ORAL ABSTRACTS

Invited talk: Sugar in our beverage supply: Patterns, Consequences, Policy Options

Barry Popkin¹

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We have become increasingly aware of the role of added sugar, particularly in beverages, as a major driver of increased weight gain and other NCSs. This critical knowledge linked with our high sweetness preference (developed over millennia as a survival mechanism) has allowed the modern food industry to utilize this preference to make caloric sweeteners (CS) omnipresent in our beverage (mainly SSB’s) and food supply, particularly in the last half century. First we review the increasing role of CS in our global food supply. For example, 68% of packaged foods and beverages in the USA contain CS, 7% include both caloric and low-calorie sweeteners (LCS), and a few % are made with LCS only. Increasingly our beverage supply has beverages with both types of sweeteners. We review global patterns, with some focus on the Australian-New Zealand region. The added CS come from hundreds of different versions of sugar and its glucose and fructose subcomponents, all of which have the same equal adverse health effect. It has only been in the past 2-3 decades that we have understood for beverages with calories that consumption is not associated with compensatory declines in food intake and this mismatch in our preferences; the modern food sectors push to market these caloric beverages has been responsible for increased risk of a wide range of health problems.

Recent metaanalyses are on the health impact of CS in both food and beverages, particularly beverages, are reviewed. Two major unsettled issues related to the role of 100% fruit juice and LCSs are reviewed. The major program and policy options being utilized or under active consideration are reviewed. We must find ways to change our culture of eating and drinking and the relative cost and dominance of CS beverages in our diets.

Invited talk: Epigenetics and Obesity

Emma Whitelaw¹

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The notion that environmental influences on phenotype can be mediated by detectable/measurable epigenetic marks is of interest to the biologist, the clinician and the broader community. These molecular epigenetic marks might be valuable as biomarkers of future disease, proving opportunity for preclinical diagnosis. This is dependent, to some extent, on the long term stability of these marks, which is in most cases unknown. This makes their predictive value unclear. I will discuss how the meaning of the word epigenetics has changed over the last ten years and why this has caused confusion. Empirical evidence has altered our view of the importance of DNA methylation in the determination of phenotype. Over the last fifty years, obesity levels have increased dramatically and changes to adipose tissue and epigenetic marks in adipose tissue have been detected. Whether these marks are drivers of obesity or consequences of obesity is yet to be determined. Moreover, there is some evidence that obesity can be inherited across generations, not just via DNA sequence (genotype) but also via epigenetic marks in the gametes. The idea is that mothers or fathers who have become obese transmit this to their offspring independent of any genetic susceptibility to obesity. The current evidence for this is weak. I will discuss these ideas using data collected from studies in mice and humans.

Invited talk: What's hot in obesity: the microbiome

Mark Morrison¹

1. Diamantina Institute, University of Queensland, Brisbane, QLD, Australia

To be provided.

Invited talk: Hot and sweet: brown fat beyond thermo-regulation in humans

Paul Lee¹

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There are three kinds of fat tissue. White adipose tissue (WAT) stores energy and in excess leads to obesity. Brown adipose tissue (BAT) consumes energy and produces heat for thermo-regulation. Beige adipose tissue (BeAT) emerges within WAT during cold exposure and manifests thermogenic function comparable to BAT. Animals with high BAT/BeAT status are protected against diabetes and obesity. Recent re-discovery of thermogenic BAT in humans has brought the relation between ambient temperature, thermogenesis and systemic energy and substrate metabolism to the forefront (1).
Humans maintain core temperature through a complex neuroendocrine circuitry, coupling environmental thermal and nutritional cues to heat-producing and dissipating mechanisms. Up to 40% of resting energy expenditure contributes to thermal homeostasis maintenance. The dynamic interplay between BAT, BeAT and WAT modulates systemic energy homeostasis and highlights the presence of a previously under-appreciated thermogenic adipose axis in humans.

In addition to well-known pituitary-thyroid-adrenal axis, recently identified endocrine signals, such as FGF21 and irisin (2), orchestrate crosstalk between WAT, BAT and muscle, tuned to non-shivering and shivering thermogenesis responses. Cold-activated BAT modulates systemic metabolic and endocrine milieu, and cold-induced hormones cause bioenergetics transformation sufficient to impact whole body energy and substrate balance (3), suggesting BAT may serve important physiologic functions beyond thermoregulation in humans.


5

Short-term exposure to energy-matched diets enriched in fat or sugar differentially affects memory, gut microbiota and markers of brain inflammation and plasticity

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Short-term exposure to high-energy diets impairs memory but there are limited data regarding the relative contributions of fat and sugar to these deficits or the mechanisms responsible. Here, we investigated how these different macronutrients affect memory, neuroinflammation and neuroplasticity markers and the gut microbiota in the short-term. Rats were fed matched purified diets for 2 weeks; Control, Sugar, Saturated Fatty Acid (SFA) or Polyunsaturated Fatty Acid (PUFA), which varied only in the percentage of energy available from sugar and the amount and type of fat. Memory was assessed after 8-9 days and rats were culled after 12-13 days exposure. The expression of genes related to inflammation and plasticity were determined via reverse transcription polymerase chain reaction (RT-PCR) and the fecal microbiota was quantified via high-throughput sequencing of the 16S ribosomal RNA. Weight gain and energy intake were comparable across the diets. Rats consuming the SFA and Sugar diets were impaired on hippocampal-dependent place recognition memory compared to Controls and PUFA rats. All rats performed comparably on the perirhinal-dependent object recognition task. Hippocampal and hypothalamic inflammatory and neuroplasticity genes were not substantially affected, but each of the diets significantly altered the microbial composition in distinct ways. Specifically, the relative abundance of 89 taxa differed between groups with the majority of changes accounted for by the Clostridiales order and within that, Lachnospiraceae and Ruminococcaceae. These taxa showed a range of macronutrient specific correlations with place memory. In addition, Distance based Linear Models found relationships between memory, a cluster of hippocampal inflammation-related genes and gut microbiota composition. In conclusion, our study shows that even in the short-term the macronutrient profile of the diet is crucial for diet-induced memory deficits and suggests a possible link between diet, gut microbiota and hippocampal inflammatory genes. Longer term studies are warranted.

6

AMPK-ACC signalling is required for increasing appetite under conditions of metabolic stress

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Activation of AMP-activated protein kinase (AMPK) during increased energy demand promotes food intake and reduces brown fat thermogenesis to shift the organism to neutral energy balance. The underlying molecular interactions are not entirely understood.

The acute effects of AMPK on lipid metabolism are mediated by phosphorylation of acetyl-CoA carboxylase (ACC) 1 at Ser79 and ACC2 at Ser212, thereby inhibiting fatty acid synthesis and promoting fatty acid oxidation. To investigate the physiological impact of this regulation on whole body energy balance, we generated mice with Ser79Ala/Ser212Ala knock-in mutations (ACC double knock-in, ACC DKI). ACC DKI mice have increased ACC1/2 activity in peripheral tissues and a propensity for increased lipid synthesis. Despite deregulated lipid metabolism, ACC DKI mice do not gain more weight when compared to wild type control mice and, in contrast, show a tendency for reduced body weight from 15 weeks of age.

Food intake measurements showed that ACC DKI mice have reduced appetite in response to metabolic stress, such as overnight fasting or cold exposure. Furthermore, while ACC DKI mice are able to maintain normal body temperature under cold stress, they compensate for reduced energy intake by utilizing lipids as preferred energy source. Cold exposure and overnight fasting are accompanied by increased plasma levels of the orexigenic hormone ghrelin in ACC DKI mice. Importantly, we demonstrate that feeding in response to ghrelin is attenuated and ghrelin-induced expression of the orexigenic neuropeptides NPY and AgRP is inhibited, indicating that the anorexic phenotype of ACC DKI mice may be due to ghrelin insensitivity.

These results show that AMPK regulation of ACC is an important physiological mechanism in the control of body weight regulation, whereby the lipid accumulating effects in the periphery are outweighed by anorexic effects in the hypothalamus.
Invited talk: Executive dysfunction in obese individuals

Evelyn Smith1
1. Western Sydney University, Penrith, NSW, Australia

Research has indicated that individuals with obesity have neurocognitive deficits, especially in executive function, which may in turn impact on weight loss and maintenance. In this talk I will review the evidence of this relationship, highlighting some of the mechanisms, and limitations of the literature. I will then present data on our latest randomized controlled trial which examined efficacy of a manualized cognitive remediation therapy for obesity (CRT-O) in terms of improving executive function, reducing binge eating behaviour and helping with weight loss. 80 adults with obesity (body mass index >30 kg/m2), 70% binge eaters, received three weekly sessions of group Behavioral Weight Loss (BWL) and then were randomized to 8 sessions of individual CRT-O or to a no-treatment control group. Mixed-effects model analyses revealed that the CRT-O group had a significant improvement in executive function at post-treatment and 3-month follow-up compared to the control group (Cohen’s d = 0.96 to 2.1). 68% of those in the CRT-O group achieved a weight loss of 5% or more at follow-up compared to only 15% of the controls. Individuals in the CRT-O group lost on average 6.6% of the weight at 3 month follow up (Cohen’s d = 1.4). Changes in executive function predicted changes in weight (p< .05). Binge eating reduced in the CRT-O group compared to the control (Cohen’s d = 0.80). CRT-O seems to be a promising treatment for obesity and binge eating. CRT-O studies with longer follow-ups, pairing it with longer BWL programs and examining the mechanisms are currently underway in Australia and Germany.

Invited talk: Interactions between insulin resistance and bone health

Katherine Tonks1
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The contribution of insulin resistance vs. adiposity in determining bone mineral density (BMD), bone turnover and fracture risk in humans remains unclear. Bone mineral density (BMD) predicts fracture risk, and obesity is associated with higher BMD. People with both type 1 and type 2 diabetes have increased fracture risk, despite many people with type 2 diabetes being overweight or obese, with normal BMD. Factors that contribute to increased fracture risk in diabetes are insulin use, increased risk of falls due to neuropathy and retinopathy, inflammation, glycation of collagen, use of PPAR-y agonists and poor bone quality related to poor nutrition. Fracture risk in diabetes does not appear to be associated with BMD, and so must occur at a cellular level.

Bone turnover markers are lower in people with the metabolic syndrome, and in diabetes, and is associated with insulin resistance rather than adiposity.

This talk will review published data looking at fracture rates and bone turnover marker levels in people with obesity, insulin resistance and diabetes. Data will be presented from studies looking at bone turnover markers performed locally. These data suggest that increased visceral adiposity and higher fasting insulin levels in insulin-resistant states is associated with lower fasting OC and CTX, and failure to further suppress with more insulin. This raises the possibility that diabetic osteopathy may be considered another complication of diabetes.

Invited talk: Is the increased exposure to antidepressants a key contributor to the obesity pandemic?

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Major depressive disorder (MDD) and obesity are both common heterogeneous disorders with complex aetiology, with a major impact on public health. Antidepressant prescribing has risen nearly 400% since 1988. In parallel, adult obesity rates have doubled since 1980, from 15 to 30 percent, while childhood obesity rates have more than tripled. Are these two facts related? Despite the concomitant rise of antidepressant use and of the obesity rates in Western societies, the association between the two, as well as the mechanisms underlying antidepressant-induced weight gain, remain under explored. Our recently developed animal paradigm shows that the combination of stress and antidepressants followed by long-term high-fat diet results, long after discontinuation of antidepressant treatment, in markedly increased weight, in excess of what is caused by high-fat diet alone. On the basis of existing epidemiological, clinical and preclinical data, we have generated the testable hypothesis that escalating use of antidepressants, resulting in high rates of antidepressant exposure, might be a major contributory factor to the obesity epidemic, particularly in Western countries.
Impact of energy restriction on eating behaviour traits in individuals with low satiety efficiency

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Introduction: Studies showed that some individuals express weaker satiety efficiency, and thus, may be more susceptible to weight gain or weight loss resistance. This study aimed to evaluate the impact of a weight-loss program on eating behaviour traits in individuals with different satiety efficiency. Methods: A pooled cohort of obese individuals (n=100; aged 38.7±8.7 years) who participated in a 12-16 wk weight-loss program targeting an energy deficit of 500-700 kcal/d were included in this study. The satiety efficiency was determined by median split of mean satiety quotients based on appetite sensations measured in response to a test meal at baseline. Anthropometric variables, eating behaviour traits (TFEQ) and ad libitum energy intake (EI) (buffet) were assessed before and after the intervention. Results: Similar weight loss was observed between low and normal/high satiety efficiency groups (-3.5±3.2 vs. -3.8±2.9, p=0.64). ANOVAs (adjusted for initial weight and behaviour) showed time by group interactions for cognitive restraint, flexible control (FC), strategic dieting behaviour (STB), avoidance of fattening foods (AFF) and situational disinhibition (SD) (0.02 ≥ p ≤ 0.01). T-tests showed that individuals with low satiety efficiency experienced a higher increase in cognitive restraint (5.5±4.1 vs. 3.5±3.5, p=0.016), FC (2.5±2.1 vs. 1.6±1.3, p=0.019), SD (1.6±1.5 vs. 0.9±1.5, p=0.02), AFF (1.0±1.2 vs. 0.4±1.0, p=0.015) and a lower decrease in SD (-0.7±1.1 vs. -1.2±1.3, p=0.02) after the intervention compared to the normal/high satiety efficiency group. Moreover, individuals with lower satiety efficiency had a higher EI at the buffet meal after the intervention compared to the normal/high satiety efficiency group (920±323 vs. 788±291 kcal, p=0.036). Conclusion: This study suggests that energy restriction could have an undesirable impact on eating behaviour traits and energy intake in individuals experiencing lower satiety efficiency. Other studies should evaluate if these changes could increase their susceptibility to weight regain.

The effects of increasing dietary protein during energy balance and energy restriction on homeostatic and hedonic processes

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Introduction: Compensatory increases in hunger and changes to food preferences in response to energy restriction may reduce weight loss efficacy. Increasing dietary protein could moderate these adaptive responses. The aim of this study was to determine if adding dietary protein during energy balance and energy restriction reduces compensatory increases in hunger and changes in preferences for energy-dense foods.

Methods: 22 Participants (11 M, 11 F) undertook the study. The study involved 4 dietary treatments, each 2 weeks in duration: habitual diet 1 (HD1), habitual diet 2 (HD2), high protein energy balance (HPEBal: energy balance while increasing protein by 0.5g/kg/day with a protein supplement) and high protein energy restriction (HPER: increasing protein by 0.5g/kg/day with a protein supplement while reducing energy intake by 33%). Appetite and L & W were measured during 11hr probe days at the end of each treatment.

Results: Total day hunger significantly increased and fullness decreased during HPER compared to HD1, HD2 and HPEBal (P < 0.01). Satiety quotient did not differ between the conditions. There was no relationship between protein intake (grams, g/kg/day, or % energy intake) and changes in hunger in response to HPEBal or HPER. There were significant increases in explicit wanting for high fat savoury and high fat sweet foods during HPER compared to HD1 (p<0.05).

Conclusions: Increasing dietary protein by 0.5g/kg/day did not significantly mediate the compensatory changes in appetite and food preferences commonly reported during energy restriction.

Invited talk: Nudging supermarket customers toward healthier eating

Adrian Cameron1

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The primary drivers of unhealthy diets are food environments that encourage unhealthy eating. Australian supermarkets are our primary source of food, with marketing techniques in this environment (manipulation of promotion, product, price and placement) having the potential to improve the healthiness of consumer food purchases at a population level. The current Australian supermarket environment (both within-store and in catalogues) will be reviewed, including how it compares internationally. Following on from this, the results of a series of recently completed within-store interventions in Australian supermarkets will be presented. These trials were a collaboration between retail, local government, state government and academic partners and were conducted in eight supermarkets in regional Victoria. Primary outcome assessment was whole-store sales of healthy and unhealthy food based on store sales data (scanner data). The low-cost, scalable and feasible interventions tested included labelling, signage and positioning interventions. Customer perceptions of these interventions, and the financial effect on the retailer were also assessed and will be discussed.
Invited talk: Can price discounts on healthy food influence spending in an extremely socioeconomically disadvantaged population?: The SHOP@RIC study

Julie Bramblecombe
1. MENZIES SCHOOL OF HEALTH RESEARCH, CASUARINA, NT, Australia

Globally, diet is the leading risk for burden of disease. Diet is poorer and burden of disease higher for socio-economically disadvantaged populations in high and middle income countries. Strategies are urgently needed to address this inequity. We examined the effectiveness of a price discount on selected purchases with and without consumer education, delivered in-store in remote Indigenous communities. A stepped-wedge randomised design was used, with 20 communities randomly assigned to 5 sets of 4 communities, spaced eight weeks apart. A 20% price discount on fresh and frozen fruit and vegetables, water and diet soft-drinks was applied for a period of 24 weeks in the community store. Two stores in each set were randomly assigned to receive a combined strategy (discount and education). Intervention effect was measured using mixed models employing weekly point-of-sale data for 131 weeks. The primary outcome was the percent change in fruit and vegetable purchases (grams) per person per day. The immediate effect of applying the price discount alone was to increase sales of fruit and vegetables combined by 13% (95% CI: 5%, 23%), fruit by 21% (7%, 37) and vegetables by 9% (1%, 18). Bottled water sales increased by 18% (1%, 37); no significant effect was observed for artificially sweetened soft drink 5% (-6, 18). The additional benefit of in-store consumer education was an increase in vegetable sales of 14% (3%, 26%). Consistent with other studies, a price discount can improve food purchasing in low socio-economic communities.

Invited talk: Healthy Food Environments: navigating, synthesising and communicating the quagmire of evidence to inform policy-making

Debra Hector
1. _, ACT, Australia

Making sense of copious, heterogeneous evidence to inform large-scale public health environmental intervention and policy is highly challenging. This is especially so in complex arenas such as ‘the Food Environment’. While there is often sufficient evidence of associations between risk factors and environmental determinants, few food environmental and policy actions have been implemented and/or sufficiently evaluated to provide robust evidence of effectiveness at the impact and outcome levels. Linking intervention to distal health outcomes of policy interest, such as obesity, is often not possible. Additionally, study designs applicable to the clinical setting are often much less applicable or possible in public health. Further, decision-makers can lack an understanding of the different types of evidence that might inform decision-making in these more complex areas hence may dismiss evidence considered less ‘strong’ according to traditional evidence hierarchies. Systematic reviews of randomised, controlled ‘trials’ are still hailed as the gold standard despite them rarely providing answers to broad public health policy questions. The lack of consensus on an evidence grading system within the public health domain further stymies the synthesis and translation of evidence. Existing schemas and typologies differ in the criteria used to appraise individual studies and to grade overall bodies of evidence. They differ also in the text descriptors used for communicating the ‘strength’ of evidence. In this presentation I describe the challenges encountered in synthesising, appraising and communicating the complex, diverse evidence base that pertains to the retail, pricing and promotion domains of the food environment, to inform government decision-making. An extensive dialogue between the reviewer and government was required to find solutions to these challenges. The tabulated summaries of evidence will be presented and discussed to illustrate the identified solutions in this instance.

The effect on beverage sales of removal of unhealthy beverages from display in a self-service café

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5. Population Health, Alfred Health, Melbourne, Victoria, Australia

Objectives: Compelling evidence suggests that consumption of unhealthy drinks is associated with weight gain and an increased risk of a number of adverse health outcomes (1, 2). This study assessed the impact of the removal of unhealthy beverages from display by the retailer at a self-service café within a major health service.

Methodology: Beverages were categorised based on a state government nutrient profiling system, which classifies beverages as ‘green’ (best choices), ‘amber’ (choose carefully) and ‘red’ (limit). The total sales (as number of items sold per week) of beverages in the café were measured for five weeks prior to strategy implementation and for another six weeks after removal of
all red beverages from self-service display (which were still available for purchase on request). T-tests were used to compare mean total beverage sales and sales of red, amber and green beverages, pre- and post-strategy implementation. **Results:** After strategy implementation, the proportion of red beverages sold decreased significantly from 34% to 10% of total beverage sales (P <0.001). As amber and green beverage sales increased after strategy implementation, mean total weekly beverage sales did not significantly change (P=0.78). Consumers appeared to more readily switch from purchasing red beverages to purchasing amber beverages, rather than green beverages (the healthiest option). **Conclusions:** The removal of unhealthy beverages from display can result in consumers making healthier purchases, while not significantly affecting retailer sales.


### Import Duty of Palm Oil: A case study of policy making in Fiji

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**Abstract**

**Background:** Non communicable diseases (NCD) impose a significant burden on Fiji. Food-related policies designed to curb NCDs have been implemented in Fiji, including a 32% increase in palm oil import duty (2012). Studying the development and implementation of such policies should provide valuable insights on policy making process and its effectiveness.

**Aim:** To analyse the development and implementation of the palm oil import duty policy in Fiji. More specifically, to document the policy process, identify barriers and facilitators during implementation and to examine the impact of the new import duty.

**Methods:** Based on a case study approach, data were collected through key informant interviews with private stakeholders, government officials and supermarket managers. Transcripts were analysed thematically. National import data and prices were analysed for the 2010–2014 period.

**Results:** Facilitators to policy implementation included awareness, preparation of a comprehensive policy briefing paper, and inter-sectoral support and leadership. Barriers included counter lobbying from retailers and the political environment. Import volume abruptly declined after the policy was implemented in 2012. The decrease in availability of palm oil as a result of the price rise was encouraging. However this was counteracted to some extent by industry moves to mislabel the product as vegetable oil.

**Discussion:** Potential unintended side-effects of policy changes need to be considered and addressed during policy formulation. Whilst the decline in imports probably decreased consumption, further research is needed to determine if this translated to a population wide reduction in NCD risk.

### Invited talk: Impact of sugar – brain, gut and beyond

**Margaret Morris**

1. University of NSW, Sydney, NSW, Australia

There is much public debate around the detrimental impact of sugar, particularly in the form of sweetened beverages, to overall health. We investigated the impact of chronic sucrose post-weaning on hippocampal genes related to plasticity, neurogenesis, stress responses and mitochondrial biogenesis. Female rats were provided with chow and 30% sucrose (in addition to water) to drink from weaning, and hippocampus was collected at 13 weeks. Control rats drank water. Sucrose intake was associated with marked reductions in expression of genes related to neurogenesis (Reln, Neurod1, Gsk3a) and mitochondrial biogenesis (Pgc-1α, Nrf1). Expression of markers related to the stress response (GR, Homer 1) were also downregulated. Thus chronic sucrose consumption impacted an array of genes that govern development, and emotional and other brain functions.

