSA) is a novel NASH-regulated hepatokine and potent regulator of glycaemic control

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Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver condition in developed countries. NAFLD involves a spectrum of liver diseases that range from simple steatosis to its progressive form, non-alcoholic steatohepatitis (NASH). We have developed an advanced discovery platform with the primary aim of identifying liver-secreted proteins, that are regulated in NASH and that impact systemic metabolism.

C57BL/6 mice were fed one of two NASH-inducing diets (1. high-fat, high-cholesterol, high-fructose; 2. methionine choline deficient), followed by hepatocyte isolation and proteomic assessment of liver-secreted proteins. This screen identifies arylsulfatase A (ARSA) as a novel hepatokine that is upregulated in NASH and type 2 diabetes.

Chronic injections of ARSA recombinant protein and AAV-mediated hepatic ARSA overexpression improve glycaemic control in pre-diabetic and type 2 diabetic db/db mice, without affecting insulin secretion. Mechanistically, hepatic ARSA reduces sulfatide content and increases lysophosphatidylcholine (LPC) accumulation within cell surface lipid rafts and suppresses LPC secretion from the liver, thereby lowering circulating LPC and lysophosphatidic acid (LPA) levels. Reduced LPA is linked to improvements in skeletal muscle insulin sensitivity and systemic glycaemic control.

Hepatic silencing of Arsa or inactivation of ARSA's enzymatic activity reverses these effects. Together, this study provides a unique resource describing global changes in hepatokine secretion in NASH, and identifies ARSA as a novel regulator of liver to muscle communication and potential therapeutic target for type 2 diabetes.

18

Leptin is a key regulator of glucose homeostasis in obesity

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Approximately 9 out of 10 people with type-2 diabetes are overweight. Leptin is a hormone secreted from white fat cells that exerts control over both food intake and energy expenditure. Recently we described the central mechanisms underlying the hypertensive effects of hyperleptinemia in obesity. Work presented here used continuous radiotelemetric glucose monitoring in mice in combination with multiple gold standard techniques in order to determine the effects of dorsomedial hypothalamic (DMH) leptin signalling on peripheral glucose control. A leptin receptor (LepR) antagonist

administered directly into the brain impaired DIO mouse glucose tolerance demonstrating that leptin retains the ability to regulate blood glucose concentration in obesity. Knockdown of DMH LepR function using short hairpin adeno-associated virus (AAV) RNA significantly reduced brown adipose tissue (BAT) thermogenesis by -0.8 ± 0.1°C and increased basal blood glucose (14.3 ± 0.6mmol/l to 9.4 ± 0.5mmol/l) and impaired glucose tolerance. Conversely, chemogenic activation of LepR-expressing DMH neurons significantly elevated BAT thermogenesis (1.5 ± 0.2 °C increase). This increased BAT temperature was immediately followed by a decrease in plasma blood glucose concentration (7.6 ± 0.5 mmol/l to 5.8 ±0.5 mmol/l). Work presented here demonstrates that increasing the activity of LepR expressing neurons in the DMH can improve glucose tolerance in obesity though an elevation of BAT metabolic activity.

19

The effect of mild sleep loss on dietary intake in children: a randomized cross-over trial

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Background: While insufficient sleep duration is a strong, independent risk factor for obesity in children, the mechanisms remain unclear. Emerging research suggests that sleep loss may impact dietary intake, resulting in weight gain over time. Therefore, the objective of this study was to determine how mild sleep loss influenced food intake in children.

Design: Using a randomized, cross-over study design, 100 healthy children (8-12 years) with normal reported sleep (~8-11 hours/night) were randomized to go to bed one hour earlier (sleep extension) or one hour later (sleep restriction) than their usual bedtime, over two intervention weeks, separated by one washout-week. Sleep was measured via actigraphy and dietary intake by multiple 24-hour recalls. Type of food was classified by level of processing, and as core and non-core food. Data were analyzed according to 'intention to treat' and as 'per protocol', set at a 30-minute difference in sleep duration between intervention conditions. Mixed effects regression models were used to determine mean differences (95% CI) between the two sleep conditions.

Results: Compared with sleep extension, during sleep restriction children consumed significantly more carbohydrates [10.7 grams (1.6, 19.7)], total sugar [6.2 grams (1.4, 10.9)] and energy from non-core foods [416 kJ (6.5, 826)] daily. Trends of increased total energy intake [233 kJ (-42, 509; p = 0.096)] and increased intake of ultra-processed food and beverages [326 kJ (-57, 708; p = 0.095)] were noted. These trends were confirmed by the per protocol analysis (n=59) with findings of significantly greater energy intake [361 kJ (20,702)] and ultra-processed foods consumption [523 kJ (93.4, 952)] when at least 30 minutes of sleep was truly lost.

Conclusion: Findings indicate that mild sleep loss in children may play a role in pediatric obesity by increasing energy intake, mainly from carbohydrates, total sugar, non-core foods and ultra-processed foods.

20

Sustainability of effects of early childhood obesity prevention interventions: follow-up of an individual participant data prospective meta-analysis of four randomised controlled trials

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Background

In a world-first prospective meta-analysis, we found that early obesity prevention interventions resulted in a modest reduction in body mass index (BMI) z-score and improved weight-related behaviours at 1.5 to 2 years of age.[1] Yet, there is little evidence regarding the longer term effects (i.e. sustainability) of such interventions for the prevention of childhood obesity.

Aims

We aimed to determine whether these intervention benefits were sustained at 3.5 and 5 years of age.

Methods

Follow-up of the Early Prevention of Obesity in Childhood (EPOCH) individual participant data (IPD) prospective meta-analysis (PMA) of four randomised controlled trials comprising 2196 mother-infant dyads. The trials were conducted in Australia or New Zealand, and evaluated the effectiveness of childhood obesity prevention interventions commencing in late pregnancy or within 6 months of birth and ending before two years of age. Interventions comprised support and education for weight-related behaviours and controls received standard care. The pre-specified primary outcome was BMI z-score initially measured at 1.5-2 years and followed up at 3.5 years and 5 years of age. Secondary outcomes included prevalence of overweight/obesity, waist-to-height-ratio, dietary intake, feeding practices, physical activity, television viewing, sleep, and parenting practices.

Results

Positive initial intervention effects on BMI z-scores at 1.5-2 years of age disappeared by 3.5 years of age (-0.04 adjusted mean difference, 95% CI, -0.14 to 0.06, p=0.424), and 5 years of age (0.03; 95% CI, -0.08 to 0.14, p=0.60). While intervention benefits remained for some weight-related behaviours at follow-up (feeding practices, television viewing), these effects diminished over time.

Conclusions

In the absence of continued intervention, initial positive effects of early childhood obesity prevention interventions were not sustained. This suggests a life-course approach involving frequent complementary interventions across childhood is needed to address the major public health problem of obesity and sustain effects of early interventions.

1. 1. Askie L, Espinoza D, Martin A, et al. Interventions commenced by early infancy to prevent childhood obesity - the EPOCH Collaboration: an individual participant data prospective meta-analysis of four randomised controlled trials. Pediatr Obes. 2020:e12618.

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An interactive workshop to introduce a framework and e-tools for the CO-creation and evaluation of food environments to Advance Community Health (COACH).

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This workshop will guide participants through a framework designed to increase the likelihood of successful adaptation and sustained implementation of healthy food retail interventions into new contexts. The framework was informed by the combined experience of researchers from multiple Universities and practitioners in real-world contexts. The framework is based on a stepped process that allows continuous quality improvement within a co-creation model. The **CO**-creation and evaluation of food environments to **A**dvance **C**ommunity **H**ealth (COACH), framework comprises a six-phase continuous quality improvement process: 1) stakeholder engagement, evidence collection and governance; 2) communication, policy alignment and development; 3) community engagement and co-design of evidence-informed action; 4) implementation 5) feedback and evaluation, and 6) maintaining momentum and quality. This framework guides the establishment of stakeholder engagement and governance and communication processes early in intervention planning. It

harnesses adaptive technologies to identify relevant relationships of cause and effect within a system to generate prioritized actions to improve the health of food retail environments. All elements of the framework have been tested separately; and is currently undergoing pilot testing as a wholistic framework. For this workshop we will workshop COACH in 'Coachville' a mock community to demonstrate how COACH can assist stakeholders with the design, implementation, evaluation, and maintenance of a food retail intervention that promotes health.

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Sugars in commercial foods for infants and toddlers in Australia

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Background The first three years of life are a critical opportunity to support and encourage healthy dietary habits and good nutrition and to prevent overweight and obesity. It is also a period in which the palate is developed, and lifelong tastes, habits and food preferences are established. There is growing scientific and community concern around the impact of free sugar on children's health. This study analysed the presence, source and amount of sugar ingredients used in commercial infant and toddler foods in Australia.

Methods We conducted a survey of infant (4-12 months) and toddler (1-3 years) foods instore and online at 3 major Australian supermarket chains. Nutritional and ingredient information was recorded and analysed.

Results Of the 250 products reviewed, 71% were marketed as suitable for infants. Just over three-quarters of the products analysed (76%) contained free sugars. Fruit puree was the most common source of free sugar in foods for infants, found in 55% of products, and concentrated fruit sugars and sugar/cane sugar were the most common sources of free sugar in foods for toddlers (47% and 31% respectively). Almost two-thirds of the products reviewed (63%) had ≥15% energy from total sugar. Foods with ≥15% energy from total sugar are considered high in sugar under Australian healthy eating guidelines. This was more common in foods for infants (73% of infant products) than in foods for toddlers (52% of toddler products).

Conclusion Many commercial infant and toddler foods available in Australia contain harmful levels of sugar ingredients and do not represent optimal nutrition for young children. Higher standards should be set to ensure that free sugars are not used in commercial infant and toddler foods (with limited specific exceptions) and that sweet snacks are not marketed as suitable for infants and toddlers.

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How frames can influence public opinion towards nutrition policy options

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Purpose: There has been no mandatory regulatory nutrition reforms in Australia during the past decade despite evidence demonstrating their effectiveness. One reason cited for this lack of action is concern that such measures will not be acceptable to the general public. However we know that public acceptability of messages can be influenced by how a message is framed . This research sought to explore public opinion on different regulatory options and examine how message frames can affect level of support.

Methods: We undertook 2 studies: street intercept interviews and an online experimental survey. The street intercept interviews in a metropolitan location and 4 regional towns (n = 76) incorporated qualitative and quantitative questions to explore the attitudes of Australians towards different nutrition policies. These results informed the development of 4 values-based messages which were tested in a randomised online experimental survey. A nationally representative sample (n=1500) was recruited for the online survey. Each participant was assigned to one of four message conditions. Descriptive and logistic regression analysis were used to examine associations between message condition, demographic variables and support for regulation. Framing analysis was used for the qualitative data.

Results: Most participants supported the full range of policy options presented with lowest levels of support for reformulating food products and a tax on sugar-sweetened beverages. Analysis of the online experimental survey is currently underway. Early results indicate that political ideology is not a

guaranteed variable to predict support for nutrition policy. However, the message frame of 'protecting teenagers' is showing moderate levels of support.

Conclusion: The findings of this study suggest there is broad public support for the Australian government to use regulatory policy to address nutrition-related diseases. The results from this empirical analysis provide valuable insights that can be used when advocating for effective public health nutrition actions.

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Public support for obesity prevention policies in Western Australia

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There is a strong imperative for government interventions to reduce obesity rates.[1-3] While education campaigns form a critical part of a comprehensive obesity prevention strategy, regulatory approaches to create supportive environments for obesity prevention are likely to bring about larger, more equitable population health improvements.[4] However, implementing regulatory approaches requires political support, which is often lacking.[4-6] As public support has the potential to influence political decision-making, this study explored trends in support for government policies in WA using data from evaluation surveys of a healthy lifestyle campaign conducted between 2012 and 2019.

The LiveLighter® education campaign encourages and supports WA adults and their families to make healthier dietary choices, be more active, achieve and maintain a healthy weight. Independent evaluations of each campaign wave were conducted between 2012-2019 using cross-sectional surveys of adults aged 25-49 years, including questions on support for nutrition policies. The sample (N=10,280) was selected using random digit dialling (RDD) for all surveys except 2019 (50% RDD and 50% list sample) and surveyed using computer-assisted telephone interviews.

Overall, all nutrition policies were supported by a majority (62.3%-95.4%). Support was particularly high among women, people in a healthy weight range, and those who had completed high school. Support for regulation was high compared to other studies.[7] In 2019, approximately 65.1% of WA adults supported introducing a sugar-sweetened beverages tax, markedly higher than reported in a recent international review.[7] Between 2012 and 2016, support increased significantly for 'changing regulations to ensure consistent food labelling to help consumers make healthy choices' (90.7% cf. 95.4%).

Campaigns and advocacy efforts from the LiveLighter® campaign may have contributed to higher support and increases in support for stronger nutrition policies in WA since 2012. These findings suggest there is substantial public support for regulatory action on obesity prevention in the WA community.

1. Beswick A, Ambrosini G, Radomiljac A, Tomlin S, Chapman A, Matcevic J, et al. The burden and cost of excess body mass in Western Australian adults and children. Perth, Western Australia: WA Department of Health; 2020.
2. Western Australian Department of Health. Western Australian Burden of Disease Study 2015 - Contribution of risk factors to burden. Perth, Western Australia: Department of Health WA; 2020.
3. Western Australian Department of Health. Health and Wellbeing of Adults in Western Australia 2019, Overview and Trends. Perth, Western Australia: Department of Health; 2020.
4. Sacks G, Robinson E. Policies for tackling obesity and creating healthier food environments: 2019 progress update, Australian governments. Melbourne, Victoria Deakin University; 2019.
5. Swinburn B, Wood A. Progress on obesity prevention over 20 years in Australia and New Zealand. Obesity Reviews. 2013;14(S2):60-8.
6. Obesity Policy Coalition. Obesity in Australia: A decade of inaction. 2020.
7. Eykelenboom M, van Stralen MM, Olthof MR, Schoonmade LJ, Steenhuis IHM, Renders CM. Political and public acceptability of a sugar-sweetened beverages tax: a mixed-method systematic review and meta-analysis. Int J Behav Nutr Phys Act. 2019;16(1):78.

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Time restricted eating alters the 24-hour transcriptomic profile in human adipose tissue

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Background: Time-restricted eating (TRE), limits the eating duration to 6-10 contiguous hours improving cardio-metabolic health (6, 17, 36, 38). However, the effect of TRE on subcutaneous adipose tissue (SAT) clock genes and transcriptomic profile in humans remains unclear.

Aims: To investigate the effects of TRE on 24-hour metabolites, glucoregulatory hormones and SAT transcriptome.

Methods: Men with obesity (N=15, aged 63 ± 4 years, BMI 30.5 ± 2.4 kg/m^2) were recruited to a single-arm, open-labelled, within-subjects design (NCT03590158). At baseline and after eight weeks of TRE (eating window of 10 hours per day), a 35-hour metabolic ward stay was conducted. Plasma glucose, insulin, ghrelin, glucagon-like peptide-1 (GLP-1), glucose-dependent insulinotropic peptide, non-esterified fatty acid (NEFA), and triglyceride were measured three hourly and the SAT transcriptome was assessed six hourly. Dim light melatonin onset (DLMO) and morning cortisol (sampled hourly from 6am to 12pm) were also examined.

Results: TRE did not alter DLMO (P=0.86), but reduced the cortisol area under the curve (-17.4±9.4ug/L.Hour, P=0.02). TRE also increased the amplitude (0.04±0.01mmol/L, P=0.02; highest at 12am) and advanced the phase (-3±1.2hours, P=0.05) of NEFA and increased the amplitude of triglycerides (0.2±0.1mmol/L, P=0.006; lowest at 12am) and GLP-1 (6.4±2.6pg/mL, P=0.03; highest level at 3pm). Of known clock genes, TRE increased *Clock* (FDR=0.05) and *Nr1d2* (FDR=0.01) and decreased mRNA levels of *Per1* (FDR=0.02) and *Nr1d1* (FDR=0.02) at 12am only. Overall, 325, 611 and 3423 transcripts were found to be differentially expressed at 6am, 6pm and 12am, respectively, by TRE. Of these, 450 showed variation in the expression pattern over 24-hours following TRE. Pathway analysis showed these genes were involved in transcription corepressor activity and endocytosis.

Conclusion: TRE decreased morning cortisol and advanced the phase of plasma NEFA. The data also suggest there was a phase advance in rhythmic genes in human SAT by TRE.

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Trimethylamine-N-oxide in obesity and metabolic syndrome: exploring links between diet, the gut microbiome, and disease status

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The gut metabolite trimethylamine-N-oxide (TMAO) has gained recognition for potential involvement in cardiovascular disease (CVD), though whether this reflects a biomarker function or a causal role in disease pathogenesis awaits elucidation. Elevated TMAO is reported in chronic disorders including obesity, type 2 diabetes (T2D) and metabolic syndrome (MetS). Shifts in gut biome compositions may contribute to changes in formation across diseases. We explored relationships between dietary intake, gut biome profiles, circulating TMAO and cardiometabolic disease status. Biobanked plasma samples from well-defined (age and gender matched) healthy, overweight, obese, and MetS subjects (n=35-40 per group) were analysed. Patient health/medical and lifestyle history (including T2D risk) were assessed along with dietary composition (3-day food diary), blood biochemistry and gut microbial composition (16s rRNA sequencing). Circulating TMAO and its precursor substrates were assayed in stored plasma via LC-MS/MS. Across the data set, TMAO correlated significantly with insulin (p<0.0001), cholesterol (p<0.05) and seafood intake (p<0.0001). Conversely, markers of gut biome

diversity were negatively correlated with MetS criteria (p<0.001), BMI (p<0.001), glucose (p<0.01) and diabetes risk (p<0.001), while correlating positively with HDL (p=0.0001) and select dietary macro- and micronutrients. These correlations grew stronger when data were limited to individuals from the obese or MetS groups. Microbiome profiles from the MetS group were statistically less diverse based on operational taxonomic unit count (p<0.005) and Shannon (p<0.05) indexes. Circulating carnitine was significantly higher in patients with MetS (p<0.05), though no other significant differences were present in precursors or TMAO itself. These results suggest that while biome shifts arise with disease status, this does not translate into changes in TMAO. Biome changes may be explained by diet, though additional investigation is needed to elucidate these relationships and influences of additional variables, including gut permeability.

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Intensive management of obesity in people with Prader-Willi syndrome

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Background: Prader-Willi syndrome (PWS) is characterised by hyperphagia with childhood-onset obesity. Strict dietary supervision and restriction is integral to prevent weight gain, but limited data are available to guide intensive weight loss interventions (VLED, pharmacotherapy, bariatric surgery) in this population. The aim of this study was to evaluate the safety, tolerability and efficacy of intensive weight loss interventions in individuals with PWS.

Methods: A retrospective audit was undertaken of individuals with PWS attending the Austin Health Weight Control Clinic between July 2005-April 2021. Main outcome measures of intensive weight loss interventions (VLED, pharmacotherapy) were duration of use, weight outcomes, and adverse effects.

Results: Data were available for 18 individuals, of whom 14 were treated with intensive weight loss interventions. Mean body weight at baseline was 96.8 kg (BMI 40.8 kg/m^2). Mean weight loss during VLED (n=7) was 11.7 kg over 132 weeks, though did not result in weight loss in two individuals. Combination pharmacotherapy was most commonly prescribed. Mean weight loss with phentermine-topiramate (n=7) was 16.2 kg over 56 weeks. Mean weight loss with liraglutide 0.6-3mg (n=7), prescribed with topiramate in 3 individuals, was 14.9kg over 138 weeks. Weight loss was documented in 5 of 7 individuals treated with liraglutide. Naltrexone-bupropion resulted in weight loss in 2 of 4 individuals. Five individuals discontinued pharmacotherapy due to adverse effects (phentermine: psychosis, insomnia; topiramate: rash, depression, memory impairment). Five individuals maintained >10% weight loss at last follow-up. Non-adherence with prescribed regimen resulted in weight regain; mean weight at last follow-up was 98.4 kg (BMI 41.3 kg/m^2). No individual underwent bariatric surgery.

Conclusions: VLED and pharmacotherapy can be successfully utilised in some individuals with PWS though non-adherence results in substantial weight regain. Adverse effects were ascribed to phentermine and topiramate and resulted in discontinuation, whereas liraglutide was well-tolerated in this population.

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The everyBODY study: Improving weight bias internalisation in young women

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Background: Weight bias internalisation (WBI) is the application of negative weight-based stereotypes to oneself and has been associated with preventing long-term weight-loss, low confidence managing eating behaviour (weight self-efficacy) and poor mental health. With few weight-loss interventions targeting WBI, this study aimed to determine if it could be improved in a tailored program for young women.

Methods: Overweight and obese young women (BMI>25; 18-25y; n=51) engaged in a dietitian-led weight-loss intervention, followed by one of two cognitive behavioural therapy (CBT) group programs. Participants randomised to the everyBODY arm (n=26) engaged in CBT addressing body dissatisfaction

and WBI and those in the Standard Care arm (n=25) engaged in CBT best-practice care for weight management (that does not address WBI). Following the 12-week intervention, follow-up was conducted at 6 and 12-months.

Results: Participation in the everyBODY arm was associated with improved WBI, body attitudes, weight-self-efficacy, and binge eating. These improvements were sustained at follow-up. In comparison, participation in the Standard Care arm was associated with improved weight (post-treatment and maintained at follow-up) and improved binge eating (post-treatment but not maintained by 12-months). While WBI and weight self-efficacy did not improve over the course of the Standard Care intervention, improvements were observed at 12-months.

Conclusion: The study showed that engaging in a program designed to address weight bias is associated with improvements in WBI, body attitudes, weight self-efficacy and eating, and that these changes can be sustained long-term. While Standard Care also resulted in improved WBI and weight-self-efficacy, these changes occurred only after weight-loss. There was also evidence that positive changes to eating in the Standard Care arm (namely, reduced binge eating) were not maintainable. These findings provide support for addressing weight bias in weight-management programs. Further research is needed to understand the longer-term effects of doing so on weight and eating.

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Weight loss reduces the need for total knee replacement: A survival analysis using Osteoarthritis Initiative data

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PURPOSE

The annual healthcare cost of total knee and hip replacements (TKR and THR) due to osteoarthritis in Australia is expected to reach A$5.32 billion by 2030. While associations between osteoarthritis and obesity are well-established, and while inter/national osteoarthritis guidelines recommend weight loss for patients with overweight/obesity, the effects of weight loss on progression to joint replacement are unknown. We aimed to determine the effect of weight change on the risk of TKR and THR.

METHODS

Using data from the Osteoarthritis Initiative, a multicenter, prospective observational study which collected data over 10 years from adults aged 45-79 years who had or were at risk of clinically significant knee osteoarthritis at baseline, we conducted a time-to-event survival analysis to determine the effect of weight change on TKR and THR.

RESULTS

A total of 8,069 knees and 8,076 hips from 4,081 and 4,064 participants (59.3% female) with mean (SD) baseline body mass index (BMI) of 28.7 (4.8) kg/m^2 were included in the TKR and THR analyses, respectively. Weight change had a small, positive, dose-responsive effect on the risk of TKR (hazard ratio [HR] 1.02; 95% CI, 1.00-1.04, p=0.025). Weight change also had a small, positive, dose-responsive effect on the risk of THR, but only in people with radiographic evidence of hip osteoarthritis at baseline, and the effect was only borderline significant (HR 1.03; 95% CI, 1.00-1.07, p=0.058). There was no significant interaction between baseline BMI and weight change in effects on joint replacement.

CONCLUSIONS

For every 1 kg of weight lost, regardless of starting BMI, the risk of TKR was reduced by 2%. Weight loss also seemed to reduce the risk of THR in people with existing signs of hip osteoarthritis. This has potential implications for incorporating weight loss interventions into public health strategies to reduce the burden of joint replacement surgery.

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Effect of body composition on bone mineral density in men, pre- and post-menopausal women with complex obesity

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Background: Obesity has a complex relationship with bone mineral density (BMD) and fracture rate.[1] The respective effects of lean mass (LM) and fat mass (FM) on BMD is debated. LM has a positive correlation with BMD,[2] whereas FM and FM percentage (FM%) have shown negative associations with BMD,[3] although studies show positive relationships in women.[4] Limited studies explore how LM and FM interact with BMD in complex obesity.

Methods: Cross-sectional study of patients with complex, severe obesity referred to the Blacktown Metabolic and Weight Loss Program who underwent dual-energy x-ray absorptiometry scans. Population subgroups were based on gender and menopausal status. Spearman correlations compared BMD at the lumbar spine (L1-L4), femoral neck (FN) and total hip (TH) with anthropomorphic variables and body composition.

Results: The study consisted of 121 patients (40 men, 81 women), with mean age 49.8±12.4 and BMI 43.4±6.9 kg/m^2. The osteoporosis rate in men ³50 years and post-menopausal women (n=57) was 3.5%. Increasing age expectedly correlated with worse BMD at L1-L4 (p=0.039), FN (p<0.001) and TH (p<0.001). Weight significantly positively correlated with FN (p=0.004) and TH (p=0.016) BMD, but the relationship was non-significant when corrected for age. BMI did not correlate with BMD. In men, LM positively correlated with FN (p=0.003) and TH (p=0.017) BMD, whereas mixed relationships were demonstrated in pre- and post-menopausal women. In the whole cohort, FM was not correlated with BMD, whereas FM% negatively correlated with FN BMD (p=0.042). In post-menopausal women, FM% had a significant positive relationship with L1-L4 BMD (p=0.009).

Conclusion: In patients with complex, severe obesity, LM is potentially a better predictor of osteoporosis risk compared to BMI or FM, particularly in men. However, evidence remains mixed in women. Further longitudinal research with larger cohorts is required to explore the complex effects of severe obesity and body composition on BMD.

1. Qiao D, Li Y, Liu X, Zhang X, Qian X, Zhang H, et al. Association of obesity with bone mineral density and osteoporosis in adults: a systematic review and meta-analysis. Public Health. 2020;180:22-8.
2. Ho-Pham LT, Nguyen UDT, Nguyen TV. Association Between Lean Mass, Fat Mass, and Bone Mineral Density: A Meta-analysis. The Journal of Clinical Endocrinology & Metabolism. 2014;99(1):30-8.
3. Dolan E, Swinton PA, Sale C, Healy A, O'Reilly J. Influence of adipose tissue mass on bone mass in an overweight or obese population: systematic review and meta-analysis. Nutr Rev. 2017;75(10):858-70.
4. Ijuin M, Douchi T, Matsuo T, Yamamoto S, Uto H, Nagata Y. Difference in the effects of body composition on bone mineral density between pre- and postmenopausal women. Maturitas. 2002;43(4):239-44.

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A qualitative exploration of dieting experience among people with overweight or obesity following intermittent fasting or daily calorie restriction

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Background & Objective: Dietary management remains the first-line treatment for obesity. This qualitative study aimed to explore participants' experiences in a six-month controlled weight loss intervention with set meal plans, following either an intermittent fasting (IF) diet or daily calorie restriction (CR), and a two-month follow-up period, to better understand factors that promote sustained dietary change.

Methods: Fifteen participants with overweight or obesity, who completed or dropped out from the two intervention groups, were recruited using purposive sampling. In-depth, semi-structured interviews were conducted during the 2-month follow-up phase. All interviews were audio-recorded and transcribed verbatim. Transcripts were coded by two independent researchers and analysed thematically.

Results: Interviews from the two intervention groups showed similar behaviour change patterns. Participants first joined the weight loss trial with varied levels of intrinsic motivation to improve health, but relied more on "accountability" to researchers for early dietary adherence. They stressed the importance of frequent visits with researchers and being monitored with objective clinical measurements. Such feedback mechanisms either encouraged dietary adherence or prompted self-review. Meanwhile, it was highlighted that transition to the new diet took time and effort. Participants who worked with researchers to adjust to their prescribed diet showed more positive attitudes towards the intervention. This reflected an ownership of self-care and sustaining adherence to new diets. However, those who continued to rely on the frequent visits with researchers to be disciplined were more likely to report returning to usual dietary habits once the intervention finished.

Conclusion: Our findings demonstrated that individuals successfully making and maintaining the prescribed dietary changes underwent a transition of being accountable under supervision to owning the intervention themselves. This process not only required initial motivation, but frequent external monitoring and feedback along the way that prompts participant's adjustment of the new diet to fit their lifestyle.

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Relationship between polypharmacy and clinical disease burden in adults with super-obesity in a tertiary weight management program; A prospective observational study

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Objectives: Obesity is typically associated with greater comorbidities and a corresponding increase in medication use.[1,2] Few studies have examined the relationship between polypharmacy, therapeutic categories of medication and body mass index (BMI), Edmonton Obesity Staging System (EOSS) Stage, presence of ischaemic heart disease (IHD), type 2 diabetes mellitus (T2DM), hypertension and chronic kidney disease (CKD) stage within a complex, super-obese population.[3]

Design: A prospective observational cohort study (2018-2020) of complex obese patients in the Blacktown Metabolic and Weight Loss Program of BMI>35 kg/m^2 with T2DM or BMI>40 kg/m^2 with two obesity complications. Total number and therapeutic categories of medication were correlated with clinicopathologic parameters.

Results: A total of 270 patient records were analysed (mean(SD) BMI 51.3(11.8) kg/m^2, mean(SD) age 48.9(12.4) years, 95 males (35.2%), 175 females (64.8%)). Age correlated significantly with total medication burden ($p<0.001$), cardiovascular medications ($p<0.001$), respiratory medications ($p=0.031$) and analgesic medications ($p=0.047$). The mean(SD) medications used by patients across all EOSS stages was 5.4(3.7), with patients of EOSS Stage 1, 2 and 3 using 2.5(2.3), 4.6(3.4) and 7.0(3.7) medications respectively. Significant correlations were found between EOSS and total, cardiovascular and psychotropic medications ($p<0.001$, $p<0.001$ and $p=0.030$ respectively), whereas BMI correlated only with respiratory medications ($p=0.014$). There was a significant increase in total and cardiovascular medications for patients with IHD, and in total, cardiovascular and diabetes medications for patients with T2DM (all $p<0.001$). Total, cardiovascular and diabetes medications correlated with HbA1c% (all $p<0.001$). There was a significant difference between individuals of each CKD stage and total ($p<0.001$), cardiovascular ($p<0.001$) and respiratory medications ($p=0.003$).

Conclusions: EOSS Stage may be a superior predictor for polypharmacy than BMI in super-obese patients. Cardiovascular medication use correlates with several clinicopathologic parameters. Further research is required across larger cohorts and to establish whether medications of specific pharmacologic classes correlate with clinicopathologic parameters.

1. Wang YC, McPherson K, Marsh T, Gortmaker SL, Brown M. Health and economic burden of the projected obesity trends in the USA and the UK. Lancet Lond Engl. 2011 Aug 27;378(9793):815–25
2. Narbro K, Agren G, Jonsson E, Näslund I, Sjöström L, Peltonen M, et al. Pharmaceutical costs in obese individuals: comparison with a randomly selected population sample and long-term changes after conventional and surgical treatment: the SOS intervention study. Arch Intern Med. 2002 Oct 14;162(18):2061–9.
3. Sharma AM, Kushner RF. A proposed clinical staging system for obesity. Int J Obes. 2009 Mar;33(3):289–95.

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Improved metabolic profile in mice receiving dual pharmacological targeting of NAD^+ biosynthesis and degradation.

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Nicotinamide adenine dinucleotide (NAD+) plays a crucial role as the substrate for NAD+-dependent enzymes that mediate numerous fundamental cellular processes including energy metabolism, cell survival, DNA repair, inflammation, circadian rhythms and lifespan. Despite its repeated cycling in redox reactions, NAD^+ levels decline with age in both rodents and humans and have also been shown to decrease with other metabolically compromised states such as obesity. Conversely, metabolically beneficial interventions such as calorie restriction and exercise are associated with increases in NAD^+ levels. To date, various studies have demonstrated positive metabolic effects of replenishing declining NAD+ levels in these conditions through the provision of NAD+ precursors such as NMN or NR, or the inhibition of NAD+-consumers such as CD38. In addition to NAD^+, CD38 has also been shown to degrade NMN, compromising its ability to increase NAD^+*in vivo*. Given the promising effects of NMN administration alone, we sought to examine the effects of NMN treatment in combination with the inhibition of CD38 through the use of the compound 78c in mice. We found that the combination of NMN+78c acutely raised NAD+, NADH and NR levels across multiple tissues as well as hepatic NMN levels in mice, more so than NMN or 78c alone. When administered for eight weeks in HFD-fed mice, the most significant attenuation of weight gain and fat deposition relative to HFD controls was observed in the combined treatment group, with a more pronounced effect compared to either treatment alone. The combination of NMN+78c was also the only treatment that resulted in improved insulin sensitivity relative to HFD controls (based on an index of glucose and insulin levels during an oral glucose tolerance test). These effects of enhancing NMN treatment with inhibition of NAD+ precursor breakdown show promising therapeutic potential for metabolic conditions affecting modern society, such as obesity.

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Mitochondrial uncoupler BAM15 restores normal glucose homeostasis in male *db/db* mice

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Aims: Mitochondrial uncoupling increases energy expenditure and has therapeutic potential for the treatment of metabolic disorders. We previously demonstrated that the mitochondrial uncoupler BAM15 reverses obesity and improves insulin sensitivity in mouse models of diet-induced obesity. This study aimed to determine the effect of BAM15 on glucose homeostasis in a more severe model of obesity and insulin resistance in leptin receptor-deficient (*db/db*) male mice.

Methods: Four groups of mice were maintained for 4 weeks on various diets; these included *db/+* mice fed *ad libitum* chow (lean controls), *db/db* mice fed *ad libitum* chow (chow *ad lib* control), *db/db* mice pair-fed chow to match lean controls (chow pair-fed, positive control), and *db/db* mice with *ad*

libitum access to chow diet containing 0.2% (w/w) BAM15 (BAM15-treated). Liver gene expression was analysed by RT-qPCR of frozen tissue.

Results: BAM15 treatment significantly lowered body mass with efficacy similar to pair-feeding. BAM15 treatment completely normalized fasting glucose and glucose tolerance to levels comparable to lean controls, while the calorie restricted pair-fed group only showed partial improvement compared to chow *ad lib* controls. These improvements were associated with decreased liver mRNA expression of glucose-6-phosphatase in both the BAM15-treated and chow pair-fed mice compared to chow *ad lib* controls. Pair-feeding resulted in the best effect on lowering liver triglyceride levels amongst the *db/db* groups. There were no changes in fasting plasma insulin or liver cholesterol among any *db/db* groups.

Conclusions: These results indicate a strong effect of the mitochondrial uncoupler BAM15 on normalizing glucose homeostasis. This effect likely occurs through a mechanism that is independent of adiposity and liver triglyceride levels and at least in part associated with a decrease in gluconeogenesis. These results support further investigation into the therapeutic potential of BAM15 and related molecules as pharmacotherapies for diabetes.

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You are what your mother eats: Maternal macronutrient intake and the effects on offspring metabolism

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As the obesity epidemic continues to increase worldwide, the need for accessible and effective treatment also grows. Nutrition is often considered as the single most important modifiable factor that influences reproduction, health and the intergenerational risks of obesity and metabolic disease. It is well accepted that *in utero* exposure to maternal diet can program offspring body composition and susceptibility to disease in later life. While animal studies have focused primarily on the effects of either maternal under-nutrition (e.g., calorie or protein restriction), or over-feeding of high fat diets, little is known about the effects of macronutrient balance in modulating offspring health. An important model, called *protein leverage*, posits that a tight, innate regulation of protein intake can result in the overconsumption of fats and carbohydrates when given low protein diets, and their underconsumption on diets with a high proportion of protein. However, the question remains as to *when* and *how* this strong regulation is programmed in an individual. Here, we investigate how maternal protein to carbohydrate (P:C) balance influences protein-specific appetite in offspring and the implications for the development of obesity using a mouse model. Using food choice experiments, we show that offspring from dams fed high P:C diets have greater protein targets, a result consistent across sexes. We also show that these greater protein targets increase offspring food intake when placed on no-choice diets, resulting in an overall increase in body weights and fat mass. This work highlights the massive implications of early life programming on later life metabolism. It could help to explain known patterns in the epidemiology of obesity and will provide fundamental new understanding of the ways in which maternal nutrition shapes offspring health.

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A history of obesity reduces the immune response to influenza virus in an NLRP3 dependent manner

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INTRODUCTION: Obesity significantly increases the risk of death following an influenza virus infection. Consistent with these clinical observations, we and others have shown that mice with diet-induced obesity develop much more severe influenza than their lean-fed counterparts. Traditionally, it has been assumed that this increased susceptibility can be reversed by weight loss. However, this remains to be tested experimentally. *METHODS:* Here, a novel mouse model was developed to study the long-term effects of obesity on anti-viral immunity. Four week old C57BL/6 mice were fed a high fat or lean diet for 10 weeks. After 10 weeks, mice fed a high fat diet had a significantly higher total body weight and percentage body fat compared to mice fed the lean diet. Obese mice were then swapped to a lean diet for 10 weeks. *RESULTS:* After 10 weeks on the lean diet, mice that were previously obese (PO) had an equivalent body weight and percentage body fat to mice that received the lean diet for the entirety of the 20 week treatment period. However, upon infection with influenza virus (A/Auckland/09(H1N1)), PO mice displayed increased viral replication, inflammation, body weight loss and pulmonary dysfunction compared to lean-fed mice. Cells in the lung lumen of PO mice also had an altered metabolic state compared to those of lean fed mice. Importantly, in mice deficient in the NLRP3 inflammasome, obesity had no long term effect on susceptibility to influenza virus infection. *CONCLUSIONS:* We propose that obesity can have long-term, NLRP3 dependent, effects on the metabolism of innate inflammatory cells such that they are impaired in their anti-viral response. Understanding the long-term effects that obesity has on anti-viral immunity will help pave the way for the development of novel therapeutics to improve the health of the billions of people who are, or previously have been, obese.

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Intermittent fasting as a sexually dimorphic intervention that can induce interferon-alpha signaling in the liver.

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Intermittent fasting (IF) is a beneficial dietary treatment for obesity that improves liver health. A major co-morbidity of obesity is non-alcoholic fatty liver disease (NAFLD), where the accumulation of liver fat leads to fibrosis and reduced liver function. The risk for NAFLD is higher in men and post-menopausal women, which suggests sex hormones play a critical role in NAFLD prevention. Recently, we completed the first proteomic analysis of IF in both male and female mice. Of the 4500 proteins identified, 1050 were significant for IF-responsiveness, 800 were enriched in one sex and 500 were differently regulated by IF between the sexes. This strongly supports a sexually dimorphic response to IF in the liver. Strikingly, females had vastly increased interferon-alpha (IFNα) pathway induction after IF, whereas males had very little induction. To determine if ongoing sex hormone action was required for these differences, we applied IF to either castrated or sham treated mice. In the absence of testosterone, IFNα signaling increased in the liver after IF which suggests the androgen receptor actively suppresses IFNα pathway induction. Currently, we are performing similar experiments in ovariectomised mice to dissect the role of estrogen in the IF response. IFNα signaling has previously been shown to reduce lipid accumulation and fibrosis within the liver. Further questions remain about the protective efficacy of IF for liver fibrosis, which we aim to test in a mouse NAFLD/fibrosis model. This works highlights an interesting link between IF and sex with potential consequences for human treatment and disease prevention. Identification of pathways triggering the IF response could lead to therapeutic strategies to treat liver disease.

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The contribution of PSMD9 to the regulation of hepatic lipid metabolism

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Perturbations to lipid homeostasis can promote deleterious metabolic pathologies including hepatic lipotoxicity and insulin resistance. Indeed, non-alcoholic fatty liver disease (NAFLD) is associated with both obesity and type 2 diabetes. Here, we characterise the protein, 26S proteasome non-ATPase regulatory subunit 9 (PSMD9), in the setting of excess lipid consumption which drives lipotoxicity and metabolic dysregulation.

To assess the *in vivo* contribution of PSMD9 to lipid metabolism, C57BL/6J and DBA/2J mice were administered an anti-sense oligonucleotide (ASO) against PSMD9 to silence expression while

concomitantly being administered a Western Diet for 4 weeks. PSMD9-ASO treatment was associated with robust knockdown of PSMD9 in both liver and white adipose tissue (WAT), as well as reduced weight gain compared to control ASO mice. Moreover, PSMD9-ASO treated mice exhibited significant reductions in the expression of key genes and proteins of the *de novo* lipogenesis (DNL) pathway, in both the liver and WAT. Furthermore, PSMD9-ASO treated mice exhibited significantly reduced hepatic and WAT triacylglycerol and diacylglycerol accumulation as well as reductions in plasma glucose levels.

Likewise, PSMD9-ASO mice fed a high fat, high fructose diet for 26 weeks exhibited significant reductions in weight gain and markers of DNL, in epididymal and subcutaneous WAT, with increased expression of browning genes in subcutaneous WAT compared to control ASO mice. Moreover, to delineate the metabolic effect of PSMD9 ablation in a tissue-specific manner, we generated a liver-specific PSMD9 knockout (KO) mouse. PSMD9 KO mice fed a HFD for 16 weeks exhibited increased liver mass with a converse reduction in epididymal WAT. Moreover, hepatic expression of genes from the DNL pathway were modulated in PSMD9 KO mice.

In summary, these studies suggest that PSMD9 may be an attractive target for therapeutic attenuation of hepatic lipid accrual associated with NAFLD.

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Exercise-responsive hepatokines and the role of Syndecan-4 in systemic energy homeostasis

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Inter-tissue communication via endocrine signals is crucial for appropriate regulation of systemic metabolism and energy homeostasis. Disruptions in tissue crosstalk occur in obesity and other metabolic diseases, including non-alcoholic fatty liver disease (NAFLD). Specifically, changes in liver-secreted proteins (i.e., hepatokines) in NAFLD were previously shown to induce metabolic dysregulation. On the other hand, exercise training increases energy expenditure and can reduce NAFLD severity. However, exercise-induced changes in hepatokine secretion and whether such endocrine remodelling contributes to the beneficial effects of physical activity on energy expenditure (EE) is unknown. Here, we aimed to identify novel exercise-responsive hepatokines and assess their impact on aspects of adiposity and energy balance in mice.

Mice were fed a high-fat diet (HFD) for six weeks to induce obesity and NAFLD and remained sedentary or were endurance exercise trained for a further six weeks. Hepatocytes were isolated three days after their last exercise bout, and changes in the secreted proteome were identified by label-free mass spectrometry. We identified 1590 hepatokines, 102 were classically secreted and markedly altered following exercise training. Syndecan-4 was identified as a novel exercise-responsive hepatokine. Hepatic syndecan-4 was implicated in controlling EE in drosophila, hence, we aimed to determine whether overexpression of syndecan-4 in the livers of obese mice can increase EE and reduce adiposity.

Mice were fed a HFD for six weeks and injected intravenously with an adenoassociated virus to increase syndecan-4 expression specifically in the liver. Six weeks later, adiposity (MRI) and energy expenditure was assessed. Syndecan-4 expression was increased 2-fold in the liver and did not impact adiposity, whole-body substrate utilisation, EE, food intake, liver lipid and glucose metabolism, or NAFLD severity. Taken together, we provide a novel resource describing changes in hepatokine secretion following exercise training and identify syndecan-4 as an exercise-induced hepatokine that does not control energy balance.

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Dual inhibition of CD36 and ACC is not a therapeutic approach for non-alcoholic fatty liver disease in mice.

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Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease worldwide, with a global prevalence of 24%. Patients with NAFLD often have insulin resistance and/or type 2 diabetes and have an increased risk for developing advanced liver disease, including non-alcoholic

steatohepatitis (NASH), fibrosis, cirrhosis and liver cancer. Despite this increasing clinical epidemic, there are currently no approved pharmacotherapies for NAFLD and NASH.
Dysregulation in lipid metabolism, including increased fatty acid uptake and *de novo* lipogenesis (DNL), is a hallmark of NAFLD. Here, we investigated the therapeutic potential of dual inhibition of the fatty acid transporter CD36, and acetyl-CoA carboxylase (ACC), the rate-limiting enzyme in DNL, for the treatment of NAFLD in mice.
Mice with hepatic CD36 deletion (CD36-LKO) and their respective wildtype littermates were fed a high fat diet for 8 weeks, in the absence or presence of daily oral administration of an ACC inhibitor (GS-834356, Gilead Sciences, ACCi). Neither CD36 deletion or ACC inhibition impacted body weight, adiposity, energy expenditure, glucose tolerance or insulin sensitivity. The respiratory exchange ratio (RER) was significantly increased in CD36-LKO mice, pointing to reduced capacity for fatty acid oxidation. ACCi-treated mice, as expected, showed a significant reduction in liver triglyceride content; however, CD36 deletion led to a mild compensatory increase in the expression of the fatty acid transport protein FATP5, and an overall increase in liver triglyceride accumulation.
Overall, these data confirm the therapeutic utility of ACC inhibition in NAFLD but indicate that dual inhibition of CD36 and ACC is not an effective strategy for the treatment of NAFLD.

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Gut-brain pathways that drive learning about food

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Animals must learn through experience which foods are nutritious and should be consumed, and which are toxic and should be avoided. This learning process is critical for survival in the wild and contributes to the motivational pull of energy dense foods in modern society. However, our understanding of the underlying cells, signals and pathways remains rudimentary. I will describe our work developing genetic tools to monitor and manipulate GI sensory pathways in the mouse, and the application of these tools to investigate mechanisms of post-ingestive learning.

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Obesity in populations: 20 years on

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From the population and public health perspective, I will hazard a guess about the state of global obesity in 20 years' time
1. Obesity transition: The trickle of high-income countries entering phase IV of the Obesity Transition (reducing prevalence) will accelerate. The reductions among pre-school children will spread to older children and then youth, especially young women. The downturn to date has mostly occurred in the absence of specific public health efforts to prevent obesity and is often associated with increasing inequities (by disadvantage, ethnicity and rurality). Unless #3 below occurs, this will continue to be the pattern. Scandinavian and high-income Asian countries will lead reductions in obesity prevalence and most middle-income countries will not yet have entered phase IV.
2. Ultraprocessed foods (UPFs): In 20 years, giving children UPFs in schools will acquire the same status as teachers smoking in the classroom. The evidence of harm will be incontrovertible; in Australia and New Zealand, schools will ban UPFs, but; children from disadvantaged households will still be exposed to UPFs for the same reasons they are currently exposed to tobacco smoke.
3. Dealing with inequities: Only countries that deal with the underlying drivers of societal inequities in wealth, education and justice will see major improvements in obesity prevalence and obesity inequities. This will also entail de-powering the commercial influences over policy-making and implementing pro-equity policies (like bans on marketing and taxing UPFs). New Zealand will make more progress than Australia as Māori gain more influence in governance.
4. Climate change and sustainability: The social momentum for sustainable eating will be the dominant determinant of dietary trends as the consumption of UPFs, red meat and dairy declines. All ANZOS catering will be vegetarian and UPF-free with a small, special-request section to the side for obligate carnivores.

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Obesity and clinical care: where will we be in 20 years from now?

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Obesity prevalence will remain high in 2041. Here is what my optimistic self anticipates for clinical care by then:

1. **More person-centred care**: The voices of people living with obesity - across the life course, as well as culturally and linguistically diverse populations, First Nations peoples, and people experiencing social disadvantage - will have influenced the ways in which care is provided. Weight-related stigma within the health system will have decreased.

1. **Targeted treatments**: Treatments will be better targeted for obesity "phenotype", this term covering a diverse range of genetic, biological, psychological and social factors that influence responses to treatment. "Precision health" approaches will extend to group programs, behavioural therapy, drug therapy, intensive dietary interventions and bariatric surgery. Clinicians will be experienced in the selection of the "right treatment for the right patient at the right time".

1. **Improved access to high quality care within health services**: Health services will (finally!) have developed coordinated clinical pathways across primary, secondary and tertiary care. Treatment-seeking people with obesity will be better able to navigate the clinical care systems, supported by well-trained health professionals. Many more services will be well-resourced and affordable for all.

1. **Obesity meets eating disorders more peacefully**: The traditional divide between obesity and eating disorder treatment will be bridged. Obesity care will include strategies to recognise and minimise eating disorder risk, and treatment of binge-eating will include management of obesity.

1. **More collaborative and large-scale research in clinical care**: There will be improved resourcing and ethics and governance support for high quality collaborative obesity research. Data sharing and big data approaches for analysis of individual participant data and complex interventions will be routinely undertaken. National treatment registries will be publicly resourced.

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Obesity Research in 20 years will look very different to now.

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Genetics and diet play a major role in the development of insulin resistance (IR). While diet effects have been extensively studied, the role of genetics alone or the interaction between genes and the environment is not well characterized. This is due, in part, to the inability to subject the same background to multiple environmental perturbations, and the lack of tissue-specific phenotypic resolution afforded by many model systems. The latter is crucial, as it is widely accepted that, under obesogenic conditions, IR in muscle is driven by IR in adipose tissue via some form of tissue crosstalk. However, there is a need to investigate how genetic background influences the development of tissue-specific IR and consequent systemic disease. We undertook a comprehensive analysis of tissue level

insulin action combined with other metabolic phenotypes in a panel of inbred mice strains fed two different diets. Each strain exhibited unique metabolic responses to Western Diet (WD). Strikingly, muscle and adipose tissue IR were not correlated, with IR in each tissue being associated with discrete metabolic indices: muscle IR, but not AT IR, was strongly correlated with hyperinsulinemia; soleus IR was correlated with fat pad mass, indicating a possible link between lipid storage capacity and muscle IR independently of AT IR per se. In contrast to soleus IR, adipose IR was correlated with adipocyte hypertrophy but not fat pad mass, suggesting AT IR is driven by factors intrinsic to the adipocyte. Interestingly, the heritability of IR was higher in EDL than soleus, whereas Western diet feeding had a greater impact on IR in soleus, emphasizing mechanistic heterogeneity behind IR in different muscles, which may be based on functional and structural differences. Co-expression network analysis of the soleus proteome revealed marked variation in the expression levels of specific proteins across different inbred strains and in response to diet. The strongest response module comprised numerous glycolytic enzymes that were strongly correlated with muscle IR. By leveraging the effects of discrete dietary conditions across diverse genetic backgrounds in mice, this study has uncovered extensive gene-by-diet interactions, which create unique tissue- and strain-specific IR phenotypes. We have harnessed these signatures to deconvolute the metabolic contributions of tissue-specific IR, revealing unique AT-muscle crosstalk, as well as potential mechanisms of IR inherent to each tissue.

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Device-based measures of movement behaviour. Is it time to say goodbye to cut-point methods?

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Accelerometer-based monitoring of movement behaviours has become popular among researchers and consumers. However, the research potential of accelerometers has been severely under-utilised, with analysis restricted to the application of simple cut-points or linear regression models based on proprietary activity counts. Machine learning approaches to accelerometer data reduction have emerged as a more accurate and versatile alternative to cut-point methods. However, the uptake of machine learning methods by clinical and public health researchers has been limited, in part, due to the difficulties of implementation, the concern that models trained on data from laboratory-based activity trials do not generalize well to free-living environments, and the lack of studies demonstrating the relative advantage of machine learning approaches over traditional cut-point methods. This presentation will focus on the application of machine learning accelerometer data processing methodologies for human activity recognition. It will demonstrate the advantages of machine learning methods relative to cut-point methods and introduce deployment tools that enable health researchers without specialist training in data science to implement machine learning physical activity classification and energy expenditure estimation algorithms.

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Activity recognition models for quantifying movement behaviours in children and adults.

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Traditional device-based physical activity measurement methods are unable to accurately differentiate between low intensity movements (i.e., lying/sitting/reclining/standing/non-wear). These limitations prevent the development of accurate 24-hour behavioural profiles. This is important as many countries have now adopted 24-hour movement guidelines, combining physical activity, sedentary behaviour, and sleep. Classification of activity behaviours using raw accelerometer data is becoming more prominent and is consistently acknowledged as an avenue of progression. This presentation will explore the development and utility of a dual-accelerometer system for capturing 24-hour movement patterns in children and adults. A series of studies will be presented, starting in a structured laboratory environment before moving into free-living settings. The application of these measures in several study populations (including a national child cohort and adult shift workers) will be demonstrated, before ending with a summary of the challenges and future research directions of this field.

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Assessing activity patterns in youth using device-based measures

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The measurement of physical activity and sedentary behaviour using device-based measures (e.g. accelerometers) has traditionally focused on quantifying the volume of activity undertaken. As accelerometers provide date- and time-stamped data, it is possible to examine how and when youth accumulate their activity during the day. These patterns of activity accumulation include the timing, duration, and intensity of activity bouts, and the times of the day when activity occurs. In recent years, there has been some emerging evidence to suggest that the way in which youth accumulate their activity may be important for their health. This presentation will initially highlight the evolution of assessing activity patterns using device-based measures such as accelerometers. It will then focus on the importance of considering patterns of activity accumulation, and provide an overview of research that has examined associations between patterns of activity accumulation with health outcomes. It will finish with a discussion of the implications that understanding how youth accumulate their activity may have for public health.

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Adherence to 24-hour movement guidelines among Australian adolescents: results from the NaSSDA survey, 2009-10 to 2018

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Background/Aims: 24-hour movement guidelines promote a healthy balance of high levels of physical activity, low levels of sedentary behaviour and sufficient sleep each day. At present, surveillance data on how Australian adolescents are performing against these guidelines are lacking. The present study aimed to provide current population estimates of adherence to the physical activity, screen time and sleep duration recommendations outlined in the national 24-hour movement guidelines, both individually and in combination, and investigate whether compliance levels varied according to socio-demographic factors. Trends over time were also assessed to determine if there have been significant changes in these behaviours over the past decade.

Methods: National cross-sectional surveys of students in year levels 8 to 11 (ages 12-17 years) were conducted in 2009-10 (n=13,790), 2012-13 (n=10,309) and 2018 (n=9,102) using validated instruments administered via a self-report web-based questionnaire. Prevalence estimates were calculated using weighted data adjusted for the clustering of students within each school.

Results: Only 2% of students surveyed in 2018 met all three key recommendations outlined in the 24-hour movement guidelines. Adherence to the sleep duration recommendation was highest (67%) with substantially smaller proportions meeting the physical activity (16%) and screen time (10%) recommendations. Females were less likely than males to report meeting recommended levels of physical activity, while older adolescents were less compliant with both the physical activity and screen time recommendations. Students' adherence to the screen time recommendation has halved since 2009-10 (19%), whereas there has been no change in the proportion meeting the physical activity and sleep duration recommendations.

Conclusions: Findings underscore the need for policy proposals and environmental interventions to better support all Australian adolescents in meeting the 24-hour movement guidelines, with particular focus on strategies to assist in the reallocation of sedentary screen time to physical activity.

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Low Volume Interval Training for Cardiometabolic Health

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High intensity interval training (HIIT) involves alternating short bursts of high intensity aerobic exercise with recovery periods of low intensity exercise. Based on the total duration spent completing the high intensity interval/s, HIIT can be divided into high volume (>15 mins) or low volume (≤15 mins). Recent evidence suggests that low volume aerobic HIIT provides cardiometabolic benefits similar to moderate intensity exercise of a much longer duration. Our group has combined low volume aerobic HIIT with interval resistance training and studied its effects in people with type 2 diabetes (Exercise for Diabetes

(E4D) Trial). This presentation will contain data from the recently completed E4D Trial along with a discussion of the evidence supporting low volume interval training for cardiometabolic health.

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Diet-induced thermogenesis: fake friend or foe

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Diet-induced thermogenesis (DIT) is energy dissipated as heat after a meal, contributing 5–15% to total daily energy expenditure (EE). There has been a long interest in the intriguing possibility that a defect in DIT predisposes to obesity. However, the evidence is conflicting. DIT is usually quantified by indirect calorimetry, which does not measure heat. Using gas exchange, indirect calorimetry measures total post-prandial EE, which comprises heat energy produced from brown adipose tissue (BAT) and energy required for processing and storing nutrients. We questioned whether DIT is reliably quantified by indirect calorimetry by employing infrared thermography to independently assess thermogenesis. Thermogenic activity of BAT was stimulated by cold and by a meal that induced a parallel increase in energy production. These stimulatory effects on BAT thermogenesis were inhibited by glucocorticoids. However, glucocorticoids enhanced postprandial EE in the face of reduced BAT thermogenesis and stimulated lipid synthesis. The increase in EE correlated significantly with the increase in lipogenesis. As energy cannot be destroyed (first law of thermodynamics), the energy that would have been dissipated as heat after a meal is channelled into storage. Post-prandial EE is the sum of heat energy that is lost (true DIT) and chemical energy that is stored. Indirect calorimetry does not reliably quantify DIT. When estimated by indirect calorimetry, assumed DIT can be a friend or foe of energy balance. That gas exchange-derived DIT reflects solely energy dissipation as heat is a false assumption likely to explain the conflicting results on the role of DIT in obesity. Concepts on the thermal energy of food may need to be revisited.

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Available Soon

Michael Cowley[1]

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Available Soon

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Do women lose more weight on *ad libitum* Mediterranean diets?

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Background: Tailored advice to individuals or groups achieves better weight loss outcomes than generalised advice alone. The literature suggests a profound impact of gender on weight loss processes and outcomes, as a result of physiological and socio-psychological differences between men and women. Diets without defined energy restriction allow a more meaningful comparison of group differences and thus analysis examined gender differences reported in weight loss clinical trials that employed an *ad libitum* Mediterranean diet approach.

Methods: Three databases (Medline, Embase, Cochrane Central) were systematically searched to retrieve relevant clinical trials for screening by two independent reviewers. Eligibility criteria for title and abstract included: (1) adult population with overweight or obesity, (2) both men and women, (3) weight loss outcome, (4) *ad libitum* Mediterranean diet and control. Final inclusion after review of full texts required a report of weight loss separately for each gender (with or without supporting data).

Results: Of 34 studies screened, 17 were duplicates. Of the 17 remaining, only 3 (18%) reported weight loss separately for men and women. 2 of these reported no difference between genders while 1 reported that women lost more weight than men (Shai *et al.,* 2008).

Conclusions: It is alarming that such few papers analysed weight loss by gender despite known physiological differences between men and women, highlighting the importance of gender stratification in future clinical trials. Further research is required to explore whether women lose more weight than men on a Mediterranean diet, perhaps by widening the search to include calorie restriction. This study compliments our previous investigation of calorie-restricted low-carbohydrate diets where greater weight loss was seen in males. Examining gender variations in response to

different dietary programs will assist health professionals in better tailoring weight loss advice to their patients in the future.

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A role for Trim28 in Regulating Sex Differences in Obesity and its Complications

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The storage of lipids in white adipose tissue (WAT) is a conserved trait that functions to both insulate from the cold, and to store energy to defend against bouts of famine. Researchers have identified 100s of genes that are important in this process, which impact pathways including adipocyte endocrine function, differentiation and energy homeostasis. It is clear that factors such as lifestyle, biological sex, and ageing can influence these processes, and that their dysregulation promotes obesity and disease. Given that obesity remains a major global health issue, it is important that we continue investigating these pathways to better manage this condition, and develop new therapeutics. This talk will present data demonstrating that the gene Trim28 is an important mediator of sex specific differences in adiposity.

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Browning human fat

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Unlike classic white adipose tissue, brown adipocytes burn lipids and glucose to produce heat, using the specialized Uncoupling Protein 1 (UCP1). Adult humans have small quantities of brown fat in the deep layers of the neck, and beige fat in the shallower layers in the neck is most individuals. However, people have vastly greater quantities of white fat than brown. Studies show this white fat can be made more brown-like, or 'beiged' in mice.

Strategies to increase quantity and activation of beige fat in humans may be helpful for the treatment of metabolic syndrome including obesity and diabetes.

This symposium will present data showing that human fat can be browned, causing a significant increase in UCP content, and energy expenditure of fat explants.

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Insulin Regulation of Lipolysis in Adipocytes

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Insulin suppresses adipose tissue lipolysis after a meal, playing a key role in metabolic homeostasis. This is mediated via the kinase Akt and its substrate phosphodiesterase 3B (PDE3B). Once phosphorylated and activated, PDE3B hydrolyses cAMP leading to the inactivation of cAMP-dependent protein kinase (PKA) and suppression of lipolysis. We recently identified a novel player in this process, the abhydrolase domain containing protein 15 (ABHD15) that interacts with PDE3B. We showed that in the absence of ABHD15, insulin is no longer able to suppress lipolysis, and ABHD15 knockout mice display unrestrained lipolysis, elevated plasma fatty acid levels and fatty liver in the presence of stress. ABHD15 deletion was associated with dysregulated PKA signalling on lipid droplets. We have new evidence that ABHD15 acts as a PDE3B repressor. The regulated interaction between PDE3B and ABHD15 is mediated via Akt mediated phosphorylation and 14-3-3 binding and this plays a key role in regulating intracellular cAMP Levels setting the lipolytic tone of the fat cell.

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Rational design and evaluation of multi-functional white adipose tissue-targeting peptides anti-obesity effects

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Obesity is a major health problem worldwide and the strongest risk factor for diabetes, the fifth leading risk for global deaths. Although body fat can be reduced through diet and lifestyle adjustments, pharmacotherapies are required for long-term weight loss management in obese patients. Phentermine, orlistat and liraglutide are the only three drugs approved by the Therapeutic Goods Administration to treat obesity in Australia. Despite being effective they show significant side effects and were not explicitly designed to treat obesity. Thus, treatment of obesity based on targeted therapy with minimal adverse side effects represents a significant unmet clinical need. In general, peptides can fill this gap, offering greater efficacy, selectivity, and specificity than small molecules drugs. Peptides are the smallest functional part of natural proteins, and their degradation products are amino acids, thus minimising the risk of toxicity and potential side effects. Here we report the design of a new generation of peptide-based therapeutics that target white adipose tissues (WAT) with great potential for reducing body weight. We evaluate a series of multi-functional anti-obesity peptide by fusing a helical peptide warhead with a WAT-targeting motif. These two motifs work together to target the destruction of white adipocyte mitochondria. This study provides an insight into the rational design and development of multi-functional anti-obesity peptide therapeutics that are effective, stable and non-toxic with good pre-clinical safety profiles. We demonstrate that this novel approach has resulted in a potent multi-functional drug lead that could regulate the adipogenesis process by reducing overcrowded adipocyte expansion and with significant body weight reduction in a high-fat diet-induced mouse model (daily subcutaneous injection, 3 weeks, >30% loss in WAT, and >20% loss in overall body weight). This study provides a promising approach for developing anti-obesity peptide and highlights its potential to treat metabolic disorders for treating obesity.

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Inflammatory adipose tissue is a potential stratification biomarker for metabolic unhealthy obesity.

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Adipocyte death caused by local inflammation is one feature in the early biological development of metabolic unhealthy and diabetes. When cells become necrotic or apoptotic, cell DNA is released into the bloodstream, which is known as cell-free DNA (cfDNA). DNA methylation is cell type-specific and each cell type has its unique DNA methylation pattern. Detecting cell-type-specific DNA methylation levels reflect the presence of certain cell in samples. Therefore, by identifying adipocyte/liver-specific DNA methylation in plasma, we could infer the adipocyte/liver death and metabolic unhealthy. Here, we propose a novel approach to determine the metabolic health status by detecting adipocyte and liver-specific DNA methylation markers from plasma and validate the analytic utility of this assay. We firstly identified the differential methylation at CpG loci specific to adipocyte and liver using 323 whole-genome bisulfite sequencing samples consisted of 28 types of tissues. We then designed the methylation-specific PCR assay to detect liver and adipose signals. A Four-plex assay with two adipose- and one liver-specific methylation locus was designed to detect cfDNA elevated in response to metabolic health. We also verified the analytical utility of this metabolic assay in 42 cfDNA samples extracted from lean and obese patients' plasma using digital droplet PCR. Our assay results demonstrated Metabolic Abnormal Obese (MAO) people have a higher adipose and liver cfDNA concentration (median: 2.5 and 10 copies/mL plasma, respectively) compared to that in Metabolic Healthy Obese (MHO) (median: 1.5 and 3.5 copies/mL plasma, respectively) and lean groups (median: 1.4 and 4 copies/mL plasma, respectively). MAO patients usually have a significantly higher percentage of adipose and liver in cfDNA (1.8%) than MHO and lean patients (0.7% and 1.1%). In summary, our proof-of-concept study shows that our novel metabolic assay distinguishes MAO from MHO and lean. This promising assay enables precise stratification for metabolic unhealthy and diabetes.