We have shown in rats that both high fat, and high sugar, diets can impair hippocampal dependent behaviours, even after short-term exposure. Similar deficits are seen in young men exposed to poor diet for less than one week. Potential mechanisms underlying the cognitive deficits include neuroinflammation, changes in brain neurotrophic factors, and diet-related changes in gut microbiota. Even intermittent exposure to an energy-dense, western diet can shift the biota towards that seen in obese rats, with reduced microbial diversity. We compared the effects of added fat plus sugar, or added liquid sugar only, on behavior and hippocampal gene expression after 2 weeks of diet. When animals drank liquid sugar (10%) for 2 weeks, we observed increased expression of hippocampal proinflammatory cytokines, along with memory deficits (place recognition). Cytokine mRNA expression correlated with blood glucose concentrations. Other work has shown that greater sucrose consumption leads to distinct microbiota profiles, in the absence of weight differences. Examining key underlying processes is an essential step to enable testing of novel interventions in humans to combat diet-related cognitive deficits.
Invited talk: Sweet taste in the gut – implications for diabesity

Chris Rayner
1. University of Adelaide, Adelaide, SA, Australia

The digestion and absorption of nutrients, and the neuroendocrine signals arising from their interaction with the gut, are fundamental to the regulation of energy intake and blood glucose. Sweet taste receptors, responding to a broad array of sugars and artificial sweeteners, are found not only on the tongue but also in the small intestine. They play a role in the release of gut peptides in response to sugars, and regulate the expression of intestinal glucose transporters. Epidemiological evidence suggests that consumption of artificial sweeteners, as well as sugars, increases the risk of developing type 2 diabetes; the underlying mechanisms are unclear, but could involve the gut. Recent studies investigating the expression and regulation of intestinal sweet taste receptors and glucose transporters in diabetes and obesity are yielding insights into the pathophysiology of these disorders.

Invited talk: Sugar Free Societies: How do we get there and will it be worth it in the end?

Kieron Rooney
1. University of Sydney, Lidcombe, NSW, Australia

Sugar is out! Haven’t you heard? In recent years, the recommendation from national dietary guidelines and the World Health Organisation has been to limit the intake of foods and drinks with added sugars. And while some in the community are yet to be convinced that regulating sugar intake is worth all the fuss, amid the cries of Nanny Statists and Fun Police momentum gathers for public health to intervene in our sugar sweetened societies.

Sugar sweetened beverages in particular have been targeted on account that they provide no nutritional benefit for an individual, can bring significant risk of harm yet dominate the beverage choices in our environment. But, will public health make the public healthy and can the strategies they have on standby deliver the health outcomes the public may be expecting? A rich collection of evidence from successful population based interventions is building across the globe upon which this question can be answered.

During this talk, two core themes will be explored. In the first instance, the various strategies that could be implemented for the regulation of added sugars in our food supply will be discussed within the context of why we should focus on added sugar. Whether or not weight gain (or obesity) is the strongest platform upon which to build support for sugar regulation will be considered as well as some of the typical arguments encountered opposing those that attempt to make change. Following this the theme of success will be explored in consideration of the evidence from sugar withdrawal studies. Specifically, what outcome (or outcomes) will we base the success of any intervention that seeks to reduce the consumption of added sugars through regulation.

Invited talk: The role of NAFLD and Hepatokines in Metabolism

Norbert Stefan
1. Institute of Diabetes Research and Metabolic Diseases (IDM) of the Helmholtz Center Munich, University of Tübingen, Tübingen, Germany
2. German Center for Diabetes Research (DZD, Tübingen, Germany
3. University Hospital of Tübingen, Tübingen, BW, Germany

The liver is known to be involved in the natural history of the ongoing epidemics of type 2 diabetes mellitus and cardiovascular disease. In particular, the liver has a role in increased glucose production and dysregulated lipoprotein metabolism, conditions that are often found in patients with nonalcoholic fatty liver disease. Additionally, several proteins that are exclusively or predominantly secreted from the liver are now known to directly affect glucose and lipid metabolism. In analogy to the functional proteins released from adipose tissue and skeletal muscle-adipokines and myokines-these liver-derived proteins are known as hepatokines. The first hepatokine that has been proven to have a major pathogenetic role in metabolic diseases is α2-HS-glycoprotein (fetuin-A). Production of this glycoprotein is increased in steatotic and inflamed liver, but not in expanded and dysregulated adipose tissue. Thus, research into this molecule and other hepatokines is expected to aid in differentiating between the contribution of liver and those of skeletal muscle and adipose tissue, to the pathogenesis of type 2 diabetes mellitus and cardiovascular disease.
Invited talk: Maternal Obesity: New Insights

Leonie Callaway¹
1. University of Queensland, Herston, QLD, Australia

Maternal obesity remains a major public health issue and a major clinical issue in the delivery of clinical care. It remains a key risk factor in many adverse pregnancies and neonatal outcomes and is associated with a significant economic burden.

The drivers of human obesity are fascinating - dietary advice and guidelines, the food industry, exercise, exercise guidelines, appetite regulation, industry drivers, endocrine disruptors within our food change, changes in lifestyle, medications, trauma.

New insights into this fascinating area of medicine will be discussed.

Invited talk: Impact, Impact, Impact - GP Pathways to successfully empower your patients and families to better health and well-being

Gary Leong¹
1. Lady Cilento Children’s Hospital, Brisbane, QLD, Australia

The overweight and obese child lives within a Family and Cultural environment in which your role as their GP is critical to the Family’s long-term health and well-being. Dr. Leong will highlight the many factors and barriers to Family health change and some simple strategies you can take that will empower both you and your GP team and the Families who are seeking your help. You will feel enlivened and enthused after his talk to make a small but significant difference to your clients in your practice for better health and well-being.

Invited talk: Obesity management – lifestyle and therapeutics

Trisha O'Moore-Sullivan¹
1. Mater Health Services, South Brisbane, QLD, Australia

To be provided

Invited talk: Recognising NAFLD and what should be done?

Norbert Stefan¹,²,³
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Nonalcoholic fatty liver disease (NAFLD) has gained much attention in the recent years because of its high prevalence, amounting to more than 30% in the general population and to more than 70% in certain high risk groups, such as morbid obese individuals and patients with type 2 diabetes. NAFLD strongly associates not only with progressive hepatic, but also with cardiometabolic diseases and NAFLD is thought to be involved in the pathogenesis of cardiometabolic diseases. Diagnosis of NAFLD by the gold standard method, liver biopsy, is invasive and, therefore, not feasible in routine practice. Consequently, there has been intense interest in blood markers that, alone or in combination with clinical parameters, would be able to identify patients with NAFLD.

The most effective and safe treatment strategy to reduce liver fat content and improve hepatic inflammation and fibrosis in subjects with NAFLD is lifestyle intervention. However, a considerable amount of patients is not compliant with the respective recommendations or liver fat content and/or liver pathology does not improve, although weight loss can be achieved. In this respect novel studies have indicated that specific pharmacological treatment approaches may be effective and relatively safe to treat NAFLD.
Glucose-sensing neurons of the mediobasal hypothalamus project to brown adipose tissue

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It is well established that neural input to BAT remains a critical feature of its functional recruitment. In the case of postprandial thermogenesis, activation of BAT sympathetic nerve activity following peripheral or central glucose infusion suggests a central nutrient-sensing mechanism in the regulation of BAT activity. It is hypothesised that BAT-directed neurons in discrete hypothalamic brain regions alter their electrophysiological properties in response to increased extracellular glucose concentration. Injection of the GFP-tagged, transsynaptic retrograde virus, pseudorabies virus (PRV), into the intracapsular BAT of Sprague-Dawley rats allowed for identification of neurons with a known polysynaptic projection to BAT. Whole-cell patch clamp recordings were performed on GFP+ neurons from coronal sections of the arcuate nucleus (ARC) and retrochiasmatic area (RCh). Increasing the extracellular glucose concentration from 1mM (“fasted”) to 5mM (“fed”) revealed both glucose-excited (6.00 ± 0.84mV; 0.63 ± 0.18Hz; n=14 (29%)) and glucose-inhibited (-5.34 ± 0.75mV; -0.34 ± 0.07 Hz; n=18 (37%)) BAT-directed neurons in the ARC. Similarly, there were also substantial numbers of glucose-excited (7.32 ± 2.20mV; 0.75 ± 0.22Hz; n=5 (45%)) and glucose-inhibited (-3.12 ± 2.24mV; -0.80 ± 0.44Hz; n=4 (36%)) neurons in the RCh that projected polysynaptically to BAT. Retrospective immunohistochemical analyses of biocytin-filled cells revealed both POMC+ (n=9) and POMC- (n=5) glucose-sensitive neurons in both regions.

Furthermore, in attempt to delineate the heterogeneity of glucose-sensitive neurons through their monosynaptic projections, Retrobeads (RB) were injected into the paraventricular nucleus, lateral hypothalamus and spinal cord of rats, and the glucose sensitivity of ARC/RCh double-labelled (RB+/PRV+) neurons was tested. These data provide a basis for the postprandial regulation of BAT thermogenesis through glucose-sensing mechanisms in hypothalamic neurons. They also provide additional insights into the axonal trajectory of identified hypothalamic glucose-sensors, which may form the basis of the observed heterogeneity within these populations of glucose-responsive, BAT-directed neurons.

Effect of Glucocorticoid on Brown Adipose Tissue Function in Humans – A Randomised Double-blind Placebo Controlled Cross-over Study

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Background: Glucocorticoid (GC) excess causes obesity. In animals, GC inhibits brown adipose tissue (BAT) function, leading to weight gain. The involvement of BAT in the development of obesity induced by GCs in humans is not known.

Aim: To investigate the effect of GC on BAT function in humans.

Method: In a randomised double-blind cross-over design, 13 healthy adults (6 men, 7 women; age mean±SEM, 28±2 year; BMI 24±1 kg/m²) underwent 1 week each of oral prednisolone (15mg/day) and placebo treatment with an intervening 2-week wash-out period. At the end of each treatment, under standardised cooling (19°C), BAT function was assessed by measuring (i) BAT activity on PET-CT scan after 75MBq of FDG (ii) supraclavicular (SCL) skin temperatures using infrared thermography (iii) energy production after a standardised meal using indirect calorimetry.

Results: Compared to placebo, SCL BAT activity (SUVmax 6.1±2.2 vs 3.7±1.2, P=0.049) was lower with prednisolone. During cooling, SCL skin temperature fell to a greater degree with prednisolone (-0.45±0.1 vs -1.0±0.1°C, P=0.01). Energy production was stimulated by the meal and the stimulation was significantly higher during prednisolone treatment (187±16 vs 255±25 kcal/day, P=0.01). Postprandially, SCL skin temperature rose during placebo but fell during prednisolone treatment (+0.2±0.1 vs -0.3±0.1°C, P=0.03).

Summary: Prednisolone suppresses BAT activity on PET-CT, enhances meal induced energy production but reduces thermogenesis.

Conclusions: GC suppresses the function of human BAT. The enhancement of energy production in the face of a reduced thermogenic response suggests that GC reduces the dissipation of energy as heat, enhancing deposition as energy stores after nutrient intake. This is a likely mechanism by which GC induces obesity.

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Cost-effectiveness and equity impacts of a sugar sweetened beverage tax in Australia

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A sugar sweetened beverage (SSB) tax has been shown to be effective in reducing consumption of SSBs and increasing government revenue, but the fairness of such a policy should also be considered. We assess the cost-effectiveness of a SSB tax of 20% for Australia with explicit inclusion of equity through the distribution of health gains and the financial impacts by socioeconomic position (SEP) subgroup.

Application of a 20% SSB tax across the Australian population will lead to improvements in HALYs and considerable health care cost savings across the Australian population, with the greatest gains in the lowest SEP group. We estimate the increase in annual expenditure on SSBs to be around $4 higher in the lowest quintile compared to the highest (around $11 compared to $7). Total tax revenue resulting from this policy is estimated to be $610m.

A SSB tax can bring substantial health and health care cost savings, especially to those in the lowest SEP group. The tax revenue could potentially fund interventions that further reduce rates of obesity and or reduce the obesity disparities between SEP groups.

Abrogated glucocorticoid signalling in osteoblasts prevents diet-induced obesity, insulin resistance and bone loss

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Overconsumption of energy-dense diets has become a major public health challenge due its causal association with obesity, diabetes and poor skeletal health. However, most animal studies that examine diet-induced obesity and diabetes have focused solely on very high-energy high-fat feeding and thus, we aimed to determine whether these adverse health outcomes are due to the high-energy density or high-fat component of diets. We have previously shown that disruption of glucocorticoid signalling in bone protects mice from the adverse metabolic side effects of exogenous glucocorticoids hence, we also aimed to investigate whether abrogating glucocorticoid signalling in bone can protect from diet-induced metabolic disturbances.

To compare the effects of high-energy versus high-fat, two high-energy diets (both 16.3kJ/g) were designed: standard-fat (SFD)14% total-energy as fat) and high-fat (HFD)43% total-energy as fat). A standard chow was used as control (13.8kJ/g, 14% total-energy as fat). Seven-week-old male wild-type (WT) mice and their transgenic littermates that have glucocorticoid signalling selectively disrupted in osteoblasts (n=6-15/group) were fed ad libitum for 18 weeks. At endpoint, body composition, glucose handling and bone mass were measured.

High-energy feeding, regardless of dietary fat content resulted in significantly increased fat mass in WT mice compared to WT chow-fed mice (SFD14%:+88%, HFD14%:+73%) and exhibited fasting hyperglycaemia and reduced insulin sensitivity. WT HFD mice also demonstrated pronounced glucose intolerance. Both high-energy diets induced significant tibial cortical volume loss to a similar extent (SFD14%:-11%, HFD14%:-14%). Surprisingly, transgenic mice that have abrogated osteoblast glucocorticoid signalling were protected from excessive fat accrual, insulin resistance, glucose intolerance and bone loss, despite consuming the same amount as their WT littermates on either high-energy diet.

Our data indicates that high-energy density rather than high-dietary fat content is a major driver of metabolic dysfunction. These effects appear to be mediated by glucocorticoid signalling in osteoblasts.
Circulating bile acids are associated with insulin resistance and visceral and liver fat in human subjects

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INTRODUCTION

Bile acids (BA) are purported to have a potential role in insulin resistance and obesity, although the exact mechanism remains elusive. We hypothesised that BA concentration is increased in obesity and/or insulin resistance. METHODS Seventy-one adult volunteers formed four groups based on BMI, homeostatic model assessment of insulin resistance (HOMA-IR) and a 75-g OGTT: lean insulin-sensitive (BMI≤25 kg/m², HOMA-IR<2.0, n=19), overweight/obese insulin-sensitive non-diabetic (Obins, BMI≥25 kg/m², HOMA-IR<1.5, n=11), overweight/obese insulin-resistant (Obres, BMI≥25 kg/m², HOMA-IR>3.0, n=20) and type 2 diabetes mellitus (T2DM, n=21). We measured insulin sensitivity by hyperinsulinaemic-euglycaemic clamp, body composition/central abdominal fat by dual energy X-ray absorptiometry, visceral fat area by computed tomography and fasting insulin, adiponectin and BA. RESULTS Neither total BA (r=0.12, p=0.91) nor cholic acid (CA, the predominant primary BA) (r=0.04, p=0.70) correlated with percent total body fat. However, there were significant associations between BA and CA levels and waist circumference (r=0.39, p=0.0008; r=0.34, p=0.0035), central abdominal (r=0.33, p=0.0057; r=0.28, p=0.01) and visceral fat (r=0.26, p=0.026; r=0.24, p=0.045), respectively. CA, but not total BA, correlated with liver density (an inverse marker of hepatic fat, r=−0.25, p=0.03). Total BA inversely correlated with insulin sensitivity (glucose infusion rates corrected for fat-free mass [GIR/FFM], r=−0.35, p=0.003) and adiponectin levels (r=−0.24, p=0.04). In group comparisons, GIR/FFM was significantly lower, and visceral and liver fat significantly higher, in Obres compared to lean and Obins subjects, despite similar total adiposity in Obins and Obres (data not shown). Consistent with correlation analyses, total BA concentration tended to be higher in Obins (1.35±1.1 mmol/L) versus Obres (0.67±0.28 mmol/L) (p=0.057), but were similar between Obins and lean (1.00±0.69 mmol/L). CONCLUSION Our data suggest that BA concentrations aligned closely with insulin resistance, central abdominal, visceral and liver fat in human subjects. Whether BA play an aetioloical role in insulin resistance is yet to be elucidated.

Gestational Diabetes Mellitus among young adult women with PCOS: Association with BMI trajectories over 13 years

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Objective: Meta-analyses indicate a 3X increased risk of gestational diabetes (GDM) among women with polycystic ovary syndrome (PCOS), however relationships between longitudinal trajectories of body mass index (BMI) and GDM risk in PCOS remain unclear. We aimed to identify BMI trajectory groups, compare GDM prevalence across trajectory groups and assess BMI trajectories impact on GDM risk.

Methods: This is a secondary analysis from the (Australian longitudinal Study on Women’s Health) ALSWH with 8,200 women aged 18-36 across five surveys (13 years). The main outcome measure was GDM prevalence. We used latent-class growth modelling to identify distinct BMI trajectory and logistic regression to assess GDM risk.

Results: 575 women (7.0%, 95% CI 6.5-7.6 %) reported PCOS. Among women with ≥1 live pregnancy, 15.1% developed GDM vs. 6.0% controls (p<0.001). Three distinct BMI trajectories were identified over the 13 year follow-up: low-stable (LSG) (63.4% women), moderately-rising (MRG) (29.2%) and high-rising (HRG) (7.5%). These were defined as: LSG-average trajectory remaining within healthy range; MRG-curvedlinear trajectory commencing in healthy and terminating in overweight range and HRG-curvilinear trajectory starting and terminating in obese range. Women with PCOS were more likely to belong to MRG and HRG groups (OR 1.8, 95% CI 1.5-2.2 & OR 4.2, 95% CI 3.2-5.4). The GDM prevalence in PCOS differed significantly across trajectory groups (9.4% vs 20.0% vs 21.0%, p=0.02). After adjusting for BMI trajectories, age and demographic factors, women with PCOS were twice as likely to develop GDM compared to controls (OR 2.3, 95% CI 1.6-3.2).

Conclusion: Women with PCOS have higher rates of weight gain, yet PCOS remains an independent predictor of GDM irrespective of BMI trajectories over reproductive years. This aligns with the non-BMI dependent inherent insulin resistance in PCOS highlighting need for aggressive universal GDM screening in PCOS, independent of BMI and weight gain.
Palmitoylation of the adiponectin receptors, AdipoR1 and AdipoR2, is essential for function in vitro and in vivo.

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Dysregulation of the adiponectin axis contributes to obesity-related cardiometabolic disorders making it an attractive therapeutic target. However, our understanding of the adiponectin receptors, AdipoR1 and AdipoR2, atypical seven transmembrane domain proteins, is rudimentary. We reasoned that elaboration of key properties of AdipoR1 and AdipoR2 would reveal therapeutic strategies. To address this we have employed in-silico, molecular and cellular approaches.

First, using a series of complementary qualitative (microscopy) and quantitative (flow cytometry) assays we demonstrated that under steady-state conditions (no serum starvation) AdipoR1 exhibits robust (60%) cell-surface expression (CSE), whereas AdipoR2 is predominantly restricted to the ER. Second, overexpression of AdipoR1 in HEK-293 cells resulted in acute activation of downstream signalling networks (AMPK, AKT, ERK & P38MAPK) whereas overexpression of AdipoR2 promoted more chronic activation (peaking at 15 min and 24 h). Third, characterisation of chimeric receptors (comprised of a series of AdipoR1/R2 and AdipoR2/R1 constructs) demonstrated that the differences in CSE and temporal signalling profiles of AdipoR1 and AdipoR2 are underpinned by the non-conserved regions (spanning AdipoR1Δ1-29 and AdipoR2Δ1-31) in the cytoplasmic ‘trunks’ of the receptors. Fourth, bioinformatics analysis (using CSS-Palm) revealed several putative palmitoylation sites including a conserved ‘canonical’ site (common to GPCRs) in the juxtamembrane region of both receptors as well as additional non-conserved sites. Palmitoylation of these sites was confirmed using Acyl-Biotinyl exchange chemistry and site-directed mutagenesis which also revealed rapid turnover of palmitoylation (t½ < 60 min). Moreover, palmitoylation of the canonical site in AdipoR1(Cys124) or AdipoR2(Cys139) was required for efficient CSE and coupling to downstream signalling networks (all p<0.05).

Collectively these findings demonstrate fundamental differences between AdipoR1 and AdipoR2, highlight the importance of the cytoplasmic ‘trunks’ and post-translational regulation (palmitoylation) of the receptors. Studies are ongoing to elucidate changes in the latter contribute to the pathophysiology of cardiometabolic disease and afford novel therapeutic opportunities.

The independent effects of dietary energy restriction and circuit exercise training on fat oxidation in patients with NAFLD

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AIM: To investigate the independent effects of 6-months of energy restriction or exercise training on whole-body and hepatic fat oxidation of patients with NAFLD.

METHODS: Participants were randomised into either circuit exercise training (EX; n=13; 3h/week without changes in dietary habits), or dietary energy restriction without changes in physical activity (ER; n=8). Respiratory quotient (RQ) and whole-body fat oxidation rates (Fatox) were determined by indirect calorimetry under basal, insulin-stimulated and exercise conditions. Severity of disease and steatosis was determined by liver histology; hepatic Fatox was estimated from plasma β-hydroxybutyrate concentrations; cardiorespiratory fitness (CRF) was expressed as VO2peak. Complete-case analysis was performed (EX: n=10; ER: n=6).

RESULTS: Hepatic steatosis and NAFLD activity score decreased with ER but not with EX. β-hydroxybutyrate concentrations increased significantly in response to ER (0.08±0.02 vs. 0.12±0.04, P=0.03) but remained unchanged in response to EX (0.10±0.03 vs. 0.11±0.07, P=0.39). Basal RQ decreased (P=0.05) in response to EX, while this change was not significant after EX (P=0.38). VO2peak (P=0.001) and maximal Fatox, during aerobic exercise (P=0.03) improved with EX but not with ER (P>0.05). The increase in β-hydroxybutyrate concentrations was correlated with the reduction in hepatic steatosis (r=0.56, P=0.04).