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Strengthening evidence-informed healthy store policy in remote Indigenous Australia

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Background: Retail environments can be optimised to support healthier food purchasing. Evidence for the use of merchandising techniques targeting product, placement, promotion and price to create health-enabling environments is rapidly emerging. In addition to achieving commercial outcomes, store owners and retailers operating in remote Aboriginal and Torres Strait Islander community stores are increasingly interested in adopting health-promoting merchandising techniques into their store nutrition policies and have highlighted that a better understanding of what is most effective would assist in informing store policy.

Methods: A participatory policy priority-setting exercise was conducted with 30 Northern Territory and North Queensland Aboriginal and Torres Strait Islander store owners, retailers, health and government personnel and researchers.

Results: A series of Policy Actions have been co-designed using evidence from research, store sales, and store owners and retailers. A range of strategies to maximise the acceptability and feasibility of these actions in stores has been informed by evidence from store owners and retailers. The series includes best practice for: i) Product, Placement & Promotion of Healthy Foods & Drinks, ii) Product, Placement & Promotion of Unhealthy Foods & Drinks, and iii) Price & Price Promotion on Foods & Drinks. It is aimed to be used by store owners and retailers, and those who support them, to consider in developing and revising their own store nutrition policy.

Conclusions: Co-design with retailers and other experts can result in evidence-informed policies that aim to shape the food environment and positively impact on the nutritional quality of food purchased in remote community stores, whilst maintaining sustainable businesses. This method is highly relevant to global populations in defining approaches to creating evidence-informed local food policies.

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Associations between food purchasing practices in various retail settings and dietary intake among Australian adolescents

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Background/aims: Most Australian adolescents do not meet the recommended daily fruit and vegetable intake and derive a higher percentage of their daily energy intake from discretionary food and drink than Australians in other age groups. Food retail settings frequently accessed by adolescents are saturated with energy-dense, nutrient-poor food and drinks that are heavily marketed at point-of-sale. This study examines associations between food purchasing practices in various retail settings and dietary intake among Australian adolescents.

Methods: National cross-sectional surveys of secondary school students in years 8 to 11 (ages 12 to 17 years) were conducted in 2009-10 (n=13,790), 2012-13 (n=10,309) and 2018 (n=9,102), and were pooled for analysis. The surveys measured self-reported food purchasing practices in different settings and consumption of various discretionary foods, sugary drinks, fruits and vegetables.

Results: Relative to students who usually brought their lunch from home, those who purchased lunch from the school canteen or from nearby take-away outlets each reported significantly higher intake of discretionary food and sugary drinks and lower fruit and vegetable intake (all $p<0.05$). Leaving school grounds to buy food/drink, buying food/drink on the school commute, buying food/drink displayed at the supermarket checkout and ordering fast food using a mobile phone app were each associated with higher discretionary food and sugary drink intake (all $p<0.001$). Checkout purchases were also associated with lower vegetable intake ($p<0.01$).

Conclusions: Food purchasing practices in retail settings such as school canteens, shops near schools and on the school commute, supermarket checkouts and food delivery apps are associated with higher intake of discretionary food and drink among Australian adolescents. Some purchasing practices appeared to displace fruit and vegetable intake. These findings highlight a need to improve the accessibility and promotion of healthier options in school and other retail settings.

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Impact on business outcomes of restricted promotion of unhealthy food in a retail food setting: A randomised controlled trial

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Background

Retailers are key stakeholders in the co-design and implementation of strategies to modify retail food environments to be health enabling. They hold concerns about potential loss of profit and customer loyalty. A large Indigenous corporation, ALPA, that owns and provides retail services to remote community stores partnered with researchers to test the impact on business outcomes of a strategy to limit merchandising of unhealthy foods.

Methods

A set of strategies considered acceptable to trial by ALPA from a business perspective and likely to be the most effective based on best available evidence were identified and implemented over a 12-week period, August to December 2018. Impact on gross profit (GP) was assessed using sales data. Implementation fidelity, impact on ordering, stocking practices, customer satisfaction and resources required to maintain the strategy were assessed using store manager interview data and photographic material.

Results

A small increase in gross profit (6.1% [0.8,11.6]; p=0.022) occurred in association with reductions in sales of targeted unhealthy products and concomitant increases in sales of healthier products. Store conversions were successfully implemented and maintained without adverse impacts on customer satisfaction or retail operations other than adjustments in stock ordering required in the first few weeks of the trial.

Conclusion

Healthy Stores 2020 provides evidence that restrictions on promotion of unhealthy food in food retail can occur without adverse impact on business outcomes. This evidence gave ALPA the confidence to scale Healthy Stores 2020 through their company nutrition policy. Research to support policy uptake of restricted promotion on unhealthy food in the wider remote and non-remote food retail setting is needed.

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Healthier Together: methodology, results and impact of a co-designed, community-based, childhood overweight and obesity prevention program, culturally tailored to the Māori & Pacific Islander community to tackle health inequity.

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Background

Children of Māori & Pacific Islander descent living in Australia have a greater prevalence of overweight/obesity, and consequently, an increased risk of adverse health outcomes. Despite this, childhood obesity prevention programs accessible within the community and tailored to the Māori & Pacific Islander population are lacking. Ultimately, the risk of chronic disease and the rates of health inequity continue to increase, placing a significant health and financial burden on the Australian health care system.

Methods

Program co-design involved a three-phase, iterative, participatory and experience-based process, guided by the Te Ara Tika: Guidelines for Māori Research Ethics, to promote respect and equity. Following traditional oratory customs of Māori & Pacific Islander cultures, “talanoa” facilitated the collaborative program design with consumers, cultural advisors and health professionals. Co-design empowered consumers to formulate program objectives, session plans, resources and evaluation tools. Implementation and research processes are ongoingly co-designed with consumers, ensuring cultural sustainability across all program aspects.

Results

Co-design developed an 8-week community-based childhood overweight/obesity prevention program providing culturally tailored education across nutrition, physical activity, positive parenting practices and culture. Child participants reported life-changing improvements to health behaviours, with 72% reducing their sugar sweetened beverage consumption and 60% increasing their vegetable consumption. As a reflection of improved health behaviour, 59% of children decreased their BMI z-score. Positive outcomes were observed across the life course, with 47% of parents decreasing their BMI, 67% decreasing discretionary drink consumption and 47% increasing vegetable consumption.

Conclusion

Co-design empowered consumers to successfully build on community strengths and tackle the complexities of obesity. A bottom-up approach holds high potential to be adapted to other priority populations, significantly improving culturally tailored health care delivery. A consumer-led approach is pivotal to sustaining engagement and improving health outcomes across generations, ultimately tackling childhood obesity and health inequity among Australia’s priority populations.

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Keriba Way: Co-designing a culturally tailored healthy lifestyle program for communities in the outer Islands of the Torres Strait

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The proportion of Aboriginal and Torres Strait Islander adults in Australia who were overweight or obese increased from 69% in 2012-13 to 74% in 2018-19. Programs with strong community involvement to improve knowledge and skills are effective in reducing personal risk factors related to obesity. Culturally tailored programs led by Aboriginal and Torres Strait Islander facilitators are more effective than non-Indigenous programs in addressing risk factors associated with obesity, such as the importance of relationships, connection to lands, community, identity, self-determination, spirituality and culture. A needs assessment was conducted and identified the outer islands of the Torres Strait as a priority area for obesity prevention. A healthy lifestyle program adapted from Queensland Health’s Living Strong was co-designed with 13 local Aboriginal and Torres Strait Islander staff. Following this, 10 Healthy Lifestyle Officers from outer island communities gathered for consultation and training in the program. Results from consultation indicated the need for inclusion of local foods, gardening, practical activities, and separation of groups by gender for some topics. The pilot program, called Keriba Way, includes information on nutrition, physical activity, food security, gardening, diabetes and smoking cessation. Keriba means "our" in Meriam Mir. Keriba Way is facilitated by Healthy Lifestyle Officers who are also community members. All adults in the community can participate, allowing for flexibility around each community’s needs. Keriba Way has been piloted in three outer island communities so far with over 30 participants. Baseline data has been collected, and evaluation based on changes in anthropometry and behaviours and community feedback is ongoing with the aim to implement the program in further settings. Feedback from community has been positive, and development of this program will contribute to a suite of obesity prevention activities adapted for Torres Strait Islander peoples, by Torres Strait Islander peoples.

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Identifying the most effective on-bottle warning labels to reduce consumption of sugar-sweetened beverages

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Background: Australians are high consumers of sugary drinks. Interventions aimed at reducing population-level consumption would produce public health benefits. On-bottle warning labels that convey the risks of consumption without requiring the consumer to understand complex nutrition information is gaining momentum internationally. This study aimed to identify warning labels that resonated most with consumers.

Method: This online study involved random allocation of n=3500 sugary drink consumers aged 14-60 years, to view a beverage from one of 5 drink conditions: (a) 250ml Coke; (b) 600ml Coke; (c) 250ml lemon mineral water; (d) 500ml lemon mineral water; or (e) 500ml unsweetened orange juice. Respondents viewed this beverage a total of 6 times with randomly assigned label variants from the following categories: Health-text (5 label variants), Health-graphic (5), Sugar-text (4), Sugar-pictogram (5), exercise information (4), and energy information (4). Respondents rated each label on four perceived effectiveness scales: cognitive elaboration, persuasiveness, emotional response, and overall effectiveness.

Results: The difference in average overall effectiveness score (range 0-10) across the 27 labels was small, with four out of five graphic health labels scoring between 6.5 and 6.7, and three out of five sugar pictogram labels scoring between 6.3 and 6.6. The energy information labels received the lowest scores, ranging between 3.9 and 5.0. The results were similar across drink types, including fruit juice. The health effects labels had slightly lower scores on 'taught me something new' and 'is relevant' compared to sugar and exercise information labels.

Conclusions and implications: Labels conveying simple and easily understood information (e.g. teaspoons of sugar) were consistently rated highly. These results can be used in future studies to evaluate whether on-bottle warning labels contribute to behaviour change in real-world settings. On-bottle warning labels have the potential to improve the food environment through product reformulation and increasing consumers' awareness of unhealthy drinks.

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The association between knowledge of health effects and consumption of soft drinks among Australian adolescents

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Background: Adolescents are among the highest consumers of sugar-sweetened beverages in Australia. Gaining insight into sugar-sweetened beverage knowledge and behaviour of these young consumers can assist policy makers in developing effective responses.

Methods: This study was conducted on a nationally representative sample (stratified two-stage probability design) of 9102 Australian secondary school students (12-17 years) surveyed in 2018 as part of the National Secondary Students' Diet and Activity survey. We assessed knowledge of the nutritional contents of soft drinks (sugar, calories/kilojoules and exercise equivalents), knowledge of potential health consequences of soft drink consumption (in general, and as specific health effects), and actual consumption level.

Results: A high proportion of adolescents reported future health problems were likely with regular soft drink consumption (87%), and the individual health effects of tooth decay (76%), weight gain (72%), diabetes (73%) and heart disease (56%). Relatively lower proportions accurately reported the sugar content of a 600ml soft drink (22%), exercise equivalent for a 600ml soft drink (34%) and calories/kilojoules in a 600ml soft drink (3%). Bivariate analyses indicated demographic variation in one or more knowledge indicators according to sex, age and level of disadvantage ($p<.001$); with the general pattern of lower knowledge among males, younger adolescents and those from areas of greater disadvantage. Adjusted multilevel logistic regression analyses indicated those who perceived

health effects were lower consumers of soft drink (p<.001), and those less knowledgeable regarding some of the assessed nutritional aspects of soft drink were higher consumers (p<.001).
Conclusions: Overall, results indicated that general awareness of the potential future health effects of soft drink consumption was much higher than the more specific knowledge indicators (nutritional contents), and that there were relationships between knowledge and consumption. The results of this study highlight potential areas for targeting public health interventions.

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Shared medical appointments for weight loss in primary care: a systematic review

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Background: General practitioners encounter many barriers when addressing obesity in primary care. Shared medical appointments (SMAs) are increasing in popularity and may help mitigate some of these barriers.
Aims: Primary aims were to measure the effect of weight loss SMAs on initial and sustained weight loss. Secondary aims were to explore patient engagement with weight loss SMAs including participant characteristics (e.g., socioeconomic status, gender), response rates, attrition and cost.
Methods: Systematic searches were conducted in the CENTRAL, Medline Complete, PsycINFO, Scopus, CINAHL, EMBASE and Web of Science databases in March 2021. Studies reporting on weight loss SMAs for adults and children in primary care were included. Risk of bias was assessed using the Effective Health Practice Project Quality Assessment Tool for Quantitative Studies. Meta-analysis of controlled studies was planned.
Results: Fifteen studies involving weight loss SMAs in adults (n=10) and children (n=5) were identified. All but one included study was assessed as being weak in quality and six studies had controls. Inconsistency in reporting weight loss and/or weight change in controlled studies meant that data could not be pooled for meta-analysis. There was also a high level of heterogeneity in the design and delivery of weight loss SMAs (e.g., duration, number of SMAs in program). Results from individual studies indicated that SMAs can support adult patients to achieve significant weight loss. Females and older adults were more likely to take up SMA invitations. Results from studies involving children were less conclusive. Despite the purported cost advantages of SMAs, for patients and the health system, only four studies reported on the cost of weight loss SMAs.
Discussion: Weight loss SMAs can facilitate weight loss in adults. Well designed, prospective and controlled studies are required to assess whether weight loss SMAs are superior to other weight loss options in primary care.

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Involving people with lived experience of obesity in policy and service development

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Consumer stories, voices, needs, and interests are at the foundation of the development and implementation of the WA Healthy Weight Action Plan. The Plan is a collaboration between Health Consumers' Council WA, the Department of Health, and the WA Primary Health Alliance.
Partnering with consumers is a requirement of all public and private hospitals, and day procedure services that are required to be accredited to the National Safety and Quality Health Service Standards1. "The active involvement of consumers and community members in health and medical research benefits the quality and direction of research."2
Health Consumers' Council WA has been creating opportunities for people with overweight and obesity to share their stories and experiences to ensure that health services and policy in WA are planned and implemented based on a good understanding of the needs and experiences of consumers since 2018.
In this session we'll share a number of the lessons we have learned about how people with obesity want to be involved, the importance of tailoring involvement activities to reach particular groups, as well as what people with obesity would like to see from general and specialist health services.

We'll also share insights from the consultations we've undertaken, including on how consumers feel about talking about weight with health professionals.

1. Australian Commission on Safety and Quality in Health Care, National Safety and Quality Health Services, https://www.safetyandquality.gov.au/standards/nsqhs-standards
2. Statement on Consumer and Community involvement in Health and Medical Research, National Health and Medical Research Council (2016), Consumers Health Forum of Australia. p5

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Comorbidity and outcomes following bariatric surgery in a public hospital multidisciplinary intensive weight loss program

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BACKGROUND The majority of bariatric surgeries in Australia are performed in private hospitals (93.8%) compared to public settings (6.2%). Publicly funded operations are generally provided to patients who have completed an intensive lifestyle and education program prior to bariatric surgery, though outcomes is less known in this setting. METHODS A prospective analysis of comorbidity and clinical data on all patients who have completed the 1-year intensive lifestyle program and have had bariatric surgery at the Blacktown Metabolic & Weight Loss Program between 2017 to 2021. Patients were referred by the primary care physician from the Western Sydney community and required a BMI>35 kg/m^2 plus type 2 diabetes or BMI>40 kg/m^2 plus 2 obesity complications to be enrolled in the program. RESULTS 72 patients were included in the analysis. Mean age was 48.5±10.2yrs, weight 144±31kg, BMI 51±11kg/m^2, waist circumference 143.0±26.8 cm, with females comprising 68%. Mean systolic (SBP) and diastolic blood pressures (DBP) were 134.6±16.9mmHg and 81.6 ±11mmHg, respectively, with mean glycosylated haemoglobin A1c of 7.4±1.9%. Patients were primarily of Edmonton Obesity Stage II (41%) or III (41%). Prevalence of comorbidities was very high, with baseline rates of fatty liver disease of 93%, chronic kidney disease 78%, hypertension 74%, type 2 diabetes 71% (of whom 29% required insulin), obstructive sleep apnoea 57%, depression 49%, joint disease 49%, thyroid disease 19%, PCOS 18%, and cardiovascular disease 15%. In line with national trends, 62% of the cohort had a laparoscopic sleeve gastrectomy, with 38% receiving a single anastomosis gastric bypass. To date, mean excess weight loss 1-year following surgery (n=23) was 48.6±23.9%, with significant reductions in SBP (-13 mmHg) and DBP (-6.3 mmHg). Data collection is ongoing. CONCLUSION Outcomes of publicly funded bariatric programs is comparative to other settings and is imperative to improve patient care and access to this underfunded resource.

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Once-weekly subcutaneous semaglutide 2.4mg reduces body weight in adults with overweight or obesity regardless of baseline characteristics (STEP 1)

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Aims: Semaglutide is a long-acting, subcutaneous, GLP-1 analogue currently being investigated for obesity management in adults with overweight or obesity in the STEP clinical trial programme. This post-hoc analysis of STEP-1 investigated weight loss in subgroups of participants based on baseline characteristics.

Methods: A randomised, double-blind, placebo-controlled, phase 3 trial (NCT03548935). Adults aged ≥18 years with either BMI ≥27kg/m^2 with ≥1 weight-related comorbidity or BMI ≥30kg/m^2, without type 2 diabetes, were randomised 2:1 to 68 weeks' treatment with once-weekly subcutaneous semaglutide 2.4mg or placebo, as adjunct to lifestyle intervention. A descriptive evaluation of categorical weight loss with semaglutide from baseline to week 68 (≥20%, 15-<20%, 10-<15%, 5-<10%) by baseline characteristics (age, sex, race, body weight, BMI, waist circumference and glycaemic status) was conducted. Mean percent weight loss with semaglutide from baseline to week 68 was analysed separately by sex and baseline body weight using MMRM analysis with treatment, subgroup and the interaction between treatment and subgroup as factors, and baseline body weight as a covariate; all nested within visit.

Results: STEP 1 included 1,961 randomised participants (mean age 46 years, body weight 105.3kg, BMI 37.9kg/m^2; 74.1% female). For categorical weight loss, observed proportions of participants with ≥20%, 15-<20%, 10-<15% and 5-<10% weight loss at week 68 were 34.8%, 19.9%, 20.0% and 17.5% with semaglutide vs 2.0%, 3.0%, 6.8% and 21.2% with placebo, respectively. Distribution of participants across weight loss groups did not appear to be affected by any baseline characteristics, except sex and baseline body weight. Mean percent weight loss at week 68 with semaglutide was greater among females than males, and in participants with lower vs higher baseline body weight.

Conclusions: Weight loss with semaglutide was seen in all subgroups evaluated. Female sex and low baseline body weight were associated with greater response to semaglutide.

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Semaglutide 2.4 mg and intensive behavioural therapy in subjects with overweight or obesity (STEP 3)

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Aims: Semaglutide, a glucagon-like peptide-1 (GLP-1) receptor agonist, has shown clinically relevant weight loss vs placebo in a phase 2 trial. Studies have shown additive effects of lifestyle interventions combined with weight loss medication.

Methods: This 68-week, randomised, double-blind, multicentre, placebo-controlled, phase 3 trial (NCT03611582) compared the effect on body weight of once-weekly subcutaneous semaglutide 2.4 mg vs placebo, both as adjunct to a low-calorie meal replacement diet for the first 8 weeks and intensive behavioural therapy (IBT; decreased energy intake, increased physical activity and counselling) for the trial duration in adults with overweight (body mass index [BMI] ≥27 kg/m^2) plus ≥1 comorbidity, or obesity (BMI ≥30 kg/m^2), without type 2 diabetes. Effects on cardiovascular disease (CVD) risk factors, glucose metabolism, patient-reported outcomes and safety/tolerability were also assessed.
Results: 611 randomised subjects (mean age 46 years, body weight 106 kg, BMI 38 kg/m^2; 81% female) were included. At week 68, mean body weight decreased from baseline by 16.0% with semaglutide vs 5.7% with placebo (estimated treatment difference: –10.3; 95% CI: –12.0, –8.6; p<0.0001). More subjects achieved weight loss ≥5%, ≥10%, ≥15% and ≥20% with semaglutide vs placebo (87% vs 48%; 75% vs 27%; 56% vs 13%; 36% vs 4%, respectively; all p<0.0001). From baseline to week 68, the proportion of subjects with prediabetes decreased from 48% to 7% in the semaglutide group, and from 53% to 26% in the placebo group. Greater improvements were seen with semaglutide in waist circumference, BMI, blood pressure and lipids (total cholesterol, LDL, VLDL, FFA and triglycerides). Semaglutide was well tolerated; gastrointestinal adverse events were most common (semaglutide: 83%; placebo: 63%).
Conclusions: In adults with overweight or obesity, semaglutide 2.4 mg as an adjunct to IBT led to significantly greater weight loss and improvements in CVD risk factors and glucose metabolism vs placebo plus IBT.

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Weight loss maintenance with once-weekly semaglutide 2.4 mg in adults with overweight or obesity reaching maintenance dose (STEP 4)

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Aims: The STEP 4 clinical trial programme investigated weight loss maintenance with continued subcutaneous semaglutide (a GLP-1 analogue) vs switching to placebo in overweight or obese participants reaching semaglutide 2.4 mg during a 20-week study run-in.
Methods: This was a randomised, quadruple-blind, placebo-controlled, phase 3 trial of 803 adults with a body mass index (BMI) ≥30 kg/m^2 or ≥27 kg/m^2 with ≥1 weight-related comorbidity, without diabetes, who reached 2.4 mg of once-weekly subcutaneous semaglutide following dose escalation over 20 weeks (NCT03548987). Participants were randomised 2:1 to continue semaglutide 2.4 mg or switch to placebo for 48 weeks, both with lifestyle intervention. The primary endpoint was body weight change between weeks 20–68. Treatment policy estimand results are presented.

Results: Mean (±SD) body weight was 107.2 (±22.7) kg at week 0 and 96.1 (±22.6) kg at randomisation (mean change −10.6%). In randomised participants (mean age 46 years, BMI 34.4 kg/m^2; 84% white, 79% female), mean body weight change between weeks 20–68 was −7.9% (semaglutide 2.4 mg) vs +6.9% (placebo) (estimated treatment difference [ETD]: −14.8%; 95% CI: −16.0, −13.5; p<0.0001). Similar results were obtained with the trial product estimand. For participants continuing semaglutide 2.4 mg, body weight change from week 0–68 was −17.4%. Continued semaglutide 2.4 mg led to improvements in cardiometabolic risk factors vs placebo. During run-in, 5.3% of participants discontinued treatment due to adverse events (AEs); after randomisation, 2.4% (semaglutide 2.4 mg) and 2.2% (placebo) of patients discontinued because of AEs. Most frequent AEs with semaglutide 2.4 mg were nausea, diarrhoea and constipation (mostly transient and mild-to-moderate).
Conclusions: In adults with overweight or obesity, continued semaglutide 2.4 mg after dose escalation led to clinically relevant weight loss, while switching to placebo led to weight regain. These findings underscore the chronicity and relapsing nature of obesity and the need for continued treatment.

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The medical management of obesity with semaglutide-the first Australian experience

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Liraglutide 3mg is a TGA approved GLP-1 agonist to treat people living with overweight and/or obesity (PwOw/Ob). Our clinical experience in a metabolic/bariatric obesity service is that liraglutide is effective and tolerated by most PwOw/Ob, however compliance with daily dosing was variable and the cost prohibitive. Whilst semaglutide was recently TGA approved for the management of Type 2 diabetes (T2DM,) Wilding[i] showed its safety and efficacy in weekly doses of 2.4mg s/c. Aim is to determine if this once weekly preparation may provide similar weight loss in a real-world clinical setting and with greater compliance.
A retrospective analysis of EMR of 60 medical PwOw/Ob prescribed Semaglutide for weight loss at a medical/surgical bariatric clinic. An accelerated dose escalation protocol, starting with 0.25mg/week and titrated to doses up to 2.25mg/week. Demographic factors, nadir weight as adult and weight at commencement of therapy were recorded. Results, including weight loss, side effects and duration of therapy were collected.
The population weight range was between 59-148 kg and mean % total body weight-loss (%TBWL) for patients completing 3-4 months of treatment was 9.9% (range 1.3-16.9%) for a mean 8.8(0.9 – 17.4)kg weight loss. At 6-7 months weight loss was 11.6 (range 4.3-24.7) % TBWL for mean 10.7kg (3.8-19.4) kg weight loss at doses of 0.5-2mg (mean 1.13mg, median 1mg) per week. Adverse effects were minor and there were no severe adverse effects.

Semaglutide can be safely used as adjuvant pharmacotherapy for PwOw/Ob. It provides significant WL at lower doses than reported in RCT. The simplicity and affordability of a once-weekly preparation for WL and then for WL maintenance, could lead to pharmacologic adjuvants having a greater acceptance amongst PwOw/Ob, HCPs and policy makers as part of the overall chronic disease management plan.

1. [i] John P.H. Wilding et al; Once-Weekly Semaglutide in Adults with Overweight or Obesity; The New England Journal of Medicine 2021; 384:989-1002

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Predicting diabetes resolution after metabolic - external validation of predictive scores.

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Background:

Bariatric surgery is the most efficient treatment of obesity and type 2 diabetes mellitus (T2DM). Despite detailed qualification, not every patient achieve T2DM remission after intervention. Recently, new scores: Individualised Metabolic Surgery (IMS), DiaRem, Ad-DiaRem, DiaBetter and Robert's score have been developed to predict diabetes remission after bariatric surgery.

Objectives:

The aim of the study was to validate and compare the performance of different models as the predictors of diabetes remission 1 year after surgical treatment.

Methods:

The retrospective analysis included patients with T2DM who underwent Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG) and completed 1-year follow-up. Each score relationship with diabetes remission was assessed using logistic regression. Discrimination was evaluated by area under the receiver operating characteristic curve (AUROC) whereas calibration by Hosmer–Lemeshow test.

Results:

Out of 252 patients 150 (59.5%) were women whereas 102 (40.5%) were men with median age 48 years. 46.83% of patients underwent SG whereas 53.17% had RYGB. The T2DM remission rate reached 90.5%. Median of preoperative A1c was 6.75% and preoperative BMI was 45.39 kg/m2, both decreased to 5.8% and 33.09 kg/m2 respectively after 1 year. %EWL amounted to 53.4%. All IMS, DiaRem, Ad-DiaRem, DiaBetter and Robert's scores were predictive of diabetes remission in a logistic regression analysis (OR 0.97, $p<0.0001$; OR 0.83; $p<0.0001$; OR 0.80, $p=0.0001$; OR 0.51, $p<0.0001$; OR 1.93, $p=0.0031$, respectively). The majority of models showed acceptable discrimination power. Robert's score had poor discrimination with AUROC=0.67 ($p<0.0001$) whereas DiaBetter presented excellent discrimination with AUROC 0.81 ($p<0.0001$). Most of scores except IMS did not lose their goodness of fit.

Conclusion:

All developed scores can be used in preoperative assessment of patients before bariatric surgery. Since DiaBetter score seem to be more accurate than others scores in predicting metabolic outcomes it is more likely to be implemented into day-to-day practice.

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Disruption of the circadian clock component BMAL1 elicits an endocrine adaption that prevents insulin resistance and nonalcoholic fatty liver disease

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The circadian clock is an important molecular oscillator that temporally orchestrates mammalian physiology to optimize nutrient metabolism and storage. Increasing evidence has implicated a disrupted circadian clock as a major driver of metabolic diseases such as nonalcoholic fatty liver disease (NAFLD). However, the molecular mechanisms by which a dysfunctional circadian clock causes NAFLD are poorly understood. Our transcriptome studies in human patients with NAFLD and progressing liver fibrosis show an important role for the circadian core clock regulator BMAL1. To delineate the mechanisms by which BMAL1 drives NAFLD and fibrosis, we challenged *Bmal1* knockout mice with either high fat diet or leptin deficiency. Surprisingly, while these mice developed obesity and had impaired lipid metabolism and storage, they were protected against insulin resistance, inflammation, hepatic steatosis and fibrosis. Further studies revealed that this protection against liver disease was caused by alterations in growth and sex hormone pathways. Specifically, male mice showed a feminized liver and white adipose tissue transcriptome that correlated with lower growth hormone and testosterone levels and elevated estradiol concentrations. These endocrine adaptations were also consistent with the transcriptional profiles observed in human NAFLD or during liver fibrosis progression, providing novel opportunities for clinical translation. Collectively, we provide the first

evidence that endocrine adaptations induced by BMAL1 deletion play a crucial role in preventing liver inflammation and fibrosis. Moreover, our studies challenge the current dogma that postulates a protective role for a functional circadian clock in the pathogenesis of metabolic diseases. We show that, while a functional circadian clock reportedly protects from liver pathology in healthy individuals, it can have detrimental effects on physiology when disease is already manifested.

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The neuroinflammation biomarker, translocator protein (TSPO), plays a role in sucrose overconsumption in mice

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Sugar overconsumption is a major cause of obesity. Existing pharmacotherapeutics for obesity have failed to stop the growing prevalence of this disease. Emerging research suggests that neuroinflammation mediates the pathogenesis of diet-induced obesity. Neuroinflammation has been implicated in many neuropathologies by measuring the expression of a neuroinflammatory biomarker – the translocator protein (TSPO). Etifoxine, a TSPO partial agonist and FDA approved anxiolytic, is one of the few antipsychotic medications that does not cause weight gain. Given the proposed role of TSPO in anorexia and obesity, we hypothesized that etifoxine may have therapeutic potential in the treatment of sugar overconsumption. In this study, C57/BL6 mice consumed a 25% sucrose solution for 12 weeks starting at 6 weeks of age following common a common addiction consumption paradigm. After 6 and 12 weeks of sucrose consumption, two groups of 12 mice were treated with either intraperitoneal injections of etifoxine (20 mg/kg or 50 mg/kg) or the TSPO specific antagonist PK11195 (1mg/kg or 10 mg/kg). A single injection of 50 mg/kg etifoxine reduced sucrose consumption both 30 mins and 2 hrs into the drinking session, after 4 and 12 weeks of sucrose consumption. In contrast, PK11195 treatment did not alter sucrose consumption at either dose after 4 or 12 weeks of sucrose consumption. To assess if the effect seen from etifoxine is TSPO specific, a third group of 12 mice were pre-treated with 10 mg/kg PK11195 30 minutes prior to receiving a 50 mg/kg etifoxine injection. Pre-treatment with PK11195 blocked the consumption-reducing effect of etifoxine. Together, these results demonstrate that etifoxine acts through TSPO to reduce sucrose consumption in sucrose overconsuming mice. Given the well-documented safety profile of etifoxine, this study provides preliminary supporting evidence for its potential repurposing as an anti-obesity medication.