CONCLUSIONS: ER and EX lead to specific benefits on fat metabolism of patients with NAFLD. Increased hepatic Fatox in response to ER could be one mechanism through which the ER group achieved reduction in steatosis.
Consumption of Sugar Sweetened Beverages and Type 2 Diabetes Incidence in Thai Adults: Results from an Eight Year Prospective Study

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Introduction
The global prevalence of type 2 diabetes mellitus (T2DM) is high and increasing in countries undergoing rapid socio-economic development, such as Thailand. Sugar sweetened beverage (SSB) intake may contribute to the risk of developing T2DM. However, this has not been assessed in Thai adults. We aimed to assess the association between SSB intake and T2DM risk and whether this association was mediated by obesity in a prospective study of Thai adults.

Methods
Data were from Thai Cohort Study participants surveyed in 2005, 2009 and 2013. The sample included participants who were free of diabetes in 2005 and who were followed up in 2009 (n=59,314) and/or in 2013 (n=39,175). We used multivariable logistic regression to assess associations between SSB intake and four and eight year T2DM incidence. We used a counterfactual mediation analysis to explore potential mediation of the SSB intake and T2DM risk relationship.

Results
Frequent consumption of SSBs was associated with increased risk of T2DM in women, but not in men at both the four (SSB intake 1-6 times per week OR=1.7, 95%Confidence Intervals (CI) 1.3-2.4 and >1 per day OR=2.5, 95%CI 1.5-4.1) and eight year follow-ups (SSB intake 1-6 times per week OR=1.7, 95%CI 1.2-2.3 and >1 per day OR=3.1, 95%CI 2.0-5.0). The addition of both weight gain and body mass index (BMI) to the full regression model only slightly attenuated these effects. Having a BMI of 25kg/m2 or over in 2009 was a significant mediator of the total effect of SSB intake in 2005 on T2DM risk in 2013 (natural indirect effect 1.10, 95%CI (1.07, 1.13) and mediated 15.9% of the total relationship.

Conclusion
The consumption of SSBs increased the risk of T2DM incidence in women but not in males. Obesity mediated a proportion of this relationship but most of the effect appeared to act through other mechanisms.

Invited talk: Lipid Metabolism and the Complications of Diabetes

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Diabetes is a disorder of lipid as well as glucose metabolism. The lack of insulin signaling, caused by either insulin deficiency in type 1 diabetes or insulin resistance in type 2 diabetes, disrupts lipid metabolism in part through effects on the process of de novo lipogenesis. This process requires the activity of fatty acid synthase (FAS), a multifunctional enzyme that synthesizes the saturated fatty acid palmitate from malonyl-CoA, acetyl-CoA, and NADPH. Studies over the past decade have demonstrated that FAS has complex tissue-specific effects that are relevant to the complications of diabetes. In liver, FAS participates in the generation of an endogenous phospholipid ligand for PPARalpha, a transcription factor that promotes fatty acid oxidation and is the target of fibrate drugs used in clinical practice. In the hypothalamus, FAS controls feeding behaviors. At the vascular endothelium and at the intestinal epithelium, FAS is required for normal homeostasis by promoting the palmitoylation of endothelial nitric oxide synthase (eNOS) and mucin 2, respectively. In cardiac muscle and skeletal muscle, FAS alters calcium metabolism through effects on the membrane environment. In macrophages, FAS promotes inflammation and atherosclerosis. In adipose tissue, FAS regulates the conversion of beige adipocytes in part by generating ether lipid ligands for PPARgamma, a transcription factor required for adipogenesis. Pharmacological inhibitors of FAS have been demonstrated to treat diabetes in animal models. However, potentially detrimental effects of FAS inhibition in certain tissues limit this approach. Available evidence suggests that FAS channels lipids to specific intracellular sites, raising that possibility that modulating this process could treat diabetes complications such as retinopathy, vascular disease, and other disorders related to chronic inflammation.
Invited talk: Protein Kinase Ce in adipose tissue - not merely an effector but a regulator of lipid intermediates?

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Obesity and lipid oversupply have been linked with defective insulin action in liver and muscle for some time. As lipid-activated kinases, isoforms of the protein kinase C (PKC) family are strong candidates for mediating the inhibitory effects of lipid intermediates. More specifically, PKCε is widely believed to play a direct role in liver insulin resistance through inhibition of proximal insulin signalling. Our laboratory has extensively investigated the effects of global and tissue-specific PKCε ablation on in mice. This has revealed previously unsuspected roles for the kinase in the regulation of lipid metabolism and glucose homeostasis.

Invited talk: Ectopic lipids and defective glucose metabolism: cause or association?

Clinton Bruce
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Accumulation of lipids in non-adipose tissues, particularly liver and skeletal muscle, is associated with the development of insulin resistance. However, it is not entirely clear whether ectopic lipid accumulation plays a causal role in the development of insulin resistance or whether this is simply an associative relationship. We have conducted a number of studies to explore this relationship. Firstly, to further understand the role of muscle lipids in mediating insulin action, we generated a muscle-specific knockout of a key enzyme in phospholipid synthesis, CTP:phosphoethanolamine cytidylyltransferase (ECT), which resulted in marked (2-3-fold) increases in both diacylglycerol and triacylglycerol content in muscle. Despite this increase in lipid content, whole body and skeletal muscle insulin sensitivity, as determined by euglycemic hyperinsulinemic clamp, was not altered. These findings demonstrate that lipid accumulation in muscle is not always associated with insulin resistance. To examine the role of hepatic lipids, we performed a study where chronically (8 wk) high-fat, high-sucrose fed (HFSD) mice were switched back to a standard chow diet for 7 days. Upon the switch, energy intake was reduced, resulting in reductions of fat mass and hepatic diacylglycerol and triacylglycerol content. However, these parameters were still elevated compared to chow-fed mice, thus representing an intermediate phenotype. Nonetheless, glucose intolerance and hyperinsulinemia were completely normalized in mice that underwent the 7 day diet switch. This indicates that lipotoxicity per se does not necessarily maintain the glucose intolerant and insulin resistant state in HFSD fed mice. Rather, it appears that persistent over nourishment is likely to be the major factor responsible for causing defects in glucose metabolism. Together, these findings dissociate tissue lipid accumulation from the development of insulin resistance and glucose intolerance.

Invited talk: Do factors secreted from the fatty liver cause diabetes?

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Obesity is a risk factor for the development of secondary complications including dyslipidemia, non-alcoholic fatty liver disease, cardiovascular disease and type 2 diabetes. An accumulation of lipid in the liver, which is clinically known as hepatic steatosis, is a pathologic abnormality that is common in obese and type 2 diabetes patients. Hepatic steatosis occurs when fatty acid supply outweighs fatty acid demand and occurs in a time-course that usually precedes the induction insulin resistance and type 2 diabetes. In this presentation, we describe how ‘omics’ approaches are used to delineate the hepatocyte protein and lipid secretome in health and obesity. Further, we report on the pre-clinical validation of several liver secreted factors that cause insulin resistance and disturbances in systemic metabolic homeostasis.
Invited talk: Diabetes Surgery - has the time arrived?

John Dixon
1. Baker IDI Heart & Diabetes Institute, Melbourne, Vic., Australia

Bariatric-metabolic (BM) surgery as a treatment for type 2 diabetes (T2DM) has progressed rapidly. There is now high quality evidence of efficacy, safety, reduced morbidity and mortality, and very favourable health economic profile. Yet surgery is rarely performed as a treatment for Type 2 diabetes and has been slow to enter the treatment algorithms of managing diabetes. The International Diabetes Federation has provided a position statement, and the NHMRC and NICE have included BM surgery in their algorithms for managing weight in patients with obesity and T2DM.

An international consensus conference was convened in collaboration with leading diabetes organizations to develop guidelines to inform clinicians and policy makers about benefits and limitations of metabolic surgery for T2DM. The evidence collected, the process used to reach consensus, and the level of international acceptance will be presented.

Key points of consensus:

Given its role in metabolic regulation, the gastrointestinal tract constitutes a meaningful target to manage T2DM. There is now sufficient clinical and mechanistic evidence to support inclusion of metabolic surgery among anti-diabetes interventions for people with T2DM and obesity.

Metabolic surgery should be recommended to treat T2DM in patients with Class III obesity (BMI >40 kg/m2) and in those with Class II obesity (BMI 35.0-39.9 kg/m2) when hyperglycemia is inadequately controlled by lifestyle and optimal medical therapy. Surgery should be considered for patients with T2DM and BMI 30.0-34.9 kg/m2 if hyperglycemia is inadequately controlled despite treatment with either oral or injectable medications.

Our challenge now is to understand where this fits into real world management of T2DM in Australia.

Invited talk: Prediabetes Phenotypes improve Prediction and Prevention of Type 2 Diabetes

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The prevalence of prediabetes is increasing world-wide. Prediabetes is not only associated with an increased risk of type 2 diabetes and cardiovascular disease (CVD), but also of dementia and cancer, and, therefore, has recently gained much attention in the field of clinical research. In prediabetes lifestyle and pharmacological intervention can prevent diabetes and possibly CVD. Thus, the implementation of interventions in this condition is of major importance. However, prediabetes is a very heterogeneous metabolic state, both in respect to its pathogenesis and prediction of diseases. Thus, better understanding of its pathophysiology and stratification of the risk should be done. This can be achieved by applying precise phenotyping strategies. It will be discussed how stratification of individuals with prediabetes at baseline into a high-risk and a low-risk phenotype, based on corrected insulin secretion and insulin-resistant NAFLD, may help to determine the effectiveness of a lifestyle intervention to revert individuals to normal glucose regulation. By addressing evidence that has derived from lifestyle intervention studies the further aim ist to clarify whether these phenotypes can be used for individualized prediction and prevention of cardiometabolic diseases in prediabetes.

Invited talk: Metabolic Syndrome: Sympathetic (Neural) Perspectives

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The sympathetic nervous system (SNS) plays a pivotal role in both cardiovascular and metabolic regulation. Prospective cohort, offspring and clinical studies indicate that elevated SNS activity is an early pathophysiological phenomenon that predicts future metabolic abnormalities (insulin resistance, hyperglycemia, type 2 diabetes, dyslipidemia and adiposity), increases in blood pressure and cardiovascular risk. In established obesity several factors act in concert to maintain chronic elevation of central sympathetic drive to skeletal muscle, the kidneys and the heart. Primary amongst these are hyperinsulinemia, impaired baroreflex function, sleep apnoea and elevated adipokine levels.

Using the techniques of clinical microneurography to quantify sympathetic nerve firing rate in skeletal muscle vasculature and isotope dilution to estimate total body noradrenaline spillover rate, our group has demonstrated associations between SNS activity and insulin resistance and insulin clearance (inverse) in obese cohorts. Furthermore, insulin resistant obese individuals display blunted postprandial sympathetic response to oral carbohydrate loading compared with age- and body mass index-matched insulin sensitive controls. This is relevant to body weight homeostasis, given that facultative thermogenesis accounts for 3-4% of daily energy expenditure. The sympathetic neural signal is also modified by the rate of removal of noradrenaline from the neuroeffector junction and plasma compartment. We recently reported reduced plasma noradrenaline clearance in obese treatment naïve type 2 diabetic patients compared with controls with impaired glucose tolerance. This was attributed to reduced peripheral noradrenaline transporter (NET) expression, and haemoglobin A1C was an independent inverse predictor of NET levels.
Weight loss and exercise are first line treatments for the metabolic syndrome that elicit sympathoinhibitory effects and reverse blunted postprandial sympathetic response in insulin resistant states. The magnitude of sympathoinhibition is greatest in hyperinsulenic subjects. Insulin-sensitizing, oral hypoglycemic and sympathomoderating drugs may offer other approaches to modify sympathetic drive and protect against target organ damage and metabolic derangement.

41

Insulin-sensitive overweight/obese individuals remain as insulin sensitive and normotensive as lean subjects over 6 years

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BACKGROUND: While obesity is a strong risk-factor for insulin-resistance, some obese individuals are as insulin-sensitive as lean individuals. However, whether insulin-sensitive obesity is an enduring phenotype remains unknown.

METHODS: Subjects were studied at the Garvan4 (2007-2010) using hyperinsulinaemic-euglycaemic clamps and DXA to measure insulin resistance and body composition, respectively (n=101, ‘baseline studies’). Participants were categorised as lean (BMI≤25kg/m²), overweight/obese insulin-sensitive or overweight/obese insulin-resistant (Obun or Obur; above or below median glucose infusion rate, respectively). Subjects were followed up after 6±1yr. Fifty-nine individuals had their weight, systolic (SBP) and diastolic blood pressure (DBP) measured; a sub-cohort agreed to participate in repeat clamp and DXA studies (n=42).

RESULTS: Average age at follow-up was 60±11yr. Insulin sensitivity (P=0.43), BMI (P=0.53) and body fat mass (P=0.10) did not change significantly over time in this cohort. Despite this, visceral abdominal fat (P=0.004), SBP (P=0.002) and DBP (P<0.001) increased, without a difference between groups (Pbaseline<0.04). At baseline, insulin sensitivity was 90±40% and 40±10%, relative to lean, in Obun (P=0.62) and Obur (<0.001), respectively. This finding persisted at follow-up (78±31%, P=0.46; and 44±15%, P<0.001, in Obun and Obur relative to lean, respectively). At baseline, SBP (120±10mmHg) and DBP (76±7mmHg) measured in Obun were not statistically different to lean (114±14mmHg, P=0.09; and 71±9mmHg, P=0.051, respectively), but were markedly lower than Obur (136±19mmHg, P<0.01; and 86±9mmHg, P<0.001, respectively). This pattern also persisted at follow-up where Obun had similar SBP (126±19mmHg) and DBP (79±10mmHg) to lean (124±21mmHg, P=0.97; and 79±14mmHg, P=0.99, respectively), but values were lower than Obur (143±17mmHg, P=0.02; and 91±12mmHg, P=0.01, respectively).

CONCLUSION: We observed that in Obun, relative normotension and insulin sensitivity was preserved over 6 years, suggesting a phenotype distinct from Obur. These findings may partly explain relative protection from cardiovascular disease observed in Obun relative to Obur in longitudinal studies.


42

Effects of a large breakfast versus large dinner on 24-h glucose profiles during a day of prolonged sedentary behaviour

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Evidence indicates that postprandial glucose concentrations may be manipulated by reducing energy consumption at dinner and increasing energy intake at breakfast. It is possible that the effects may be largest for dysglycaemic individuals, particularly those who are inactive on a daily basis. We aim to test the hypothesis that an increased energy intake at breakfast can improve blood glucose metabolism during periods of prolonged sitting in overweight/obese men and women with prediabetes.

To date, nine adults (age: 58 ± 5 y, BMI: 33 ± 4 kg/m²) with prediabetes (IFG and/or IGT) have completed two 10 h laboratory visits in a randomized order consisting of sitting uninterrupted for breakfast, lunch and dinner meals of either 20%/30%/50% energy intake (Breakfast condition) or 55%/30%/20% energy intake (Breakfast condition), respectively, with the same meal composition (50% carbohydrate, 20% protein, 30% fat). Continuous glucose monitors (CGM) measured interstitial [glucose] from 0800 on a trial day to 0800 the morning after.

The total 24 h area under the curve (AUC) [glucose] was not different between conditions (P=0.49) nor was the mean amplitude of glucose excursions (MAGE; P=0.22). The incremental AUC (IAUC) between breakfast and lunch was higher in the Breakfast condition (P=0.01) but between lunch and dinner was greater for the Dinner condition (P=0.001). No difference in IAUC between conditions from dinner to 0800 the following day (P=0.08) was observed.
Our preliminary findings indicate that while the total 24 h AUC and the MAGE do not support a difference in blood glucose regulation in response to a large breakfast, a more consistent blood glucose concentration profile was observed across a day in the Breakfast condition. These findings suggest that a larger breakfast balanced by a smaller dinner may hold some benefit for the acute regulation of blood glucose during prolonged sedentary behavior in dysglycaemic individuals.

Invited talk: The Mexico Experience with SSB and Junk Food Taxes: Impact after 1 and 2 years of the taxes

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From 1 January 2014, Mexico implemented an excise tax of 1 peso per liter on sugar sweetened beverages and an 8% tax on nonessential food products (junk food tax). In both cases, longitudinal models that examined how pretax trends in SSB and food purchases of a representative sample of Mexican urban consumers were studied. A panel of households who kept all receipts and all containers along with registering the location of the purchases were surveyed biweekly to create the longitudinal data used for these analyses. Outcomes were volumes of beverages and grams of foods. The results for both studies on impact of the tax overall and on different socioeconomic (SES) groups were comparable. Consumption declined significantly of the taxed items with the largest impacts in low and middle SES consumers. Purchases of taxed beverages decreased by an average of 6% in 2014 compared with expected purchases without the tax. Furthermore, these reductions became large over time, reaching a 12% decline by December 2014. All three socioeconomic groups reduced purchases of taxed beverages, but the reduction was greatest among households of low socioeconomic status, averaging a 9% decline during 2014 and reaching a 17% decrease by December 2014 compared with pretax trends. For taxed foods, there was a 5.1% decline change beyond what would have been expected based on pre-tax (2012-2013) trends, with no corresponding change in purchases of untaxed foods. Low SES households showed greater response to the tax, purchasing on average 10.2% less taxed foods than expected, whereas middle and high SES households purchased 5.8% and 2.3% less taxed foods than expected, respectively. Additional research examined trajectories of consumer. For high and low consumers prior to the tax and after them. High consumers significantly reduced both SSB’s and taxed food much more than others.

Invited talk: Enabling healthy food and beverage choices: is the price right?

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An unhealthy diet is considered the leading cause of poor health in Australia and globally, including excess weight gain and obesity. The price of foods and beverages have been shown to influence what people consume. Healthier foods and beverages are often more expensive than less healthy options, creating an economic barrier to healthier choices. This is especially true for individuals with lower incomes. Food and beverage pricing strategies can create incentives for purchasing and consuming healthier items. Among various options, taxing unhealthy foods and/or beverages or subsidising fruits and vegetables are two commonly proposed policies to promote healthy diets. Whilst, several countries have been successful in enacting such policies, political obstacles have limited the uptake and implementation of such. This presentation will explore the potential role of food and beverage pricing strategies in a range of contexts and for different population sub-groups. It will draw on current and new methodological techniques for examining the effect of food and beverage pricing strategies on consumer dietary choices and will outline real-world future strategies that alter the relative price of healthy and unhealthy foods to promote healthy choices.

Invited talk: Modelling the health impact of taxing sugared drinks in Australia and South Africa

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Worldwide, countries are experiencing a nutrition transition towards foods of higher energy density, and a rapid increase in obesity is observed. This is contributing to an increasing burden of chronic disease. There is strong evidence that sugar-sweetened beverage (SSB) intake is causally related to increased body mass. Higher SSB prices are associated with reduced consumption of SSBs. We used established multi-state life table modelling methods and publicly available data to estimate the potential impact of SSB taxes on health in South Africa, and in Australia. For South Africa, we estimated that a 20% tax would reduce energy intake by about 36kJ per day, reducing obesity prevalence by 3.8% in men and 2.4% in women. Our 2014 paper generated much debate, and we have since published papers the impact on diabetes (374,000 health-adjusted life years [HALYs] gained over 20 years) and stroke (550,000 HALYs over 20 years). In February 2014, Finance Minister Pravin Gordhan announced plans to introduce a tax on SSBs. For Australia, we estimated that a 20% tax could lead to gains of 168,000 HALYs, a reduction in overall health care expenditure of AUD609 million over the lifetime of the cohort of adult Australians currently alive, and revenue of AUD400 million annually. Following the announcement of a sugar tax in the UK as it did, our paper generated much media interest last April. The third largest political party endorsed a tax, but at the time of writing, we are yet to see further policy action. In combination with targeted health promotion efforts (lobbying), quantifying the expected impact on of fiscal measures that
improve nutrition can help mobilize public opinion. More importantly, the research has informed briefings with policy makers, politicians, and public health organisations, so they can understand the benefits of an SSB tax and potentially support it.

Healthy Diets ASAP (Australian Standardized Affordability and Pricing) methods and results: Are healthy diets really more expensive and how would price be affected by changes to the GST?

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Introduction Fiscal policies may help improve population diets but standardised food pricing methods to inform decisions are lacking. We aimed to develop and validate methods following approaches proposed by the International Network for Food and Obesity/Non-communicable Diseases Research, Monitoring and Action Support (INFORMAS)¹; use resultant methods to assess price, relative price and affordability of current and healthy (recommended) diets; and assess impacts of potential changes to taxation policy in Australia.

Methods ‘Current diets’ were constructed using data from the recent Australian Health Survey and ‘healthy diets’ from Australian Dietary Guidelines models, for households of two adults and two children. Food prices were collected in all stores in randomly selected areas of SEIFA quintiles in two capital cities. Diet cost under potential policy scenarios was compared with household incomes. Methods were endorsed at a National Forum.

Results Households spent the majority (58%) of their current food budget on unhealthy, energy-dense choices, including take-away foods (14%) and sugar sweetened beverages (4%) as confirmed by Australian Bureau of Statistics analysis of household consumption data. Healthy diets cost 15% less than current diets and 31% of the disposable income of low socioeconomic households. These would become unaffordable under proposed changes to expand 10% goods and services tax (GST) to include basic healthy foods. However, retaining exemptions and increasing GST rate may help improve food security.

Conclusions This project shows that standardized diet pricing methods can be developed, validated and agreed nationally. Results suggest that healthy diets can be more affordable than current diets, but other factors may be as important as price in determining food choice. Expanding the base of the GST is not a good idea for food security or health.


Food pricing strategies aimed at improving health in remote Indigenous communities

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Background Food pricing strategies, independently or combined with strategies such as nutrition and price promotion at remote community stores holds promise as a strategy to improve Indigenous health.

Methods Retailers, nutritionists and others identified using a snowball sample methodology, participated in semi-structured interviews to identify food pricing strategies in remote communities aimed at improving health outcomes. Interviews were audio-recorded and transcribed verbatim. Relevant documents were sourced or provided by participants. Content analysis was conducted by two authors.

Results 43 participants based in the Northern Territory or Queensland participated from September 2015 to May 2016. Interview and document analysis show that food pricing policy was dominated by subsidies (i.e., price reduction, voucher) or cross-subsidies (i.e., price reduction combined with price increase), often of moderate magnitude and largely on fruit and vegetables, water, diet soft-drinks and soft-drinks. Business practices described indicate that healthier foods often had a lower mark-up than unhealthier foods. Whilst there was some evidence of promotion and other complementary strategies, this is a developing area for remote stores.

Conclusion Food pricing policies target key products for health improvement (i.e., fruit, vegetables and beverages). The limited range of targeted products, the mostly moderate magnitude of strategies and the lack of use of taxes are notable. Improving health outcomes through pricing strategies is likely to require a broader selection of targeted foods, the deployment of higher subsidies/taxes and the use of well-designed complementary strategies. The feasibility, sustainability and acceptability of such approaches would need to be considered by remote food suppliers.
Invited talk: IC7: a novel therapy for the treatment of metabolic disease

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We have previously shown that the gp130 cytokines interleukin-6 (IL-6) and ciliary neurotrophic factor (CNTF) can improve obesity and insulin resistance in both mice and humans 1,2. However, due to the known inflammatory effects of IL6 and the antigenic response in some patients to the clinically used form of CNTF (Axokine), both proteins have no therapeutic utility. In an attempt to overcome this issue, we have designed a chimeric gp130 ligand, termed IC7, where one gp130 binding site has been removed from IL6 and replaced with the LIFR binding site from CNTF. This ‘module swap’ creates a new cytokine with CNTF-like, but IL-6R dependent activity. In a series of experiments, we have shown that IC7 has similar positive metabolic effects as CNTF, but may overcome the negative effects experienced by Axokine. Specifically, IC7 significantly improved glucose tolerance and hyperglycemia and prevents weight gain and liver steatosis in obese mice. In addition, we have shown efficacy and safety in a study in non-human primates (Macaca fascicularis). In addition, in comprehensive human cell based assays, we have demonstrated that IC7, unlike Axokine, results in no signs of immunogenicity. Thus IC7 is a realistic and viable next generation biological for the treatment of obesity and T2D, disorders that are currently pandemic.

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Invited talk: Obesity in diabetes: friend or foe?

John Wentworth

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We associate obesity with poor clinical outcomes, including in people with type 2 diabetes. Compelling evidence links obesity in early life to higher risks of diabetes and death, justifying population-wide prevention efforts. However, obesity has been associated with improved rather than poorer diabetes outcomes and we lack good evidence that weight loss prevents diabetes complications and death. Obesity in diabetes might also confer health benefits in terms of enhancing beta-cell mass and maintaining bone health. These paradoxical findings will form the basis of discussion about the therapeutic role of weight loss in diabetes.

Invited talk: Current controversies in diabetes management: lessons from the mega trials

Sophia Zoungas

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To be provided

Invited talk: Walt Whitman, Herman Melville, and the Challenges of Obesity and Diabetes

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Worldwide prevalence reports for obesity and diabetes over recent decades suggest that the chronic management of metabolic disease will dominate health care for the foreseeable future. Feeding behaviors contributing to obesity have been recognized for nearly a half-century, many of the key molecular mediators of central nervous system appetite control have been identified, and novel pharmacological agents have been introduced to treat obesity. However, less than robust results from medical management have promoted the pursuit of alternative clinical and scientific approaches. Anatomical interventions including bariatric surgery are gaining acceptance despite uncertainties about patient selection and long-term consequences. In rodents, manipulating the microbial community structures that constitute the intestinal microbiota can impact body composition, but how this information may translate to humans is still unclear. The realization that brown-like adipose tissue exists in humans has prompted provocative studies in animals demonstrating that adipose depots can be induced to carry out inefficient metabolism, a process that if translated to humans could alter energy balance to treat obesity and diabetes. A common obesity complication is type 2 diabetes, but obesity does not universally lead to diabetes, providing some support for the notion of ‘healthy’ obesity. For those with obesity-associated diabetes, recent therapeutic options appear to decrease certain diabetes complications although the responsible mechanisms are poorly understood. Emerging evidence suggests that a combination of genetic and metabolic profiling could help guide management, but such an approach will also require behavioral and population-based strategies to address the failure of many providers and patients to utilize proven therapies.
Increased intestinal permeability as a risk factor for type 2 diabetes in obesity

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Introduction: The interplay between the gut microbiota, intestinal permeability and chronic low grade inflammatory responses in the context of risk for obesity-associated disease continue to be of interest. A permeable intestinal mucosa is necessary to facilitate critical absorptive functions, but alterations in intestinal permeability have the potential to trigger Metabolic Endotoxaemia (ME) which may result in downstream activation of inflammatory signalling pathways and contribute to risk for disease. The aim of the study was to examine the associations between intestinal permeability and type 2 diabetes (T2D) using a derived risk score approach. Methods: A total of 130 individuals with T2D (age: 57.5±6.2 years (mean ± SD); BMI: 30.4±3.2; 45% female) and 161 individuals without T2D (age: 37.4±12.5 years; BMI: 25.1±3.9; 65% female) were included in the study. Assessment of intestinal permeability included measurement of circulating lipopolysaccharide (LPS), LPS-binding protein (LBP) and intestinal fatty acid binding protein (iFABP) concentrations which were then used for calculation of a derived permeability risk score (PRS) based on quartile scoring of each individual measure. Associations between the PRS and T2D status were assessed using logistic regression models. Results: LBP (~34%, p<0.001), iFABP (~46%, p<0.001) and the PRS (~24%, p<0.001) were all significantly higher in the T2D affected individuals. Quantification of risk across PRS tertiles revealed that individuals with a PRS in the upper tertile were 5.07 times more likely (CI: 1.72-14.95; p=0.003) to have T2D independent of age, sex and BMI. Conclusions: These data support an association between intestinal permeability and risk for T2D. Consideration of intestinal permeability assessment as a potential tool for classifying individuals with Metabolic Syndrome as high or low risk for T2D development appears a logical progression of this work.

Insulin transport and activity in the central nervous system

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Insulin acts within the central nervous system to alter numerous physiological outcomes including energy balance and glucose homeostasis. Insulin is transported into the central nervous system by a saturable-receptor mediated process that is proposed to be dependent on the insulin receptor. Transport of insulin into the brain is altered by numerous factors including diet induced obesity (1). It has previously been observed that the weight sparing effect of detemir insulin, relative to other long-acting insulin formulations, is associated with increased transport into the central nervous system (2). We hypothesized that the effects of detemir insulin on energy balance would be mediated by an increase in central nervous system insulin signalling. Chronic treatment with detemir insulin resulted in reductions in both food intake and weight gain relative to insulin glargine or normal insulin treatment in C57BL/6J mice. Acute peripheral detemir insulin treatment resulted in reduced food intake, with increased phosphorylated Akt also observed in the arcuate nucleus of the hypothalamus of detemir treated mice, relative to other insulin treatments. When mice were maintained on a high fat diet the acute effects of detemir insulin on both energy balance and phosphorylated Akt were inhibited. Furthermore, when specific neuronal populations of insulin receptors were knocked out, animals were insensitive to the acute effects of detemir insulin on energy balance. These data demonstrate that detemir insulin reduces weight gain by acting on the central nervous system to reduce food intake. The inhibition of this effect in high fat diet treated animals indicates that detemir insulin is subject to resistance of insulin transport into the brain.


Signal transduction pathways activated by the orexigenic gut derived hormone insulin-like peptide 5 at relaxin family peptide receptor 4

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Introduction. Insulin-like peptide 5 (INSL5) is a two-chain, three-disulphide bonded peptide belonging to the insulin/relaxin superfamily expressed in the enteroendocrine L-cells of human and mouse colon (Grosse et al, 2014). It is the cognate ligand for relaxin family peptide receptor 4 (RXFP4) a GPCR mainly expressed in the colorectum and enteric nervous system. Currently little is known of the signal transduction pathways activated by RXFP4.
Aims. This study examined intracellular signalling pathways activated by INSL5 acting at the human RXFP4 receptor stably expressed in CHO cells.

Methods. Cell signalling was investigated using AlphaScreen® assays. Ca\(^{2+}\) flux was monitored in a Flexstation® using X-rhod-1AM. RXFP4 recruitment of Go, protein isoforms were determined by rescue of ERK1/2 responses by PTX-insensitive Go,, C351I mutants (mGo). Cell proliferation was studied by bromo-deoxyuridine (BrdU) cell proliferation ELISA. RXFP4 interactions with β-arrestins 1/2, G protein-coupled receptor kinase 2 (GRK2), K\(\alpha\)s and Rab5a were examined using real-time BRET.

Results. Mouse INSL5 inhibited forskolin-stimulated cAMP accumulation and activated ERK1/2, p38MAPK, Akt-Ser473, Akt-Thr308 and S6 ribosomal protein (S6RP) more potently than human INSL5. No Ca\(^{2+}\) mobilisation was observed. PTX-abolished INSL5-stimulated ERK1/2 signal was rescued by mGo, mGo, mGo, and to a lesser extent by mGo and mGo. RXFP4 interacted with GRK2, β-arrestins 1/2 and Rab5a but dissociated from K\(\alpha\)s.

Discussion. INSL5 negatively regulates cAMP production and activates multiple signalling pathways important for diverse cellular functions including growth, differentiation and proliferation (ERK1/2, p38MAPK, Akt) and protein synthesis (S6RP). Following INSL5 activation, RXFP4 recruits a variety of Go, and is regulated by β-arrestin 1/2 and GRK2 leading to receptor internalisation. Information on signalling pathways activated by INSL5 at RXFP4 is essential for understanding the biological roles of this novel gut hormone.


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55

Insights into the trajectory of neuronal projections to brown adipose tissue derived from the use of novel "brainbow" neurotropic viruses

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The medullary raphe nuclei are regarded as the final common neural relay connecting higher brain centres to the spinal cord and sympathetic outflow to brown adipose tissue (BAT), an observation which is based on functional (electrophysiological) data. In order to define the trajectory of populations of neurons in the hypothalamus, synaptically linked to the medullary raphe nuclei and ultimately BAT, a novel approach was utilised which involves the injection of a modified form of pseudorabies virus (PRV) into the BAT. This changes the colour of its fluorescent reporter when it comes into contact with Cre recombinase. We hypothesise that contrary to the dogma stated at the outset there will be two populations of neurons projecting to BAT, one which passes through the midline raphe and the other that involves alternate premotor pathways in the brainstem. An (AAV)-Cre recombinase construct was injected stereotaxically into the raphe nuclei of male Sprague Dawley rats weighing between 230 and 250 grams. This injection was followed 2 weeks later by injection of PRV Brainbow virus (PRV-263) into the interscapular BAT. After 4 days survival, rats were killed and their brains prepared for histological analyses. PRV-263 which is replication competent was transported retrogradely from the BAT through chains of synaptically-connected neurons in the spinal cord, brainstem and hypothalamus including the midline raphe. After transport through neurons expressing Cre recombinase in the raphe there was recombination of the viral genome at either paired lox2272 or lox\(^P\) sites, resulting in the loss of the red reporter and expression of either cyan (mCerulean) or yellow (eYFP). Importantly there were distinct groups of neurons in the rostroventrolateral medulla, lateral hypothalamus and paraventricular nucleus that retained their red fluorescent reporter consistent with a trajectory other than through the raphe nuclei. These data define the nature of descending neural projections to BAT.

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56

Oleylethanolamine and endocannabinoid responses to intraduodenal lipid infusion in humans: relationships with BMI and energy intake

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Introduction/Aims: Fat stimulates intestinal secretion of oleylethanolamide (OEA) to reduce food intake, while fasting induces intestinal endocannabinoids with an orexigenic effect. Animal studies suggest that high-fat diet-induced obesity impairs intestinal control of endocannabinoid and OEA production, contributing to reduced satiety and weight gain. The aims of this study were to: (i) evaluate effects of intraduodenal (ID) lipid infusion on plasma levels of anandamide (AEA), 2-arachidonylglycerol (2-AG) and OEA in humans, and to examine relationships with BMI and ad libitum energy and fat intakes, and (ii) to evaluate effects of ID lipid on duodenal concentrations of 2-AG, AEA and OEA.

Methods: 19 lean, 16 overweight and 17 obese participants underwent ID Intralipid\(^{2}\) infusion (2 kcal/min) for 120 min during which blood samples were collected every 30 min. Ad libitum energy intake was assessed at a subsequent buffet meal. Endoscopic duodenal biopsies were collected from 4 lean participants, at baseline, and following 30 min ID Intralipid\(^{2}\) infusion (2kcal/min). Plasma and duodenal 2-AG, AEA and OEA concentrations were assessed by HPLC/tandem mass spectrometry

Results: There were positive relationships between fasting plasma 2-AG (r=0.4, P=0.009) and AEA (r=0.3, P=0.018), but not OEA, with BMI. ID lipid had no effect on plasma concentrations of 2-AG or AEA, but there was a group*time interaction for OEA (P=0.026). OEA increased in response to lipid in the obese, but not the lean or overweight groups (post-hoc P=NS). There was
a relationship between plasma OEA at t=120 min with energy (r=0.35, P=0.022), but not fat, intake at the buffet meal. 30-min of ID fat infusion significantly increased duodenal OEA (P=0.046), but had no effect on 2-AG or AEA concentrations.

Conclusions: Fasting endocannabinoid tone, and lipid-induced OEA secretion appear altered in human obesity. Duodenal mobilisation of OEA may play an important role in the regulation of food intake.

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Weight loss and tissue remodelling following 8-week calorie restriction or intermittent fasting in females who are overweight and obese

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Tissue remodelling and changes in macrophage polarisation occur in adipose tissue (AT) and skeletal muscle (SM) in response to nutrient availability in animals [1-4]. This study aimed to compare the effects of daily calorie restriction (CR) versus intermittent fasting (IF) on markers of AT and SM remodelling in women.

Women (N=75, 50.3±1.0y, BMI 32.4±0.5 kg/m²) were randomised to 1 of 3 groups for 8 weeks, and provided with foods at 70% (IF70 and CR70), or 100% (IF100) of energy requirements. CR70 participants consumed food daily, whereas IF participants ate breakfast, prior to initiating a 24-hour fast, for 3 non-consecutive days/week. Fasting bloods, subcutaneous abdominal AT and quadriceps muscle biopsies were obtained at baseline, and 8 weeks, after a 12-h overnight fast (all groups), and 24-h fast (IF groups). Markers of macrophages and extracellular matrix (ECM) were examined by qPCR.

We observed significant weight loss after 8 weeks, with greater weight loss in IF70 vs. CR70 and IF100 (P<0.05). Insulin sensitivity, assessed by HOMA-IR, was improved in IF70 and CR70 following a 12-h fast and in all groups following a 24-h fast, with greatest improvement in IF70 (P<0.05). Reductions in NEFAs were greater in IF70 vs. CR70 after a 12-h fast, whereas NEFAs increased after a 24-h fast in IF groups (P<0.05). In AT, CD40 expression (M1-macrophage marker) was increased following a 24-h fast in IF70 and MMP2 (involved in breakdown of ECM) was increased in CR70 and IF70 (P<0.05). In SM, CD163 (M2-macrophage) expression was increased after 12- and 24-h fasts in fasting groups (P<0.05).

Weight loss stimulated markers of ECM remodelling in AT. IF increased pro-inflammatory M1 macrophage in AT and anti-inflammatory M2 macrophages in muscle. We speculate this increase in macrophages may be an appropriate response to buffer increased lipolysis in response to severe energy deprivation.

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The influence of meals containing differing fatty acid compositions on appetite parameters in overweight and obese individuals

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Introduction: It has been proposed that differing dietary fats are capable of modulating appetite signalling, possibly altering the amount of food consumed at subsequent meals, and in the long term, body weight.

Methods: Eight normoglycaemic overweight or obese individuals (BMI 32 ± 1.2 kg/m²) randomly completed three single-blinded, fasting breakfast challenges separated by one week. Meals provided 30% of EER and consisted of toasted bread, jam and varying oils, resulting in an isoenergetic control, oleic acid (OA) and linoleic acid (LA) meals. The two high fat meals had equal lipid contents and matched levels of the specifically elevated fat. Blood samples were collected via an intravenous cannula at baseline (1 ¼ h pre-consumption), and 1 and 2h post consumption. Appetite parameters were assessed immediately before consumption and 2 hours postprandially with visual analogue scale questionnaires. Serum adiponectin, ghrelin, leptin, adiponin, CRP, GIP, GLP-1, glucagon, insulin, PAI-1, resistin and visfatin were quantified using a Bioplex multiplex suspension array system.

Results: The LA meal resulted in a net increase in Ghrelin AUC over the sampling period compared to the control meal, accompanied by no change to postprandial prospective food intake perception. The LA meal resulted in a net increase in adiponectin AUC and absolute increase over the sampling period compared to the control and high oleic acid meals. No other measurements were affected by meal type consumed.

Discussion: The increase in Ghrelin and lack of change in post prandial prospective food intake in response to the high linoleic acid meal may show a dysregualtion in satiety signalling and appetite control. The reason for the acute increase in adiponectin following the consumption of the linoleic acid meal is unclear and requires further investigation.
Cognitive performance in normal weight and obese young women and its association with omega-3 PUFA

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Background and significance: Low body status of omega-3 polyunsaturated fatty acids (n3PUFA) has been linked with cognitive decline in older adults. Evidence also indicates that obesity and its comorbidities may be associated with cognitive decline, however it is as yet unknown as to how these factors affect cognition in younger adults. Since n3PUFA status and obesity are both modifiable risk factors for reduced cognitive function, we sought to understand their relationship with cognition at an age and stage when they may indeed be effectively treated/modified.

Methods: Non-smoking, healthy, young (18-35 y) normal weight (BMI 18.5-24.9kg/m2, NW) and obese weight (BMI >30kg/m2, OB) women were recruited. Participants completed anthropometric and cognitive assessments (using a validated computerised cognition testing platform, IntegNeuro®), and provided a fasting blood sample. Performance on five cognitive domains (impulsivity, attention, information processing, memory, executive function) was reported as z-scores (normal range ±1 z-score). Omega-3 Index (O3I) was calculated as the erythrocyte membrane content of eicosapentaenoic acid plus docosahexaenoic acid as a percentage of total membrane fatty acids. Analyses used ANOVA, Chi square and Pearson correlation.

Major findings: 288 (NW: n=150, OB n=138) women (mean±SD: 25.8±5.1 y) completed all assessments. Although cognitive function was within the normal range, OB women had poorer performance on attention (NW: 0.31±1.38; OB: -0.25±1.38, p<0.001) and were more impulsive (NW: 0.36±1.14; OB: -0.07±1.07, p=0.033). Mean O3I for NW and OB were 6.8±1.7 and 5.8±1.6 respectively, p<0.001. Differences in impulsivity, but not attention, between OB and NW women were attenuated when analyses were controlled for O3I.

Conclusions: OB women had lower scores for attention and impulsivity, with O3I explaining some of the differences in impulsivity. However, as cognitive performance was in the normal range for both groups, the clinical significance for daily cognitive function warrants further investigation.

To nanny or nudge to prevent obesity? An analysis of the ‘intrusiveness’ of stakeholder recommendations to the Australian Government.

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The ethical concern of a ‘nanny state’ averts governments from implementing cohesive policies for obesity prevention. This study explored the similarities and differences in policy options, proposed by different stakeholder groups, through constructs of intrusiveness and autonomy. We conducted a content analysis of submissions to the Australian Government’s Inquiry into Obesity (2009), sub-grouped by setting, target behaviour and stakeholder, and categorised by intrusiveness to choice. Each recommendation was labelled as autonomy-positive, neutral or negative according to an existing ethical framework [1]. Submissions (n=158) were made by academia (23%), industry (18%), public health specialists (16%), NGOs (15%), consumers (13%), public providers (11%) and policymakers (5%). The findings suggest the degree of influence to autonomy, is significantly associated with the frequency of recommendation (<0.001). Enhancing autonomy for dietary change was the most frequent recommendation in all groups. Options which reduced autonomy were least frequently recommended in every setting; but more likely in schools (28%, n=26). Cross-group comparison suggests a significant difference in the frequency of autonomy-negative, neutral, and positive recommendations made between the stakeholder groups (p<0.05). Consumers recommend reducing individual autonomy to the greatest extent, whilst industry and policy makers suggest this least frequently. To improve dietary choice, industry were the only group not to recommend diminishing autonomy. To increase physical activity, consumers were the only group to recommend reducing autonomy more frequently than enhancing autonomy. This analysis supports the relevance of these constructs to obesity prevention policy options. The acceptable level of intrusiveness may vary according to setting, target behaviour and stakeholder. The emphasis can be diverse among stakeholders involved in obesity, and significance of industry in influencing policy decisions. Given the consensus across stakeholder groups favouring policies which enhance autonomy, considering the influence of policy on autonomy could provide a tool for governments to re-frame action for obesity prevention.

1. (1) Griffiths & West (2015) http://dx.doi.org/10.1016/j.puhe.2015.08.007
Understanding attitudes towards the integration of obesity and eating disorders health promotion among key stakeholders: A focus group study

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In the past three decades, there has been a substantial increase in prevalence of both obesity and eating-disordered behaviours (EDB). There are strong empirical and conceptual arguments to support initiatives that aim to simultaneously prevent obesity and EDB. However, the perceived acceptability of integrated programs among the public, health professionals, and other key stakeholders is largely unknown. The lack of this information is a major barrier to health promotion efforts. With a view to redressing this situation, we conducted focus groups with a broad range of health professionals at the 2015 Eating Disorders and Obesity Conference.

The goal of this presentation is to summarise the key findings from this research. Issues addressed included: knowledge and beliefs concerning the relative importance of eating disorders and obesity as public health problems requiring attention; beliefs about the desirability and feasibility of an integrated approach to prevention; and beliefs about the specific health promotion messages likely to be most effective in the context of an integrated approach. Using a grounded theory framework, three interdisciplinary focus groups were conducted with a total of 24 participants including doctors, mental health professionals, dietitians, academics, teachers and consumer group representatives.

Themes that emerged included: scepticism regarding the feasibility of integrating obesity and EDB prevention/health promotion messages; poor awareness and understanding of EDB relative to obesity; broad support for health promotion messages focusing on health and well-being; body diversity, a balanced diet, and physical activity; the need to target youth in prevention/health promotion campaigns; broad support for government regulation of factors affecting individuals’ diet and physical activity; and a strong belief in the role of the environment in people’s health decisions behaviours. The implications of these findings will be discussed, along with plans for the conduct of further focus groups and for the next, quantitative phase of the research.