1. Jacques, A., Chaaya, N., Beecher, K., Ali, S. A., Belmer, A., & Bartlett, S. (2019). The impact of sugar consumption on stress driven, emotional and addictive behaviors. Neuroscience and Biobehavioral Reviews, 103, 178–199. https://doi.org/10.1016/j.neubiorev.2019.05.021
2. Nuss, P., Ferreri, F., & Bourin, M. (2019). An update on the anxiolytic and neuroprotective properties of etifoxine: From brain GABA modulation to a whole-body mode of action. Neuropsychiatric Disease and Treatment, 15, 1781–1795. https://doi.org/10.2147/NDT.S200568
3. Costa, B., Cavallini, C., Da Pozzo, E., Taliani, S., Da Settimo, F., & Martini, C. (2017). The Anxiolytic Etifoxine Binds to TSPO Ro5-4864 Binding Site with Long Residence Time Showing a High Neurosteroidogenic Activity. ACS Chemical Neuroscience, 8(7), 1448–1454. https://doi.org/10.1021/acschemneuro.7b00027
4. https://doi.org/10.1016/s0014-2999(00)00760-3 Tuisku, J., Plavén-Sigray, P., Gaiser, E. C., Airas, L., Al-Abdulrasul, H., Brück, A., Carson, R. E., Chen, M.-K., Cosgrove, K. P., Ekblad, L., Esterlis, I., Farde, L., Forsberg, A., Halldin, C., Helin, S., Kosek, E., Lekander, M., Lindgren, N., Marjamäki, P., … Cervenka, S. (2019). Effects of age, BMI and sex on the glial cell marker TSPO - a multicentre [11C]PBR28 HRRT PET study. European Journal of Nuclear Medicine and Molecular Imaging, 46(11), 2329–2338. https://doi.org/10.1007/s00259-019-04403-7
5. Ibrahim, K. S., Craft, J. A., Biswas, L., Spencer, J., & Shu, X. (2020). Etifoxine reverses weight gain and alters the colonic bacterial community in a mouse model of obesity. Biochemical Pharmacology, 180, 114151. https://doi.org/10.1016/j.bcp.2020.114151

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Intermittent access to high-fat high-sugar food is sufficient to induce compulsive-like eating, increases in visceral fat and glutamatergic dysfunction in the dorsal striatum

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Background: Occasional consumption of junk food is very common and is not usually considered to be harmful, particularly when normal body weight is maintained. Interestingly, intermittent schedules of access are routinely used in the drug addiction field to induce escalation of drug intake and compulsive patterns of use. Compulsive reward seeking behaviour is a hallmark feature of addiction and can explain why so many people find it difficult to restrain from unhealthy food despite known negative consequences. There is increasing evidence that a compulsive reward-seeking behaviour reflects dysregulation in mesocorticolimbic circuitry in the brain. This study investigated the possibility that intermittent access to junk food may induce brain changes which facilitate unhealthy eating patterns.

Aim: To investigate whether occasional versus continuous access to high-fat high-sugar (HFHS) can induce compulsive-like eating and glutamatergic dysfunction in the striatum, a region of the brain associated with compulsive reward-seeking behaviour.

Methods: Rats were given either continuous access or intermittent access (IA; 1hx3 per week) to junk food (4.7kcal/gr, 30% fat) for at least 9 weeks. A control group was given access to standard chow only. Compulsive-like eating was assessed using a conditioned suppression paradigm. Membrane bound levels of target proteins (GluN2B, GluA1, GLT1 and xCT) in the dorsal striatum was measured by Western blot and recordings were made from dorsal striatum using whole cell patch clamp electrophysiology.

Results: Total food intake and body weight were similar in IA and control groups, however IA had more visceral fat. IA rats showed compulsive-like behaviour towards HFHS compared to other groups, as well as increased levels of GluN2B, GluA1 in the dorsal striatum. Electrophysiology analysis is ongoing (results will be presented at meeting).

Conclusion: These findings suggest that even occasional exposure to HFHS causes glutamatergic changes in dorsal striatum which are sufficient to promote compulsive eating behaviour.

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Mild chronic stress suppresses cerebral mitochondrial function and hedonic behaviour in mice, effects countered by a Western diet

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Co-morbidities and multi-morbidity are emerging as the new norm in modern societies. Obesogenic diets and psychosocial stressors may be important in this trend, although how they interact is controversial: palatable diets may ameliorate behavioural effects of stress, whereas obesity may exaggerate metabolic disruption. We investigated the interactive effects of a hypercaloric Western diet (WD) and chronic stress on brain mitochondrial activity. Male C57Bl/6 mice received a control or WD (32%/57%/11% calories from fat/carbohydrates/protein) for 16 weeks, with chronic restraint stress (CRS; 1 hr restraint/day) implemented in sub-sets throughout the final 2 weeks. Behaviour was assessed via sucrose preference and open-field tests. Frontal cortex (FC), hippocampus, hypothalamus, and nucleus accumbens (NAc) were surgically isolated from the left hemisphere, homogenised in Mir05 respiration media, lysate normalised to 1 mg/mL and ~2.2 mL loaded into an Oroboros 02k-oxygraph to measure mitochondrial respiration. The WD increased body weight, an effect amplified when combined with CRS, while CRS alone had no effect. Cerebral mitochondrial activity was impaired by stress (p<0.005), including reduced maximal Complex I and leak respiration together with cytochrome *c* respiration, the latter reflecting potential disruption of mitochondrial membrane integrity. Mitochondrial effects were most prominent in FC, followed by hippocampus/NAc, and hypothalamus. A WD did not independently modify respiratory function

across the 4 brain regions. However, the WD ameliorated in part stress-dependent respiratory dysfunction, although peak Complex I respiration was still reduced compared to a WD alone (p<0.05). Respiratory changes were mirrored by hedonic behaviour: chronic stress reduced sucrose preference while WD feeding countered anhedonia. Summarising these observations: i) cortical respiratory function is particularly sensitive to chronic stress, followed by hippocampus, hypothalamus and NAc; ii) a WD protects against cerebral mitochondrial dysfunction; and iii) these mitochondrial changes may contribute to both stress-dependent anhedonia and behavioural benefits of a WD in chronically stressed mice.

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Deletion of TRIM28 in the hypothalamus induces obesity but preserves glucose tolerance

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Tripartite motif-containing 28 (TRIM28) is a multi-domain protein that interacts with chromatin to suppress gene transcription. *TRIM28* haploinsufficiency in humans triggers obesity. Moreover, *Trim28* haploinsufficient mice and adipose specific Trim28 KO mice develop obesity that influences whole body metabolism. TRIM28 is highly expressed in hypothalamic nuclei that regulate energy and glucose metabolism, including the arcuate nucleus (ARC). However, the importance of neuronal TRIM28 in energy and glucose metabolism remains to be determined.

Here, we utilised genetically modified mouse models to examine the role of neuronal TRIM28 in regulating energy and glucose metabolism. *Trim28$^{fl/fl}$* mice were crossed with *Leptin receptor (LepR)-Cre* mice to generate *Trim28$^{fl/fl}$LepR-Cre* mice with deletion of *Trim28* specifically in LepR-expressing neurons. At 10 weeks of age, male *Trim28$^{fl/fl}$LepR-Cre* mice did not exhibit differences in metabolic phenotypes including body weight, fat/lean mass, fasting glucose or glucose tolerance (ipGTT, 2 g/kg lean mass) compared to their *Trim28$^{fl/fl}$* counterparts. Interestingly, there was a trend for increased fat mass in female *Trim28$^{fl/fl}$LepR-Cre* mice, and this was associated with significantly improved glucose tolerance compared with littermate control mice.

To eliminate the effects of developmental compensation, adeno-associated virus (AAV) expressing *Cre* was injected into the ARC of 10-week old male *Trim28$^{fl/fl}$* mice, to generate mice with post-developmental *Trim28* deletion in the ARC. After just 10 weeks, these mice exhibited a 23% increase in body weight compared to mice injected with a control AAV. This effect was attributed to an increase in fat mass, with no difference in lean mass observed. Interestingly, fasting glucose and glucose tolerance were not affected in mice with *Trim28* deletion in the ARC.

Together, these studies suggest that deletion of TRIM28 in the hypothalamus induces obesity but preserves glucose tolerance. Further studies are warranted to understand the underlying mechanisms by which TRIM28 mediates these effects.

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Long-term overconsumption of sugar starting at adolescence produces overweight, persistent hyperactivity and neurocognitive deficits in adulthood

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Sugar became embedded in the modern food and beverages. This has led to overconsumption of sugar in children, adolescents, and adults, with more than 60 countries consuming more than four times (>100 g/person/day) the WHO recommendations (25 g/person/day). Recent evidence suggests that obesity and impulsivity from poor dietary habits leads to further overconsumption of processed food and beverages. The long-term effects on cognitive processes and hyperactivity from sugar overconsumption, beginning at adolescence are not known. Using a well-validated mouse model of sugar consumption, we found that long-term sugar consumption, at a level that significantly augments weight gain, elicits an abnormal hyperlocomotor response to novelty and alters both episodic and spatial memory. Our results are similar to those reported in attention deficit and hyperactivity disorders. The deficits in hippocampal-dependent learning and memory were accompanied by altered hippocampal neurogenesis, with an overall decrease in the proliferation and differentiation of newborn neurons within the dentate gyrus. This suggests that long-term overconsumption of sugar, as that which occurs in the Western Diet might contribute to an increased risk of developing persistent hyperactivity and neurocognitive deficits in adulthood.

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Cognitive, behavioural and metabolic effects of time-restricted access to healthy and unhealthy diets in rats

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Time-restricted feeding (TRF) is a popular dietary intervention for weight loss and maintenance in which daily food intake is confined to an 8-12 hour window. Evidence from observational studies and randomized clinical trials indicates that TRF can aid in the management of obesity, type 2 diabetes and other cardiometabolic conditions. By contrast, the cognitive and behavioural effects of TRF interventions are less well understood, with studies reporting both neutral and positive effects. Understanding how TRF influences cognition and brain function is critical, as the adverse effects of unhealthy diets on cognition may sabotage the ability to adhere to dietary interventions and control food choice. Here we report interim results from an ongoing study exposing adult male Sprague-Dawley rats to continuous or time-restricted access (8hr/day; ZT12-20) to chow (chow and TRF-chow groups) or a varied, palatable cafeteria-style diet (Caf; Caf and TRF-Caf groups; n=12/group) rich in sugar and fat, which doubles energy intake relative to chow under ad-libitum conditions. Preliminary data show that TRF transiently suppressed energy intake in chow-fed rats. By contrast, TRF halved intake in rats fed Caf diet, such that energy intake of TRF-Caf and chow groups was comparable. Accordingly, after 3 weeks of the diets, TRF abrogated the increase in weight gain associated with Caf diet consumption, and reduced the rate of weight gain in rats fed chow. Tests conducted after 3 weeks of diet indicated that any form of access to Caf diet increased anxiety-like behaviour on the Elevated Plus Maze. Results from cognitive tests of short-term memory, and measures of adiposity and fasting glucose will be presented alongside detailed analyses of macronutrient intake over time. The daily measurement of energy intake provides an opportunity to test whether macronutrient intake is associated with behavioural and metabolic measures under both continuous and TRF conditions.

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The intergenerational transmission of obesity: are the cards stacked against us?

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Obesity is a global epidemic and considered to be one of the most urgent public health problems of modern times. In adults, obesity rates have more than tripled since the mid 1970's and for children obesity is now evident at birth and one in five people develop obesity prior to adulthood. Obesity is a disease with polygenic origins. Furthermore, exposures during critical periods of development invoke epigenetic alterations to cells and tissues with life-long effects to normal physiology. Conception and pregnancy are two periods of human development which are vulnerable to epigenetic modifications leading to future obesity risk. To break the intergenerational cycle of obesity, it is believed that interventions prior to conception improving gamete health and interventions during pregnancy influencing fetal growth will attenuate obesity risk of future generations. Until now these interventions have largely failed to improve offspring obesity risk for people. Studies are urgently needed to better understand the vulnerable periods for programming the ~50% unexplained variance in individual body size. Then we can develop and test interventions with greater specificity and implement public health strategies to overturn the intergenerational cycle of obesity. Until then, we must advocate for individuals suffering from obesity and bring attention to the necessity for more research.

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'Don't treat junk food as everyday food': Development of a new healthy weight campaign

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Introduction

LiveLighter® is a healthy lifestyle program which targets Western Australian (WA) adults. It is delivered by Cancer Council WA and funded by the WA Department of Health. In 2019 and 2020, Cancer Council WA commissioned exploratory research and concept testing to inform the design of a new LiveLighter® advertising campaign that aims to raise awareness of the serious health risks associated with being above a healthy weight.

Methods

Exploratory research occurred in August 2019. In February 2020 an advertising agency was engaged to develop four concepts for a TV commercial based on the research findings. These concepts were tested in mid-late 2020.

WA adults aged 25-59 years took part in 18 focus groups during the exploratory research and concept testing. Groups were segmented by age, gender, and location (regional or metro). To ensure participation of low-SES demographics, people with university education were excluded. The exploratory research separated people into groups of BMI 26-30 and BMI over 30. The concept testing only included people of BMI 26-30.

Findings

Results from both research projects will be presented. Key insights include:

- Referring to 'excess body fat' rather than 'overweight' increases personal relevance of messaging
- People with higher BMIs prefer more 'how' messaging to increase self-confidence, people with lower BMIs are more open to messaging about serious health consequences of being above a healthy weight
- Messages about the risk of cancer associated with carrying excess body fat convey new information for many
- Advertising must communicate messages using a tone that is understanding, creates personal relevance, and motivates action.

Conclusion

New campaigns that aim to raise awareness of the risks of being above a healthy weight and motivate behaviour change amongst WA adults need to strike a balance between having an empathetic and understanding tone, whilst maintaining an appropriate level of threat appeal.

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Quantifying Australian advertising relating to weight, physical activity and diet: Expenditure on public health, unhealthy product and commercial diet/weight loss advertising, 2016-2018

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Obesity, physical inactivity and poor nutrition are important risk factors for non-communicable diseases such as type 2 diabetes, cardiovascular disease and some cancers. Social marketing campaigns can raise awareness of these risk factors and promote behaviour change but must compete for share of voice in an increasingly complex and cluttered media environment. Commercial advertising for products and services may dilute or even undermine public health messages by presenting a distorted view of foods and activities available and their associated health benefits. We know food and beverage advertising in Australia is dominated by unhealthy products, with sugary drinks among the most heavily advertised. Data is needed on other food and diet-related product advertising. Artificially sweetened drinks offer a lower-kilojoule alternative, but their overall benefit to weight loss and chronic disease prevention is dubious. Likewise, some commercial products and services with purported weight loss benefits (including 'diet' meals and snacks, meal replacements, weight loss or fitness programs and products with purposed 'fat burning' or 'appetite suppressant' qualities) may be effective for weight loss or behaviour change, however others may be ineffective or even detrimental to health. Using estimates from a media monitoring company, this study aims to compare advertising expenditure for (a) obesity prevention, physical activity, and/or healthy diet public health campaigns with commercial advertising for (b) sugary drinks, (c) artificially-sweetened

drinks, and (d) diet/weight loss products and services in Australian media from 2016 to 2018. Expenditure will be compared between advertising categories and within different media channels (television, outdoor, cinema, radio, newspapers, magazines and limited online) to describe the Australian advertising landscape in relation to obesity prevention and promotion of healthy diet and physical activity.

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Children's exposure to unhealthy food and beverage advertising near schools in Perth, Western Australia

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Background: Previous research has highlighted children's frequent exposure to advertisements of unhealthy food and beverages on television. However, the food industry is increasingly utilising non-broadcast channels such as outdoor advertising (e.g., billboards, bus shelters, shop fronts) for product marketing. Few studies have investigated children's how 'obesogenic' the outdoor food marketing environment is around primary and secondary schools. This study aimed to quantify the presence and content of outdoor food advertisements within a 500m radius of primary and secondary schools in Perth, Western Australia.

Methods: The INFORMAS protocol for monitoring outdoor advertising around child-serving institutions was used. The area within a 500m radial buffer of 64 Perth schools selected using random sampling within population density and socio-economic strata was audited by trained research staff for all outdoor advertisements in July-December 2019.

Results: In total, 5636 outdoor advertisements were identified within a 500m radius of all 64 schools combined and 30% were for food. Of the 1708 food advertisements, 74% were for unhealthy (non-core) food. The most frequently advertised food products were alcohol, fast-food and sugar sweetened beverages. Only 8% of food advertisements featured a healthy product. Schools had on-average 27 food advertisements within 500m (range 0-190). Schools in lower socio-economic areas had more food advertisements and a significantly higher proportion of unhealthy food advertisements within 250m.

Conclusion: Outdoor advertising around schools constitutes a frequent source of children's exposure to unhealthy food and alcohol advertising. Policy interventions restricting the content of outdoor food advertising near schools are needed and could be a useful strategy in the fight against childhood obesity.

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Is food and drink marketing across various settings associated with dietary choices and intake among Australian adolescents? Findings from a national cross-sectional survey

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Background/Aims: Australian adolescents are bombarded with unhealthy food and drink marketing across multiple settings. The pervasive promotion of energy-dense, nutrient-poor products undermines adolescent and parent/carer efforts to maintain a nutritious diet during a crucial developmental and dietary habit-formation period. This study examined the association between awareness of food and drink advertisements and adolescents' dietary choices and intake.

Methods: A nationally representative sample of secondary school students aged 12-17 years (N=8,763) self-reported their frequency of awareness of food and drink advertisements across seven settings (website, social media, public transport, school, magazine, supermarket, sporting event), whether they had tried a new product or asked a parent/carer to purchase a product they had seen advertised, and consumption of various unhealthy food types (sweet foods, fast foods, confectionery,

ice cream, salty snacks, fried potato products) and drink types (fruit juice, soft drinks, cordials, sports drinks, diet drinks, non-alcohol energy drinks). Analyses were conducted using multi-level logistic regression adjusted for school-level clustering, socio-demographic factors and commercial TV viewing.
Results: On average, students reported seeing food and drink advertisements 14 times a week across all settings. The likelihood of trying a new product they had seen advertised was greater among students with medium (AOR=1.74, 95%CI=1.56-1.94, p<0.001) or high (AOR=2.32, 95%CI=2.07-2.59, p<0.001) marketing awareness compared with low marketing awareness. As awareness of food and drink advertisements increased, so too did students' likelihood of requesting an advertised product. Frequency of food and drink marketing awareness was also associated with a high unhealthy food and drink intake.
Conclusions: Findings suggest that Australian adolescents are vulnerable to the persuasive effects of food and drink marketing, with higher frequency of marketing awareness linked to trying and requesting advertised products and poorer dietary behaviours. Higher standards in the way the food and drink industry can market products to adolescents are needed.

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Attenuating the harms of ultra-processed food consumption for healthy and sustainable food systems: is Australia's national food regulatory system fit for purpose?

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Ultra-processed foods (UPFs) – for example, soft drinks, snack foods, mass-produced breads and confectionery – are harmful to human health. The consumption of UPFs is linked to poor health outcomes, including an increased risk of obesity and non-communicable diseases. UPF consumption and production also harms the environment, accounting for more than a third of the total diet-related environmental impact in Australia. Despite the harms, UPF consumption continues to rise across the globe. In Australia, UPF contributes to 42 percent of dietary energy intake, among the highest globally. The drivers of UPF consumption include many food systems-related factors, such as urbanisation and the demand for convenience, and feature substantial commercial influences, including the intensive UPF marketing practices of large transnational UPF corporations. To reduce UPF consumption and the associated harms, an ecological approach to regulation is necessary. This requires a synergistic package of policy measures, a strong role for government intervention and food regulatory frameworks equipped to respond to the drivers of UPF consumption.
This presentation draws on an extensive investigation of the Australian food regulatory system and asks whether it is fit for the purpose of attenuating the drivers associated with UPF consumption. It discusses key aspects and approaches of the current regulatory framework and highlights the implications for regulating UPFs and promoting healthy and sustainable food systems. To capture the multi-faceted and complex nature of the topic, this study uses a narrative review and synthesis method. This qualitative method has been selected to facilitate a comprehensive and contextualised analysis of relevant source materials from various academic disciplines in addition to reports and resources from governmental bodies and related organisations.

1. Elizabeth L, Machado P, Zinocker M, Baker P, Lawrence M. Ultra processed foods and health outcomes: a narrative review. Nutrients . 2020;12(7):195 5 1988; Monteiro CA, Levy RB, Claro RM, De Castro IRR, Cannon G. Increasing consumption of ultra processed foods and likely impact on human health: evidence from Brazil. Public Health Nutr. 2011;14:5 13; Monteiro CA. Ultra processed foods: what they are an d how to identify them. Public Health Nutr . 2019;22(5):936 941.
2. Hadjikakou M, Baker P. The untenable role of "junk food" in a healthy and sustainable food system. In: Lawrence M, Friel S, eds. Healthy and Sustainable Food Systems . London: Routledge; 2019:158 169.; Hadjikakou M. Trimming the excess: environmental impacts of discretionary food consumption in Australia. Ecol Econ . 2017;131:119 128.
3. Machado PP, Steele EM, Levy RB , et al. Ultra processed foods and recommended intake levels of nutrients linked to non communicable diseases in Australia: evidence from a nationally representative cross sectional study. BMJ Open . 2019;9; Swinburn BA, Kraak VI, Allender S, et al. The global syndemic of obesity, undernutrition, and climate change: the lancet commission report. Lancet . 2019;393:791 846.

4. Baker P, Machado P, Santos T, et al. Ultra processed foods and the nutrition transition: Global, regional and national trends, food systems transformations and political economy drivers. Obes Rev . 2020;1 22.

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Lifting the silence on lived experiences with food and low incomes during COVID-19

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Objective: Little empirical evidence exists to support our understanding of how policies that address the social determinants of health (i.e. income, housing, jobs, education) can improve diet-related health and reduce obesity among households receiving low incomes. We aimed to explore low-income household's lived experiences with food in the context of the novel COVID-19 social policy changes that took place in Australia.

Methods: During November – December 2020, we conducted in-depth interviews with 24 Victorians who were receiving government coronavirus income support (an income change in 2020). Interviews were guided by a theoretical understanding of the social determinants of health and inequities – which we aligned to the social protection policy context at the time. The phone/video interviews lasted up to one hour. Data were audio-recorded, transcribed, inductively coded, categorised and thematically analysed.

Results: Our sample predominantly consisted of women (80%) who were single parents (46%) receiving additional coronavirus Parenting Payments, JobSeeker or JobKeeper. Four key themes emerged. Firstly, participants described how living paycheque to paycheque was inflexible and the 'battles all around them' continued to make healthy eating and diet-related health difficult to prioritise during the pandemic. Secondly, housing, income, job and education opportunities were perceived to heavily constrain budget allocations for food and healthful eating (even with COVID-19 income increases). Thirdly, despite their best efforts to eat healthily, families continued to purchase the cheapest and most affordable options (less healthful foods that are constantly price discount promoted). Finally, they perceived the policy rhetoric around income support schemes and healthful eating inaccurate and shaming – often misrepresenting their lived experiences.

Conclusions: Policymakers should create opportunities to include the voices of populations that experience social and economic exclusion in decision-making processes. This is important to promote the adoption of food and social policies that can reduce inequities in diet-related health.

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Evaluation of the population-level impact of the LiveLighter® healthy lifestyle campaign on knowledge and dietary behaviours

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Background/Aims: LiveLighter® is a comprehensive, whole-of-population program that encourages WA adults to lead healthier lifestyles by choosing healthy food, moving more, and achieving and

maintaining a healthy weight. LiveLighter® uses various public education strategies including mass media campaigns delivered through TV, radio, newspaper, digital and outdoor advertising, and event sponsorships. Established in WA in 2012, LiveLighter® is funded by the WA Department of Health and delivered by Cancer Council WA.

Methods: Population-level impacts of the LiveLighter® campaign in WA were independently evaluated using cross-sectional surveys of approximately 1,000 adults aged 25-49 years, following each of the seven campaign waves, from 2012 to 2019. The sample was selected using random digit dialling (RDD) for all surveys except 2019 (50% RDD and 50% list sample) and surveyed using computer-assisted telephone interviews.

Results: Since the launch of LiveLighter®, knowledge of excess body weight as a risk factor for cancer has significantly increased from baseline (2012) to 2019 (55.2% cf. 40.9%). Significant increases in intentions to eat more fruit and vegetables in the next seven days were observed between baseline and 2019 (57.3% cf. 67.6%) The proportion of respondents meeting guidelines for daily vegetable intake increased significantly from baseline to 2019 (16.6% cf. 10.8%). However, the proportion of respondents who met the guidelines for daily fruit intake remained stable over the same time period (49.0% cf. 46.3%). Reported consumption of sugar-sweetened beverages (SSBs) at least once or more per week decreased significantly between baseline and 2016 (60.2% cf. 46.0%) and was maintained in 2019 (41.3%).

Conclusions: LiveLighter® campaigns are associated with marked improvements in knowledge of health risks associated with excess body mass and with dietary behaviour change, including increased vegetable intake and reduced SBB consumption in WA adults.

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Unhealthy promotion on the Instagram pages of WA's elite sports teams: a picture of health?

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Aims

The popularity and reach of sporting organisations and teams in Australia makes them the ideal setting for the promotion of physical activity, healthy eating and low-risk alcohol use. While some teams have opted to pursue health neutral or health promoting sponsorship opportunities, the prevalence of unhealthy sponsors remains high. Research to date has focused on unhealthy sponsor promotion during televised sporting games, however less is known about the extent to which sporting teams promote unhealthy products on their social media platforms. This study aimed to determine the level of unhealthy sponsorship promotion on the Instagram pages of elite sporting teams in WA.

Methods

A content analysis was conducted of the Instagram pages of seven elite sporting clubs in WA, including the men's and women's West Coast Eagles and Fremantle Dockers teams (AFL), West Coast Fever (netball), Perth Glory (soccer) and the Perth Wildcats (basketball). All Instagram posts appearing within a two-month period were analysed to determine the extent to which junk food, alcohol, health-neutral and health promoting sponsors appeared in post images and text.

Results

Junk food sponsorship was common, with two of the sporting teams including a junk food sponsor in two out of three posts. The team with the highest level of alcohol sponsorship included an alcohol sponsor in one in every ten posts. Teams with a pro-health sponsor had a small number of posts promoting unhealthy products. The results of this study highlight the concerning frequency with which unhealthy products, particularly junk food, are promoted on the Instagram pages of elite sporting teams in WA. The importance of investment by governments in pro-health sporting sponsorships is apparent. Policy changes could also be used to protect children from exposure to unhealthy product marketing when engaging with the social media accounts of Australian sporting organisations and teams.

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i-PATHWAY: A co-design of clinical decision-making guides to support a childhood obesity prediction tool in practice

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Objective

This study's objective was to co-design two clinical resources – a *User* and *Clinical Actions* guide to support the implementation of a childhood obesity prediction tool (*i- PATHWAY)* in an Australian healthcare setting. *i-PATHWAY* uses six routinely collected risk factors at age 1 year to predict childhood obesity at age 8-9 years with 74% accuracy.

Methods

Multidisciplinary clinicians *(n 3)* and caregivers of infants (aged 0-2 years) *(n 3)* (end-users) were recruited during COVID-19 restrictions in 2020 and participated in two iterative, semi-structured virtual focus groups to co-design the guides. Co-design was actioned across three user-centred, participatory phases, contextualised to the study objective: (1) Exploring clinical dynamics of clinicians and caregivers; (2) Assessment of end-user needs; (3) Concept development of clinical resources. Focus groups were recorded and transcribed verbatim. Thematic analysis was conducted using the Framework Method to inductively identify themes.

Results

Four main themes were identified that directly informed co-design of the *User* and *Clinical Actions* guides. Clinicians and caregivers require unique, targeted language approaches when communicating obesity risk; standardisation of language, resource design and clinical delivery of *i-PATHWAY* is necessary; resource conciseness will enhance acceptability; clinician phraseology must be people-first, positive, non-judgmental and evidence-based. Digital concepts of the *User* and *Clinical Actions* resources were then created. The *User* guide provides sequential, pragmatic scenarios and language recommendation to guide sensitive clinical use of *i-PATHWAY*. The *Clinical Actions* guide is a simple clinical decision pathway to inform preventive action for infants at-risk of developing future obesity.

Conclusions

A *User* and *Clinical Actions* guide were co-designed with end-users. Implementation of these clinical resources in conjunction with *i-PATHWAY* in practice can enhance acceptability of predicting childhood obesity and improve clinical preventive decision-making. Successful implementation of *i-PATHWAY* may contribute to a reduction in childhood obesity prevalence in the long-term in Australia.

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i-PATHWAY: Development and validation of a clinical prediction model for childhood obesity in Australia

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Introduction: Childhood overweight/obesity prevention requires prioritisation, yet clinical practice in Australia focuses on identification and treatment. A model that can accurately predict childhood overweight/obesity from the first 1,000 days may be a clinically useful preventive tool. This study aimed to develop and validate *i-PATHWAY*–a model to predict childhood (age 8–9 years) overweight/obesity from infancy (age 12 months) using an Australian prospective birth cohort.

Methods: The Transparent Reporting of a multivariable Prediction model for individual Prognosis or Diagnosis (TRIPOD) checklist was followed. Participants were *n*=1947 children (aged 8–9 years) from the Raine Study Gen2 – an Australian prospective birth cohort – who had complete anthropometric measurement data available at follow up. The primary outcome was childhood overweight or obesity (age 8–9 years), defined by age- and gender-specific cut-offs. Multiple imputation was performed to handle missing data. Predictors were selected using 2000 unique backward stepwise logistic regression models. Predictive performance was assessed via: calibration, discrimination and decision-threshold analysis. Internal validation of *i-PATHWAY* was conducted using bootstrapping (1000 repetitions) to adjust for optimism and improve reliability. A clinical model was developed to support relevance to practice.

Results: At age 8–9 years, 18.9% (*n*=367) of children were classified with overweight or obesity. *i-PATHWAY* predictors included: weight change (0–1 year); maternal pre-pregnancy body mass index (BMI); paternal BMI; maternal smoking during pregnancy; premature birth; infant sleep patterns; and sex. After validation, predictive accuracy was acceptable: calibration slope=0.956 (0.952–0.960), intercept=−0.052 (−0.063, −0.048), area under the curve=0.737 (0.736–0.738), optimised sensitivity=0.703(0.568–0.790), optimised specificity=0.646 (0.571–0.986). The clinical model retained acceptable predictive accuracy without paternal BMI.

Conclusion: *i-PATHWAY* is a simple, valid and clinically relevant prediction model for childhood overweight/obesity - the first in Australia. After further validation, this model can influence state and national health policy for overweight/obesity screening in the early years.

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Increasing medical and psychosocial complexity of young people attending Victoria's specialist paediatric weight management service.

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Background: The Weight Management Service (WMS) at the Royal Children's Hospital is Victoria's only dedicated paediatric obesity service. In 2019, overwhelming demand for the service prompted change from a medical to Allied Health led model of care and referral criteria were modified to focus on youth with neurodevelopmental or physical disabilities or obesity-related comorbidities. This resulted in increased medical and psychosocial complexity of the population attending this service.

Aims: To describe the medical and psychosocial complexity of patients attending the WMS.

Methods: This was a cross sectional analysis of all patients attending the WMS for an initial or review appointment between 2019 and 2020. Records were reviewed retrospectively to obtain historical data. Outcomes collected included: demographics, referral information, anthropometry and patient medical and psychosocial history which were analysed descriptively.

Results: Data were collected for 413 patients. Of referral sources, 57% were external (70% of these from General Practitioners) and 43% internal. The most common neurodevelopmental disabilities were autism spectrum disorder (17%) and intellectual disabilities (15%), 29% of patients were eligible for the National Disability Insurance Scheme. Genetic abnormalities associated with obesity were present in 9% of patients. The most prevalent obesity-related comorbidities were non-alcoholic fatty liver disease (35%) and obstructive sleep apnoea (OSA, 21%), 26% of those with OSA required home continuous positive airway pressure respiratory support. 34% of patients had depression and/or anxiety. Psychosocial vulnerabilty factors included: single parent households (30%), parental mental health concerns (23%), issues with school engagement (18%), involvement of child protection services (15%), family violence (14%) and housing vulnerability (11%).