The impact of weight-loss interventions on health expenditure in Australia: evidence from a microsimulation model of obesity and chronic disease

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Obesity is a costly health issue within the Australian context. It is a major risk factor for multiple chronic diseases, significantly contributing to Australia’s burden of disease and health system costs. This study describes potential health system savings and productivity gains in the older working population across three interventions: usual care of general practitioner advice, commercial weight loss programmes by doctor referral and bariatric surgery.

This study is based on a microsimulation model, NCDMod, focused on obesity, its inter-relationship with other health risk factors and chronic disease (cardio-vascular disease and diabetes). The model uses the ABS 2005 National Health Survey as the base file and projects out to 2025 in 5 year increments. BMI transition equations operate by changing an individual’s weight over time as their risk factors change. The model allows the comparison of various health outcomes. The projected CVD prevalence are then input into Health&WealthMOD2030 to obtain productivity impact measures including productive years of life lost.

The modelling included simulation of approximately 300,000 participants in the commercial weight loss programme scenario and 30 000 individuals in the bariatric surgery scenario. Under the model assumptions, commercial weight loss programme scenario projected 3500 averted cases of diabetes, 7500 averted CVD incidents and 2000 CVD deaths avoided over 10 years. Bariatric surgery scenario projected 2500 averted cases of diabetes, 2000 averted CVD events and 30 averted CVD deaths. To the health system, the commercial weight loss programme projected $Au 2200 million savings to the health system whilst the bariatric surgery projected approximately $Au 150 million in savings to the health system in the 10 year period.

Interventions such as a commercial weight loss programme, with potential wider reach, though not as effective at the individual level for weight loss, have potential population level impact offering meaningful prevention of chronic disease and health system savings.
Improving nutrition in Australia and globally: lessons from Mai Wiru and the Anangu Pitjantjatjara Yankunytjatjara Lands

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Introduction: Indigenous communities suffer a greater burden of diet-related ill health than other Australians. This study examined the impact of efforts to improve nutrition and food supply on Anangu Pitjantjatjara Yankunytjatjara (APY) Lands in Central Australia from 1986.

Methods: Multiple methods were employed including systematic document searches. Dietary intake of the five APY communities that have a Mai Wiru (good food) store was quantified by the store-turnover method. The price of a basket of basic foods, implementation of nutrition policy requirements and healthy food checklists were assessed in all APY communities at intervals from 2012. Results were compared with previous available data.

Results: Concerted efforts resulted in marked achievements including decreased intake of sugar, increased availability and affordability of healthy foods (particularly fruit and vegetables) and consequent improvement in some nutrient intakes. Yet, the overall effect has been a decrease in total diet quality since 1986, characterised by increased supply of unhealthy products high in saturated fat, added sugar and salt, particularly sugar sweetened beverages, convenience meals and take-away foods.

Conclusions: Improvements confirm that residing in remote communities can help Aboriginal residents exert control over key aspects of the food system. However, the overall findings reflect broader changes to the broader Australian food supply and reinforce the notion that, in the absence of supportive regulation and market intervention, adequate and sustained resources are required to improve nutrition, prevent and manage diet-related disease on the APY Lands. The study also provides insights into food systems affecting other remote communities, wider Australia and countries globally.


A new index to examine junk food consumption among Australian children: trends and associated characteristics

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Background
An overall measure of children’s junk food consumption may prove useful in the development of strategies aimed to prevent childhood overweight and obesity. The aims of this study were to a) describe the development of a children’s Junk Food Index (JFI); b) summarise junk food consumption (c) examine the association between the JFI and health related behaviours and d) examine change in JFI between 2010 and 2015 among children age 5 to 16 years.

Methods
Secondary analysis of the 2010 and 2015 New South Wales School Physical Activity and Nutrition Survey (SPANS). Data were collected by questionnaire with parent’s proxy reporting for children in years K, 2 and 4 and children in years 6, 8 and 10 self-report. Descriptive statistics and logistic regression analyses were conducted using SPSS Complex Sample Analyses.

Results
A total of 7,565 and 6,944 children had complete data on consumption of junk foods, in 2010 and 2015, respectively. The 2015 survey data showed that among students from high SES neighbourhoods, there were fewer high junk food consumers than low junk food consumers. Children from Middle Eastern cultural backgrounds had a higher junk food consumption, were more likely to consume take-away three or more times per week, ate dinner in front of the television, received sweet rewards, allowed to consume snacks anytime and had soft drinks available at home. There was a lower proportion of high junk food consumers in 2015 compared to 2010.

Conclusion
This is the first study to provide and examine an index summary of overall junk food consumption among Australian children. While junk food consumption reported among NSW school children is lower in 2015 compared with 2010, the public health workforce must continue their efforts, as levels of junk food consumption remains of concern among children from NSW and nationwide.
Feasibility of an online PEACH™ (Parenting, Eating and Activity for Child Health) Lifestyle program for parents of primary school children

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Delivery of the PEACH™ program to parents of primary school-aged children via face-to-face groups identified barriers to engagement, attendance and retention of families. This pilot study aimed to determine the feasibility of a modified PEACH™ program delivered online, PEACH™ Lifestyle. The 4-month program consisted of 3×10-minute videos, an introductory pack, a pre-session welcome phone call and 4×1-hour online group-based sessions (every 3 weeks). Sessions were facilitated by a trained PEACH™ Dietitian using the online platform “FLO (Flinders Learning Online)-Live” and between-session support provided through a private Facebook group. Participants completed pre- and post-program evaluation questionnaires. A subsample completed a semi-structured, post-program telephone interview exploring their views on enablers and barriers to program engagement and retention. Fifty-seven families expressed interest in the program (n=2 ineligible, n=23 did not enrol). Of the 32 enrollees, 15 did not participate in any online sessions (‘dropouts’), 14 participated in some sessions (‘partial completers’), and three participated in all sessions (‘completers’). Nine participants (n=3 ‘completers’, n=6 ‘partial completers’) completed the evaluation questionnaires. Eight reported being moderately/extremely confident in making changes to their child/rent’s eating and activity patterns post-program compared to 1 pre-program. Overall, seven participants were extremely satisfied with the program and all nine would recommend it to other families. Interviews (n=15; n=4 ‘non-enrollees’, n=5 ‘dropouts’, n=4 ‘partial completer’, n=2 ‘completers’) identified five major (31 minor) enabler themes and four major (19 minor) barrier themes. Consistent major enabler and barrier themes were: 1) family factors, 2) program characteristics and 3) online delivery. The PEACH™ Lifestyle online program eliminated the geographical barrier of program access previously observed in PEACH™ programs delivered face-to-face, whilst maintaining improvements in parental confidence to make family healthy lifestyle changes. However, parental engagement remains a challenge. Future online programs should consider barriers to internet access and connectivity issues and strategies for improving engagement.

Weight management practices associated with Polycystic Ovary Syndrome and their relationships with diet and physical activity

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Objective: To comprehensively examine weight management practices in a large community sample of women with and without PCOS and their associations with dietary intake and physical activity.

Design: This study is a large population-based observational cross-sectional study (Australian Longitudinal Study on Women’s Health).

Setting: Australia.

Participants: Women in the 1973-78 cohort (n=7767 total; n=556 with PCOS, n=7211 without PCOS).

Main outcome measures: Healthy or potentially unhealthy weight management practices, dietary intake and physical activity.

Results: Women with PCOS were more likely to be following both healthy (reducing meal or snack size, reducing fat or sugar intake or following a low glycaemic index diet) and potentially unhealthy weight management practices (smoking or use of laxative, diet pills, fasting or diuretics) than women without PCOS. For women with PCOS, use of a range of healthy weight management practices were associated with increases in physical activity, diet quality, % protein and decreases in glycaemic index, % fat, % saturated fat, % carbohydrates or fibre. Use of potentially unhealthy weight management practices were associated with decreases in diet quality.

Conclusion: In PCOS, a common condition where lifestyle management is recommended first line, we report novel findings that community-based women with PCOS are more likely to follow both healthy and potentially unhealthy weight management practices than women without PCOS. Use of healthy practices is generally associated with improved dietary intake or physical activity and use of potentially unhealthy practices is associated with poorer dietary intake. In PCOS we should focus on improving healthy weight practices across both diet quality and quantity and on addressing unhealthy weight practices and their potential adverse effect on dietary intake.
Seniors’ food shopping priorities

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Both obesity and malnutrition are serious health issues associated with older age, highlighting the importance of managing diet and nutrition to achieve healthy ageing. This study investigated seniors’ priorities when food shopping to provide insight into health promotion strategies that could assist in optimising nutrition in later life. A novel exploratory approach was adopted to access and engage with older Australians. Various recruitment strategies (e.g., community newspaper and radio advertisements and flyers) were used to attract an initial cohort of seniors (n=8) who were subsequently trained in interviewing techniques and asked to invite up to 10 friends and acquaintances also aged 60+ years to participate in the study. These eight seniors then interviewed their peers, resulting in a final sample of 75 seniors. The interview guide covered a range of nutrition-related issues, including food shopping preferences and behaviours. The interviews were audio-recorded, transcribed verbatim, and analysed using NVivo11. The study produced a comprehensive typology of factors that influence seniors’ food shopping behaviours, including those relating to store, product category, and brand decisions. Overall, the interviewees expressed satisfaction with current food retailing options and felt there was adequate range and quality available in most food product categories. Reflecting earlier research, price was of paramount concern. Nutrition-related issues nominated as problematic by the interviewees included packaged portion sizes and country of origin, the latter being perceived as a serious nutrition issue. There was relatively little concern about specific micro or macro nutrients, with most considering their diets to be already healthy due to being based on a lifetime of nutrition knowledge. The findings indicate that the health value of foods could be made more salient to older shoppers to encourage them to reconsider their choices in the context of current dietary guidelines and reduce high levels of concern about country of origin.

Invited talk: Understanding human movement and energy expenditure - how far have we wandered and are we on the right track?

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In the field of obesity research, physical activity and activity energy expenditure were viewed for many years simply as one side of the energy balance equation. Interest in these domains was driven predominantly by the challenge to explain why obese individuals were in positive energy balance, and how much movement would be needed to offset levels of energy intake. An array of objective and subjective measurement approaches have been devised to capture movement in its various guises; sometimes with the intention to also measure energy expenditure. Misalignment of assessment tool and outcome measure can lead to misinterpretation of the extent to which physical activity level contributes to weight gain, and the particular therapeutic benefit of exercise for treating comorbidities. Despite considerable research effort, there remains some confusion in what physical activity messages and interventions are most valuable for combating obesity and comorbidities. Revisiting the basics of human movement measurement may be needed before we can fully appreciate the interface between physical activity and obesity.

Invited talk: Exercise: Understanding physiology and molecular mechanisms - a pathway to therapies

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There is convincing epidemiological evidence that regular physical activity, including structured exercise, is associated with improved health outcomes. This appears to be partly related to the total exercise energy expenditure. Over the years, many physiologists have examined the integrative biology of exercise to better understand physiological responses to homeostatic challenges. These insights have often been used to identify the physiological limits of, and the optimal strategies to enhance, athletic performance. Increasingly, studies in exercise biology provide new ideas on the mechanisms by which exercise exerts its beneficial effects on health. With increased application of emerging techniques in molecular and cell biology, there is now even greater understanding of the molecular mechanisms underpinning the adaptive responses to acute and chronic exercise. This information has the potential to optimise exercise interventions and to identify novel therapeutic strategies, including potential “exercise mimetics”, although whether full recapitulation of exercise effects can be achieved by one, or several, pharmacological agents is debated. Another prospect emerging from the ‘omics’ era is greater understanding of the physiological and molecular bases of individual variation in responses to exercise. Although the technology remains ahead of the biology, analysis of the large data sets being generated from exercise studies may one day result in precision “exercise medicine” and a really personalised trainer.
Invited talk: Mapping complex molecular networks underlying exercise using global phosphoproteomics

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Exercise is essential in regulating energy metabolism and remains the most promising therapy for obesity and type 2 diabetes. However, the intricate cellular signalling networks underlying tissue responses to exercise-stimulated metabolic and mechanical stress are not fully understood. Global, unbiased discovery approaches are warranted to map these complex, interconnected molecular networks that promote the systemic health benefits of exercise.

Protein phosphorylation is central to a range of exercise-induced tissue adaptations including regulation of skeletal muscle metabolism and contraction. Therefore, we previously undertook a global mass spectrometry-based phosphoproteomic analysis comparing human skeletal muscle biopsies before and after a high-intensity exercise bout (1). This revealed over 1,000 exercise-regulated phosphorylation sites on over 500 proteins, including a majority of kinases and phosphosites never previously implicated in exercise signalling. Furthermore, novel exercise-regulated substrates of the energy-sensing AMP-activated protein kinase (AMPK) were uncovered using this global approach. Ongoing studies will be discussed that are aimed at determining how components of the acute exercise signalling network are impacted by skeletal muscle contraction and nutrient availability.

Collectively, multidisciplinary global phosphoproteomics and targeted physiological approaches have led to the discovery of exercise biological targets and new roles for kinases such as AMPK. This rapidly expanding frontier in understanding the molecular underpinnings of exercise will aid development of therapeutic strategies to improve human health and target obesity-related pathophysiology.


Invited talk: Use of a Potent Calorie Restriction Mimetic to selectively recover POMC activity, thereby reversing dietary induced weight gain

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17α-E2 significantly extends lifespan in male mice following late-life administration. We previously showed that this non-feminising, naturally occurring enantiomer of 17β-estradiol (17β-E2) mimics the beneficial effects of calorie restriction, reversing multimorbidity in aged male mice1. Given that 17α-E2 reduced food intake, it was proposed that 17α-E2 might promote weight loss in obese mice through suppressing appetite.

We first assessed the effect of dietary-17α-E2 treatment on body mass, body composition, food intake, activity and energy expenditure in male mice maintained on an obesogenic high fat diet. 17α-E2 initiated weight loss soon following treatment, resulting in an overall reduction in body mass regardless of continued high fat feeding. Reduced body mass was attributed to a loss in total, epigonal and subcutaneous fat mass and not fat free mass. This was matched by improved glucose clearance and insulin sensitivity. Dietary supplementation with 17α-E2 selectively reduced food intake, without altering physical activity or metabolic rate. We previously proposed that 17α-E2 might selectively modify food intake, acting via hypothalamic proopiomelanocortin (POMC)-expressing neurons. POMC-expressing neurons, located within the arcuate nucleus (ARC) of the hypothalamus, are widely recognized for their capacity to regulate energy homeostasis, and represent the largest and most dominant anorexigenic node of central appetite regulation. Ancillary experiments in mice with selective deletion of ARC POMC neurons found complete loss of 17α-E2 treatment effects on food intake, confirming that 17α-E2 promotes satiety by enhancing the function of anorexigenic feeding circuitry.

Collectively, our data show that 17α-E2 acts via hypothalamic POMC-expressing neurons to inhibit food intake. We propose that 17α-E2 may serve as a potent calorie restriction mimetic by enhancing calorie sensing of POMC neurons.

Impact of Endurance Exercise Training on Adipocyte miRNA Expression in Overweight Men

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Adipocytes are major regulators of metabolism and dysregulated adipocyte function in obesity is linked to the metabolic syndrome. Endurance-exercise training improves adipocyte function; however, the molecular mechanisms that regulate the chronic adaptive responses are incompletely described. microRNAs (miRNAs) influence adipocyte differentiation and metabolism, yet their role in exercise-induced adipocyte phenotypes is unknown. We used next generation sequencing (NGS) to profile miRNA expression of adipocytes isolated from subcutaneous abdominal (ABD) and gluteofemoral (GF) adipose tissue of overweight men before and after six weeks of endurance-exercise training. Differentially expressed miRNAs were over-expressed or silenced in 3T3-L1 adipocytes and lipid metabolism examined. NGS identified 526 miRNAs in adipocytes and there were no statistical differences in miRNA expression when comparing the pre- and post-training samples for both ABD and GF adipocytes. miR-10b expression was increased in ABD compared with GF, while miR-204, miR-3613 and miR-4532 were more highly expressed in GF compared with ABD adipocytes. Blocking miR-10b in adipocytes suppressed β-adrenergic lipolysis but had a minor effect on lipid metabolism in general. Unlike their critical role in adipogenesis, stable changes in miRNA expression do not play a prominent role in the regulation of adipocyte function in response to endurance-exercise training.

CNS reward pathways and anorexia nervosa (AN) - insights from a rat model.

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Patients suffering anorexia nervosa (AN) become anhedonic; unable or unwilling to derive normal pleasures and tend to avoid rewarding outcomes, most profoundly in food intake. Conversely, obesity is a condition that may be potentiated by excessive reward seeking and enhanced motivation for the rewarding properties of food. The activity-based anorexia (ABA) model allows investigation of the underlying neurobiology of AN, especially because it displays many characteristics in common with the human condition, including anhedonia. We aim to exploit this model to highlight the importance of CNS reward in the maintenance of body weight. We hypothesise that increasing the neuronal activity of circuits with predicted involvement in the anhedonia/reward pathways of ABA will prevent associated weight loss.

Female rats (n=24; 6 weeks old) underwent separate bilateral stereotaxic injections of canine adenovirus-2-Cre (CAV-2-Cre) and activating DREADDs [AAV-hSyn-DIO-HM3D(Gq)-mCherry] into the NAcc (shell) and the VTA, respectively. DREADDs reorient in the presence of retrogradely-transported Cre and systemic clozapine-n-oxide (CNO) administration causes mCherry-labelled cells to depolarise with temporal and anatomical specificity. The ABA protocol involves free access to running wheels and time-limited (90 min) access to food, with daily i.p. injections of CNO or saline (control) at the onset of the feeding period. CNO activates DREADD-expressing, VTA neurons as evidenced by colocalisation with elevated levels of Fos protein, a marker of neuronal activation. Importantly, excitation of this pathway with CNO attenuates the rapid weight loss associated with ABA with a profound effect on survival $[\chi^2(1)=8.14, p=0.004]$. Activation also increases food anticipatory activity (FAA) and decreases basal running activity at discrete time periods. The contribution of energy expenditure to body weight maintenance during activation is unclear. These results will inform not only the neurobiological underpinnings of AN but also provide an insight into the mechanisms of reward pathways relevant to feeding and weight loss.
Harnessing the sun to halt obesity: vitamin D, nitric oxide and brown adipose tissue.

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The role of vitamin D in curtailing the development of obesity and comorbidities like the metabolic syndrome (MetS) and type-2 diabetes has received much attention recently. However, clinical trials have failed to conclusively demonstrate the benefits of vitamin D supplementation. In most studies, serum 25-hydroxyvitamin D (25(OH)D) decreases with increasing BMI above normal weight. These low 25(OH)D levels may also be a proxy for reduced exposure to sunlight-derived ultraviolet radiation (UVR). We have found that frequent skin exposure to a low non-burning dose of UVR reduced weight gain in C57Bl/6 male mice fed a high fat diet. Ongoing exposure to UVR also significantly suppressed glucose intolerance, insulin resistance, signs of non-alcoholic fatty-liver disease and serum levels of fasting insulin and glucose. These findings were independent of circulating 25(OH)D, and most could not be mimicked by vitamin D supplementation. We are now starting to characterize the effects of biological mediators induced by exposure to UVR, such as nitric oxide, and their potential to prevent obesity in already ‘overweight’ mice, as well as the potential involvement of brown adipose tissue using the uncoupled protein-1 luciferase transgenic mouse (“Thermomouse”), in which thermogenesis in brown adipose tissue can be tracked in vivo. Our studies suggest that UVR (sunlight exposure) may be an effective means of suppressing the development of obesity and MetS through mechanisms that are partially dependent on nitric oxide, and other novel UVR-induced mediators.

Investigating the molecular basis and therapeutic potential of the Heme oxygenase-1 (HO-1) – adiponectin axis

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Adiponectin is a beneficial hormone produced primarily by adipocytes. paradoxically, circulating adiponectin levels are reduced in the context of obesity and associated diseases. This hypoadiponectinemia is implicated in the aetiology of obesity-related cardiometabolic diseases making therapeutic strategies to increase adiponectin attractive. An emerging body of literature suggests that increasing heme oxygenase 1 (HO-1) may increase adiponectin levels, prompting the proposal of an ‘HO-1 – adiponectin axis’. We have performed a series of investigations to explore this possibility.

Using two in vitro models of human adipocytes, combined with a comprehensive array of pharmaceutical (cobalt protoporphyrin (CoPP) or hemin) and genetic modulators of HO-1, we found that neither acute¹ nor chronic induction of HO-1 results in increased adiponectin production. However, in a mouse model of diet-induced obesity we observed that systemic induction of HO-1 with CoPP increased circulating adiponectin levels and this was concurrent with decreased food intake, body weight gain and adipocyte size as well as enhanced insulin sensitivity and reduced liver steatosis. Importantly only the effect on adiponectin was blunted when mice were co-treated with an inhibitor of HO-1 activity (SnMP).

Taken together, our in vitro and in vivo observations suggest that CoPP increases circulating adiponectin levels in an indirect manner that is, at least partly, dependent on HO-1 activity. Furthermore, our in vivo studies indicate that systemic treatment with CoPP results in reduced food intake and improvements in a range of metabolic parameters in a manner that is independent of HO-1 activity. Further studies are warranted to identify the underlying mechanisms that may reveal new molecular targets for the treatment of obesity and associated diseases.


Invited talk: Treating Diabetes and Obesity Using the Gut Microbiome Involves Dietary Diversity

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Background: A healthy gastrointestinal microbiome is a diverse microbiome and results from a diverse diet. During the past 50 years, 75% of the world’s dietary diversity has been lost. One can look for gut dysbiosis in disease and give foods to correct the dysbiosis or use rare, heirloom foods to increase microbiome diversity as two strategies to treat disease by acting on the gastrointestinal microbe.

Methods: The microbiome in diabetes is low in short chain fatty acid (SCFA) production, has increased GI inflammation and produces excess methane. NM-504 contains inulin, beta-glucan and blueberry pomace to address the SCFA, GI inflammation and methane abnormalities, respectively. Soy pod fiber can be stimulated to make glyceollin which increases microbiome diversity.

Results: NM-504 reduced blood sugar in a clinical trial to a similar degree as sitagliptin, a DPP-4 inhibitor. NM-504 protected the GI mucosal barrier from inflammation, reduced hsCRP, reduced appetite, and had no adverse events while increasing bowel regularity. NM-504 also reduced the GI side effects associated with metformin. Young soy pods activated to make glyceollin by cutting was fed to mice with dietary obesity. The mice ate more food, but lost weight and systemic inflammation was reduced.
Fecal fat was increased, but there was no oil in feces. The activated soy contains an FXR agonist, reduces inflammation, fecal bile acids, bile acid transport and decreases microbiota making antagonists of bile acids in the gut. Conclusion: Increasing the diversity and correcting the dysbiosis of the GI microbiome in disease can be used in the treatment of diabetes, metformin intolerance, obesity and possibly non-alcoholic fatty liver disease.

77

Early weight loss responders to liraglutide 3.0 mg had greater weight loss, regression to normoglycaemia, and reduced T2D development at 3 years vs early non-responders: SCALE Obesity and Prediabetes

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Background: The SCALE Obesity and Prediabetes (NCT01272219) trial randomised adults with prediabetes and obesity (BMI ≥30 kg/m²) or overweight with comorbidities (≥27 kg/m²; dyslipidaemia/hypertension) to liraglutide 3.0 mg (N=1505) or placebo (N=749) as adjunct to diet and exercise for 3 years.

Methods: This post-hoc analysis compared liraglutide 3.0 mg early responders (ERs; ≥5% weight loss [WL] at Week [W] 16) and early non-responders (ENRs; <5% WL at W16), in keeping with EMA and Australian stopping-rule criteria. Efficacy outcomes are estimated means in ERs (n=580) and ENRs (n=210) who completed 160 weeks’ treatment. Development of T2D/regression to normoglycaemia were analysed using the full analysis set with LOCF. Safety was analysed using the safety analysis set. Placebo data are shown only for proportion of ERs/ENRs.

Results: Of those with W16 data, for liraglutide 3.0 mg (n=1302) 68.0% were ERs and 32.0% ENRs; for placebo (n=640), 22.3% were ERs and 77.7% ENRs. At W160, greater WL (−8.6% and −9.1 kg change in ER body weight versus −2.9% and −3.1 kg for ENRs), reduced proportions of subjects developing T2D (0.5% ERs, 3.2% ENRs) and greater regression to normoglycaemia (69.8% in ERs, 55.4% in ENRs) were observed in ERs to liraglutide 3.0 mg vs ENRs. ERs showed greater clinical improvements (FPG, HbA1c, SBP levels) and patient-reported improvements compared with ENRs (SF-36 score +3.68 vs +1.81 and IWQOL-Lite score +13.40 vs +9.53 for ERs and ENRs, respectively. Increase in score=improvement). Adverse events (AEs) and GI AEs were similar between groups (87.1% and 75.3% for ERs; 95% and 71.6% for ENRs) while serious AEs and gallbladder disorders were more frequent in ERs (17.7% and 6.3% vs 12.7% and 2.2% for ENRs).

Conclusions: Among those treated with liraglutide 3.0 mg for 160 weeks, greater benefits were seen in ERs vs ENRs; overall AE rates were similar.

78

Liraglutide 3.0 mg reduces body weight and improves cardiometabolic risk factors in adults with obesity or overweight, but without diabetes: the SCALE Obesity and Prediabetes randomised, double-blind, placebo-controlled 3-year trial

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Aims/Objectives: Obesity and prediabetes are risk factors for developing T2D. 5-10% weight-loss can reduce risk of developing T2D by >50%. This phase-3 trial investigated effects of liraglutide 3.0mg, as adjunct to diet+exercise, on delaying onset of T2D over 3 years (primary endpoint), body-weight and cardiometabolic risk factors.

Methods: Individuals (BMI ≥30kg/m², or ≥27kg/m² with ≥1 comorbidity) were randomised 2:1 to once-daily subcutaneous liraglutide 3.0mg (n=1505) or placebo (n=749) and advised on a 500-kcal/day deficit diet and 150-min/week exercise. Efficacy data are observed means, with last-observation-carried-forward (LOCF) imputation. Clinicaltrials.gov NCT01272219.

Results: Baseline characteristics were (mean±SD): age 47.5±11.7 years, 76.0% female, weight 107.6±21.6kg, BMI 38.8±6.4kg/m². With continued treatment over 160 weeks, time to T2D onset was 2.7-fold longer with liraglutide 3.0mg than placebo [95%CI 1.9:9.9, p<0.0001], corresponding to a hazard ratio of 0.2; 3% vs 11% of patients, respectively were diagnosed with T2D. More individuals on liraglutide (66%) than placebo (36%) progressed from prediabetes (ADA2010 criteria) to
normoglycaemia by week 160 (OR 3.6 [3.0;4.4], p<0.0001). Individuals on liraglutide 3.0 mg lost more weight than on placebo (6.1% vs 1.9%; estimated treatment difference [ETD] -4.3% [95%CI -4.9; -3.7]), accompanied by greater mean reductions in waist circumference (ETD -3.5 [-4.2; -2.8] cm), SBP (ETD -2.8 [-3.8; -1.8] mmHg), triglycerides (ETD -6%[-9%; -3]) and high-sensitivity C-reactive protein (ETD 29% [-34; -23]) (all p<0.001). Mean pulse increased with liraglutide 3.0mg vs placebo (ETD 2.0 [1.2;2.7] beats/min, p<0.0001). AE incidence was 94.7% with liraglutide 3.0mg vs 89.4% with placebo, SAEs 15.1% vs 12.9%. Adjudicated major adverse cardiovascular events (non-fatal myocardial infarction, stroke, cardiovascular death) were low overall (0.19 vs 0.20 events/100 patient-years-of-observation for liraglutide 3.0mg vs placebo).

Conclusion: Liraglutide 3.0mg, as adjunct to diet+exercise, delayed the onset and reduced the risk of T2D over 3 years in adults with prediabetes, reduced body weight and improved cardiometabolic risk factors.

Effects of exercise on appetite and gut hormones: implications for weight management.

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Background: Regular exercise is essential for long-term weight maintenance; however, the role of exercise in weight loss is sometimes questioned due to the potential compensatory increases in hunger and food intake, associated with changes in appetite hormones. We examined the effects of exercise training on appetite and gut hormones, in addition to energy intake, subcutaneous adipose tissue (SAT) and visceral adipose tissue (VAT) in adults with overweight/obesity.

Methods: Twenty-three inactive adults with overweight/obesity (BMI 33.3 ± 5.5 kg/m²) aged 47 ± 9 years were randomised to 8-weeks of aerobic (n=17, 30-60 minutes per session at 50-70% of VO2max, 3-4 days/week) or resistance exercise training (n=5, 8-10 exercises per session, 8-12 repetitions, 2-3 sets per exercise at 80-85% of 1-repetition maximum, 3 days/week). Intervention group data (aerobic and resistance exercise training) were combined for data analyses. Participants were instructed not to alter their diet. Before and after the intervention, fasting subjective appetite sensations (using visual analogue scale) and plasma for gut hormone levels were collected after an overnight fast. Energy intake was recorded using 3-day food diaries, and VAT and SAT were measured via magnetic resonance imaging. Changes from baseline were analysed using paired t-tests.

Results: Eight-weeks of both exercise training interventions induced significant reductions in VAT (-159 ± 195 cm², p<0.001) and SAT (-331 ± 756 cm², p=0.003), with no significant changes in weight (-0.9 ± 2.2 kg, p=0.07), subjective appetite sensations, plasma ghrelin, PYY or energy intake (p=0.05 for all).

Conclusions: In the absence of explicit dietary restrictions in adults with overweight/obesity, neither type of exercise training, which effectively reduces body fat without weight loss, affects fasting subjective sensations of appetite, or fasting plasma levels of ghrelin or PYY. Exercise-induced changes in body composition appear not to be influenced by changes in gut hormones. Supported by Diabetes Australia Research Trust

Tertiary level management of severe paediatric obesity-Interventions must focus on younger children and address attrition rates.

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The prevalence of severe obesity in Australian children continues to increase thus it is imperative to determine optimum weight management interventions. Data from tertiary level treatment programs helps inform patient and service characteristics most likely to yield successful outcomes.

As part of ongoing service improvement we evaluated data from our NSW tertiary paediatric multi-disciplinary weight management clinic, CHOOSe Health, to determine potential identifiable criteria predictive of greater weight loss results. CHOOSe Health clinic has clearly defined referral criteria and clinical pathways with a mixture of parent workshops and individual tailored sessions with the team’s health professionals over 6 months. Clinic visits measure weight, height and waist circumference (WC) and BMI, z-score and waist-to-height ratios (WHHR) are calculated.

Data from 249 families (children aged 18 months to 14 years) attending from 2012-2015 were analysed. (56% male). Mean baseline BMI z-score and WHHR were 2.8 (range 1.2 – 6.4) and 0.68 (range 0.49-1.0) respectively. >93% had a WC >80cm. Younger patients (≤6 yrs) had higher baseline BMI z-scores. Only 43% of families attended the initial (triage) appointment whereas 33% of families attended at least 5 appointments. There were no significant differences between those attending triage only compared with multiple attenders. For multiple attenders, there was a significant (p=0.0001) mean change in BMI z-score from visit 2 to last visit being greatest in those ≤ 6 years of age. Regression analysis indicates significant (p<0.0001) decreases in mean BMI z-score over visits 1-5.

Interventions in the real-life setting are effective for management of severe paediatric obesity and resources should focus on younger age groups where greatest changes in weight parameters are achieved. More research is needed to reducing attrition rates which remain high and distinguishing between attenders and non-attenders cannot be determined using baseline anthropometry alone.
Metabolic and nutrition-related effects of a duodenal-jejunal bypass sleeve in patients with obesity and Type II diabetes: preliminary results of a pilot study

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**Background:** Effective and safe treatments for obesity and type 2 diabetes are urgently needed. The endoscopically placed duodenal-jejunal bypass sleeve (DJBS) (Endobarrier®) proposes to impair digestion and absorption of macronutrients, thus inducing weight loss. Absorption of micronutrients may therefore also be impaired.

**Aim:** To assess the safety, efficacy, and mechanisms of the DJBS in 4 pilot patients with obesity and type 2 diabetes who had failed all previous conservative interventions.

**Methods:** The DJBS was placed endoscopically and left in-situ for 48 weeks. Subjects received medical and dietetic support throughout. Metabolic, functional, psychological and dietary intake investigations were performed at baseline, and monthly or bi-monthly thereafter.

**Results:** All patients completed the 48 week period with devices in place. No device-related events were observed. The median weight loss was 27.85 kg (21.5 – 32.4), or 23.17% (19.76 – 26.51) of body weight. During the study period, mean daily energy intake was reduced as compared to baseline (baseline mean 6737 kJ (range 5156-7750) as compared to week 48: 3845 kJ (range 3442 – 5871)). Liver function tests substantially improved (median alanine transaminase baseline 37 U/L (15.5 – 73.5) as compared to week 48: 17 U/L (12.5 – 22.5); median aspartate transaminase baseline 25.5 U/L (21.5 – 51.5) as compared to week 48: 18 U/L (15 – 22)). In parallel, median glycated haemoglobin decreased from 6.8% (range 5.9-7.9) to 5.8% (range 5.7-6.0)) at week 48. No significant decrease in circulating micronutrient concentrations was observed. Dietary quality did not change.

**Conclusion:** Weight loss during treatment with a DJBS in the setting of a multi professional team approach is clinically meaningful and appears to be largely explained by decreased energy intake. The small pilot study did not provide evidence for malabsorption of micronutrients.

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Do making habits or breaking habits influence weight loss and weight loss maintenance? A randomised controlled trial.

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**Background:** Despite the significance placed on lifestyle interventions for obesity management, around 40% of weight loss is regained over the first year following treatment, and much of the rest over the next three years. Two psychological concepts (habitual behaviour and automatically) have been suggested as the most plausible explanation of this overwhelming lack of long-term weight loss success.

**Method:** We evaluated the efficacy of two interventions that explore these theories: Ten Top Tips (10TT) and Do Something Different (DSD). 10TT promotes automatically; this is the ability to perform tasks without awareness or deliberation. Therefore, diet and exercise related behaviours become automatic or habitual. Conversely DSD promotes behavioural flexibility. This program disrupts daily routines by assigning an individual with unstructured tasks to perform. Behavioural flexibility therefore has an inverse relationship with automaticity and is defined as the measure of an individual’s range of mindful behaviours. In previous studies, both interventions have achieved significant weight loss with results suggesting potential for maintenance of the weight lost. The research however is limited and long-term (12 month) results are yet to be explored. Men and women (n = 75), aged 51 + 6 (s.d.) years with body mass index 34.5 + 4.1 kg/m² were randomised to 12-week 10TT, DSD or no treatment control. Active intervention participants underwent 12 weeks of the program with 12-months follow-up.

**Results:** We collected data for weight, BMI, waist circumference as well as habitual behaviour and wellbeing. After 12 weeks intervention, weight loss averaged 4.6kg in the 10TT group, 4.1kg in the DSD group and 1.3kg in the control group. There was significant improvement in wellbeing in the 10TT and DSD groups.

**Significance of research:** Results from this RCT have the potential to help in understanding the mechanisms relating to weight loss maintenance.
How many Australian women will be obese in twenty years’ time?

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Successive generations of Australians are becoming fatter. The prediction of future trends in obesity is necessary in order to plan for future health service needs to manage the medical consequences of obesity, such as type II diabetes.

We used data from the Australian Longitudinal Study on Women’s Health to predict trends in the prevalence of obesity among Australian women taking into account: generational or cohort differences in mean levels and life course trajectories; general long-term, secular or period effects; and age-related weight gain. We combined these estimates with population projections from the Australian Bureau of Statistics under a range of scenarios of different rates of immigration, fertility and increases in life-expectancy.

We estimate that the proportion of obese women will increase from 25.5% in 2015 to just over 38% in 2035. Taking population increases into account this amounts to an increase from 2.3 million women in 2015 to between 4.5 and 4.8 million in 2035. Consequentially the proportions of health service costs associated with obesity are predicted to increase by about 46%.

These estimates are higher than might be inferred from the multiple cross-sectional National Health Surveys, which cannot fully account for generational differences.

The strong generational increases in the prevalence of obesity highlight the importance of reducing childhood obesity and then maintaining lower BMI throughout the life course, as well as reducing overweight and obesity among adults.

LiveLighter Mass Media Campaign is Associated with Reduced Sugary Drink Consumption

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Background: The LiveLighter ‘Sugary Drink’ (SD) campaign, originally produced in WA, was launched in Victoria in October 2015. The campaign targeted adults 25-49 and aimed to reduce SD consumption as part of a systems approach to preventing obesity-related chronic disease.

Methods: Using a pre-post cohort design, population surveys (N=900) were undertaken in the campaign (Victoria) and comparison state (SA) with 78% followed-up after the campaign (Vic N=673; SA N=730).

Results: Almost half (48%) of Victorian adults were aware of the campaign and parents were more likely to be aware. Awareness was equitable between socio-economic groups and metro versus rural adults. Almost half (47%) perceived the campaign was self-relevant, and more so among those with higher baseline SD consumption and BMI. Tests of interactions between state (Vic, SA) and time (pre-, post-campaign) showed among overweight/obese adults, there was a nonsignificant trend towards increased awareness of the health effects of SD consumption in Vic (64% cf. 72%) but not SA (63% cf. 64%) and increased self-referent thoughts about its relationship to weight gain in Vic (50% cf. 55%) but not SA (50% cf. 47%). The campaign was associated with a significant reduction in frequent sugary drink consumption (4+ cups p/wk) in Vic (31% cf. 22%) and not SA (30% cf. 29%). This was accompanied by a nonsignificant trend towards an increased proportion of overweight/obese SD consumers who consume 4+ cups water p/day in Vic (66% cf. 73%) and not SA (68% cf. 67%).

Conclusions/Implications: These findings provide compelling evidence that the LiveLighter campaign reduced SD consumption among Victorian adults. This outcome is notable in a context where public health campaigns occur against a backdrop of heavy commercial product advertising promoting increased consumption. With continued investment, LiveLighter should yield further improvements in public knowledge and behaviour, which could ultimately contribute to reducing obesity-related chronic disease over the longer-term.

Impact of a sugar sweetened beverage price increase in a convenience store

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Background

Retailer-led price changes remain an underexplored avenue for changing beverage purchases in community retail settings. This study aimed to determine the changes in beverage purchases associated with a sugar sweetened beverage (SSB) price increase in a convenience store in Melbourne, Australia.

Methods

Beverages were classified using an existing traffic light system as ‘red’ (‘limit’, e.g. sugary soft drinks, juices over 250mL), ‘amber’ (‘choose carefully’, e.g. diet soft drinks) and ‘green’ (‘best choices’, e.g. water). Prices of ‘red’ beverages were increased by 20% while ‘amber’ and ‘green’ beverage prices were unchanged. Weekly sales data were examined for 122 weeks before and 17 weeks post price change implementation. Time series segmented regression analyses compared volume sales of ‘red’, ‘amber’,
Results
There was a significant reduction in the volume of ‘red’ beverages (-27.8%) and ‘amber’ beverages (-26.7%) sold and a significant 27.7% increase in volume of ‘green’ beverages sold in the 17th week post intervention compared to expected sales without an intervention. There were small significant reductions in total volume of beverages sold (-12.3%) and beverage dollar sales (-11.3%).

Conclusion
A 20% SSB price increase was associated with a reduction in their sales and an increase in sales of healthier alternatives. Community retail settings present a key bottom-up approach to improving consumer beverage choices.

86

You Wouldn’t Eat 16 Teaspoons of Sugar – So Why Drink it? Community Response to the Aboriginal Rethink Sugary Drink Advertisement

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Background: The evaluation aimed to assess community response to the Aboriginal Rethink Sugary Drink (RSD) advertisement. The Aboriginal RSD advertisement launched online in April 2015 and aired on NITV in October/November 2015. The advertisement was developed in Victoria, and featured members of the Victorian Aboriginal community.

Methods: An online survey was completed by 156 Aboriginal adults nationally (Vic=90, other states=66) in November/December 2015. The survey was distributed via email to Aboriginal and Torres Strait Islander adults through the Victorian Aboriginal Community Controlled Health Organisations (VACCHO) distribution networks, including Aboriginal health services and mainstream partner organisations, and social media.

Results: Around half (49%; n=76) of respondents had viewed RSD (recall and recognition) and the proportion was significantly greater in Victoria compared with the other states (62% cf. 30%, p<0.01). RSD was seen to have an important message for the Aboriginal community (89%), while 69% agreed it was relevant to them and 62% agreed it motivated them to improve their health. Those who had viewed RSD (n=76) were somewhat more likely to identify the sugar content of regular soft drink, compared with those who had not (n=80) (63% cf. 49%, p=0.07). Just over half of those who viewed the campaign (55%) reported they drank less sugary drinks as a result. Somewhat more Victorians compared with respondents in the other states reported reduced sugary drink consumption (59% cf. 45%, p>0.05) and increased water consumption (46% cf. 35%, p>0.05) after viewing RSD.

Conclusions: These results provide some evidence RSD impacted knowledge about the content of sugary drinks and positively influenced sugary drink consumption among the Aboriginal community, particularly in Victoria where the campaign originated. Overall, this suggests RSD resonated with Aboriginal and Torres Strait Islander adults and highlights the importance of Aboriginal-led health promotion campaigns and tailoring health messages to the local Aboriginal community.

87

Effects of interpretive front-of-pack nutrition labels on consumer food purchases: a randomized controlled trial

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Publish consent withheld
The potential of front-of-pack labels on unhealthy foods to counteract the misleading effects of health claims

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Health and nutrition claims on packaged food products are an effective market tool as they emphasise one positive aspect of a food without mention of any potentially negative aspects (e.g. nutrient content claim: “High in calcium”; general-level health claim: “Contains calcium for healthy bones and teeth”; high-level health claim: “High in calcium to reduce the risk of osteoporosis”). Health claims can create cognitive biases wherein consumers report stronger positive evaluations and purchase intentions for products with health claims compared to identical products without claims. This is concerning since studies have shown that the presence of a claim, and particularly nutrition claims, may have little relation to overall product healthiness. Recent studies suggest that front-of-pack labels (FoPLs) can attenuate the cognitive biases created by health claims. The aim of this qualitative study was to contribute to this small evidence base and explore how consumers traded-off between conflicting health claims and FoPLs, and assess whether certain FoPLs are more effective at eliminating the cognitive biases created by health claims. Eighty-five males and females, who ranged in age (from 10 to 46+) and socioeconomic status, took part in 10 focus groups in Perth, Western Australia. Participants were provided with examples of pack labels on unhealthy foods to counteract the misleading effects of health claims

Attributes used by consumers to assess alternative front-of-pack food labelling systems

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Governments are increasingly relying on population-level interventions such as food labelling to encourage individuals to make healthier food choices. Such interventions are employed in an attempt to address high and growing levels of obesity and the rapidly increasing prevalence of nutrition-related diseases. There are many front-of-pack labelling systems in existence, but there is inadequate evidence available for policy makers to make informed decisions about the most appropriate system for their national context. The aim of the present study was to explore Australians’ front-of-pack label preferences and the criteria they use to determine these preferences. More than 2,000 consumers aged 10 years and older responded to a national online survey that invited them to choose between the daily intake guide (DIG), multiple traffic lights (MTL), and health star rating (HSR) systems. They were then asked to provide any reasons for their stated preference; they were able to state as many reasons as they wished. The most popular system by a substantial margin was the HSR, with this stronger preference being especially apparent among children. The next most preferred system was the MTL, followed by the DIG. The label attributes most commonly cited as determining respondents’ preferences were (1) ease of understanding and use, (2) speed of use, and (3) salience. The HSR system was considered most effective in terms of ease and speed of use, while the MTL system was perceived to be most salient due to the inclusion of colours. These results provide further evidence of the potential positive impact of the HSR system on consumers’ food choices and suggest that future research assessing front-of-pack labelling systems should ensure the variables of ease and speed of understanding/use and salience are included in study instruments.
Comparison of an electronic versus traditional food diary for assessing dietary intake – a validation study

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Background

Paper-based estimated food diaries are often used in research to collect dietary data, despite this method being burdensome for both participants and researchers. Such food diaries are often time consuming, labour intensive, and rely on participant literacy and therefore may lead to greater rates of under-reporting.