Conclusions: Young people with obesity attending the WMS have a range of developmental, metabolic and mental health comorbidities and are at risk of psychosocial vulnerability. These factors require a multidisciplinary approach, with adequate clinical resources, to address the medical and psychosocial complexities of this population.

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"It would put a rocket up me": a qualitative study of parent and clinician attitudes towards predicting childhood obesity in practice

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Introduction: In Australia, almost one-in-four (24.9%) children live with overweight or obesity (OW/OB). A clinical prediction model *(i-PATHWAY)* has been developed by our research team to identify infants at-risk of developing future OW/OB. Prior to implementation of *i-PATHWAY*, the acceptability of predicting childhood OW/OB must be determined. This study aimed to: (1) Investigate the attitudes of clinicians and parents of infants (aged 0-2 years) towards predicting childhood OW/OB in practice and (2) Determine key language and phrasing to reduce judgment and maximise the acceptability of a model like *i-PATHWAY*.

Methods: Cross-sectional and qualitative, comprising individual semi-structured interviews. The COREQ (Consolidated criteria for Reporting Qualitative research) checklist was followed. Participants were multidisciplinary paediatric clinicians (*n*=18) and parents of infants (*n*=13) (aged 0-2 years) recruited across networks of public hospital and health services in Queensland, Australia. Interviews were conducted by telephone at a children's research centre in south-east Queensland. Interview data were analysed under the Framework Method using an inductive, thematic approach.

Results: Five main themes were identified across both clinician and parent interview data: (1) Optimism for prevention and childhood obesity prediction (2) Parent dedication to child's health (3) Adverse parent response to risk for childhood obesity (4) Clinical delivery (5) Language and phrasing for discussing weight and risk. Most participants were supportive of using a childhood OW/OB prediction tool in practice. Parents expressed dedication to their child's health that superseded potential feelings of judgment or blame. When discussing weight in a clinical setting, the use of sensitive (i.e. 'overweight', 'above average', 'growth' versus 'obesity') and positive, health-focused language was mostly supported.

Conclusion: Multidisciplinary paediatric clinicians and parents of infants generally accept the concept of predicting childhood OW/OB in practice in Queensland, Australia. Clinicians and policymakers can act now to implement sensitive communication strategies concerning weight and risk of obesity.

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Precision support for preventing and managing childhood obesity (PRECISE): Co-design methodology of clinical resources for primary health care professionals

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Primary health care (PHC) is a critical setting for childhood overweight/obesity prevention and treatment. Most children living with overweight/obesity do not receive evidence-based care in PHC. Common primary healthcare professional (PHP) barriers include low self-efficacy and confidence, limited consultation time and fear of discussing weight with families. These barriers are pervasive; yet, there is limited availability of resources to assist PHPs to overcome established clinical barriers. When mapped to individual clinical barriers, resources can become "precision resources" – personalised clinical tools to provide precise, evidence-based decision support in real-time to prevent and manage childhood overweight/obesity at the point-of-care.

The PRECISE study aims to: (1) conduct a clinical needs assessment with multidisciplinary PHPs to prioritise gaps and opportunities for precision resources for childhood overweight/obesity; (2) co-design identified precision resources with multidisciplinary PHPs and caregivers of children (aged 0-17) as end-users.

This study will apply a two-phase participatory, experience-based co-design approach that aligns with its two project aims. The COM-B (Capacity, Opportunity, Motivation, Behaviour) change wheel was used to map evidence-based barriers to (a) prevention (b) management and (c) referral of childhood overweight/obesity in PHC. A total of 36 participants (18 PHPs, 18 caregivers) will be recruited (20 PHPs currently recruited). Each phase will comprise multimodal focus groups with (1) PHPs only and (2) PHPs in conjunction with caregivers. Inductive thematic analysis will be conducted using the Framework Method for qualitative data analysis in multidisciplinary health research.

This study will co-design novel precision resources for PHPs to enable best-practice clinical decision-support for every child patient and their family, every time and in real-time. PRECISE resources will be hosted in 'Clinicians Hub' – Health and Wellbeing Queensland's digital ecosystem of clinical initiatives for childhood overweight/obesity. Future work will digitally integrate PRECISE resources with PHC clinical systems to maximise translation into routine practice.

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Tackling childhood obesity in clinical settings - Exploring clinicians' experiences and perceptions of implementing routine growth assessments in the Mid North Coast Local Health District

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As part of a NSW Health state wide initiative to address childhood obesity, all children aged 0-16 years who come into contact with a NSW Health clinical service should have their height and weight measured and recorded every 90 days. In conjunction with mandated growth assessments, clinicians are expected to advise the family of the child's weight status, assist the family by providing a brief lifestyle intervention and arrange referrals to appropriate services.

This qualitative study explored the experiences and perceptions of a range of clinicians who are implementing routine growth assessments in clinical services in the Mid North Coast Local Health District.

Online focus groups were conducted in November 2020. Some clinical settings were underrepresented in focus groups so health professionals from these settings were purposefully recruited to participate in semi-structured interviews to add their perspective. Focus groups and interviews were video recorded, transcribed and manually coded to identify emergent themes.

Seventeen allied health clinicians and four nurses from inpatient, outpatient and community health settings participated in the focus groups. Five clinicians including an emergency physician, paediatric NUM, out of home care coordinator, refugee health manager and mental health manager participated in semi structured interviews.

Clinicians' perception of the mandate and their clinical practice depended on whether they believed compliance compromised or complemented patient care. This belief was influenced by interpersonal qualities, professional identity, clinical workflow and broader factors in the health service ecosystem. These key themes could act as barriers or facilitators depending on the clinician and the setting.

This work will inform practice based recommendations about how future interventions can address these factors to better support health professionals and the health service ecosystem to address childhood obesity in clinical settings.

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Healthy Kids Club: implementation of a multidisciplinary, systemic, evidence-based, holistic, culturally appropriate and family-centred service, empowering children and their families to tackle the challenges of childhood obesity.

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Background

A staggering 1-in-4 Australian children are overweight or obese, placing Australia's youngest generation at an increased risk of living a life dominated by chronic disease. With a high risk of obesity escalation into adulthood and extremely poor attendance rates at outpatient obesity clinics, the need for appropriate community-based and family-centred childhood obesity clinical services, is highly evident.

Methods

The Healthy Kids Club is a community-based, multidisciplinary paediatric weight management service delivered by the Good Start Program. The Model of Care underpinning the service promotes the delivery of family-centred and evidence-based care, supporting children from ethnically diverse and low socioeconomic backgrounds in Logan, to live a healthy lifestyle and reduce obesogenic behaviours. The multidisciplinary team including a Multicultural Health Worker, Dietitian, Clinical Nurse Consultant and Physiotherapist, deliver collaborative, holistic and tailored care. Practical strategies including home visits, telehealth, cooking sessions and family workouts, effectively address nutrition, physical activity, sleep, screen time and family-connectedness.

Results

Addressing stigma, considering the family's stage of change and tailoring education to an appropriate literacy level, creates a supportive environment inducive of positive health behaviour change. Increasing service access, family engagement and dynamic care delivery helps to improve patient health outcomes and ultimately contribute to mitigating the obesity epidemic. With failed to attend appointment rates as low as 5%, strong engagement has equated in the maintenance or reduction of body mass index among 60% of children attending the service.

Conclusion

The Model of Care elucidates the integral factors underpinning successful childhood obesity management, minimising the barriers of traditional care. With high potential for translation and contextualisation to additional locations and priority populations, this approach holds outstanding reach, impact and sustainability to successfully address the childhood obesity epidemic. Ultimately, decreasing the prevalence of chronic disease among Queensland's priority population groups, significantly tackling health inequity for future generations.

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Exploring adolescents and families' experiences of attending a specialist paediatric weight management service: opportunities for innovation

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Background: Adolescents with severe obesity are referred to specialist outpatient weight management services within tertiary healthcare settings for assessment, monitoring of risk and multidisciplinary input. Understanding stakeholder experiences of these services may highlight opportunities to tailor services to more effectively meet adolescents and their families' needs.

Aim: To explore adolescent, parent and clinician experiences of attending or providing care within a specialist pediatric outpatient weight management clinic in Victoria, Australia and to identify their preferences for care.

Method: Semi-structured interviews were conducted with adolescents (aged 10–17 years), parents and clinicians. Interviews were transcribed, inductively coded and analysed thematically.

Results: Ten in-depth interviews were conducted with adolescents (n=5), parents (n=5) and clinicians (n=4). Six key themes were identified: 1) Antecedents to attending, 2) Value of a family-based approach, 3) Adolescent experience and engagement, 4) Collaborative, multidisciplinary care, 5) Care within a complex and changing environment, 6) Envisaging future care. Adolescents and their families' had diverse motivations and experiences prior to attending. Adolescent's interest and engagement with the service varied. The Covid-19 global pandemic highlighted the strengths and challenges of telehealth. When envisaging future care, families' desire practical, relevant information from experts. Technology, visual or interactive information may promote adolescent engagement.

Discussion: Adolescents and their families' provided valuable perspectives regarding their care, with families appreciating specialist input, monitoring, education and support. Although services adopted a multidisciplinary approach, additional clinician training and input from Psychology, Social work and

Exercise physiology may be advantageous. Strategies that increase the service accessibility, such as addressing long waiting lists, may increase the acceptability of the service.
Conclusion: The specialist service was generally well received by families who accessed the service. Strategies that promote adolescent engagement in their own care and service design may improve the accessibility, acceptability and utility of weight management services for adolescents and families.

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A Novel Role of Endogenous Interleukin-22 as a Regulator of Glucose and Lipid Metabolism

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We had previously discovered that exogenous IL-22 is highly efficacious in metabolic disease, with benefits including: complete restoration of glucose tolerance, suppression of fasting hyperinsulinemia/hyperproinsulinemia, and restoration of insulin sensitivity [1]. Importantly, obese animals treated with IL-22, show significant improvements in circulating triglycerides, an improvement in liver function (AST:ALT ratio) and a reduction in lipid accumulation in the liver. However, the role of endogenous IL-22 in maintaining metabolic homeostasis remained unknown. To evaluate the role of endogenous IL-22 in metabolic tissue, we generated tissue specific IL-22 receptor (IL-22RA1) knockout mice lacking the receptor in pancreatic β-cells (IL-22RA1$^{-/-\ Ins2Cre}$) and hepatocytes (IL-22RA1$^{-/-\ AlbCre}$), and challenged these mice with a high fat diet. Assessments included glucose tolerance and insulin resistance tests, changes in histology, changes in gene expression of inflammatory, ER, oxidative stress markers, assessing changes in lipid accumulation and hormone secretion. As the IL-22RA1$^{-/-Ins2Cre}$ mice aged, they had inappropriate glucose control compared with IL-22RA1$^{fl/fl}$ control animals, and this was exacerbated when the mice were challenged with a high fat diet. Our data demonstrates the importance of endogenous IL-22 in the liver as the ablation of hepatic IL-22RA1 signaling induced insulin resistance, with an increase in fasting blood glucose observed in the 20-week-old animals. Expression of lipogenic markers (*Srebp1c* and *Chrebp*), glucose transporter (*Glut-2*) and glycogen metabolism (*Gys2, Pygl*) were significantly reduced in the absence of hepatic IL-22-signaling. This was accompanied by increased inflammatory cytokines (*Tnfa*, *Il1b, Il10*, *Ccl2*), and increased cellular stress (*Nos2*, *Grp78*) in the liver; supporting the hypothesis that endogenous IL-22 is hepatoprotective. Our work provides new evidence that IL-22RA1 signaling plays an essential regulatory role in pancreas and liver homeostasis under physiological conditions, which is exacerbated during obesity.

1. Hasnain, S.Z., et al., Glycemic control in diabetes is restored by therapeutic manipulation of cytokines that regulate beta cell stress. Nat Med, 2014. 20(12): p. 1417-26.

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A role for the CREBRF^{R457Q} "obesity variant" in the regulation of metabolism during fasting

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An Arg457Gln variant in the CREBRF gene (encoding Cyclic AMP Response Element Binding Protein 3 Regulatory Factor) has previously been identified as driving excess body weight in Pacific/Oceanic populations. Intriguingly, despite the substantial increase in body mass, carriers of the Arg457Gln variant had a paradoxical reduction in type 2 diabetes risk, indicating a critical role in whole-body metabolism. To study its function in more detail, we have generated mice on an FVB background where this CREBRF Arg457Gln variant has been knocked in to replace the endogenous CREBRF. The whole-body metabolic phenotype was characterised for male and female mice on a regular chow diet or an 8-week high-fat challenge. The CREBRF variant significantly increased both lean mass and naso-

anal length in male mice, with total body weight and fat mass unaltered. Although indirect calorimetry measures of whole-body energy expenditure were unaffected, the CREBRF variant exaggerated fasting-induced trends in nutrient homeostasis, including alterations to tissue glycogen and lipid contents as well as enhanced elevation of plasma NEFAs. Further *in vitro* examination of insulin and glucagon signalling pathways using a primary hepatocyte model revealed significant dampening of Akt/PKB signalling in cells isolated from male mice carrying the missense variant. Overall, this novel mouse model appears to show a whole-body growth phenotype effect of the CREBRF variant in males, with a speculative role in regulating energy homeostasis during periods of nutrient deprivation without benefit to insulin sensitivity or glucose tolerance. The mild effects of the mutation in mice may invite reconsideration of the link between CREBRF function and the risks of obesity and diabetes in variant allele carriers.

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A model to investigate the effects of fasting in calorie restriction

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Calorie restriction (CR) without malnutrition is a dietary intervention known to improve metabolic health in humans. To investigate the mechanisms involved in this, rodent models are often used which involve giving them a portion of food at one time point during the day. This asks the question is it the longer fasting period or the calorie restriction itself, causing the improvements. Thus, we undertook a study to investigate this phenomenon. At 12 weeks of age, C57BL6 mice (9 male and 9 female per group) were randomly assigned to either the control diet (ad lib; 21% protein, 64% carbohydrate, 15% fat; 14.7 kj/g energy density), 20% calorie restriction of the control diet (given at 4pm daily) or the cellulose diluted diet (ad lib; same percentage as control diet but at 10.5 kj/g energy density) for 6 months. Body weight and food intake were measured throughout the experiment while body composition and oGTT were measured just prior to cull. Results showed that the calorie restricted groups ate a similar amount of kilojoules per day, being ~20% lower than controls (Control 48kj/day, 20%CR 37kj/day, 37 kj/day). This resulted in body weight, body length and fat mass (Control 10.6±0.9g; 20%CR 5.0±0.8g; CRdil 4.5±0.6g; $p<0.001$) being reduced to a similar amount in the restricted groups compared to controls, while lean mass was similar in all 3 groups. Glucose tolerance tests were similarly decreased in the restricted groups (control AUC, 1216±40; 20%CR, 985±44; CRdil, 1023±39 mM/90min; $p<0.001$). These results suggest that calorie restriction, not fasting time, is a likely mediator of improved metabolic health. Further investigations will determine if the reductions seen in both groups are via similar molecular mechanisms and if they persist long-term.

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Metabolic and Kidney health in Obese Mothers and Offspring are Influenced by Pre-conception Weight Loss With Liraglutide.

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Background/aim:

Maternal obesity adversely impacts metabolic health in mothers and offspring. Maternal complications include diabetes and chronic kidney disease(CKD). Our previous work showed that offspring have increased risks of obesity and CKD. While pre-pregnancy weight optimisation is advocated, evidence of benefits for mother and offspring are lacking. We aimed to determine if weight loss prior to pregnancy, by administration of liraglutide, improves maternal and offspring kidney health in obese mothers and the offspring.

Methods:

C57BL/6 female mice were fed a high-fat-diet (HFD) for 8 weeks and compared to lean chow-fed controls. HFD-fed dams were administered liraglutide (0.3mg/kg,s.c.,for4weeks) or switched to chow, to induce pre-conception weight loss. Maternal anthropometry and glucose tolerance were measured before and after intervention, and at late gestation. Pregnant dams were culled at gestational day 18-20 with blood and kidney harvested, or allowed to deliver their offspring. Offspring anthropometry, and glucose tolerance were assessed at postnatal week 12 after either HFD or chow feeding. ELISA,

Immunohistochemistry and RT-PCR were used to measure kidney metabolic and inflammatory markers.

Results:

Obese mothers had reduced glucose tolerance compared to chow-fed mothers($p<0.0001$), and higher expression of renal metabolic and inflammatory markers in late gestation(FAS <0.05, TGFb <0.05). Liraglutide lowered body weight, improving glucose tolerance prior to conception($p<0.001$). Markers of kidney damage (albuminuria, fibronectin, serum creatinine) were reduced in obese mothers administered liraglutide($p<0.05$). Liraglutide treated mothers exhibited greater gestational weight gain than obese mice given vehicle control($P<0.001$). Oxidative stress were similar in obese mothers with or without preconception weight loss with liraglutide(8-OHdg,MnSOD,PGC1α). Kidney metabolic and inflammatory markers(MCP-1,FAS,SREBP) were altered in HFD-fed offspring of obese mothers administered liraglutide($p<0.05$).

Conclusions:

Preconception weight loss with liraglutide improves kidney and metabolic outcomes in mothers and the offspring. Therefore, obese women should be targeted for pre-conception weight loss to improve intergenerational metabolic health.

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Understanding the complex bidirectional relationship between the gut microbiome and gut-derived serotonin, and its impact on host metabolism.

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4. King's College London, London, UK

Background: Specialised enterochromaffin (EC) cells within the gut provide almost all serotonin (5-HT) in the body, the synthesis of which is regulated by the rate-limiting enzyme, tryptophan hydroxylase 1 (TPH1). EC cells are important luminal sensors, and gut microbiota signal to EC cells via a range of microbial metabolites to increase 5-HT biosynthesis. We have demonstrated that gut-derived 5-HT is a signalling nexus between gut microbiota and host metabolism [1]. We, and others [2,3], observed that gut-derived 5-HT also impacts gut microbiota composition. The impacts of 5-HT driven changes to microbial composition on specific metabolite abundance and host metabolism remain unknown, however. The aims of this study were to establish whether a bi-directional relationship exists between gut microbiota and EC cells and to examine the metabolic impacts of this in mice.

Methods: Gut-derived 5-HT synthesis was inhibited in mice by a daily oral gavage of the TPH inhibitor, LP533401 (30 mg/kg) for 28 days. Faecal samples were collected at Days 0 and 28 and analysed for microbial taxonomic and metabolite composition. Cecum contents from control (C-FMT) and LP533401-treated (drug-treated, D-FMT) mice were then transplanted into donor germ-free (GF) mice via oral gavage and mice colonised for a further 28 days. Effect of donor microbial composition on blood glucose control were determined by intraperitoneal glucose tolerance test, circulating and mucosal 5-HT levels analysed by ELISA, and EC cell density quantified by immunohistochemistry.

Results: Inhibition of gut-derived 5-HT synthesis significantly altered the gut microbiome and microbial metabolite abundance after 28 days compared to controls. In D-FMT mice, this shift in microbial composition was not associated with changes to blood glucose control, weight or duodenal 5-HT content compared to C-FMT mice. However, colonic mucosal 5-HT and EC cell density was significantly lower in D-FMT mice compared to C-FMT controls.

1. [1] Martin AM et al (2019) PNAS, 116(40): 19802–19804
2. [2] Fung et al (2019) Nature Microbiology, 4:2064–2073
3. [3] Kwon et al. 2019, Cell Mol Gastroenterol Hepatol, 7(4):709-728

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Effect of Maternal Dietary Glycaemic Index on Offspring Metabolic Phenotype in Mice

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Carbohydrates are the most abundant macronutrient in the diet, their quality is paramount to good metabolic health. The glycaemic index (GI) measures carbohydrate quality based on postprandial blood glucose levels, with lower GI foods associated with better metabolic health. This study compared free sugars with a range of GIs from glucose (highest), sucrose (middle) and isomaltulose (lowest). C57BL/6 female mice were fed one of three sugar-based isocaloric diets or an AIN93-G control. Pups continued on their mother's diet until 30-weeks to determine the effects of *in-utero* and lifelong exposure. Body composition was determined by EchoMRI, energy expenditure and respiratory quotient measured in Promethion metabolic cages and oral glucose tolerance tests (OGTT) were performed. Preliminary results show female mice exposed to high-sugar diets were heavier, longer and fatter by 30-weeks compared to controls. In male mice, glucose-fed pups were heavier, and all sugar-fed pups were fatter and longer compared to controls. Female sugar pups secreted more insulin in response to glucose, however, insulin peak response was delayed in mice fed isomaltulose. Overall, sugar-based diets increased food intake compared to starch-based AIN93-G at 12- and 24-weeks of age. Interestingly, at 24-weeks food intake was reduced compared to 12-weeks in sugar-fed mice. These results may be due to increased presence of liver fibrosis observed in 32% of glucose-, 38% of sucrose- and 24% of isomaltulose-fed mice and corroborated with histology. Preliminary results show female mice are more heavily affected at 30-weeks across all sugar diets with a higher body weight, percent fat, insulin response to an OGTT, increased food uptake and liver fibrosis. Male mice show less differences in weight but sugar still negatively effects body composition, food intake and liver fibrosis. These findings show that free sugars, regardless of their GI can induce changes in body composition and risk of metabolic disease.

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Sucrose intake by rats affected by both intraperitoneal oxytocin administration and time of day

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Daily limited access to a palatable food or drink at a fixed time is commonly used in rodent models of bingeing. Under these conditions, entrainment may modulate intake patterns but has received little attention. Oxytocin is involved in circadian patterns of intake and when administered peripherally, reduces sucrose intake. However, oxytocin's effects on intake under limited-access conditions and its potential interaction with entrainment have not been explored. This study examined the role of entrainment on intake patterns, oxytocin's effects on sucrose intakes and locomotor activity and whether oxytocin's effects were mediated by its actions at oxytocin or vasopressin V1a receptors. Sated rats received daily 1-h access to 10% sucrose solution either at a fixed or varied time of day. Rats received intraperitoneal oxytocin (0, 0.3, 1, 3 mg/kg) prior to sucrose access and spontaneous locomotor activity was assessed in an open-field test. Rats were then pre-treated with an oxytocin receptor antagonist, L368,899 or a vasopressin V1a receptor antagonist, SR49059 prior to oxytocin before sucrose access. Intake patterns did not differ between fixed- or varied-time presentations, rats consumed more sucrose solution in the middle as opposed to early dark phase. Oxytocin dose-dependently reduced sucrose intakes, but also reduced locomotor activity. There was some evidence of partial blockade of oxytocin-induced sucrose intake reductions by both L368,899 and SR49059, but the results were unclear. Time of day and oxytocin impact sucrose solution intake under daily limited access in rats, and the sedative-like effects of oxytocin should be considered in future studies on oxytocin and food intake.

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Framing childhood obesity: how to increase policy support while reducing stigma

Mark Chenery[1]

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In this presentation, Mark Chenery, co-founder and director of Common Cause Australia will outline key findings from a childhood obesity message testing project he conducted on behalf of VicHealth in 2020. The primary objective of the research was to identify messages that increase support for policy

measures that address childhood obesity in Australia – such as restrictions on unhealthy food marketing. A secondary objective was to explore how to avoid stigmatising or alienating children above a healthy weight and their parents when talking about these topic areas.
The research included a public discourse analysis of over 8,000 words of language data from media articles, political debate, social media discussions and popular culture on the topics of food marketing and childhood obesity. This was followed up with extensive message testing on a nationally representative sample of over 1,200 people. Mark will take participants through the main recommendations to emerge from the research – including key words, phrases and frames to either replace or embrace in future communications.

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We need to change the narrative around obesity

Tiffany Petre[1]

1. The Obesity Collective, NORTHBRIDGE, NSW, Australia

We know that people blame individuals for obesity and assume that this is an issue of personal choice. This frame is unfair, harmful, and holding back progress. If we keep blaming people from an oversimplified perspective, then we don't have to think about research, investing in prevention and healthier environments or offering support, treatment and care for those that want to improve their health.
We need to change the narrative around obesity. Personal stories are powerful and needed for this.
Tiffany Petre from the Obesity Collective and Andrew Wilson from the Weight Issues Network will share their understanding of the narrative around obesity, what needs to change, and how.

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Experimental assessment of potential unintended impacts of healthy weight and lifestyle campaigns among Australian adults

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Background/Aims: Concerns have been raised that healthy weight and lifestyle campaigns could have unintended negative psychological or behavioural consequences. This study tested potential adverse reactions to healthy weight and lifestyle campaign advertisements among a sample of Australian adults.
Methods: In an online between-subjects experiment, *N*=2,208 adults from WA and Victoria (*LiveLighter*® states) were randomly assigned to view one of five advertisements: 'Toxic fat' or 'Sugary drinks' (from the *LiveLighter*® campaign, employing graphic imagery to illustrate negative health consequences of overweight), 'Become a swapper' or 'How to swap it' (from the *Swap it* 'campaign, employing animation and light-hearted messaging), or a control advertisement (*HSBC Bank*). A supplementary control group of *n*=440 adults from SA (non-LiveLighter® state) also viewed the control advertisement. After viewing their assigned advertisement, participants' behavioural intentions, internalised weight bias, anti-fat attitudes, self-esteem, and body dissatisfaction were assessed.
Results: Exposure to each of the healthy weight advertisements prompted significantly greater intention to engage in adaptive lifestyle behaviours compared to viewing the control advertisement ($p<0.05$). Intention to engage in maladaptive behaviours (e.g., skipping meals) was low and did not differ between advertisement conditions. Respondents who saw *LiveLighter*® 'Sugary drinks' reported higher anti-fat attitudes than those who saw the control advertisement ($p<0.05$); however mean scores were at the low end of the 9 point scale (M=3.89, SD=1.64). None of the healthy weight and lifestyle campaign advertisements promoted internalised weight bias, reduced self-esteem or body dissatisfaction.
Conclusions: Overall, the healthy weight and lifestyle advertisements performed favourably compared to the control advertisement on intended outcomes and showed no clear evidence of adverse impacts. Findings suggest that campaigns like *LiveLighter*® and *Swap it* can continue to be used safely in public health efforts addressing poor diet, inactivity and obesity.

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Obesity and Diabetes: what is the relationship?

Anthony Russell[1]

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Obesity is a well-recognised risk factor for the development of type 2 diabetes. This relationship will be explored mainly from an adipocyte biology perspective, to explain the pathophysiological processes linking obesity with the development of diabetes. Obesity relates to a state of energy excess where inappropriate storage of this energy leads to insulin resistance and pancreatic dysfunction. Treatment of diabetes, utilising very low-calorie diets or bariatric surgery, demonstrate the importance of excess energy in the pathophysiology of diabetes and how remission can be induced by reaching a negative energy balance.

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Impacts of maternal obesity on pregnancy

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2. Endocrinology, Mater Health, South Brisbane, QLD, Australia

Nearly half of pregnancies in Australia are to women who are overweight or obese. This presentation will discuss the challenges and complications experienced by women undertaking pregnancy with an elevated maternal BMI. It will also consider the impacts of bariatric surgery on pregnancy outcomes for mother and infant.

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The effect of testosterone treatment on body composition glucose metabolism in men with visceral obesity at risk of, or with newly diagnosed type 2 diabetes: a double-blind placebo-controlled trial.

Gary Wittert[1], **Kristy Robledo**[1], **Mathis Grossmann**[1], **Karen Bracken**[1], **Bu Yeap**[1], **Bronwyn Stuckey**[1], **Robert McLachlan**[1], **David Handelsman**[1], **Carolyn Allan**[1], **Warrick Inder**[1], **David Jesudason**[1], **Anthony Keech**[1], **Alicia Jenkins**[1], **Mark Ng Tang Fui**[1], **Mark Daniel**[1]

1. University of Adelaide, Adelaide, SA, Australia

Men with obesity, particularly when visceral and associated with insulin resistance have lower serum testosterone (T) concentrations than age matched healthy men. The low serum T is an independent risk factor for incident type 2 diabetes (T2D) in these men. We aimed to determine whether T treatment for 2 years decreased this risk over and above the effects of a lifestyle program.

We undertook a parallel, 6-centre, randomised, double-blind, placebo-controlled phase 3 trial. Participants were men, aged 50–74 years, waist circumference (WC) ≥ 95 cm, serum testosterone ≤ 14 nmol/L and with either impaired glucose tolerance (IGT) or newly diagnosed T2D assessed by Oral Glucose Tolerance Test (OGTT), (N=1007, 20% with T2D). All men were enrolled in a lifestyle program (WW) and randomised to receive intramuscular testosterone undecanoate 1000mg or placebo 3 monthly for 2 years.

At 2-years, in T (504) vs placebo (503) treated men 12.4% (55/443) vs 21.1% (87/413) had T2D ($p=0.0007$), 2-h glucose was 1.70 (SD: 2.78) vs. 0.95 (SD: 2.47) mmol/L lower than at baseline ($p<0.0001$), and GTT normalised in 51.9% vs 43.3% ($P=0.012$). The treatment effect was independent of baseline serum T and associated with greater loss of fat mass and increased muscle mass and strength. Lifestyle program engagement, quality of life and psychosocial function measures were similar in each group.

Harms (T vs placebo): (i) Safety triggers: Haematocrit ≥0.54% in 22% (106/491) vs. 1% (6/484); increase in PSA in 23% (109/480) vs 19% (87/468); (ii) SAEs: Cardiovascular (19 vs 19), BPH (8 vs 3), prostate cancer (4 vs 5), other cancers (10 vs 4), depression (1 vs 3), deaths (2 vs 2).

Conclusion: Testosterone treatment for 2 years reduced T2D prevalence by 40% beyond the effects of a lifestyle program, and effect primarily mediated by favourable changes in body composition.

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Associations of reproductive hormones and glucose homeostasis with metabolic-associated fatty liver disease measured by transient elastography in a super-obese population

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3. Storr Liver Centre, Westmead Millennium Institute, University of Sydney, Sydney, NSW, Australia

4. Department of Gastro and Hepatology, Blacktown Hospital, Western Sydney Local Health District, Sydney, NSW, Australia

Introduction: Low sex hormone binding globulin (SHBG) has been associated with obesity and related metabolic diseases including metabolic-associated fatty liver disease (MAFLD) and type 2 diabetes mellitus (T2D), but no studies have examined the relative significance of these relationships with MAFLD diagnosed by transient elastography or in a super-obese community-based population.

Methods: Patients were prospectively recruited into an observational cohort study to the public Blacktown Hospital Metabolic and Weight Loss Program - a tertiary weight management service in Western Sydney. Patients were referred by their primary care physician if they had a BMI>35 kg/m^2 with T2D or BMI>40 kg/m^2 with two obesity complications. Anthropometric measurements, metabolic and hormonal blood tests and transient elastography data were collected at baseline.

Results: The cohort comprised of 317 patients (48.9±13 yrs, 68% female, BMI 50.7±12 kg/m2). 87% had steatosis as defined by controlled attenuation parameter (CAP) >280dB/m on transient elastography (FibroScan®), and this was significantly associated with lower SHBG and higher HOMA2-IR in both genders, and higher BMI, waist circumference, glycosylated haemoglobin and triglycerides only in women. Addition of prediabetes/diabetes to steatosis did not significantly change the association with SHBG or HOMA2-IR. Lower SHBG correlated with higher CAP, glycosylated haemoglobin, HOMA2-IR and triglycerides in both genders, but not measures of adiposity including BMI or waist circumference, nor Edmonton Obesity stage. Controlling for SHBG did not modify the relationship of steatosis with any metabolic parameters apart from calculated free testosterone in women.

Conclusions: In our cohort of community-dwelling severe complex obesity, low SHBG was an adiposity-independent marker of metabolic health, especially aligning with steatosis. The relationships of steatosis with adiposity, glucose homeostasis and lipids were sex dimorphic and further research is needed to clarify these findings. Beyond a rise in free testosterone, low SHBG did not mediate the metabolic associations of steatosis in women.

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Advanced liver fibrosis in adults with obesity is associated with alterations in cardiac structure andfunction

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Objectives: Adults with obesity have increased cardiovascular disease risk and mortality. Alterations in cardiac structure and function have been reported in adults with obesity, independent of known cardiac disease. However, the factors modulating these alterations in obesity remain unclear. Non-alcoholic fatty liver disease (NAFLD) has also been associated with obesity, however the association between advanced liver fibrosis due to NAFLD, and cardiac remodelling and dysfunction, has not been well characterised. The aim of our study was to examine the relationship between liver fibrosis and measures of cardiac structure and function.

Methods: Consecutive patients attending the Metabolic and Weight Loss Clinic at Blacktown Hospital (2017-2019) with a comprehensive transthoracic echocardiography were included. Patients were referred by their primary care physician and had a BMI > 35 kg/m^2 with co- existent type 2 diabetes or BMI > 40 kg/m ^{2} with two obesity complications. A range of clinical, biochemical, and echocardiographic parameters of cardiac structure and function were examined in patients with

advanced liver fibrosis (defined by a NAFLD Fibrosis Score >0.675) vs those without advanced liver fibrosis.

Results: Of 158 included patients (27.8% male, mean age 48.6 years, mean BMI 48.0kg/m^2), 65 had advanced liver fibrosis and 93 did not. Patients with advanced liver fibrosis had higher mean interventricular septum thickness (p=0.0019), larger left ventricular mass (p=0.029), and larger right ventricular basal diameter (p=0.020). Advanced liver fibrosis was also associated with an increased average E/e' (p=0.026), longer deceleration time (p=0.001), and a reduced septal e' (p=0.049), lateral e' (p=0.003) and E/A ratio (p=0.012), suggestive of impaired diastolic function. There were no significant differences between left and right ventricular systolic function between both groups.

Conclusions: Advanced liver fibrosis is associated with changes in cardiac structure and left ventricular diastolic function. Further research is required to corroborate the associations identified in this study.

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A High-Fat Diet Increases Influenza A Virus-Associated Cardiovascular Damage

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Background

Influenza A virus (IAV) causes a wide range of extrarespiratory complications. However, the role of host factors in these complications of influenza virus infection remains to be defined.

Methods

Here, we sought to use transcriptional profiling, virology, histology, and echocardiograms to investigate the role of a high-fat diet in IAV-associated cardiac damage.

Results

Transcriptional profiling showed that, compared to their low-fat counterparts (LF mice), mice fed a high-fat diet (HF mice) had impairments in inflammatory signaling in the lung and heart after IAV infection. This was associated with increased viral titers in the heart, increased left ventricular mass, and thickening of the left ventricular wall in IAV-infected HF mice compared to both IAV-infected LF mice and uninfected HF mice. Retrospective analysis of clinical data revealed that cardiac complications were more common in patients with excess weight, an association which was significant in 2 out of 4 studies.

Conclusions

Together, these data provide the first evidence that a high-fat diet may be a risk factor for the development of IAV-associated cardiovascular damage and emphasizes the need for further clinical research in this area.

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Linking NAFLD, hepatokine secretion and metabolic dysregulation in obesity

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Non-alcoholic fatty liver disease (NAFLD) encompasses a spectrum of diseases ranging from non-alcoholic fatty liver, which is characterised by hepatic steatosis, to the more severe form non-alcoholic steatohepatitis (NASH), which is characterised by hepatic steatosis, inflammation and hepatocyte injury (*e.g.* ballooning), with or without hepatic fibrosis. NAFLD is present in ~25% of the general population and incidence is increased strikingly in obesity, with overall NAFLD prevalence of ~75%. There is also a high prevalence of NAFLD in patients with T2DM (~55-80%). Despite these close links, there is an incomplete understanding of the factors mediating the close relationship between obesity, NAFLD and diabetes, with the likelihood of multiple contributing factors.

The liver regulates local and systemic metabolism via the secretion of proteins, which are collectively termed hepatokines, that signal via autocrine/paracrine and endocrine signalling to induce changes in lipid metabolism, peripheral insulin action and glycaemic control. Our laboratory has developed a discovery platform that couples murine and human precision-cut liver slices from disease-relevant donors with proteomic approaches to identify NAFLD/NASH-inducible hepatokines. We then performed target validation of these newly identified hepatokines using metabolic phenotyping in pre-clinical models of NAFLD. These studies have provided a deeper understanding of inter-tissue communication by hepatokines and identified targets for future diagnostics and therapies for obesity-associated diseases.

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Development of Liver-Targeted Interleukin-22 for Fatty Liver Disease

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Abstract: We discovered that the cytokine interleukin-22 (IL-22) is an efficient natural inhibitor of cellular stress and are developing IL-22-based biologics. IL-22 is highly efficacious in metabolic disease with benefits including complete restoration of glucose tolerance, suppression of fasting hyperinsulinemia/hyperproinsulinemia, and restoration of insulin sensitivity [1]. Importantly, obese animals treated with IL-22, lost weight, showed significant improvements in circulating triglycerides and liver function (AST:ALT ratio), as well as a reduction in lipid accumulation in the liver. Due to multiple tissues expressing the IL-22-receptor (IL-22RA1) and its role in wound repair, prolonged administration of IL-22 in patients might lead to off-target effects in other tissues such as increased cell proliferation in the skin. This is apparent from the recent Phase I trial with dimerised IL-22, where the 100% of volunteers developed adverse events which were mainly skin emergent, including eczematous lesions [2]. To overcome this, we have generated a prototype IL-22-based bispecific biologic drug candidate (IL-22-fusion) which is targeted towards the pancreas and liver. Whilst long term administration of IL-22-Fc (with a long half-life) induced skin proliferation and inflammation, our IL-22-fusion did not. Importantly, we demonstrate that liver targeted IL-22 has enhanced efficacy in the preclinical model of Fatty liver disease; with improvements in obesity-induced hyperglycaemia, insulin quality and decrease in fat mass compared with native IL-22. Furthermore, the data shows a reduction in hepatocyte ER stress (Grp78) and inflammation, reduction in fat/triglyceride accumulation in the liver and restoration of expression of key hepatic genes involved in fatty acid metabolism. Our work is now focused on developing this therapeutic for Phase 1 clinical trials.

1. Hasnain, S.Z., et al., Glycemic control in diabetes is restored by therapeutic manipulation of cytokines that regulate beta cell stress. Nat Med, 2014. 20(12): p. 1417-26.

2. Tang, K.Y., et al., Safety, pharmacokinetics, and biomarkers of F-652, a recombinant human interleukin-22 dimer, in healthy subjects. Cell Mol Immunol, 2019. 16(5): p. 473-482.

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Investigating the Potential of Silencing PSMD9 to Treat Obesity and Non-Alcoholic Fatty Liver Disease

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Obesity and it associated complications is increasing in prevalence worldwide, highlighting the need to find therapeutics to either reduce obesity or treat obesity related conditions. One such condition, non-alcoholic fatty liver disease (NAFLD) is characterised by hepatic lipid deposition (steatosis) and drives diseases such as insulin resistance and type 2 diabetes (T2D). Moreover, NAFLD can progress to non-alcoholic steatohepatitis (NASH), characterised by scarring and fibrosis. NAFLD is present in up to 80 percent of individuals with T2D, and up to 90 percent of individuals with obesity. Limited diagnostic, prognostic and therapeutic tools are currently available to treat NAFLD.

Recently, our lab engaged a systems genetics approach in mice to identify novel proteins and pathways important in regulating hepatic lipid abundance. Findings from this study identified the protein PSMD9 as a previously unrecognised lipid regulatory protein. We validated a causal role for PSMD9 by demonstrating that hepatic overexpression of PSMD9 leads to increased plasma and hepatic lipid accrual, whilst silencing of PSMD9 with anti-sense oligonucleotides (ASOs) prevented liver steatosis in a short term study where mice were fed a western diet for 4 weeks. In the current study, we used ASO technology to silence PSMD9 in C57BL/6J and DBA2/J mice that were fed an AMLN NASH

diet (HFD+22% fructose+2% cholesterol) over a prolonged period (6 months). Four groups of mice were studied: normal chow, AMLN+saline, AMLN+Control-ASO and AMLN+PSMD9-ASO. We demonstrate that PSMD9-ASOs silence both hepatic and adipose PSMD9. PSMD9-ASO treatment did not induce significant toxicity, and positively impacted several metabolic readouts of obesity, NAFLD and whole body metabolism; including significant reductions in weight gain. Thus, although preliminary, these studies warrant further investigations into the therapeutic potential of PSMD9-ASOs as a treatment for obesity and NAFLD.

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Modulating olfactory function affects behavior and metabolism

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Eating behaviors, particularly overeating, are not only driven by nutritional requirements but also the sensory perception of food cues that predict food reward. Olfaction is often the first sensory cue of food availability and olfaction influences mood, motivation, and memory. Individuals that can't smell show changes in the enjoyment of food and olfactory dysfunction is associated with mental and metabolic illnesses. Importantly, smell perception increases when hungry or is impaired with metabolic diseases, such as obesity. The mechanism linking metabolic state and olfaction remains unknown. Ghrelin is known as the "hunger hormone" and regulates metabolism, mood, and memory at various central nervous system (CNS) locations via its receptor under a state of energy deficit. Although the ghrelin receptors are highly expressed in the olfactory bulb (OB), their function remains unknown. We investigated whether ghrelin receptors in the OB affect olfaction and whether or not this influences mood and metabolic parameters using a viral genetic knockdown approach to chronically delete ghrelin receptors specifically in the OB in ghrelin receptor floxed mice. Deletion of ghrelin receptors in the OB significantly affected olfactory performance in olfactory discrimination and habituation tasks in both fed and fasted mice, as well as increased the latency to find food under both fasted and ghrelin-induced conditions. A two-bottle choice assay for saccharin vs water indicated that mice lacking ghrelin receptors in the OB were completely anhedonic and did not show a preference for saccharin. In support of this, we observed significantly increased anxiety and reduced exploratory locomotor activity in behavioral tasks. Intriguingly, mice increased body weight, fat mass, and blood glucose, indicating metabolic dysfunction. We conclude that OB GHSR maintains olfactory sensitivity under fasted conditions, leading to a number of behavioral and metabolic adaptations to help a mammal detect and respond appropriately to food and odor cues.

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Intranasal Targeting Hypothalamic PTP1B and TCPTP Reinstates Leptin and Insulin Sensitivity and Promotes Weight Loss in Obesity

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The importance of hypothalamic leptin and insulin resistance in the development and maintenance of obesity remains unclear. The tyrosine phosphatases PTP1B and TCPTP attenuate leptin and insulin signalling and are elevated in the hypothalami of obese mice. We report that elevated PTP1B and TCPTP antagonise hypothalamic leptin and insulin signalling to repress feeding and promote white-adipose-tissue browning and contribute to the maintenance of obesity. Deletion of PTP1B and TCPTP in the hypothalami of obese mice enhanced enhances CNS leptin and insulin sensitivity, repressed represses feeding and increased increases browning, to decrease adiposity and improve glucose metabolism. The daily intranasal administration of a PTP1B inhibitor, plus the glucocorticoid

antagonist RU486 that decreased decreases TCPTP expression, represses feeding, increases browning, promotes weight loss and improves glucose metabolism in obese mice.
Our findings causally link heightened hypothalamic PTP1B and TCPTP with the development of leptin and insulin resistance and the maintenance of obesity and define a viable pharmacological approach by which to reinstate hypothalamic leptin and insulin responsiveness to promote weight loss and combat obesity.

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Hypothalamus Extracellular Matrix Remodelling During the Development of Metabolic Disease Promotes Neuronal Insulin Resistance and Whole-Body Metabolic Dysfunction.

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Metabolic diseases, such as obesity and type-2 diabetes, are characterised by defective insulin signalling within neurons of the arcuate nucleus of the hypothalamus (ARC). This phenomenon termed "insulin resistance" promotes sustained food intake, hepatic glucose production and attenuates adipose thermogenesis; pathophysiological processes that collectively drive the development and maintenance of metabolic disease. The mechanisms underlying insulin resistance within the ARC are unclear.
We have identified that metabolically relevant neuronal populations within the ARC are encased by a specialised extracellular matrix, termed a perineuronal net (PNN). We report for the first time that the PNNs surrounding ARC neurons become significantly remodelled in both composition, density, and area in dietary and genetic models of obesity, pre-diabetes, and type 2 diabetes. Enzymatic digestion of the PNN specifically within the ARC of diet-induced obese mice ameliorates insulin resistance through the enhancement of circulating insulin penetrance into the ARC parenchyma. The resulting reinstatement of insulin signalling in the ARC consequently promotes weight loss and improves whole-body glycaemic control through the repression of feeding behaviour and enhanced adipose tissue thermogenesis. These effects are insulin receptor mediated as they are lost in mice specifically lacking functional insulin receptors on metabolically relevant ARC neurons encased within a PNN.
Finally, we have established a viable pharmacological approach to perturb the synthesis of ARC PNNs for the treatment of metabolic disease. We have identified that intracerebroventricular delivery of a potent chondroitin-sulphate proteoglycan inhibitor to the brains of diet-induced obese mice results in sustained beneficial effects on weight loss and glycaemic control. Our findings provide a previously undiscovered role of the PNN as a novel disease mechanism underlying neuronal insulin resistance and highlight an exciting potential therapeutic target alongside a drug candidate for the treatment of metabolic disease.

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Addressing weight stigma in clinical practice Louise Baur[1]

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Available soon

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Food and drink advertising on public advertising spaces: pilot outcomes from Queensland

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The Queensland Department of Health works to support Queenslanders to live a healthy life and health supporting environments are key to achieving this. As we move around our communities we are exposed to advertising and marketing for a range of products and services.

In August – November 2020, the Department of Health undertook a pilot of a tool to audit the types of products and services being advertised in public advertising spaces.

As part of the study an audit tool was developed to classify the type of products being advertised including a system to classify food and drink being advertised as healthier or unhealthy, building on

the *National interim guide to reduce children's exposure to unhealthy food and drink promotion*. The tool was tested and then used to collect data from across four major transport hubs in Brisbane.

All advertisements were assessed at each site resulting in information about 238 advertisements. Advertisements were categorised into 11 groups based on the primary brand category e.g. fashion or technology, with the most prominent primary brand category advertised being food and/or drink at 37%.

Additionally, all advertisements regardless of primary brand category were assessed as to whether they contained food and/or drink. 102 (43% of all advertisements) contained either food and/or drinks and all food and/or drinks included in these advertisements were classified as "healthier" in less than a quarter (21 or 21%) of cases.

Noting the limitations of the pilot in terms of size and convenience sampling, the pilot provides insights to the types of products and services that are being marketed in public spaces. Where food and/or drinks are included in advertisements, in the majority of cases the food and drink included was not classified as healthier.

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An investigation of combined effects of maternal obesity and hypoxic-ischemic (HI) brain injury on rat offspring

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Maternal obesity is associated with pregnancy-related complications including birth asphyxia. As both maternal obesity and neonatal HI injury have detrimental effects on neurodevelopmental outcomes, here we examined their combined effects in adult offspring.

After 7 weeks of chow or High Fat Diet (HFD) (n=10, 8) female Sprague Dawley rats were mated with chow-fed males. On postnatal day 7, the right common carotid artery of pups was occluded followed by hypoxia (7.5% O_2, 3 hours) (HI); controls underwent sham surgery. Behavioural outcomes including anxiety and social interaction were studied between 6-14 weeks of age.

Before mating, HFD mothers were ~11.1% heavier ($p<0.05$) than Chow. From week 4-13, male HFD were heavier than chow offspring ($p<0.05$); Chow HI were lighter than Chow sham and maternal HFD HI offspring (diet×HI interaction, $p<0.05$) suggesting maternal HFD mitigated the effect of HI. No effect of HFD or HI on body weight was observed in female offspring. In a social interaction 3-chamber test, male HI spent significantly less time interacting with the novel rat than Sham offspring ($p<0.05$) and offspring from HFD mothers showed higher % preference for novel rat than Chow offspring. No effect of HFD or HI was observed on social interaction in females. In the elevated plus maze, female offspring of HFD mothers spent more time in the open arm ($p<0.05$) indicating reduced anxiety. Conversely, in the open field test a significant HI effect was observed in male, but not female offspring; HI males spent more time in centre than sham indicating reduced anxiety.

These data suggest sex-dependent effects of maternal HFD and HI in offspring. In male offspring maternal HFD increased body weight and mitigated the effect of HI after weaning. HI reduced social interaction and anxiety in males and maternal HFD reduced anxiety in females.

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Opportunities for Victoria to incentivize healthy food retail

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Background: Food retail settings, where we consume and purchase food, have been identified as a leverage point to improve population diets. Government action to create healthier food retail environments in Australia has been limited to specific settings, and unhealthy options still dominate many retail settings[1]. Understanding how governments currently regulate and govern food retail spaces, will give essential insights into how healthy food retail could be incentivised and regulated.

Aim: To identify how the Victorian government currently regulates food retail businesses, in order to recommend feasible approaches to incentivising healthy food retail.

Methods: Recommended approaches to creating healthy food retail settings were identified through a search of academic and grey literature and used to build a framework for policy analysis. Victorian government health and business documents were searched to identify 1) current healthy food retail policies and 2) business regulatory/compliance requirements and guidelines related to food retail outlets. Documents were summarised and assessed against the policy framework.
Results: The policy analysis framework was comprised of eight different types of healthy food retail initiatives. Health documents (n=6) included nutrition policy guidelines for specific settings. Six business documents encompassed guidelines for fitting out retail premises, food safety requirements, health and wellbeing plans, strategic plans, and environmental safety guides.
Discussion: Current healthy food retail policies centre around healthy guidelines in health services, schools and other public institutions. Within identified business documents, there were several references to health. Food retail is strongly governed by food safety requirements, while health and wellbeing plans frequently mention chronic disease prevention.
Conclusion: The Victorian government currently regulates and recommends the promotion of health within retail outlets, demonstrating the potential for nutrition requirements to be incorporated with the goals of creating health-enabling food retail environments.

1. 1. Zorbas C, Gilham B, Boelsen-Robinson T, et al. (2019) The frequency and magnitude of price-promoted beverages available for sale in Australian supermarkets. Australian and New Zealand journal of public health;43(4):346-51.

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A rapid review of the impact of family-based digital interventions for obesity prevention and treatment in primary school aged children

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Background: Traditional family-based obesity prevention and intervention programs are effective in facilitating health behaviour change for children. However, these programs are often impeded by barriers including geographical limitations, time constraints, ease of access, and weight stigma. Research suggests that virtual delivery may be effective for supporting children and families to adopt healthy lifestyle change while enhancing program accessibility. This rapid review aimed to summarise the impact of family-based digital interventions for childhood obesity prevention and treatment.
Methods: Four databases were searched from 1990 to February 2021 for trials of interactive digital programs for obesity prevention and interventions that involved: i) children aged 5-12 years, ii) family-based or home-based settings, iii) a comparison arm, and iv) reported diet, physical activity, sedentary behaviour, sleep or weight-related outcomes.
Results: The search identified 362 articles of which 23 publications (from 18 programs) met the inclusion criteria. Most of the programs (n=13) were published in the last five years. The interventions were conducted in eight countries, ranging between four- and 20-weeks duration, with the longest follow up between two months and two years from baseline. Behaviour change theories were used in 13 programs with 'Social Cognitive Theory' applied most frequently (n=9). Interventions have used websites (n=11), text messaging (n=5), video gaming (n=3), Facebook (n=3), and/or mobile apps (n=2). Studies reported changes in BMI (n=11), diet (n=12), physical activity (n=8) and/or screen time (n=5) in children. Significant improvements were reported for child diet (n=7) or physical activity (n=4). Two of five interventions were effective in reducing screen time.
Conclusion: Family-based digital interventions have shown modest improvements in child BMI and significant effectiveness in child diet and physical activity. This review found that digital approaches were acceptable and positively received by participants, with emerging evidence of the use of social media and video gaming for program delivery.

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Developing a monitoring and evaluation framework for a preventive health agency in Queensland: a systems-based approach

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Background:

Obesity is a public health challenge requiring sustained, multifaceted action to have a population impact. Health and Wellbeing Queensland (HWQld) is a new health promotion agency which seeks to influence the underlying structures and conditions related to inadequate diet, physical inactivity, and health inequities by adopting a systems-based approach. However, there are few, reported evaluation frameworks designed for capturing signals of systems change in public health prevention.

Methods:

A partnership between HWQld and the Institute for Social Science Research at The University of Queensland co-created a comprehensive Monitoring, Evaluation, and Learning Framework (the Framework) that captures signals of system changes that contribute to health outcomes at the population level. The Framework was informed by a literature review, developed by public health researchers and practitioners, and guided by a set of underpinning principles.

Results:

The Framework is centred around a high-level 'Theory of Change' that illustrates how HWQld's actions will influence the systems associated with obesity and health inequity and contribute to population level outcomes and impacts. Four 'Systems Components' were identified to represent different parts of the system that HWQld aims to influence: Policies; Practices; Networks; and Mindsets. A 'Ceiling of Accountability' was introduced to distinguish between 'performance accountability' and 'population accountability' recognising that accountability for the higher-level population outcomes cannot be assigned solely to an organisation when addressing complex system changes. The Framework provides a pragmatic structure to operationalise the complexity of system changes into concepts that will allow for organisational strategic learning and planning, with better measures and understanding of HWQld's roles in influencing the prevention system in Queensland.

Conclusion:

The Framework integrates knowledge and data generated by HWQld's actions to capture change, report outcomes, and use learnings to flexibly adapt the organisation's efforts to improve health of Queenslanders.

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A systematic review on systematic reviews of acupuncture for weight management

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Background

Acupuncture is increasingly popular for overweight and obesity treatment [1,2]. Various systematic reviews on acupuncture for weight management have been published with contradicting conclusions. This study is aimed to investigate the weight management effects and safety of acupuncture for adults by systematically review the existing systematic reviews on manual acupuncture (MA) and/or electroacupuncture (EA) for overweight and obesity.

Methods

An extensive search on thirteen databases was to identify available systematic reviews. Systematic reviews evaluated randomised controlled trials (RCTs) on MA and EA for weight management for adults were included regardless of language. All RCTs from the included studies were further screened according to the inclusion and exclusion criteria. The Assessment of Multiple Systematic Reviews was used to assess the quality of the included systematic reviews. The risk of bias of the included RCTs was evaluated by the Cochrane handbook's risk of bias assessment tool. RevMan 5.3 software was used for the meta-analyses of the end of treatment body weight and body mass index.

Results

The search yielded thirteen medium to high-quality systematic reviews and twenty-three RCTs for data analyses. No severe adverse events were reported from the included studies. The identified ten most frequently used acupuncture points for weight loss are located on the abdominal and lower limb, which are from the Spleen, the Stomach, and the Ren meridian. The meta-analyses of the included RCTs showed that acupuncture could reduce body weight and Body Mass Index (BMI) when combined with a weight management co-intervention (such as diet, exercise or diet and exercise).

Conclusion

The findings of this study suggest that acupuncture can provide an add-on effect for reducing body weight and BMI when combing with a co-intervention. However, more rigorously designed RCTs are needed to provide a solid conclusion.

1. Liu, L., Tang, Y., Baxter, G. D., Yin, H., & Tumilty, S. (2021). Complementary and alternative medicine - practice, attitudes, and knowledge among healthcare professionals in New Zealand: an integrative review. BMC Complementary Medicine and Therapies, 21(1). doi:10.1186/s12906-021-03235-z
2. Zhang, Y., Li, J., Mo, G., Liu, J., Yang, H., Chen, X., . . . Huang, W. (2018). Acupuncture and Related Therapies for Obesity: A Network Meta-Analysis. Evidence-Based Complementary and Alternative Medicine, 2018, 1-20. doi:10.1155/2018/9569685

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Less panna cotta not always the panacea: a case of thiamine deficiency post sleeve gastrectomy causing long-term neuropathy in a young male

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Abstract: A case of a 20 year old male with opthalmoplegia, nystagmus, distal weakness and ataxia 10 weeks after sleeve gastrectomy for weight loss. Nerve conduction studies revealed axonal sensory motor neuropathy consistent with vitamin B1 (thiamine) deficiency. His condition improved with IV thiamine replacement however ataxia persisted. One year later, at the age of 21, gait disturbance remained and he was using Dictus bands to assist with persisting foot drop. The case highlights the important of adequate nutritional investigation and supplementation both before and after sleeve gastrectomy.

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The nutritional quality of school lunch purchases from New South Wales school canteens: A cross sectional study of primary school aged children

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Background & Aims: School canteens represent the most frequently used food outlet by children in New South Wales, Australia, with a higher frequency of lunch purchases positively associated with child overweight and obesity. Despite this little is known about the nutritional quality of student purchases from school canteens. The aim of this study was to assess the nutritional quality of primary school student canteen lunch purchases including the; i) mean energy, saturated fat, sugar and sodium content; ii) percent of energy from saturated fat and sugar and; iii) proportion and types of foods purchased that are healthier (green) and less healthy (amber/red) according to a state school canteen policy.

Methods: A cross sectional study was undertaken of 1,666 student lunch purchases from 18 government primary school canteens in the Hunter region of New South Wales Australia. Student purchase data were collected via a one day observation in consenting school canteens.

Results: On average students' lunch purchases contained 685kJ of energy, 1.8g of saturated fat, 12.7g of total sugar and 151.4mg of sodium with 9.5% energy from saturated fat and 31.8% energy from sugar. Less healthy items represented 76% of all items purchased with 'sugar sweetened ice blocks and slushies' (13%) and 'savoury pastries' (11%) being the most common types of foods purchased by students at lunch.

Conclusion: There is considerable scope to improve the nutritional quality of student lunch purchases from primary school canteens. Future research is required to identify effective strategies that encourage the purchase of healthier foods from school canteens.

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Surviving Covid: Impacts on the university food environment after lockdown

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The high availability and accessibility of nutrient-poor, energy-dense foods in the modern food environment has been linked to poor diets and health outcomes. Tertiary education settings have been identified as potential targets for interventions. In the second quarter of 2020, the COVID-19 pandemic led to a substantial reduction in activity on The University of Queensland (UQ) campus due to the lockdown. Online learning drastically reduced numbers of students and staff on campus. This study aimed to assess the reawakening of the food environment at UQ St Lucia campus. An audit of the food environment at UQ St Lucia campus was conducted in July 2020, when the campus reopened. Food offerings were benchmarked against the *Victorian Healthy Choices framework* and *Queensland's A Better Choice*. Pricing and promotions of foods and beverages were also analysed. Out of forty-three food outlets pre-lockdown eight had not re-opened. There was a noticeable reduction in stock levels throughout the remaining outlets. Closed outlets included the salad bar in the main refractory, the fruit stall, two fast food outlets and two cafes. Of the audited outlets, only one vendor met the criteria for healthy meals, two outlets met the criteria for healthy snacks, and no retailer met the criteria for healthy drinks. Healthy and unhealthy choices were priced similarly, however red choices were more frequently promoted. Fast food outlets made up the majority of retailers around campus. The post-lock down food environment poses a substantial challenge to re-establishing a healthier food environment as students and staff return to campus. These challenges include "snap-lockdowns" resulting impacting the financial viability for retailers who require rapid turnover of perishable fresh foods. Potential management strategies could include flexible leasing and incentives to re-establish vendors supplying healthy food and drinks including vending.

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Substitution of soft drinks with non-caloric drinks, juices and waters following exposure to warning labels in an in-person drink selection study

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7. Obesity Policy Coalition, Melbourne, Victoria, Australia

Background: Implementation of strategies that reduce global consumption of drinks high in free sugar (e.g. soft drinks, energy drinks, fruit juice) are desperately needed in countries such as Australia where consumption is high. This study aimed to examine the effect of exposure to a warning label, independently and in conjunction with a Health Star Rating (HSR) icon, on the selection of commercially available beverages in an in-person app store experiment that had real decision-making stakes.

Method: 511 young adults participated in the study via laptops set up on-campus with a newly developed online convenience store app that sold 10 commercially available cold beverages (5 sugar-sweetened beverages [SSBs], 1 100% fruit juice, 2 artificially-sweetened beverages [ASBs] and 2 waters). Participants were guided through the app to select a beverage 3 times, one of which was randomly selected for them to keep after completing a brief questionnaire. The experimental manipulation was comprised of changing the drink display to show on-bottle warning labels on SSBs and 100% fruit juice in rounds 2 and 3, and HSRs on all drinks in round 3.

Results: Adding warning labels to beverages in round 2 corresponded with a significant decrease in the selection of SSBs ($p<0.001$) and 100% fruit juice ($p<0.05$) and a significant increase in the selection of ASBs and waters ($p<0.001$). Adding a HSR icon in conjunction with warning labels in round 3 corresponded with a further, albeit non-significant, reduction in SSB selection, but a statistically significant increase in 100% fruit juice selection ($p<0.001$) from round 2 to 3.

Conclusions and implications: Results indicate that warning labels can be used in conjunction with HSR icons to discourage SSB beverage consumption in settings with real decision-making stakes. However, further research on non-SSB drink selection preferences following exposure to both warning labels and HSR icons is warranted.

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Empowerment Approaches in Childhood Weight Management: A Systematic Review

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Empowerment interventions facilitate individuals, organisations and communities to gain better control over their health. They are distinctly different from traditional behaviour-change models and encourage participants to set their own health priorities and agenda. Current evidence suggests empowerment interventions are efficacious for smoking, sexual and mental health outcomes. However, empowerment in childhood obesity (which remains a global public health challenge) is under-researched. This review systematically analysed the evidence for empowerment approaches in childhood weight management. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed. A search strategy was applied to six databases from inception to 14th May 2020. Evidence was appraised using The Academy of Nutrition and Dietetics Quality Criteria Checklist and National Health and Medical Research Council Levels of Evidence. Of the 8,405 papers identified, 29 papers describing 14 programs met the inclusion criteria. Twenty-five studies rated positive and four rated neutral. Overall, the evidence body rated 'B'. 72% of the 3318 participants were from priority populations, highlighting the unique ability of empowerment interventions to engage those most in need. Results demonstrate small to large improvements in participant body mass index with effect sizes ranging from 0.08 to 1.13. Which, in some age groups, was more efficacious than current behaviour-change approaches. For diet and physical activity, outcomes were not able to be grouped due to heterogeneity in their measurement. However, results were comparable to current literature, highlighting empowerment as an alternative option to traditional approaches. Throughout the literature, empowerment was measured inconsistently and usually with a surrogate marker. All studies were set in America or Canada. This review suggests empowerment should be further investigated in childhood weight management. Empowerment interventions represent a unique opportunity to meaningfully integrate self-determination to clinical childhood weight management practice and overcome current barriers related to priority population engagement.

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Efficacy and safety of once-weekly subcutaneous semaglutide 2.4mg in adults with overweight or obesity (STEP 1)

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Aims: STEP 1 investigated the GLP-1 analogue, subcutaneous semaglutide, for weight management in adults with overweight or obesity.

Methods: This was a randomised, double-blind, placebo-controlled, phase 3 trial (NCT03548935) of adults with a body mass index (BMI) ≥30kg/m^2 or ≥27kg/m^2 with ≥1 weight-related comorbidity, without type 2 diabetes. Patients were randomised 2:1 to 68 weeks' treatment with once-weekly subcutaneous semaglutide 2.4mg or placebo, adjunct to lifestyle intervention. Co-primary endpoints were percentage change in body weight and weight loss ≥5%. Two estimands were defined: treatment policy and trial product; results are presented for the treatment-policy estimand, unless stated otherwise. P-values for parameters marked with # were not controlled for multiplicity.