Methods

This study assessed the validity of the ‘Boden Food Plate’, a novel web-based electronic application, compared to a paper-based three-day estimated food diary. Participants were also asked to rate their satisfaction with the new electronic diary. Sixty seven participants completed both the electronic and paper-based diaries at two different time-points.

Results

Baseline BMI of participants (mean ± standard deviation (SD)) was 30.4 ± 2.9 kg/m2, body weight was 87.6 ± 13.4 kg, and age was 42.3 ± 7.7 years. Fifty four percent (n=41) of the cohort were female. Bland Altman plots for total energy, and percentage of total energy intake from fat, carbohydrate, and protein, indicated that the two methods of dietary data collection were in agreement. Participants rated the electronic food diary as easier to use and more fun than the traditional paper-based estimated food diary.

Conclusion

These results show that the Boden Food Plate would be as valid and reliable as current data collection methods and is therefore a practical, and easier, means of collecting data on dietary energy and macronutrient for future studies.

Funding

None

Invited talk: Managing children and adolescents affected by overweight and obesity: implications for health systems

Louise Baur1

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While there has been a recent plateauing in the prevalence of obesity in Australian children – although not adolescents - the prevalence of severe or morbid obesity in this age group continues to increase, as does that of central adiposity. Children and adolescents affected by overweight and especially obesity also present more frequently to primary, secondary and tertiary care services than would be expected from the background prevalence of the problem, although they are only infrequently treated for it. At the same time, most paediatric health professionals feel ill-equipped to manage patients affected by obesity; existing clinical services in Australia and New Zealand are sparse, poorly coordinated and at times inequitable; and there remains significant institutional, health professional and community stigma towards affected individuals.

The chronic disease care pyramid provides a model for delivering services to people with obesity. This is based upon a tiered level of service delivery relating to severity of disease, at primary, secondary and tertiary level. Thus, although most people affected by the problem of obesity can be managed via self-care or family-based care, with support from primary care or community-based health-service professionals, treatment by multidisciplinary care teams and possibly tertiary care clinics is needed for those who are more severely affected. Access to bariatric surgery should also be available at the tertiary care level. Individual clinicians and health service providers/funders should be aware of the presence of other services within their geographical region, and the capacity of these services to take referrals or to co-manage patients. These services could include group programs, individual consultations with allied health professionals or nurses, or specialised tertiary services.

There is a need for development and evaluation of cost-effective healthcare pathways that fit in with existing paediatric clinical services and which have broad reach, especially to more socially disadvantaged people. Further, significant investment in ongoing health care professional training is required at undergraduate and postgraduate level at different levels of intensity.
Invited talk: Key learnings from the PEACH program in Queensland

Jacqueline Miller1, Carly Moores1, Lily Chan1, Lynne Daniels2, Helen Vidgen3

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2. School of Exercise & Nutrition Sciences, QUT, Brisbane, Queensland, Australia
3. Peach Program, LEAPS program, Brisbane, Queensland, Australia

PEACH™ (Parenting, Eating and Activity for Child Health) is a healthy lifestyle community program targeting Queensland families with overweight primary school children. PEACH™ aims to assist parents to build knowledge, skills and confidence around health eating and physical activity. The program implements an evidenced-based intervention consistent with clinical practice guidelines.

Methods were designed with the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework in mind and the following data are collected:
Reach: Family demographics
Effectiveness: Changes in parental knowledge, skills and confidence; child anthropometry, diet and activity behaviours; attendance rates and satisfaction with program resources
Adoption: Facilitator demographics and services involved
Implementation: No. facilitators delivering groups; Adherence to program protocol
Maintenance: Workforce capacity change; funding committed; long -term family impact

Preliminary results: 104 groups across 47 sites including rural and remote areas. Mean (±SD) age of enrollees was 9 (±1.8) years, 45% were male and 78% were obese. Single-parent households comprised 21% of cohort. Number of children meeting fruit and veg guidelines increased (fruit; 49 to 61%, NS ; veg; 3 to 9%, p

PEACH™ is successful for those families who engage. Recruitment and retention are issues that need to be addressed. Clarity is needed regarding service delivery and funding responsibilities of various parts of the health system before services to families can be universally offered.

Invited talk: Key lessons from the Go4Fun program in NSW

Christine Innes-Hughes1,2, L Henderson2, S Kahnal2, S Lukeis1, C Rissel2

1. The Better Health Company, Melbourne, NSW, Australia
2. NSW Office of Preventive Health, Liverpool, NSW, Australia

The prevalence of overweight and obesity in children has been relatively stable in NSW since 2007, with a current prevalence of 22.0% in 5-16 year old children. However, the prevalence remains high and is a cause for concern.

Clinical services have limited capacity to provide treatment and may not be accessible by many families with children above a healthy weight.

This presentation describes outcomes and key learnings of the Go4Fun program, a free weight management program for children aged 7-13 years and their families, delivered at scale across NSW since 2011. Go4Fun is delivered once per week, over 10 weeks and has demonstrated effectiveness from a recent pragmatic cluster randomised controlled trial.

To date, over 7300 families have participated. Child health outcomes are measured pre and post, and the program is routinely monitored by indicators of social disadvantage. Families from rural or regional communities comprise 28% of participants and 9% of participating families identify as being Aboriginal or Torres Strait Islander. In addition, 24% of families are sole parent and 53% of mothers are health care card holders.

On average, children achieve clinically and statistically significant changes in health outcomes. BMI decreases by 0.5kg/m2, recovery heart rate by 4.9 beats/minute, physical activity increases by 3.7 hours/week and time spent in sedentary activities decreases 3.2 hours/week. Self-esteem and intake of fruit and vegetables improve significantly, while intake of sugar sweetened beverages decreases significantly. All changes are statistically significant (p<0.0001). BMI z-scores remained statistically lower (p<0.01) at six-month follow up.

Go4Fun offers an effective scalable community based solution to the treatment of overweight and obesity in children, particularly for families living at social disadvantage.
Invited talk: What are the implementation barriers and enablers for childhood obesity management services?

Penelope Love¹, H Vidgen¹, L Daniels¹, C Innes-Hughes², C Rissel², J Nean³, K Innes-Walker¹, L Baur⁴

1. Queensland University of Technology, Brisbane, Australia
2. New South Wales Office of Preventive Health, Liverpool, Australia
3. Queensland Preventive Health Branch, Brisbane, Australia
4. Sydney School of Public Health, Sydney, Australia

The rising prevalence of overweight and obesity among Australian children, and associated health risks and economic burden to the health care system, continues to raise concerns. While the urgent need for coherent and comprehensive strategies for effective prevention is acknowledged globally, the implementation of appropriate management approaches at scale is lacking for children already above a healthy weight.

This research investigated factors affecting the implementation of two evidence-based weight management programs, Go4Fun (NSW) and PEACH (QLD), targeting families of primary aged children (7-13 years). Interviews were conducted with a broad range of program stakeholders, representative of geographical location, stakeholder role and variation in program implementation across the states. Forty-eight stakeholders were interviewed across 14 sites about their experiences in implementing Go4Fun or PEACH. The Consolidated Framework for Implementation Research (CFIR) was used to structure collection and analysis of data.

Findings will be reported against the CFIR constructs assessed identifying those constructs that strongly or weakly influenced implementation effectiveness between sites with unsustained versus sustained program implementation effectiveness. Such learnings are paramount to guide future investment in the implementation and scale-up of evidence based strategies to address childhood obesity management.

Invited talk: Exercise for managing obesity related chronic disease

Jeff Coombes¹

1. University of Queensland, Brisbane, QUEENSLAND, Australia

Regular exercise can assist in reducing body fat and protect against chronic diseases associated with obesity. High intensity interval training (HIIT) has become a popular time efficient approach to improve cardiorespiratory fitness and decrease the risk of cardio-metabolic disease. HIIT involves alternating short bursts of high intensity exercise with recovery periods or light exercise. Studies in obese individuals have shown that increasing the intensity of exercise amplifies the training stimulus and associated adaptations, such as VO2max, anaerobic threshold, stroke volume and exercise performance. This presentation will discuss the evidence for the use of exercise training, including HIIT, in the management of obesity related chronic disease. Practical approaches to incorporate exercise training such as HIIT with obese patients will also be provided.

Invited talk: Levels of Lifestyle Management & How They Impact on Obesity Management

Nic Kormas¹

1. Concord Hospital, Concord, NSW, Australia

‘Lifestyle’ is frequently used by patients to describe the aetiology of their obesity. Health professionals however, use ‘lifestyle management’ as a broad term to describe non pharmacological or non-surgical treatment of chronic diseases such as diabetes, hyperlipidaemia and obesity. It is an essential component of any weight management program and describes / includes interventions ranging from general education about diet, activity, exercise or behavioural strategies, to intensive specialist allied health involvement in all of these areas. Intensive lifestyle management invariably occurs as part of a multidisciplinary team-based model of care. Further intensity of lifestyle management can be achieved by assigning a patient case manager & by co-locating the multidisciplinary team & services they provide, including group education, support sessions, and supervised exercise. Intensive lifestyle management facilitates interventions needed to reduce the barriers (knowledge, physical and psychological) that prevent patients from achieving weight loss and maintenance of weight loss. This talk will not only review recently published lifestyle intervention studies such as the LOOK AHEAD Program & CROSSROADS but also the Australian experience with lifestyle initiatives such as GET HEALTHY, HEAL & Metabolic Rehabilitation Programs.
Invited talk: Effective and equitable population obesity prevention- why we need all hands on deck

Anna Peeters¹
1. Global Obesity Centre, Deakin University, Geelong, Australia
Recent years have seen increasing acceptance globally that we require a range of obesity prevention policies to be implemented across a number of settings and sectors in order to halt the growing obesity burden. This acceptance recognises the fact that there is a complex interaction between the many factors that influence an individual's dietary intake and physical activity levels. I will review recent progress in the implementation of recommended national, state and local government policies for population obesity prevention. I will argue that to optimise population obesity prevention effectiveness requires a more explicit understanding of the different actors and policies, and how they may interact at the level of the population and the individual. I will also argue that we need a greater understanding of the equity impact of these policies. A priority moving forward should be better recording and communication of existing activities in order to more rapidly spread the uptake of the most effective and equitable policies globally and at scale.

Invited talk: Critical Windows in the Early Life Origins of Obesity and Food Preferences

Beverly Muhlhausler¹
1. University of Adelaide, Adelaide, SA, Australia
There is compelling evidence that exposure to an inappropriate nutritional environment before birth and/or in early infancy, whether it be a nutritional deficiency, nutritional excess or deficiencies of key macro or micronutrients, is associated with an increased risk of obesity and altered food preferences in the offspring. It is also clear that the consequences of this altered nutritional exposure is also dependent on the period of development during which this exposure occurs. Recent work from our group has highlighted the critical role of the suckling period for the programming of obesity and food preferences in the offspring, which opens up the potential for the negative effects of prenatal exposures to be mitigated by improved maternal nutrition during lactation. This presentation will focus on these findings and their potential implications, and describe the impact of maternal cafeteria diet on breast milk composition in our animal model.

Invited talk: What is the evidence for effective obesity prevention strategies across childhood?

Kylie Hesketh¹
1. Deakin University, Burwood, VIC, Australia
The prevalence of overweight and obesity amongst children is high. Approximately one in five children commence school already above the healthy weight range, with these rates rising once children are at school. Thus there is much scope for prevention efforts. Most childhood obesity prevention research has been conducted with school-aged children. Strategies have predominantly been delivered within the school setting. Overall these interventions show a small positive impact on child body mass index (BMI). Interventions involving both physical activity and diet strategies appear to be more effective than interventions focusing on a single behaviour. While considerably less research has been conducted in the early childhood population, the impact of prevention strategies appear to be greater in this age group. Strategies in the early childhood population have been delivered through a range of settings including preschools, health care and family-based settings. Overall studies suggest a positive impact with some suggestion that family-based settings may hold greatest promise.
Invited talk: Challenges of interventions in adolescents with obesity

Louise Baur¹
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One in four Australian adolescents is overweight or obese, and prevalence rates in this age group have continued to increase in recent years, especially in more socially disadvantaged groups. In addition, rates of severe or morbid obesity in adolescence have more than doubled in the past two decades. Obesity in adolescence is often complicated by psychosocial distress and associated with a range of other health problems.

For all these reasons, effective prevention and treatment of obesity in adolescence should be a major priority. However, the evidence base for interventions in this age group is more limited than for other parts of the life-course, and there are specific challenges in undertaking research with, and delivering interventions to, adolescents. Further, despite its simplistic appeal, merely delivering interventions designed originally for younger children or for adults is likely to be a failure.

Physiological maturation from early-/mid-puberty to post-puberty makes interpretation of changes in anthropometry, body composition and hormonal (insulin, reproductive hormones) levels difficult. The increased nutrient requirements of adolescence (e.g. iron, calcium, zinc) must also be factored into any dietary prescriptions/recommendations for caloric restriction.

The major psychological and social changes in this age group mean that recruitment and engagement of young people and their families (where appropriate) in intervention programs is difficult. The rapidly changing nature of e-communication and social media use, and the pervasive presence of innovative forms of marketing at this life-stage, also pose implications for intervention delivery to an audience used to sophisticated communication strategies. The increased mobility of older adolescents especially may also mean they have difficulty accessing and using intervention programs.

A further consideration is the importance of designing and delivering interventions in adolescents that promote healthy eating and activity behaviours and promote positive body image, taking into account the ubiquitous background exposure to negative messages about body image.
Whole of Systems Trial Of Prevention Strategies for childhood obesity: WHO STOPS childhood obesity

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8. Barwon South Western Health, Department of Health and Human Services, Geelong
9. Biostatics Unit, Deakin University, Melbourne

Background: Permanent reductions in childhood obesity are possible if the complex and dynamic causes of obesity are taken into account. The impact of previous interventions would be sustained by increased community ownership (community-built interventions); support from existing community funds (avoiding the state and federal feast/famine of prevention funding); and, building on existing community assets (systems and networks). This research works with partners to test new ways to embed best practice for obesity prevention in existing community systems (e.g. health, workplaces, local council, schools) to ensure the most efficient and effective implementation and sustainability.

Objective: This paper introduces the WHOSTOPS Childhood Obesity initiative, an NHMRC Partnership Project Grant. The goals of this grant are to: 1) strengthen community action for childhood obesity prevention; and, 2) measure the impacts of increased action on risk factors for childhood obesity. This application builds on a 13-year partnership within the study region that has delivered several successful and world leading childhood obesity prevention interventions.

Methods: WHOSTOPS is a stepped wedge cluster randomised trial in ten communities in the Great South Coast Region of Victoria. Five communities will be randomised into the study in year one and all communities will be included in year 3. A parallel group of 13 additional communities from other regions of Victoria with no intervention will provide an external control and will help assess the potential diffusion of the intervention between regions within this trial.

Conclusion: We will assess whether the adoption of systems change interventions is scalable and rapidly increases community capacity to apply best evidence across community systems. The primary outcome of childhood obesity prevalence will be collected by the community-led monitoring system already established. In 2015, baseline data were collected from >2,500 children (90% participation rate (PR)).

Body Mass Index–measured adiposity and population attributability of associated factors in Cameroon: a population-based study in sub-Saharan Africa

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Introduction: Obesity is currently a global health challenge driven by a mix of behavioural, environmental and genetic factors. Recent population-based estimates are needed to guide successful prevention and control efforts in African countries. We investigated the prevalence and population attributable fractions of overweight and obesity in Buea, the Southwest region of Cameroon.

Methods: This was a community-based cross-sectional study involving randomly selected adults. Body mass index (BMI) was categorized according to the WHO classification. Multivariable logistic regressions were used to investigate independent factors associated with obesity. Their population attributable fractions were similarly estimated.

Results: Of the 1,139 participants, prevalence of overweight and obesity were; 34.8 (32.0 – 37.6) and 10.1 (8.3 – 11.9) percent respectively. The mean BMI was 25.3±4.3 kg/m² and women were heavier (25.8 vs. 24.4 kg/m²; p=0.0001). Factors associated with obesity were: female gender [odds ratio 3.26 (95%CI: 1.91 – 5.59)], older age [3.14 (1.56 – 5.82)], older weight [2.48 (1.30 – 4.76)] and family history of cardiovascular disease [1.61 (1.04 – 2.48)]. At the population level; older age, marriage, low level of education, high monthly income and physical inactivity accounted respectively for 11.9%, 21.8%, 11.6%, 6.4% and 8.7% of overweight and obesity among the women, while older age and marriage explained 9.2% and 28.3% respectively, of overweight and obesity in men.

Conclusion: The prevalence of overweight and obesity is high among semi-urban Cameroonians. Community-based interventions to control these would need to take into account gender specificities and socio-economic status.
The 20Lighter Experience: A review of the first two phases of an intense weight reduction program in the United States

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Background: Recent animal studies report significant and wide ranging benefits of fasting and calorie reduction. As a result, there is heightened interest in the feasibility and effects of a Very Low Calorie Diet (VLCD) in humans. Here we present data collected over the past 18 months from the US-based 20Lighter Program (T20LP), a 3-phase (9wk) intensive weight reduction program. This abstract focuses on the first 2 phases (6wk) of data from participants enrolled between Jan 2015 and June 2016.

Methods: T20LP, a doctor supervised 3-phase program includes a loading day, 6wk of VLCD, and 3wk transition back to a normal dietary intake. The VCLD (500-520 calorie/day) eliminates dairy, wheat, corn, sugar, oil. T20LP includes daily weigh-ins and texting with the doctor, proprietary vitamin/mineral supplementation, daily journaling, and requires 3 in-person office visits (Initial baseline, Day 40±3d, Day 60±3d). The VLP uses body composition analysis via Bioelectrical Impedance Analysis with bipolar foot electrodes to monitor participant progress. Baseline values are shown as median±SD.

Results: 351 men and 251 women completed the first 6wk of T20LP by July 31, 2016. Baseline age (51±9.4), BMI (35.1±6.1), comorbidities, history and prescription medications were typical of metabolic syndrome. 20LP participants showed statistically significant and clinically meaningful reductions in body weight, BMI, body fat %, visceral fat, basal metabolic rate, and metabolic age; and increases in body water % as a whole and when stratified by gender.

Conclusions: The first 6 weeks of an intensive intervention in high risk older obese adults results in significant improvements in weight and metabolism-related measures without significant safety issues.

Consumption of diets with low advanced glycation end products improves cardiometabolic outcomes: meta-analysis of randomised controlled trials

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Background: Contradictory evidence exist on the impacts of consumption of diets with low advanced glycation end products (LAGE diets) on improving cardiometabolic profile with regards to the participants’ diabetic status and amount of dietary AGEs.

Objective: To determine the effect of low and high AGE diets in reducing cardiometabolic risk.

Methods: Medline, Embase, Scopus, Cochrane, CINHAL and ProQuest databases were searched up to May, 2016. Risk of bias and data extraction was done by two independent reviewers. Meta-analysis using random effects model was employed.

Results: Seventeen RCTs comprising n=560 participants were included. LAGE diets were associated with decreased insulin resistance (MD -1.3 µmol/l/uU, 95% CI -2.3, -0.2) but no change in weight (MD -0.8kg, 95% CI -4.4 to 2.9), fasting glucose (MD -0.4 mg/dl, 95% CI -2.4, 1.7), 2-hour glucose (MD -7.2 mg/dl, 95% CI -16.7, 2.3), HbA1c (MD -0.01%, 95% CI -0.09, 0.08) and 2-hour insulin levels (MD 0.3 µU/ml, 95% CI -1.5, 2.1). Decrease in fasting insulin levels (MD -7, 95% CI -11.5, -2.5) was observed only in patients with type 2 diabetes. Total cholesterol (MD -8.5 mg/dl, 95% CI -9.5, -7.4) and low-density lipoprotein levels (MD -2.4 mg/dl, 95% CI -3.4, -1.3) reduced after consumption of LAGE diets with no change in HDL cholesterol (MD -1.6, 95% CI -6.6, 3.3) and blood pressure. Estimated glomerular filtration rate was improved after a consumption of LAGE diets. Tumour necrosis factor α, vascular cell adhesion protein-1, 8-isoprostane, leptin, and circulating AGEs were reduced in LAGE groups. In addition, adiponectin and sirtuin-1 were increased after a consumption of LAGE diets.

Conclusion: Diets low in AGEs improve cardiometabolic profile by reducing both traditional and non-traditional cardiovascular risk factors in individuals with or without diabetes. Hence restriction in dietary AGE content may be an effective strategy to decrease diabetes and cardiovascular risk.
Decaffeinated green coffee extract improves cardiovascular function in diet-induced obese rats

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Decaffeinated coffee has become a major part of the market as people wish to avoid the behavioural changes associated with caffeine. While caffeine reduces body weight as well, it is important to determine whether decaffeinated coffee improves metabolic, cardiovascular and liver function. We have therefore given decaffeinated green coffee extract (DC) to fat rats as a chronic treatment to determine these changes. Rats were given a high-carbohydrate, high-fat diet to induce metabolic, cardiovascular and liver changes characteristic of human metabolic syndrome.

8-9 weeks old Wistar rats (335 ± 5 g, n = 48) were divided into 4 groups of 12 rats: corn starch diet-fed rats; corn starch diet-fed rats given DC (5% in diet); high-carbohydrate, high-fat diet-fed rats and high-carbohydrate, high-fat diet-fed rats given DC (5% in diet). All rats were fed for 16 weeks. Treatment groups were given diets for first 8 weeks and the diets were supplemented with DC for the last 8 weeks.

DC reduced body weight in high-carbohydrate, high fat diet-fed rats while slightly reducing food intake compared to high-carbohydrate, high fat diet-fed. DC treatment reversed increase in systolic blood pressure and attenuated left ventricular diastolic stiffness while reducing collagen deposition and infiltration of inflammatory cells in the heart. DC treatment also improved liver inflammation and fat deposition in the liver. While DC improved cardiovascular function, it did not induce any changes in body fat.

These results suggest that decaffeinated green coffee improved obesity-related cardiovascular and liver changes in diet-induced obese rats.

Growth patterns and rapid weight gain in infants of Chinese-born immigrant mothers compared with Australian-born mothers living in Victoria, Australia

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Background
The third largest immigrant group in Australia originate from China. School-aged children with Asian backgrounds have increased risk of overweight and obesity. Early growth patterns of these children may provide insights regarding prevention opportunities.