Results: 1961 randomised participants (mean age 46 years, body weight 105.3kg, BMI 37.9kg/m^2; 74.1% female) were included. Mean body weight change from baseline to week 68 was −14.9% (semaglutide) vs −2.4% (placebo) (estimated treatment difference [ETD]: −12.4%; 95% CI: −13.4, −11.5; p<0.0001). Similar results were obtained with the trial product estimand:$^{\#}$–16.9% (semaglutide) vs –2.4% (placebo) (ETD: –14.4%; 95% CI: –15.3, –13.6; p<0.0001). Participants were more likely to achieve weight loss ≥5%, ≥10%, ≥15% and ≥20%$^{\#}$ with semaglutide vs placebo (86.4% vs 31.5%, 69.1% vs 12.0%, 50.5% vs 4.9% and 32.0% vs 1.7%, respectively; p<0.0001 for all). Greater improvements were seen with semaglutide vs placebo in waist circumference, BMI$^{\#}$, systolic and diastolic$^{\#}$ blood pressure, glycated haemoglobin$^{\#}$, fasting plasma glucose$^{\#}$, C-reactive protein$^{\#}$, fasting lipid profile$^{\#}$ and self-reported physical functioning (p<0.05 for all). No new safety signals with semaglutide were observed.

Conclusions: In overweight or obese adults, once-weekly subcutaneous semaglutide 2.4mg plus lifestyle intervention induced a mean weight loss of ~15% by week 68. Clinically beneficial weight loss ≥10% was achieved by over two-thirds of participants and ≥20% by one-third of participants, along with associated improvements in cardiometabolic risk factors and physical functioning.

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Long term follow-up for the Think, Eat and Move program: are healthy changes maintained after the program?

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Adolescents are largely invisible in health promotion intervention strategies. The Think, Eat and Move (TEAM) program is an eight-week healthy lifestyle program for 13- to 17-year-olds delivered throughout Central and Eastern Sydney. Participants complete weekly phone coaching sessions with a health professional that are complemented by weekly online learning sessions focussing on key healthy lifestyle topics. Topics include healthy eating, physical activity, screen time, sleep, mindfulness, and goal setting. A range of supporting resources and practical tools are also provided, and parents and carers are actively involved throughout the program.

Between September 2018 and December 2020, 128 participants completed the program. Of those 111 (87%) completed post-program measurements, and 17 (13%) completed 6-month follow-up measurements.

Female participants were more likely to complete post-program and 6-month follow-up measurements. Fifty-two percent of pre-program data collected was from female participants, 54% at post-program, and 88% at the 6-month follow-up. Similarly, retention was higher amongst participants whose parents reported home ownership before the program. Pre-program age was consistent across the data points.

Significant improvements were observed post-program for BMI (-1.06, p<0.001), BMI z-score (-0.2, p<0.001), fruit intake (Z=-4.9, p<0.001), vegetable intake (Z=-6.9, p<0.001), days meeting the physical activity guidelines (Z-6.6, p<0.001) and a range of other physical activity and eating behaviours.
A number of outcomes continued to reach significance for the participants who completed the 6-month follow-up. Compared to pre-program scores participants BMI and BMI z-score were reduced (-1.6, p<0.01 and -0.3, p<0.005 respectively), fruit and vegetable intakes were increased (-2.4, p<0.05 and -2.3, p<0.05 respectively) and days meeting the physical activity guidelines were increased (-2.5, p<0.05).
These results are limited by the challenges of long-term follow-up, however, this data suggests that the TEAM program is having a lasting impact on the weight status, physical activity habits, and eating habits of participating adolescents.

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Cost and affordability of healthy, equitable, and more sustainable diets in low socioeconomic groups in Australia

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Purpose: This study meets an identified need for better evidence to support policies to improve food environments and help drive healthier diets in low socioeconomic groups (SEGs) in Australia, by modifying the Healthy Diets Australian Standardised Affordability and Pricing (HD-ASAP) protocol. It investigates cost and affordability of habitual (based on dietary intake data) and recommended (healthy, equitable, more sustainable) diets in low SEGs.
Method: HD-ASAP protocol components were modified to align with reported dietary intakes, household structures, food purchasing habits and incomes of three low SEGs reference households. Household A included two adults and two children; Household B included one adult and two children; and Household C included two older, retired adults. Feasibility and utility of the modified protocol was tested using food pricing data of 'standard brands', and 'cheapest options' products, reflecting a common coping strategy of low SEGs.
Results:
While total energy intake was similar, habitual diets of low SEGs included more discretionary food and drinks (particularly takeaway and soft drinks) and less healthy food than habitual diets of the mean population. When 'standard brands' were purchased, habitual diets were more expensive than recommended diets for all three reference households. However, when the 'cheapest options' were purchased, habitual diets were less expensive than recommended diets for Household B, and equal cost with recommended diets for Household C. In Households A and B, reliance on unemployment benefits resulted in both habitual and recommended diets being unaffordable (>30% of household income) unless the cheapest food and drinks (usually 'own brands') were purchased.
Conclusions: Among low SEGs recommended diets can be more expensive than habitual diets, contributing to perceptions that healthy food is unaffordable. Policies to improve affordability of healthy diets by decreasing relative healthy food and drink costs and ensuring adequate incomes amongst low SEGs are needed urgently.

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Cost of habitual diets by socioeconomic group in Australia

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Purpose: This study compared habitual (current, unhealthy) diet costs across Australian socioeconomic groups (SEGs), utilising modifications of the Healthy Diets Australian Standardised Affordability and Pricing (HD-ASAP) protocol. Surprisingly, detailed quantitative evidence regarding food group intakes and dietary costs of low SEGs compared to higher SEGs has been lacking.

Method: Dietary recall data reported in the Australian Health Survey National Nutrition and Physical Activity Survey 2011-2012 were analysed to describe dietary intake of a reference household of two adults and two children in each SEG quintile (defined by household income). The habitual diet pricing tool of the HD-ASAP protocol was modified to align with these dietary intakes. Food prices from one location were collected and analysed to determine habitual diet costs in each SEG quintile, and the recommended (healthy, equitable, more sustainable) diet cost for the reference household.
Results: Low SEGs reported habitual diets of significantly lower cost than higher SEGs for the household. When the diets were divided into healthy and discretionary (not needed for health and high in saturated fat, added sugar, salt and/or alcohol) components, the cost of reported intakes of healthy foods tended to increase from the lowest to highest SEG quintile for the reference household, but costs of discretionary food intakes were similar across quintiles. Analysis of more granular food group costs shows additional differences between SEGs.
Conclusions: The lower healthy food and total dietary costs in low SEGs compared to higher SEGs, reflecting lower intakes, helps explain the higher rates of diet-related disease experienced in low SEGs. The findings can inform potential policy action to improve food environments and affordability of healthy foods, and therefore help drive healthier diets among low SEGs.

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The effect of a single session of high-intensity interval exercise in hypoxia on mitochondrial biogenesis genes and proteins

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Exercise is known to increase the content and function of mitochondria, which are critical in cellular metabolism. Both a single session of high-intensity interval exercise (HIIE) and transient hypoxia alone can induce mitochondrial biogenesis. However, their combined effect on mitochondrial biogenesis has not been fully explored. In the current study, we combined HIIE with simulated hypoxia (3200m, oxygen fraction of 0.144) to investigate their influences on the genes and proteins related to mitochondrial biogenesis. Ten healthy males (age, 28 ± 5; BMI, 26.0 ± 3.4) completed three HIIE sessions in random orders: HIIE in hypoxia (HY, 88.4% of peak oxygen uptake (VO2peak)), HIIE in normoxia matched for relative intensity to hypoxia (NR, 88.7% of VO2peak), HIIE in normoxia matched for the absolute intensity to hypoxia (NA, 74.1% of VO2peak). Skeletal muscle samples were collected before, immediately, 3 hours and 24 hours post-exercise. HY and NR similarly increased the gene expression of peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC1α) (by 606% and 480%, respectively), Hypoxia-inducible factor 1-alpha (HIF1α) (by 67% and 45%, respectively), heat shock protein 70 (HSP70) (by 237% and 314%, respectively) and vascular endothelial growth factor (VEGF)) (by 214% and 268%, respectively), 3 hours after exercise ($p<0.05$). There was no significant change observed in the measured genes following NA at the measured time points ($p>0.05$). Total and phosphorylated level of p38 mitogen-activated protein kinase and AMP-activated protein kinase, as well as the total PGC1α protein content, did not change after the 3 exercise interventions. In conclusion, a single session of HIIE in hypoxia upregulated the expression of mitochondrial biogenesis genes, which was comparable to HIIE in normoxia matched for relative intensity to hypoxia. However, HIIE in normoxia matched for the absolute intensity to hypoxia does not provide enough stimulus for the genes associated with mitochondrial biogenesis.

1. Bishop DJ, Botella J, Genders AJ, Lee MJ, Saner NJ, Kuang J, Yan X, Granata C. High-Intensity Exercise and Mitochondrial Biogenesis: Current Controversies and Future Research Directions. Physiology (Bethesda). 2019 Jan 1;34(1):56-70.
2. Jacques M, Kuang J, Bishop DJ, Yan X, Alvarez-Romero J, Munson F, Garnham A, Papadimitriou I, Voisin S, Eynon N. Mitochondrial respiration variability and simulations in human skeletal muscle: The Gene SMART study. FASEB J. 2020 Feb;34(2):2978-2986.

3. Li J, Li Y, Atakan MM, Kuang J, Hu Y, Bishop DJ, Yan X. The Molecular Adaptive Responses of Skeletal Muscle to High-Intensity Exercise/Training and Hypoxia. Antioxidants (Basel). 2020 Jul 24;9(8):E656.
4. Ferri A, Yan X, Kuang J, Granata C, Oliveira RSF, Hedges CP, Lima-Silva AE, Billaut F, Bishop DJ. Fifteen days of moderate normobaric hypoxia does not affect mitochondrial function, and related genes and proteins, in healthy men. European Journal of Applied Physiology, 2021 May 14. doi: 10.1007/s00421-021-04706-4.

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Reducing postpartum weight retention: Core components for intervention development

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Postpartum weight retention (PPWR) is a strong predictor of obesity and associated consequences in later life in women. Suboptimal lifestyle behaviours (e.g. diet and physical activity) contribute to PPWR. Postpartum lifestyle interventions are known to be efficacious in reducing PPWR, however, there are challenges to their successful implementation. According to the Consolidated Framework for Implementation Research, identification of core intervention components across intervention characteristics, implementation process, individual characteristics and outer and inner setting is critical to implementation. We have conducted three systematic reviews (n=5315) and semi-structured interviews of postpartum women (n=21) to identify these core components. Evidence synthesis was conducted with the frameworks of PIPE (penetration, implementation, participation, effect) impact metric, TIDieR (Template for Intervention Description and Replication), COMB (Capability, Opportunity, Motivation and Behaviour) and BCT (Behaviour Change Techniques) to identify core components for population impact, intervention delivery, intervention content and behaviour change strategies respectively. PIPE analysis identified few studies reporting penetration and participation and the limited evidence suggest a very low penetration rate. Interventions embedded within existing postpartum services had higher participation rates. TIDieR analysis revealed that lifestyle interventions combining both diet and exercise and delivered by health professionals were more effective. BCT analysis showed that reduction in energy intake was associated with self-regulation skills such as problem-solving, goal-setting, self-monitoring and feedback on behaviour. COMB analysis revealed peer support, involvement of partners, addressing sleep issues, low intensity and flexible delivery, low financial cost, mental health benefits of a healthy lifestyle, enjoyment of healthy lifestyle and promotion of self-care as priorities to address key barriers and facilitators reported by postpartum women. COMB analysis on health professionals revealed the need for upskilling in providing postpartum lifestyle support. These core components will be presented to stakeholders for co-production of interventions for optimising lifestyle and weight in postpartum women.

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Effects of individual and combined stress and diabetes/obesity on CNS signalling and depressive phenotype

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Introduction: As modern diseases such as depression and obesity become more prevalent, the need for investigations into the role of lifestyle factors in their development becomes more perspicuous. Studies have associated both stress and obesity with depression, however there are currently no studies that explore the role of combined subclinical stress and a highly obesogenic western diet (WD) in the aetiology of depression. Subclinical stress refers to the stress as experienced by people in their everyday life from work, family, or outside worldly events.
Methods: Sixty-four C57BL6/J mice randomly divided into 4 groups (n=16) Control (C), Western Diet (WD), control diet + restraint stress (C+RS), and WD+RS. WD macronutrient content was: 32% fat, 57% carbohydrate, 11% protein and 14% fat, 59% carbohydrate, 19% protein for the control diet. Two-hour restraint per day was used to induce restraint stress (RS) for the last two weeks of the 16-week feeding program used in the study.
Results: Animals fed a WD ate more food than animals fed a control diet. Animals exposed to stress reduced their food intake compared to their control littermates (P>0.0078). At the end of the 16-week

feeding program body mass of WD animals were higher than their respective controls (P>0.0001). The WD also increased fasted insulin levels compared to the animals on the control diet (P>0.0001). Analysis of frontal cortex (FC) and hippocampus (HPC) catecholamines shows increased levels of noradrenaline and adrenaline in animals exposed to RS, with the combined WD and RS animals having higher levels of both catecholamines compared to all other groups.

Conclusion: A WD increases food consumption, body mass, and fasted insulin levels while synergistically interacting with restraint stress to increase FC and HPC catecholamines.

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Physical activity and sitting time across postpartum life stages

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Background

Physical activity (PA) is beneficial for psychological wellbeing and weight management but is generally low in postpartum women. This study aimed to investigate how PA and sitting time (ST) varied with time since last childbirth.

Methods

Data from survey 5 (N=5219) of the 1973-8 birth cohort (31 – 36 years) of the Australian Longitudinal Study on Women's Health were used to assess the association of time since last childbirth (0–6, 7–12 and >12 months) with PA and ST using multiple linear regression.

Results

In adjusted model, PA was lower at 0–6 (-238.5METmin/day; 95%CI -319.6, -157.4) and 7–12 (-81.2METmin/day; 95%CI -157.0, -5.5) than >12 months postpartum. ST was longer at 0–6 (0.65hours/day; 95%CI 0.39, 0.91), but not different at 7–12 than at >12 months postpartum. Overall, higher BMI and being pregnant were inversely associated, while being single, higher stress levels and better self-rated health were positively associated with PA. Conversely, better self-rated health, having more children and breastfeeding were inversely associated, while higher BMI, income and stress levels were positively associated with ST.

Conclusion

In the first 6 months, women are less physically active and sit longer than beyond the first postpartum year. This may be due to the high demands of infant feeding/care in early postpartum suggesting a need for additional support to safely resume PA e.g. walking and reduce sitting time.

Key message

The first 6 months postpartum is characterized by lower PA and longer ST which may contribute to obesity and chronic diseases.

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Development, piloting, adaptation and scale-up trial of Physical Activity 4 Everyone (PA4E1): An implementation intervention to improve schools adoption of practices designed to increase students' physical activity

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Background: School physical activity (PA) programs that have demonstrated effectiveness on a small scale need to be scaled-up to achieve population level health outcomes. We report the development,

piloting, adaptation and scale-up trial of Physical Activity 4 Everyone (PA4E1), a 24-month program targeting adolescents attending schools located in low socioeconomic areas.

Methods: PA4E1 has undertaken a four step scale-up process (from 2012-2019): 1) Development of PA4E1 pilot trial (2012), inclusive of both evidence-based school PA practices and implementation support strategies to support schools to embed these practices; 2) Conduct of pilot randomised controlled trial (RCT) (from 2012-2014) in 10 secondary schools, evaluating the effectiveness (student PA and weight status) and cost-effectiveness; 3) Adaptation of PA4E1 for a scale-up trial (2016); 4) A scale-up hybrid implementation effectiveness RCT (n=49) to evaluate practice uptake by schools (primary outcome), device-measured student PA (secondary outcome) and a comprehensive process evaluation (from 2017-2019).

Results: 1) The pilot program comprised of seven PA practices and six implementation support strategies; 2) Pilot RCT found positive intervention effects on student PA and unhealthy weight gain, and was deemed cost-effective; 3) 20 adaptations were made for scale-up, resulting in seven PA practices and seven support strategies. A minority of adaptations (n=2) were fidelity inconsistent; 4) At 24-month follow up of the scale-up trial, school uptake of 4 or more practices (primary outcome) was significantly higher in the program group (16/23, 69%) than the control group (0/25, 0%) ($p<0.001$). Analysis of student and process evaluation outcomes in progress.

Conclusion: PA4E1 has been developed, piloted, adapted and subsequently scaled-up. Results of the scale-up trial indicate that schools can be supported to implement the seven PA supportive practices. Policy-makers and practitioners responsible for advocating PA in schools should consider this implementation approach.

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A novel digital tool for rapid appraisal of retail food environments: validity and sensitivity

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Optimising retail food environments to make healthy options available, affordable, accessible and appealing is recognised as a promising pathway to improving population diet and health outcomes. Appraisal of the retail food environment can be a catalyst for retailers to take action by allowing benchmarking against other stores and over time, and identification of areas for improvement. We developed a mobile app tool (Store Scout) to enable rapid assessment of the retail food environment against best practice, with results provided immediately as scores ranging from 0-100 (higher more health-enabling) overall and for seven food groups. We aimed to assess validity and sensitivity to change of this scoring system using measurements from Healthy Stores 2020 (HS2020), which tested a strategy restricting promotion and reducing visibility of unhealthy foods in 20 NT/QLD remote stores (10 control; 10 intervention). Sensitivity to change was assessed using t-test of change in scores from baseline to follow-up in intervention versus control stores, with expectation of increased drinks and snack foods scores with HS2020 implementation. Validity was assessed using linear regression of scores versus unhealthy foods sales using electronic sales data (last 4-weeks of study period) expressed as grams sold of discretionary products per total megajoule energy from all products (g/MJ). Implementation of the HS2020 strategy resulted in increased scores (more health-enabling) for overall (mean difference 4.8 [95% CI 1.1-8.5] p=0.020), drinks (16.0 [5.5-26.6] p=0.008) and snack foods (12.8 [5.6-20.1] p=0.003) scores, while other food group scores were not significantly changed. A one-point increase in Store Scout score was associated with reduced unhealthy food and beverage purchasing at baseline (-1.44 g/MJ; 95% CI -2.69,-0.19; R^2 =0.22) and change from baseline to follow-up (-0.90 (-1.31,-0.50) R squared =0.52). These findings indicate potential of Store Scout for enabling benchmarking of the consumer food environment between stores and over time.

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Barriers and facilitators to a healthy lifestyle and intervention strategies using the Behaviour Change Wheel: perspectives of postpartum women

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Background: Postpartum weight retention is a significant contributor to weight gain and obesity in reproductive-aged women. Achieving and maintaining a healthy lifestyle during this period can be

challenging. Understanding the facilitators and barriers to this is critical in supporting healthy lifestyle behaviours in postpartum women.

Objective: This study aimed to synthesise the barriers and facilitators to engaging in a healthy lifestyle during the first two years postpartum using the Capability, Opportunity, Motivation and Behaviour (COM-B) model and to develop intervention strategies using the Behaviour Change Wheel (BCW).

Design: Semi-structured interviews were conducted with women who have given birth within the last two years to explore facilitators and barriers to engaging in a healthy lifestyle. Thematic analysis were conducted using an open coding approach. The main themes were subsequently mapped to the COM-B domains. Intervention strategies were developed to address these themes using the BCW.

Participants/Setting: 21 women after birth (≤2 years) and currently living with their child were recruited through convenience and snowball sampling.

Results: According to COM-B framework, women after birth face barriers and facilitators within *capability (*sleep deprivation and mental exhaustion, ability to organise and plan), *opportunity (*influence and support of friends, partners and extended families) and *motivation* (struggle with prioritising self, exercise to cope with stress). Corresponding strategies mapped from BCW include low intensity interventions focussing on behaviour regulation and sleep to increase *capability*; engaging partners and strengthening peer support in health to create *opportunity* and increasing risk perception and highlighting the mental benefits of exercise to inspire *motivation.*

Conclusion: This study summarised key barriers and facilitators in terms of *capability, opportunity* and *motivation* for healthy lifestyle behaviours in postpartum women. Our findings suggest that postpartum lifestyle interventions should focus on organisational and planning skills, involve partners, address infant and women's sleep issues and increase risk perception.

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LiveLighter® healthy weight campaign response and impact during the COVID-19 pandemic

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Background: LiveLighter® is a healthy weight and lifestyle social marketing campaign developed and launched in Western Australia (WA) in 2012. Recent consecutive campaign phases (Aug-Oct 2019, Feb-Mar 2020, Aug-Sep 2020) explained the link between excess body fat and increased risk of 13 cancers and aimed to motivate WA adults to avoid sugary drinks to reduce their cancer risk. The emergence of COVID-19 saw the second '13 Cancers' wave conclude early and evaluation surveys for the latter two waves coincide with varying levels of COVID-19 restrictions. Evaluation assessed campaign awareness, response, and impact with consideration of the potential effect of the pandemic.

Methods: Cross-sectional telephone surveys were undertaken with population samples of WA adults aged 25-49 prior to the launch of LiveLighter® (2012: n=1,003) and following each campaign phase (2012-2020: n=501-3,507). Multivariable logistic regression models tested differences in key outcomes by campaign phase.

Results: Despite diminished ability to infiltrate competing media content at the second '13 Cancers' wave compared to previous campaign phases, campaign awareness was high following all '13 Cancers' waves with non-TV media playing a key role. Key advertising diagnostics were favourable overall, though there was evidence of heightened public sensitivity during the pandemic with increased discomfort and guilt in response to the campaign. While intentions to consume less sugary drinks and sweet foods declined at the second wave, findings suggested some recovery following the third wave. Increases in sugary drinks and sweet foods consumption were observed during this period of lifestyle disruption, along with support for sugary drinks taxes.

Conclusions: Findings highlight potential challenges and opportunities of airing a public health campaign during periods of lifestyle disruption. While there is a need to carefully consider message content and placement, there is a need, as well as desire, for extra support to enable adoption and maintenance of healthy behaviours.

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Good mood food: improving the food environment at a community mental health service

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Introduction: People experiencing mental illness are at increased risk of chronic diseases due to unhealthy lifestyle factors as well as the deleterious effects of some psychotropic medications on metabolic health[1, 2]. The extent to which nutrition is considered a priority and the quality of food provided at mental health services varies widely, with environmental and financial barriers reducing the capacity of some services to promote healthy eating.

Method: Cancer Council WA and Vinnies Mental Health Service (VMHS) are working in partnership on a pilot project to improve the food environment at VMHS. Tailored strategies are being developed and implemented across seven priority areas – policy; organisational culture and values; physical environments; staff training; process and procedures; monitoring and evaluation; and organisational engagement. As part of the project, a survey was conducted with VMHS staff (n=15) and clients (n=18).

Results: Survey data revealed that while clients and staff agreed nutrition is important for wellbeing, staff did not usually talk to clients about nutrition unless clients brought it up or the client had a nutrition-related health issue. Most staff were interested in receiving training to increase their skills and confidence in talking about healthy eating with clients, and most clients indicated a willingness to receive this information. Analysis of clients' dietary intake suggested ways in which meal provision at the service could be altered to improve health. While the project is still ongoing, a number of strategies have been successfully implemented at the service including making changes to the meals and snacks provided at the residential village, development of a nutrition policy, client nutrition education and staff training.

Conclusion: Tailored interventions focusing on the food environment of service providers have the potential to improve the mental and physical health outcomes of clients.

1. 1. De Hert, Marc, Christoph U. Correll, Julio Bobes, Marcelo Cetkovich-Bakmas, D. A. N. Cohen, Itsuo Asai, Johan Detraux et al. 2011. "Physical Illness in Patients with Severe Mental Disorders. I. Prevalence, Impact of Medications and Disparities in Health Care." World Psychiatry 10 (1): 52-77. doi: 10.1002/j.2051-5545.2011.tb00014.x.
2. 2. Stanley, Susanne, and Jonathan Laugharne. 2014. "The Impact of Lifestyle Factors on the Physical Health of People with a Mental Illness: A Brief Review." International Journal of Behavioural Medicine 21 (2): 275-81. doi: http://dx.doi.org/10.1007/s12529-013-9298-x.

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Cardiovascular impacts of low-level chronic stress and a western diet: synergistic effects of lifestyle risk factors on infarct tolerance and cardioprotection

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How co-morbid mood and metabolic disturbances interact to promote ischemic heart disease development and decrease myocardial ischaemic tolerance is largely unknown. This study examined whether chronic low-level stress and a Western diet (WD) synergistically reduce myocardial infarct tolerance and responsiveness to established cardiac conditioning stimuli. Sixty-four male C57BL6/J mice were exposed to a control diet (CD) (14% fat, 59% carbohydrates, 19% protein) or a WD (32%/57%/11%) for 16 weeks. Methods: Mice were randomised into four groups: CD, WD, CD + restraint stress (RS), and WD + RS. RS groups were exposed to low-level chronic stress during the final 14 days of feeding. Hearts from these animals were subjected to ischemic pre-conditioning (IPC) or ischemia/reperfusion (I/R). Results: Body weight was increased by the WD ($p<0.0001$) while RS decreased body weight in both WD and CD groups. Food intake was greater in the WD-fed mice ($p<0.0078$) until the introduction of the RS protocol which resulted in a significant reduction in WD consumption. The WD increased fasting insulin ($p<0.0001$ vs. CD) and glucose ($p<0.0001$ vs. CD). Sucrose preference test results suggest that the WD may have induced anhedonia ($p<0.0001$). Myocardial ischemic tolerance was improved by IPC in both the CD and WD hearts but not RS groups, irrespective of diet. IPC did not reduce myocardial cell death (LDH release) after I/R in any of the groups. Cell death (LDH release) was reduced by IPC in the CD group when compared with the WD + RS hearts, suggesting that a WD combined with stress may act synergistically to reduce the heart's response to cardiac pre-conditioning. Conclusions: A WD and low-level stress promotes metabolic dysregulation and myocardial cell death during I/R and makes the heart unresponsive to IPC. However, co-morbid WD and stress do not worsen myocardial infarct tolerance and I/R injury.

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Breakfast quality index (BQI) trends and association with zBMI among Australian children under 5 years of age

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Background: Breakfast quality has been linked with overall dietary quality and may influence childhood obesity risk. However, breakfast quality in early childhood remains understudied. This study described the changes in breakfast quality index (BQI) (i.e. trajectory) among Australian children from ages 1.5 to 5.0 years and assessed the association between BQI trajectories and obesity outcomes at ages 5.0 years.
Methods: Data of children who participated in the Melbourne InFANT Program were used (n=328). Dietary intakes were assessed at ages 1.5, 3.5, and 5.0 years using three 24-hour recalls. Multiple Sources Method[1)] was used to obtain usual intakes. BQI was calculated using a revised 9-item BQI tool[2)] based on dietary recommendations for Australian young children in. Group-based trajectory modelling identified BQI trajectory groups. Multivariable linear or logistic regression examined the associations between identified BQI trajectory groups and obesity outcomes age 5 years.
Results: Mean BQI (mean±SD) at age 1.5, 3.5, and 5.0 years was 4.8±0.9, 4.8±0.8, 2.7±1.6 points, respectively (total 9 points). Two BQI trajectory groups were identified, and both showed a decline in BQI from 1.5 to 5.0 years. The BQI of most children (74%) decreased from 5.0 to 4.0 points from 1.5 to 5.0 years (referred as "High BQI" group). The remaining children (26%) had a mean BQI of 4.8 points at 1.5 years to 1.2 points at 5.0 years (referred as "Low BQI" group). The "Low BQI" group showed higher BMI z-score and higher risk of overweight at 5 years than the "High BQI" group, but the difference was not statistically significant.
Conclusions: Two BQI trajectory groups were found in early childhood. Both trajectory groups showed a decline in breakfast quality from 1.5 to 5.0 years. Our study highlights the need for early health promotion interventions and strategies to improve breakfast quality in early childhood.

1. U. Harttig, J. Haubrock, S. Knuppel, H. Boeing EFCOVAL Consortium. The MSM program: web-based statistics package for estimating usual dietary intake using the Multiple Source Method Eur J Clin Nutr, 2011. 65: p. 87-91
2. C. Monteagudo, et al. Proposal for a Breakfast Quality Index (BQI) for children and adolescents. Public health nutrition, 2013. 16(4): p. 39-644.

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Physical activity and learning study examining the effects of active classroom breaks on moderate-to-vigorous physical activity (MVPA) and classroom behaviour, wellbeing, cognitive and maths performance in a primary school in Northern NSW.

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Issue Addressed
Approximately one in four Australian children are overweight or obese, (1) which is associated with a number of adverse health outcomes. (2) Children spend a considerable amount of time sitting, and many do not meet the Australian 24-hour movement guidelines. (3) Active breaks at school may increase MVPA without adversely affecting wellbeing, behaviour, cognitive and learning effects.
Method
In this quasi-experimental study, children in six intervention classes participated in 3x10 minute energisers per day for six weeks during class time, while five control classes were run as usual. Physical activity levels were measured using wrist-worn Actigraph accelerometers and analysed using random forest models. (4) Off-task behaviour was examined using a Functional Behavioural Analysis tool, (5) and wellbeing was measured using the Stirling Children's Well-being Scale. (6) Maths performance was measured using the Westwood One Minute Test of Basic Number Facts, (7) and cognitive performance was measured using the Trail Making Test. (8) Teachers completed a brief survey.
Results
Children in the intervention group engaged in 15 and 9.5 minutes more MVPA per day mid and post intervention respectively ($p<0.001$). The proportion of children that met the Australian Movement Guidelines changed from 44.4% to 60.8% and 55.1% (pre, mid and end of study respectively) for the intervention group, while the control group dropped slightly from 46.5% to 45.9% to 45.8%. Significant

fewer students displayed off-task behaviour in the intervention classes mid and post intervention (-1.4, p=0.003). No significant positive or negative intervention effects were found for wellbeing, cognitive and maths performance. Teachers' feedback was positive.

Conclusions

Active classroom breaks are an effective way to increase physical activity among primary school children while improving classroom behaviour. Their implementation should be considered by policy makers, educators and health professionals. Further longer term studies are warranted to identify health and learning outcomes.

1. 1. Australian Institute of Health and Welfare: Australia's Children. Canberra (Australia): Australian Institute of Health and Welfare, 2020. Cat. No. CWS 69. Available from Australia's children (Full publication;18Mar2020Edition)(AIHW)
2. 2. World Health Organisation: Report of the commission on ending childhood obesity. Geneva, WHO, 2016. Available from 9789241510066_eng.pdf (who.int)
3. 3. Active Healthy Kids Australia. Muscular fitness: It's time for a jump start. The 2018 Active Healthy Kids Australia report card on physical activity for children and young people. Adelaide, South Australia: Active Healthy Kids Australia, 2018. Available from https://www.activehealthykidsaustralia.com.au/siteassets/documents/2018/ahka-report-card-long-form-2018-final-for-web.pdf
4. 4. Pavey TG, Gilson ND, Gomersall SR, Clark, BC, Trost SG. Field evaluation of a random forest activity classifier for wrist-worn accelerometer data. J Sci Med Sport 2016, 75-80. DOI: https://doi.org/10.1016/j.jsams.2016.06.003.
5. 5. Gresham, FM, Watson, TS, Skinner CH. Functional behavioural assessment: principles, procedures, and future directions. Sch Psychol Review 2001, 30(2):1560172.
6. 6. Liddle, I & Carter GFA Emotional and psychological well-being in children: the development and validations of the Stirling Children's Well-being Scale. Edu Psychol Practice 2015, 31(2), pp 174-185. DOI: 10.1080/02667363.2015.1008409
7. 7. Westwood, P. Numeracy and Learning Difficulties: Approaches to teaching and assessment. 2nd ed. Acer Press: Camberwell, Victoria Australia 2016.
8. 8. Reitan, R. Trail making test results for normal and brain-damaged children. Perceptual and Motor Skills. University of Washington, 1971.

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Clinically relevant weight loss is achieved independently of early weight loss response to once-weekly subcutaneous semaglutide 2.4 mg (STEP 4)

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Semaglutide, a GLP-1 analogue, is being investigated in people with overweight or obesity. A post-hoc analysis of the STEP 4 trial aimed to identify whether early weight loss is predictive of later weight loss with maintenance once-weekly subcutaneous semaglutide 2.4 mg.

STEP 4 was a randomised, double-blind, phase 3 trial (NCT03548987). Adults with body mass index (BMI) ≥27 kg/m^2 and ≥1 weight-related comorbidity or BMI ≥30 kg/m^2, without type 2 diabetes, underwent a 20-week run-in. Participants reaching the maintenance dose of once-weekly subcutaneous semaglutide 2.4mg at week 20 were randomised 2:1 to semaglutide 2.4mg or placebo, as adjunct to lifestyle intervention, for 48 weeks. Percentage change in body weight from week 0-68 was estimated; trial product estimand results are presented. Participants with ≥5% weight loss at week 20 were considered responders. Whether the week 20 response to semaglutide predicted ≥5% weight loss by week 68 was also assessed.

803 of 902 participants who started STEP 4 were randomised at week 20 (semaglutide: n=535, placebo: n=268; mean age 46 years, body weight 107.2 kg, BMI 38.4 kg/m^2; 79.0% female). For 88.0% of participants randomised to semaglutide who were week-20 responders, mean body weight change from week 0-68 was –19.7%. For non-responders at week 20, mean body weight change was –6.4% with continued semaglutide vs –0.3% with placebo. Of participants randomised to semaglutide, 86.2% achieved ≥5% weight loss at week 68. Being a responder at week 20 was highly predictive of achieving this outcome (positive predictive value: 96.4%).

In STEP 4, most participants randomised to once-weekly semaglutide 2.4 mg maintenance at week 20 lost ≥5% body weight by week 68, with many achieving this by week 20. Weight loss with semaglutide was greater among early responders, but non-responders also achieved clinically relevant weight loss by week 68 if semaglutide treatment was continued.

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Chemogenetic activation of NPY neurons in the hypothalamus, but not the central nucleus of the amygdala, regulates macronutrient preference

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Background: The orexigenic effect of NPY released from the arcuate nucleus (ARC) of the hypothalamus is well established. Chemogenetic activation of NPY neurons in either the ARC or the central nucleus of the amygdala (CeA) increases consumption of chow in fed-state animals. However, the role of NPY neurons on other feeding behaviors, such as macronutrient preference, in the ARC and CeA remains unclear. The current study aimed to investigate the role of NPY neurons on macronutrient (fat vs carbohydrate) preference in these two brain regions.

Methods: 8-12 week old NPYCre/+ C57BL/6 mice were bilaterally stereotaxically infused with an adeno-associated viral vector (AAV) expressing the excitatory (Gq) DREADD (AAV9-hM3Dq-mcherry) or control virus (AAV9-mcherry; 200nL/hemisphere). After 4 weeks of viral incubation, mice were intraperitoneally administered the DREADD agonist clozapine-N-oxide (CNO) or vehicle (saline) in a counterbalanced design. Animals were tested for both food consumption and macronutrient preference in a BioDAQ system for automated monitoring and recording of consumption.

Results: Chemogenetic activation of NPY neurons in both the ARC and the CeA increased consumption of chow, due to increases in both length and number of feeding bouts. Similarly, total consumption of intralipid and sucrose solutions were greater in Gq DREADD CNO-treated animals compared with control animals. Animals expressing the Gq DREADD within the ARC displayed a macronutrient preference for fat over carbohydrate following CNO treatment, however, there was no difference observed in fat vs carbohydrate preference during chemogenetic activation of NPY neurons in the CeA.

Conclusion: These results demonstrate the important role of neuropeptide Y neurons in both the ARC and the CeA for the regulation of food intake. However, our data suggest that only ARC, but not CeA, NPY neurons are involved in macronutrient preference as activation of CeA NPY neurons has no impact on preference between fat and carbohydrate.

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Associations between inequalities in overweight and obesity and the social determinants of health

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Social determinants of health—the circumstances in which people grow, live, work and age—can strengthen or undermine the health of individuals and communities. This study uses 4 nationally representative Australian Bureau of Statistics' National Health Surveys to examine the associations

between the social determinants of health with overweight and obesity, over a 10-year period (2007–08 to 2017–18) in Australian adults, aged 18–64.
Age-standardised rates (%) of overweight and obesity were calculated across the social determinants for all 4 surveys. A mixed forward-step/backward elimination logistic regression method was applied to investigate associations between the social determinants and demographic factors with overweight and obesity for each survey.
Rates of overweight and obesity were consistently higher for those who had not completed or attended secondary school, were paying off a mortgage, lived in *Inner regional* and *Outer regional/remote* areas of Australia, or who worked as machinery operators and drivers. When controlling for other social determinants of health and individual factors, the odds of overweight and obesity were increased for those who did not complete or attend secondary school (between 1.4 to 2.1 times higher), were paying off a mortgage or renting their home (around 1.2 times higher), or who lived in *Inner regional* areas of Australia (around 1.2 times higher).
Identifying factors associated with overweight and obesity can help policy makers and health providers develop more targeted strategies to reduce inequalities and improve health related outcomes.

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How do children's abilities to self-regulate their food intakes change as they age?

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Background: The ability to self-regulate appetite means that children can select and consume appropriate foods and portion sizes, and eat when they are hungry but not when they are full, even if offered appealing foods. Appetite self-regulation involves an interplay between the biological structures and processes involved in energy balance (appetite regulation) along with cognitive functioning, goal-directed behaviours, decision making and hedonic responses to food. The developmental course of appetite self-regulation is an emerging field of theory and research.
Methods: We examined the available evidence on indicators of appetite self-regulation including children's abilities to balance energy intakes and expenditure, to delay gratification, to adjust energy intakes according to earlier energy consumption, to avoid eating appetising foods when they are full, and their general appetitive traits such as how reactive they were to the presence of food cues, or how responsive they were to internal feelings of fullness. We then compared and contrasted this evidence with that from self-regulation in non-food areas like emotions and behaviour.
Results: The results showed that in general, non-food self-regulation improves as children develop, as we expected. In contrast, appetite self-regulation on average declined across childhood, despite development in areas of cognitive functioning that help non-food self-regulation. We also noted large individual differences.
Conclusion: In contrast to non-food self-regulation, bottom up automatic reactive processes appear stronger in appetite self-regulation. For many children, then, these bottom-up approach or avoidance processes to foods may not to be matched by improvements in top-down regulatory capacities. Advances in conceptualisation and measurement of appetite self-regulation in tandem with research on mechanisms would advance our understanding of appetite self-regulation development and disruption during childhood.

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Outdoor junk food advertising and industry tactics: next steps in WA

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Context
Rising rates of overweight and obesity around Australia has led several State governments to implement policies that aim to create healthier environments, particularly those that protect children from exposure to junk food marketing. In Western Australia, the *WA Preventive Health Summit Summary Report* and the *Final Report of the WA Sustainable Health Review* supported banning unhealthy advertising on state-owned property. An advocacy policy campaign led by Cancer Council WA and the Telethon Kids Institute aimed to raise awareness of the urgency of this

recommendation. Prior to the 2021 State election, the Health Minister announced that if re-elected he would establish a cross-government implementation taskforce on this policy.

Process and Analysis

In 2019, Cancer Council WA and the Telethon Kids Institute, through funding from Healthway, established a partnership to build the evidence and community support for the ban of unhealthy products on government assets. Several rapid, policy-relevant research projects and reports were commissioned which quantified the amount of unhealthy advertising around schools and evaluated similar policies in other jurisdictions, providing robust evidence to counter industry arguments to such a policy. The research led to the development of a Joint Statement signed by leading health and medical agencies in WA, a policy brief provided to key Government departments, and a paid advertising campaign to garner community support - all contributing to a groundswell of pressure on the government to announce a ban.

Outcomes

The presentation will provide an overview of how rapid policy-informed research and a well-planned advocacy strategy can be used by non-government coalitions to counter industry arguments, develop policy recommendations and increase political pressure on governments to implement policies to protect children from unhealthy marketing. It will also present considerations for decision makers to ensure WA implements a robust policy, which is protect from industry tactics.

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Preventing childhood obesity by focusing on a life course approach. The Health in Preconception and Pregnancy (HiPP) Centre of Research Excellence

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Over 50% of Australian women enter pregnancy overweight or obese. Preconception higher BMI independently increases complications including gestational diabetes mellitus, preeclampsia, caesarean section, and large-for-gestational-age infants. Intergenerational epigenetic risks are alarming, with maternal weight at conception a key determinant of childhood obesity and those born to mothers with obesity, in turn, having twice the rate of obesity, higher insulin resistance and metabolic syndrome. In pregnancy, excessive gestational weight gain (GWG) above US Institute of Medicine (IOM) recommendations occurs in over 40% of pregnancies in Australia and in developed countries internationally, with every kilogram above IOM recommendations increasing adverse maternal and foetal and child outcomes by ~10%. Approximately, 57% of Aboriginal and Torres Strait Islander women are overweight or obese at conception16 and CALD women also experience high rates of excessive GWG.

Despite years of research, millions of dollars invested in preconception programs and in RCTs in pregnancy, implementation and translation of evidence is lacking. Crucial knowledge gaps now rest in implementation research, translation, workforce development and collaboration. In 2019 a Centre of Research Excellence was awarded by the Australian National Health and Medical Research Council to support a multidisciplinary international research team to generate the new knowledge needed to improve lifestyle preconception and in pregnancy, and reduce maternal obesity. Our Health in Preconception and Pregnancy (HiPP) initiative is also global, having formed the first Global Alliance for HiPP in September 2018 with representatives from all continents, including consumers. This paper outlines >10 years of research from our Centre and investigators and covers three areas of focus: (1) how to promote active agency in preconception women to prioritise lifestyle health and weight management prior to conception; (2) how to implement multifaceted obesity prevention strategies in pregnancy; (3) co-designing and testing culturally relevant models of preconception and pregnancy lifestyle health care.

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Is objectively measured sedentary behaviour associated with body composition of Pacific and New Zealand European women?

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Aim: To investigate differences in objectively measured patterns of sedentary behaviour (SB) among Pacific and New Zealand European (NZE) women with different body composition profiles, and to explore associations with body fat% (BF%).

Methods: Pacific (n=119) or NZE (n=159) women aged, 18-45 years were recruited according to self-reported normal or obese body mass index (BMI) categories. SB was assessed using seven-day accelerometery. Weight, height, waist and hip circumference were measured using standard protocols. BF% was assessed using whole body dual-energy x-ray absorptiometry. BF% was used to stratify women as low (<35%) or high (≥35%) BF%. Linear regression (controlled for confounders) assessed associations between SB and BF%.

Results: Pacific women with low-BF% spent more time sedentary (hours/day) compared to all other women ($p<0.05$): Pacific high- 9.93 ± 1.59 and low-BF% 10.37 ± 1.38 and NZE high- 9.96 ± 1.58 and low-BF% 9.69 ± 1.32 (hours/day).

NZE women with high-BF% had a higher ($p<0.05$) weighted median sedentary bout length (length of sedentary bout corresponding to 50% of total daily accumulated sedentary time) 20.07 ± 4.10 min compared to NZE low-BF% 17.81 ± 3.43 min and Pacific high-BF% women 18.32 ± 2.85 min.

Among NZE women, every one-hour increase in sedentary time was associated with 0.8% higher gynoid fat ($p<0.05$), and higher weighted median sedentary bout length (less interrupted/more prolonged SB) was associated with higher BF% (gynoid fat 0.3%, total body 0.4%, trunk 0.4%, android 0.4% and visceral fat 0.4% ($p<0.05$)). No significant associations between SB and BF% were found among Pacific women.

Conclusion: Pacific and NZE women in this study had high levels of SB that may be contributing to BF%. Our findings indicate breaking-up prolonged SB may assist in achieving healthier BF%. Further prospective longitudinal and randomised controlled studies, investigating the impact of SB on BF% are needed to establish causality.

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Addressing childhood obesity in a socially distanced world

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Background:

Obesity is a significant public health issue within Western Australia (WA), with 24.9% of 5 to 17-year-olds classified as overweight or obese.

The online version of the Better Health Program is a ten-week healthy lifestyle program for 7-13-year-old children classified as overweight or obese. Participants complete weekly 30-minute phone-based consultations, complemented by weekly online learning sessions.

Aims:

To determine whether a combination of phone coaching and online learning sessions is a viable option when delivering health interventions in Western Australia.

Methods:

Analysis was conducted on program data, focusing on the impact of the program on participants' dietary and physical activity behaviours, self-esteem and anthropometric measures.

From February 2019 to January 2021, 299 children aged 7 -13 years from Western Australia (urban, regional and remote) were recruited for Better Health Program (online). Ultimately, 257 participants confirmed their participation in the program and met eligibility requirements. Of those participants, 233 (90.7%) completed seven or more coaching calls and seven or more online learning sessions.

All places on the program were funded by the WA Department of Health and WA Country Health Service in their respective jurisdictions.

Results:

Significant changes were observed post-program for child BMI (-0.9 kg/m^2, n=208), physical activity hours per week (+5.7 hrs, n=195), self-esteem (+2.5, n=172) and total nutrition score (+5.5, n =207), ($p<0.001$). In addition, a Wilcoxon signed ranks test found significantly increased consumption of

water (Z=-8.07, n=207), wholegrain bread (Z=-7.11, n=207) and improved overall food variety (Z=-9.04, n=206) (p<0.001). Consumption of discretionary foods such as potato chips, lollies and chocolates were also reduced (n=207, p<0.001).

Conclusions:

These findings demonstrate that a combination of phone-based and online program delivery can be used to provide effective lifestyle interventions in urban, regional and remote areas of WA.

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What do health professionals and parents want as part of an online childhood obesity prevention program?

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Background: There are limited evidence-based referral options for children living in Queensland who are at risk of overweight or obesity. Despite the known importance of prevention initiatives, an online prevention program supporting sustainable healthy behaviours does not currently exist in Queensland.

Aim: To understand the perspectives of health professionals and parents/guardians regarding key aspects of an online childhood overweight and obesity prevention program.

Methods: This pragmatic, mixed-methods study was conducted from March – December 2020. Recruitment included participants from two distinct groups actively involved with children aged 2-17 years; health professionals and parents/guardians. Phase 1 involved dissemination of an online survey. Questions addressed program structure, content delivery (including nutrition, physical activity and parenting practices), program evaluation and information dissemination. Descriptive statistics were used to describe survey data to inform the delivery of focus groups in Phase 2. Two focus groups were conducted with each participant group separately to further explore the topics. Thematic analysis was used to investigate qualitative data.

Results: 28 health professionals and 11 parents/guardians completed the survey, and 14 health professionals and 6 parents/guardians participated in the focus groups. Participants believed the most beneficial approach would target a younger age group with family-based interventions, via a non-traditional and tailored structure. There was a strong preference for interactive content, gamification to engage children, and practical resources to translate knowledge into practice. Parents emphasised that there should be no assumption of knowledge, with storytelling and real-time feedback utilised to maximise engagement.

Conclusions: Participants provided clear direction regarding key aspects for future development of an online prevention program, highlighting the importance of the incorporation of co-design principles, particularly early in the research planning phases.

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Association between plant-based dietary index and systemic inflammation

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Publish consent withheld

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The PH12 framework: translating the Meadows 12 leverage points for use in obesity prevention

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Background: System science has a prominent place in understanding and designing potential solutions to address complex public health challenges. Systems approaches strengthen multi-level, multi-component initiatives by acknowledging the interaction between variables impacting the issue, feedback loops and consequences from initiative activity. Several system approaches empower communities to understand and act within their local system. For researchers and practitioners, it can be challenging to identify 'where' and 'how' to intervene in a system. The pioneering work of Donella Meadows, based in conservation and economic development, identified 12 places to intervene in a system for maximum impact (Meadows 12). We set out to translate Meadows 12 for the field of obesity prevention and present here the Public Health 12 Framework (PH12).

Methods: Definitions from Meadows 12 were translated into public health, user friendly language by a team of six researchers (practitioners, implementation scientists, systems specialists). We allocated actions from three existing complex large-scale community-based systems thinking obesity prevention interventions conducted in Victoria, Australia between 2016-2020 to determine where most intervention activity occurred.

Results: PH12 was created, and actions were mapped to illustrate the translated definitions. This mapping of actions revealed most actions targeted levels of the systems that potentially have less impact, thereby identifying opportunities to build, develop, or advocate for actions with potentially greater impact.

Conclusions: The PH12 is a public health translation of Meadows 12. PH12 has the potential to support practitioners, researchers, and policy makers to analyse actions and identify where more targeted work may enhance implementation and outcomes in system approaches to obesity prevention. The next step is to test the validity and acceptability of PH12 in both practice and academic environments.

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Can Chinese herbal medicine improve blood lipid profiles? A meta-analysis of randomised placebo-controlled weight-loss trials

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Introduction: Chinese herbal medicine (CHM) and evidence of its therapeutic benefits on obesity is emerging. This study was conducted to assess the effects and safety of CHM on blood lipids among overweight and obese adults.

Methods: Fourteen bibliographic databases (10 English and 4 Chinese) were searched for randomised placebo-controlled weight-loss trials who administered CHM formulation for ≥ 4 weeks. Key search terms include synonyms of "overweight", "obesity", and "Chinese herbal medicine". Data collection, risk of bias assessment and statistical analyses were guided by the Cochrane Handbook (v6.1).[1] Continuous outcomes (total cholesterol, triglycerides, low-density lipoprotein-(LDL) cholesterol, high-density lipoprotein-(HDL) cholesterol) were expressed as mean difference (MD) with 95% confidence intervals (CIs), and categorical outcomes (attrition rate and frequency of adverse events) as risk ratio (RR). All analyses were two-tailed with a statistical significance of $p < 0.05$.

Results: Fifteen eligible studies consisting of 1533 participants were included in this meta-analysis. CHM interventions, compared to placebo, reduced triglycerides (MD −0.21 mmol/L, 95% CI −0.41 to −0.02, $I^2 = 81\%$) and increased HDL-cholesterol (MD 0.16 mmol/L, 95% CI 0.04 to 0.27, $I^2 = 94\%$) over a median of 12 weeks. A non-significant reduction in total cholesterol and LDL-cholesterol were observed. Furthermore, the tendency of reduced triglycerides was identified among overweight participants with high baseline triglycerides. Attrition rates and frequency of adverse events were indifferent between the two groups ($p > 0.05$).

Conclusion: CHM may provide lipid modulating benefits on triglycerides and HDL-cholesterol among overweight/obese participants, with tendencies for significant triglycerides reduction observed among overweight participants with high baseline triglycerides. However, additional rigorously-conducted randomised controlled trials with larger sample sizes are required to confirm these findings.

1. 1. Higgins JPT, Thomas J, Chandler J, et al. Cochrane Handbook for Systematic Reviews of Interventions. John Wiley & Sons; 2019.

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In silico screening and prediction of *Nelumbinis Folium* compounds targeting PPARγ for weight management

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Obesity is a growing health concern as its prevalence nearly tripled in the past 50 years. Efforts to develop anti-obesity pharmacotherapy have been emerging and among the various drug targets, peroxisome proliferator-activated receptor γ (PPARγ) has attracted attention due to its key role in governing thermogenesis, lipid accumulation, and glucose homeostasis. In this study, we aimed to explore the potential use of phytochemicals from *Nelumbinis Folium* (NF) to manage obesity and metabolic syndrome. A total of 154 NF compounds comprehensively retrieved from pharmacological databases were subjected to computational high-throughput screening for their ability to target PPARγ (PDB: 5lsg). It is demonstrated, through focused docking, that the highest-binding compounds exhibited greater affinities to the active conformation (Procyanidin B6 -9.8kcal/mol, Rutin -9.8kcal/mol and Procyanidin B8 -9.5kcal/mol) compared to the inactive conformation (3-epi-beta-Sitosterol -8.8kcal/mol, (r)-aporphine -8.6kcal/mol, and beta-Sitosterol -8.5kcal/mol). By analysing ligand-residue interactions, we hypothesise Procyanidin B6 as a putative agonist due to its ability to form hydrogen bonds with Tyr473 on helix H12 and interacting with surrounding residues on H3 and H11, thereby stabilising the activation function-2 (AF-2) domain of PPARγ. Two partial agonists were proposed: Rutin and Procyanidin B8, as they bind favourably in the orthosteric pocket, however no hydrogen-bonding interactions with AF-2 residues were observed. Furthermore, 3-epi-beta-Sitosterol and beta-Sitosterol were predicted as antagonists as they appear to interrupt the formation of AF-2 surface domain by forming primarily hydrophobic contacts with residues in H12. This physical occlusion by putative antagonists at the C-terminus may prevent transactivation of genes involved in adipocyte differentiation and lipid accumulation. Overall, this study proposes several NF compounds which may ameliorate obesity risk factors by suppressing fatty acid storage and modulating glucose metabolism. Further molecular dynamic simulations, as well as *in vitro* and *in vivo* studies are required to validate the potential anti-obesity effects of NF compounds.

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A mitochondrial focus on the effects of low-level alterations in mood and metabolism to infarct tolerance and cardioprotection in the heart

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Chronic psychological stressors and overconsumption of hyperpalatable foods are major risk factors in the development of cardiovascular disease, mood, and metabolic disorders. This energetic imbalance overtime results in mitochondrial dysfunction, reportedly causing reduced infarct tolerance and response to cardioprotection in the heart. However, implications of low-level and possible synergistic effects of mood and metabolic disturbances have yet to be fully elucidated in cardiac mitochondrial analyses. The study aims to investigate the effects of subclinical exposure to both chronic psychological stress (CS) and a Western diet (WD) on the cardiac mitochondrial functional response and associated mitochondrial targets.

Male C57Bl/6 mice received a control or WD (32%/57%/11% calories from fat/carbohydrates/protein) for 16 weeks, with chronic restraint stress (2 hr restraint/day) implemented in sub-sets throughout the final 2 weeks. Langendorff perfusions were performed on hearts under ischemia preconditioning (IPC) protocol or an ischemia-reperfusion protocol (non-IPC) to assess post-ischaemic myocardial functional responses. Left ventricular myocardium was homogenised and loaded into an Oroboros 02k-oxygraph to measure mitochondrial respiration or used for western blotting to assess mitochondrial protein expression.

The WD increased body weight alone and combined with CS, while CS alone had no effect. WD+CS alone worsened recovery from ischemia and limited cardioprotection, evidenced by elevated lactate dehydrogenase and reduced contractile function. IPC increased non-phosphorylating mitochondrial respiration which was attenuated by CS. This was coupled with a decrease in maximal and spare

respiratory capacity although outer mitochondrial membrane was preserved in IPC treated CS hearts. Mitochondrial respiration was unchanged with WD in non- and IPC.
The combined effects of WD and CS exhibited significant myocardial injury in IPC hearts while CS appears to decrease mitochondrial functional capacity. Investigation of select mitochondrial proteins are needed to further justify the results.

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Mechanisms of Action of *Cassiae Semen* for Weight Management: A Computational Molecular Docking Study of Serotonin Receptor 5-HT2C

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Background: The epidemic of obesity has become a major challenge to health globally with overeating as one of the major casual factors. The serotonin receptor, 5-HT2C, is known to mediate satiety, appetite and consumption behaviour. Anti-obesity drug lorcaserin has demonstrated efficacy targeting 5-HT2C but can cause undesirable side effects. *Cassiae Semen* (CS), a well-known traditional Chinese herbal medicine for weight management, promotes satiety in recommended dosage without any side effects.
Aim: To evaluate the interactions of 5-HT2C receptor to the CS ligands, and hence, to propose the CS compounds responsible for exerting anti-obesity effects via appetite suppression.
Methods: A computational molecular docking study was performed to determine the binding mechanism of CS compounds to 5-HT2C in both conformations of active agonist-bound (chain A of PDBID: 6BQG) and inactive antagonist-bound (chain A of PDBID: 6BQH). The molecular docking software used in this study was AutoDock Vina version 1.1.2 [1] while the binding site and ligand interaction analysis and 2D protein-ligand interaction diagram generation were performed with software Maestro [2] from Schrodinger.
Results: By comparing binding poses and predicted relative binding affinities towards the active or inactive forms of the receptor, we hypothesise that two of the CS compounds studied may be potent agonists mimicing the appetite suppression effects of lorcaserin: obtusifoliol and cassiaside B2. Furthermore, two ligands, beta-sitosterol and juglanin, were predicted to bind favourably to 5-HT2C outside of the known agonist binding pocket in the active receptor, suggesting that such ligands may serve as positive allosteric modulators of 5-HT2C receptor function. Findings of this study have been published [3].

1. Trott, O. and A.J. Olson, AutoDock Vina: Improving the speed and accuracy of docking with a new scoring function, efficient optimization, and multithreading. Journal of Computational Chemistry, 2010. 31(2): p. 455-461.
2. Schrodinger. Maestro - The completely reimagined all-purpose molecular modeling environment. 2020 20 Jan 2020].
3. Yuen, H., et al., Mechanisms of Action of Cassiae Semen for Weight Management: A Computational Molecular Docking Study of Serotonin Receptor 5-HT2C. Int J Mol Sci, 2020. 21(4): p. 1326.

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Child and maternal determinants of infant rapid weight gain: a meta-analysis of seven Australian and New Zealand cohorts

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Background/Aims: Despite the extensive research linking infant rapid weight gain (RWG) with later obesity risk, the examination of factors associated with RWG during infancy is scarce. This study examined the association between a broad range of child and maternal factors and RWG in the first year of life.

Methods: Data from seven Australian and New Zealand cohorts were used (INFANT, INFANT Extend, Barwon Infant Study, LIMIT, Healthy Beginnings, NOURISH, POI) (n=4534). Weight z-scores at birth and around one year of age were calculated using WHO growth charts. Infant RWG was defined as a change in weight z-score≥0.67 from birth to age one year. Multivariable logistic regression was used to assess the child and maternal determinants of infant RWG in each study. Meta-analysis was conducted to obtain pooled effect sizes.

Results: Boys were more likely to experience RWG (OR 1.38 95%CI 1.19, 1.60) than girls. Higher birth weight in kg (OR 0.09, 95%CI 0.04, 0.20) and greater gestational age in weeks (OR 0.69, 95%CI 0.48, 0.98) were associated with lower RWG risk. Children who were breastfed for≥ 6 months were less likely to experience RWG (OR 0.47, 95%CI 0.40, 0.50). Solid introduction after age 6 months was associated with lower RWG risk (0R 0.77, 95% 0.63, 0.94). In contrast, children of smoking mothers showed higher odds (OR 1.60, 95%CI 1.28, 2.01) of experiencing RWG than those of non-smoking mothers. No evidence of association was found for maternal age, education level, marital status, and pre-pregnancy BMI.

Conclusion: The current study contributes to the limited body of evidence on determinants and aetiology of RWG. Child sex, birth weight, gestational age, infant feeding and maternal smoking status were identified as significant determinants of infant RWG. The findings provide valuable insights for obesity prevention policy and practice regarding the key factors to target and intervene.

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Understanding childhood obesity prevention interventions using NextGen evidence synthesis methodologies

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Almost one in four Australian children has overweight or obesity by the time they start school, underscoring the importance of early prevention interventions. Yet, existing interventions are a 'black box', meaning they are complex and their internal workings are hidden or not readily understood. Further, the heterogeneous nature of interventions can make evidence synthesis across studies difficult or even impossible. To address these issues, we have developed and applied a suite of collaborative 'NextGen' methodologies, to bring together researchers in Australia, New Zealand and globally to ultimately determine which early obesity prevention interventions work best and for whom.

This presentation will offer a brief overview of available methodologies, findings to date, and next steps, by covering the following content:

- A taster of innovative methodologies, including individual participant data and prospective meta-analysis, and how they have been applied to bring together and understand childhood obesity prevention interventions in Australia and New Zealand;
- Our findings on effectiveness and sustainability of early childhood obesity prevention interventions in Australia and New Zealand, and key recommendations for future interventions derived from the EPOCH (Early Prevention of Obesity in CHildren) Collaboration;
- Introduction to the TOPCHILD (Transforming Obesity Prevention for Children) Collaboration, a global initiative bringing together early obesity prevention trials from around the world.

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New rapid assessment tools to measure obesity related behaviours in 0-5 year olds

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Quick and robust measurement of lifestyle behaviours in young children is needed for monitoring population trends and evaluating early obesity prevention programs. CRE-EPOCH members have used a comprehensive, best practice process to develop a suite of brief tools that measure diet and movement behaviours in 0-5-year-old children. The tools are designed to be completed by parents and can be used by policymakers, researchers, and practitioners.

The development process combined information from systematic reviews, expert consultation, and cognitive interviews with parents. This multistage process identified item selection and informed question wording and design.

The brief tools (10-15 questions, <5 minutes to complete) ask parents to report how frequently over the past week their infant, toddler or preschool-aged child has consumed a range of foods and drinks; or frequency and duration of activities including outdoor play, use of mobile devices, and sleep.

Testing with parents (n=367) of young children to determine validity and reliability is nearing completion. Parents completed the tools twice over a 1–2-week period and provided data on dietary intake, physical activity, screen time and sleep using established reference methods.

Early results are promising, indicating that the tools are well understood by parents and will provide validated, reliable and fit-for-purpose solutions for measuring lifestyle behaviours (dietary intake, physical activity, screen time, sleep) in infants, toddlers and preschool-aged children.

These rapid, validated tools measuring key behaviours in children 0-5 years can provide a platform for routine and harmonised measurement of behavioural outcomes across research and practice, including the evaluation of scaled-up early obesity prevention programs. There are opportunities to explore translation for use in healthcare settings e.g. screening, referral, monitoring, feedback to families.

User-friendly, accessible online resources (measurement tool plus data management and analytical protocols) to facilitate the use and adoption of the tool(s) will be available in late 2021.

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Economic evaluation of early childhood obesity prevention interventions

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Health economic evaluation provides crucial evidence for resource allocation decisions. Despite this, very few economic evaluations have been conducted for early childhood obesity prevention strategies. Part of the reason for this is the unique challenges associated with economic research in very young children. Anagha will be presenting an overview of key advances made by the health economics stream of CRE-EPOCH to address these challenges. She will discuss the EPOCH health economic model and a costing protocol which enables economic evaluation of early childhood interventions by predicting longer term costs and benefits. She will show how the model and protocol have been used to calculate the cost-effectiveness of two interventions in early childhood: the Prevention of Overweight in Infancy (POI) and Romp & Chomp. Finally, she will discuss the key findings and messages for policy and practice.

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Translational research: Lessons learnt from two early obesity prevention initiatives

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Research on obesity prevention in early life is growing, with studies demonstrating some obesity prevention interventions to be efficacious. The translation of this research into 'real world' interventions however is limited, yet this is fast becoming a key focus of government and funding bodies. This presentation draws on findings from two evidence-based early years interventions - INFANT and Healthy Beginnings and factors influencing sustained delivery at scale.

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State and territory eclectic approaches to obesity prevention policy

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This study provides a snapshot of the approaches taken towards obesity prevention policy by Australian state and territory governments. A mixed methods approach was used to provide a snapshot of obesity prevention policy across Australian jurisdictions, late 2018 to early 2019. Policy mapping was undertaken using a tool, adapted from the WHO Ending Childhood Obesity Report. The policy mapping was an iterative process, initially undertaken to support the interviews and during the interviews participants were asked to identify other relevant policies to include in the mapping. Semi-structured interviews with senior officials in each state and territory health department were conducted to gain insights into the contextual differences of policy development and implementation across Australian jurisdictions. The study found that state and territory approaches to obesity prevention policy were eclectic and while there are numerous similarities no two jurisdictions are the same. Models for delivery of health services and community programs are unique. Policies to influence health supportive food and physical activity environments are an emerging policy space, although they tend to happen in a sporadic and uncoordinated way. The diversity of approaches between jurisdictions is influenced by the policy culture and unique social, geographic, and funding contexts in each jurisdiction.