Aim
To compare infant growth from birth to 3.5 years of age and prevalence of rapid weight gain (RWG) in infants of Chinese-born mothers (CBM) and Australian-born mothers (ABM) living in Australia.

Methods
Anthropometric data were collected (birth, 2, 4, 8 weeks; 4, 8, 12, 18 months; 2, 3.5 years, n=934 for each group) from 16 Maternal and Child Health centres. Zscores (bmi-for-age (zbmi), weight-for-age (zwei), length/height-for-age (zlen)) were calculated using WHO growth standards. RWG was defined as an increase (≥0.67) in zbmi from birth to 12 months. Differences were tested using t-test and chi²(p<0.05). Regression analyses (adjusted demographic covariates) were performed to examine the effect of ethnicity on RWG and zBMI, zwei and zlen at 3.5 years (p<0.05).

Results
Compared with ABM, infants of CBM had a lower mean zbmi score at birth, 2 weeks, 12 months until 3.5 years, but higher zBMI scores between 4 weeks and 8 months. The same differences were observed for mean zwei except at 12 months. Infants of CBM had lower mean zlen scores at birth and 3.5 years; but higher mean zlen at 8 weeks and 4 to 12 months. Regression analysis revealed infants of CBM had lower zBMI (Bcoeff(SE) -0.42(0.09)), zwei (-0.43(0.10)) and zlen (-0.21(0.09)) at 3.5 years compared to infants of ABM. A higher proportion of infants had RWG (35.6%) from CBM compared with ABM (27.5%) but regression analysis revealed no significant effects of ethnicity on RWG in the first 12 months.

Conclusion
Ethnic disparities in growth patterns are apparent. Understanding these differences enables identification of key opportunities to promote optimal growth in this population.
Increasing the availability of healthy children’s menu options in South Australia: an evidence based Code of Practice for food businesses.

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In 2015, the South Australian Department of Health established a Healthy Kid’s Menu Taskforce to increase the availability of healthy children’s menu options in South Australia. Subsequently CSIRO was commissioned to develop a voluntary Healthy Kid’s Menu Code of Practice intended for wide spread statewide adoption by clubs, hotels, restaurants and cafes.

Key sources of evidence that informed the development of the Code were:

1. Statistics derived from the National Nutrition Survey (2011/12) and Australian National Children’s Nutrition and Physical Activity Survey (2007) to identify key nutrients of concern, and their food/beverage sources, with a focus on foods eaten ‘at place of purchase’.
2. Insight from scientific and grey literature that described or evaluated similar initiatives from Australian or relevant international contexts.
3. Collaboration with key industry stakeholders to ensure that the outputs were clear, achievable and practical for business owners and staff.
4. Consistency with the Australian Guide To Healthy Eating.

The Healthy Kid’s Menu Code of Practice provides standards for the provision of:

1. Healthy drinks,
2. Nutritious main meals which include at least 1 serve of vegetables or salad, are prepared using small quantities of healthy fats and oils, and do not include any shallow or deep fried foods, processed meats or savoury pastries,
3. Fruit/reduced fat yoghurt based desserts,
4. Healthy meal combinations.

This Healthy Kid’s Menu Code of Practice is supported by a Guide for Business, and the program is due to be rolled out late 2016. This presentation will outline the evidence base underpinning this activity, along with a description of Code of Practice and its interpretation.

Sustainable Connections for Overweight and Obesity in Paediatrics (SCOOP): a clinical redesign project

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Childhood obesity is one of the NSW Premier’s 12 Priorities. Overweight or obesity affects almost one in four school-aged children in Australia, with prevalence higher in Western Sydney. Yet services for affected families in this region are sparse and uncoordinated.

The Sustainable Connections for Overweight and Obesity in Paediatrics (SCOOP) project (funded by the NSW Children’s Healthcare Network – Western Region) aims to: 1) map services currently providing paediatric obesity intervention, 2) improve capacity for multidisciplinary services for children aged 2-14 years with obesity within all levels of healthcare services, and 3) increase utilisation of Weight4KIDS obesity management eLearning program by health professionals. The geographical focus is within the Nepean Blue Mountains and Western Sydney geographical areas of NSW, with a vision for its outcomes to be translated to any region.

The project is following a rigorous clinical redesign methodology provided by the NSW Health Agency for Clinical Innovation, which engages executives, clinicians and patients in a thorough redesign framework. Phases of this methodology are: initiation, diagnostics (assessment of current processes and issues), solution design, implementation and evaluation. Preliminary results (focus groups, interviews) show that staff are very keen to tackle this issue but are disillusioned by several barriers to providing effective treatment: their time, supporting resources and patient family characteristics (such as motivation). Patients report frustration with the accessibility of services and consistency of information delivery. Further data collection is underway.

Redesigning the delivery of weight management services in close consultation with staff and patients ensures that a consistent and co-ordinated approach to childhood obesity management can be successfully implemented and ultimately reduce childhood obesity rates.
Examining the role of EXERCISE Time-Of-DAY for weight loss and associated health outcomes: study protocol for a randomised controlled trial (EXERCISE-TODAY)

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Background: Although the broad health benefits of exercise are well-documented, the benefits for weight loss vary, and this may be due, in part, to compliance. The time-of-day that people exercise could have an influence on the efficacy of exercise for weight loss, through improved compliance and/or physiological benefits. However, there is currently no evidence to support a ‘best’ time-of-day for exercise to maximise efficacy. This abstract describes a protocol to compare the effects of morning vs evening exercise on weight loss and selected health outcomes.

Aims: To determine whether morning or evening exercise is more beneficial for weight loss and health benefits.

Design: A target sample of 95 insufficiently active, overweight adults aged 18-60 years will be recruited for a 12-week intervention and randomised to one of three groups: i) morning exercise; ii) evening exercise; or iii) waitlist control. Exercise groups will be prescribed self-paced brisk-walking or running on a treadmill for 50 minutes. There will be 5 supervised sessions per week for the first 4 weeks, followed by 8 weeks of combined supervised and unsupervised sessions. Physiological and physical tests, and questionnaires will be administered to participants at baseline, mid- and post-intervention, and at 3- and 6-month follow-up. These include: body composition analysis, dietary intake and eating behaviour, objectively measured physical activity, use of time, resting metabolic rate, cardiorespiratory fitness, sleeping behaviour, chronobiology, exercise enjoyment, and blood lipid profiles.

Preliminary data will be available for the conference.

Conclusion: If, by manipulating the time-of-day at which exercise is prescribed, we can identify favourable changes in the way people restructure their time, adhere better to the programme, and improve their diet and associated eating behaviours, recommendations could be developed to promote exercise at a certain time-of-day. This is the first study of its kind, addressing a critical gap in the literature.

Learning to Track Systems Change Using Causal Loop Diagrams

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Introduction

Group model building (GMB) responds to the complexity of obesity through community engagement techniques that help participants develop causal loop diagrams (CLDs), which present the variables and relationships driving the complex problem. While the construction of CLDs is well documented in the literature, it is less clear how a community can use a CLD to measure changes in a system and evaluate obesity prevention interventions after initial GMB sessions. The aim of this paper is to present how a community used a CLD to track the underlying system changes resulting from implementing a healthy eating curriculum in a school.

Method

In a regional community in Victoria, subsequent to initial GMB sessions where a community-led CLD of the determinants of obesity was developed, a one-hour GMB session (n=7) was conducted to track implementation strategies. Participants brainstormed the steps to implement a healthy eating curriculum in a school and named variables impacted by each step (e.g. leaders attending a workshop impacts leaders’ engagement), thereby transforming transient actions into variables. Participants then drew a CLD representing the connections between their identified variables and the resulting feedback loops. Finally, this intervention CLD was then mapped onto the initial CLD.

Results

The CLD summarising changes in the system contained eight new variables, 19 new connections, and two feedback loops. Participants expressed that this exercise helped them consider how feedback loops might inform addressing any future issues that arise related to the intervention. They also noted that identifying the underlying structure helped them to consider more deeply why implementing the healthy curriculum was successful and how they might replicate that success.

Conclusion

This study presents a promising new technique to capture interventions as feedback structure, allowing practitioners to document systems change, share their findings and strengthen their systems thinking skills to build more effective interventions.
System Dynamics Modelling to Increase Water Consumption in a Community

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Introduction
The use of qualitative system diagrams to understand obesity as a complex problem is well documented in the literature, but the use of simulation modelling to support community-based obesity prevention work is less developed. Simulation modelling can be time and resource intensive; requiring expertise in modelling, extensive data collection, and ongoing input and engagement from key stakeholders who understand the problem. Despite these drawbacks, simulation offers benefits beyond what can be achieved in qualitative models, such as what if analysis for trial interventions, deeper insight into causality, and quantification of relationships. The aim of this paper is to present a system dynamics simulation model built with the input of a community in order to understand key drivers of water consumption.

Methods
Water consumption was identified as an important leverage point in an obesity prevention initiative in regional Victoria. A qualitative map of the drivers underlying water consumption was developed over a two-hour group model building session including a community working group, community members, and a representative from the local water company. A simulation model based on the qualitative map was developed with supplementary data taken from previously published obesity models and ongoing input from the working group.

Results
The model has sectors that account for marketing of sugar sweetened beverages, access to public water, habitual sugar sweetened beverage consumption, and taste of tap water in the community. The participants of the GMB expressed that the modelling was useful for clarifying the multiple contributing factors to water consumption. It also successfully engaged a representative of the local water company who expressed interest in ongoing collaboration to promote water consumption.

Conclusion
The creation of this simulation model demonstrated a novel approach to quantifying the relative importance and feasibility of leverage points in a community-based setting for a public health problem.

Project Energize: continued improvement in time to run 550 metres

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Aim.
The prevalence of childhood obesity is increasing in New Zealand. Since 2004, Sport Waikato has delivered Project Energize, a through-school nutrition and physical activity program, to primary schools in the Waikato. Energize is funded by the Waikato District Health Board. We have previously shown that obesity measures of body mass index, waist-to-height ratio and percentage body fat are negatively associated with the time taken to run 550m, T550. The aim was to compare T550 in 2015 with the 2011 T550 reference derived from the T550 from 5076 Waikato children in the 2011 evaluation of Energize.

Method.
In 2015 in a representative sample of children by age, gender, socioeconomic status and ethnicity (n=5784) T550 was measured following the 2011 protocol. The Z-score for every child in the 2011 and 2015 evaluations were derived and differences in T550 between 2011 and 2015 determined using ANOVA.

Results.
In 2015 overall children ran 550m faster than in 2011. In particular, run times in 2015 for boys were significantly faster than in 2011 (Z-score mean difference -0.12, 95% CI -0.166, -0.077) and for ages 7, 8 and 9 years.

Conclusion.
In a climate of increasing childhood obesity in New Zealand, the decrease in time to run 550m confirms that Project Energize continues to be effective. This information can be used to inform and evaluate future interventions to tackle obesity in school children.
Taking a closer look at the relationship between cortisol and weight in healthy obese humans

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Obesity is a complex disease that greatly increases the risk of diabetes and cardiovascular disease. Non-surgical weight loss is the first line of therapy for weight loss; however, many people struggle to lose weight loss and keep it off. There are strong connections between obesity and stress. Elevated levels of the stress hormone cortisol share several clinical metabolic and cardiovascular outcomes that are also apparent with obesity. It is well known that cortisol promotes cravings for sweet fatty foods and fat accumulation around the stomach region. For these reasons cortisol may play a key role in weight loss success. No studies have critically evaluated the relationship between stress and weight in healthy obese. Whilst salivary cortisol is a common technique used to diagnose Cushings Syndrome; a condition characterized by chronically elevated cortisol levels; few studies have validated this method in obesity.

Therefore, this study aims to investigate the relationship between stress and weight in healthy sedentary lean (N=12) and obese women (N=20) by assessing salivary cortisol levels throughout the day and correlating with a range of metabolic parameters including body mass index (BMI), waist circumference, body composition, adipocyte size, stress and diabetes risk. Cortisol follows a diurnal pattern, with highest levels in morning and lowest levels in evening. Day-to-day variation in salivary cortisol has not been validated; therefore, we assessed this at various time-points over multiple days. We find that obese tend to have greater variation in morning cortisol compared to lean women, and this is associated with higher anxiety and perceived stress rather than fatness. We find BMI correlates with waist circumference, fat mass, and adipocyte size but not HbA1c or cortisol. These studies demonstrate the requirement of taking multiple samples to assess cortisol metabolism. Future studies will investigate the relationship between cortisol and non-surgical weight loss success.

Rapid altering light cycles promotes increased hepatic glucose uptake and de novo lipogenesis

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Aims: Clock genes that are synchronised to the light-dark cycle can influence cellular processes in the liver. We aimed to determine the effect of rapid alterations in the light-dark cycle on energy balance and liver metabolism.

Methods: 8wk old male C57BL/6 mice were separated into 4 groups (N=40/group, 2groups standard laboratory diet (SLD), 2groups high-fat diet (HFD)). After 4wks of 12:12hr light:dark, the light cycle was rotated twice a week for one group/diet for 8wks. 8 mice from each group were placed in metabolic monitoring cages. At 12wks mice were killed at 3 hour intervals (N=5/group/time point) starting at 1800hrs.

Results: SLD mice in a rotating light cycle (SLD-RL) gained more weight that SLD mice in a normal light cycle (SLD-NL). There was no difference in weight gain between HFD-NL and HFD-RL. Blood glucose levels were higher in RL compared to NL mice in both diet groups. RL mice accessed food more during the light phase (LP) compared to NL mice on both diets but not in the dark phase (DP). SLD-RL mice showed a greater meal size only during the LP compared to SLD-NL mice. HFD-RL mice did not show any difference in meal size compared to HFD-NL mice.

SLD-RL mice had decreased energy expenditure compared to SLD-NL mice during the DP. There was no difference in energy expenditure between HFD-NL and HFD-RL mice.

RL mice had increased hepatic triglycerides compared to NL mice on both diets. Hepatic mRNA expression of Glut2, insulin receptor-β, glycogen synthase 2, and Acetyl-CoA carboxylase showed circadian variation in SLD-NL and HFD-NL mice, with upregulation and phase shifts in SLD-RL rhythms. Rhythms were ablated in HFD-RL mice.

Conclusions: Rapid light cycle rotation causes increased body mass in SLD-RL mice combined with increased glucose uptake and increased fatty acid synthesis.
Augmented Capacity for Intestinal Serotonin Release in Obese Subjects

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Introduction: Peripheral serotonin (5-HT) derived from intestinal enterochromaffin cells (EC) is an important regulator of gastrointestinal function but has recently been shown to also regulate function in metabolic tissues as a free bioamine signal. These signals sculpt hepatic gluconeogenesis, adipose lipolysis and thermogenesis to control energy balance during periods of fasting, but are also disordered in modelled obesity (Sumara et al., 2012; Crane et al., 2015; Young et al., 2015). While much of this evidence is in animal models, increased plasma 5-HT levels have also been linked to poorer glycaemic control in subjects with type 2 diabetes (T2D), while polymorphisms in tryptophan hydroxylase expression (Tph1, which synthesises gut 5-HT) link strongly with the incidence of human obesity. Together these findings demand a better understanding of this metabolic potential.

Methods: We assessed 5-HT in plasma prior to, and during, intraduodenal infusion of glucose (4 kcal/min, 30 min) in non-diabetic control (BMI 24 ± 1 kg/m², N=10) and obese subjects (BMI 44 ± 4 kg/m², N=14), and expression of Tph1 in their duodenal and colonic tissues. Glucose-stimulated 5-HT release was also assessed in primary EC cells from the duodenum and colon of control and obese subjects. Finally, EC cell density and their functional activation (immunodetection of phospho-extracellular related kinase, pERK) was assessed in duodenum. All subjects provided informed consent and protocols were approved by the Human Research Ethics Committees of the Royal Adelaide Hospital and Flinders Medical Centre.

Results: Fasting plasma 5-HT levels were positively related to BMI in control and obese subjects (P < 0.05) and higher in obese subjects prior to (1.7-fold, P < 0.05 vs control) and after intraduodenal glucose infusion (2.7-fold AUC, P < 0.01 vs control). Tph1 expression was 40% higher in the duodenum of obese subjects (P < 0.05), where expression related positively to BMI (P < 0.001). 5-HT content in primary duodenal and colonic EC cells and their dose-dependent responses to glucose were similar across study groups, however, the density of duodenal EC cells in obese subjects (P < 0.05) and their functional activation after glucose infusion (pERK colocalisation, P < 0.001) was double that in control subjects.

Conclusion: Glucose triggers gut-5-HT release in vivo and ex vivo in humans, with evidence for augmented biosynthesis and release from a larger EC cell population in the duodenum of obese subjects (rather than increased sensitivity of individual EC cells). These findings support further research into the metabolic role(s) of gut-5-HT in human obesity.

2. Sumara, G. et al 2012. Cell Metab, 16, 588-

Metformin directly triggers GLP-1 and PYY secretion in human colon and ileum

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Background: Metformin is the first-line therapy for type 2 diabetes (T2D) for more than half a century. The exact mechanisms that mediate its blood glucose-lowering effect remain uncertain. Recent reports of superior efficacy of delayed-release oral formulations of metformin over the parental route suggest at least part of its anti-diabetic action is gut-mediated. There is evidence suggesting chronic metformin treatment increases plasma levels of GLP-1 and PYY, secretory products of the enteroendocrine L cells and are pivotal in glucose and energy homeostasis. We hypothesized metformin directly triggers release of these peptides from human ileal and colonic mucosae, where the highest density of L cells are found.

Method: An ex vivo preparation of human mucosa for secretion assay was developed from surgically resected human colon and ileum sections; mucosal tissue was obtained from 46 human colons (11 with T2D) and 10 ileums (3 with T2D) soon after surgical resection. 15-minute static incubations of the preparations with metformin were performed and the secretion supernatants were assayed for GLP-1 and PYY content.

Results: Acute exposure of human gut mucosal tissue to 10 μM metformin significantly induced GLP-1 and PYY release. This stimulatory effect was preserved across BMI and T2D subjects. GLP-1 and PYY co-release was tightly correlated. Metformin-induced GLP-1 and PYY release was blocked by AMPK inhibition and by inhibiting transporters associated with metformin internalization.

Conclusion: We demonstrated acute exposure of the human gut mucosa to metformin significantly triggers GLP-1 and PYY release, independent of any neural inputs. We also showed that AMPK activation and internalization of metformin were required for metformin-induced GLP-1 and PYY release from the mucosa. This mechanism may subserve weight loss and glycaemia
benefits of metformin and are in-line with the growing acceptance that the gastrointestinal tract is the primary site of metformin’s action.

Health professionals’ perspectives on assessing children’s weight status: a case study of Rockhampton

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Introduction
Childhood overweight and obesity is a major public health issue, and its treatment, and management starts with identification of the problem. Currently in Australia, there is a lack of clarity with regard to responsibility for routine assessment of children’s weight status. According to the National Health and Medical Research Council “Clinical Practice Guidelines for Management of Overweight and Obesity in Adults, Adolescents and Children in Australia” assessing weight status is recommended to be undertaken by health professionals during standard consultations with children. Research suggests this is not occurring in practice and little is known about health professionals’ perspectives on this routine assessment. This study explored health professionals’ opinions about routine undertaking of primary school children’s weight status.

Methods
Twenty-six semi-structured interviews with health professionals who interact with children as a part of their professional role were undertaken in the area of Rockhampton in June-July 2016.

Findings
Health professionals recognise a need for change in practice in assessing primary school children’s weight status. A multi-level approach is necessary for addressing childhood overweight and obesity. There is a need for long-term commitment from the Governments to implement “ask and assess” and provide health services to address obesity, simple and consistent education across all primary health care and education settings as well as within communities.

Conclusion
Clarity is needed regarding responsibility for assessing primary school children’s weight status to effectively address childhood obesity.

Why do parents enrol in a childhood obesity management program?

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Introduction
Despite the high prevalence of childhood overweight and obesity enrolment to weight management programs remains difficult, time consuming, costly and has limited effectiveness. Previous studies explored barrier to recruitment into children’s weight management programs but only a few have explored the issue from the perspective of the parent or applied a theoretical framework to describing the decision to enrol in a weight management program. The aim of this paper was to understand what factors influence parental decision to enrol in the Parenting, Eating and Activity for Child Health Program, a program for childhood obesity management.

Methods
Semi-structured qualitative telephone interviews were undertaken with 21 enrollees in a childhood obesity management program. Questions were based on Theory of Planned Behaviour.

Findings
Parents tended to be aware of the child’s weight issue prior to deciding to enrol in the program. Theory of Planned Behaviour was inadequate in explaining the decision to enrol because parents had attempted to address their child’s weight issue themselves and had sought help from a number of people including health professionals. The participants’ decision to enrol in the program was influenced by the evaluation of their previous attempts and their child’s emotional state.

Conclusions
Health professionals should use opportunities during their contact with parents to raise child’s weight issue and to provide support and encouragement so that parents seek help from programs before reaching point of despair.
Previous weight management experiences are important: lifestyle specific health cognitions associated with excess gestational weight gain

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The perinatal period is a critical time for the development of obesity in mothers and children. Prevention of excess gestational weight gain is a key intervention strategy, however interventions to date have produced mixed results. Identification of the health cognitions associated with excess GWG and its two underpinning behaviours of dietary intake and physical activity may provide insights into lack of consistent positive effects of interventions. The aim of this study was to examine associations between lifestyle specific psychosocial factors and gestational weight gain in pregnant women from the New Beginnings Healthy Mothers and Babies Study. Pregnant women (n=664) aged 29±5 (mean±SD) years completed a questionnaire at 18 weeks gestation assessing pre-pregnancy weight, lifestyle related health cognitions common to dominant health behavior theories including risk perception, self-efficacy, outcome expectations, social support and barriers, and demographic data. Height was measured at recruitment and gestational weight gain assessed at 36 weeks gestation. Logistic regression was used to examine associations between health cognitions and excess GWG, controlling for relevant covariates. One third (34%) of participants had a BMI > 25 kg/m² prior to pregnancy and 38% gained excess weight. A stronger belief in the ability to control body weight (weight locus of control) was protective against excess GWG (β=-0.344, p=0.024) whereas higher negative outcome expectations were associated with an increased likelihood of excess GWG (β=0.191, p=0.015). Previous experiences associated with success or failure in weight control are likely to play a key role in a healthy gestational weight gain. Consideration of these experiences may be key to successful behaviour change interventions targeting healthy gestational weight gain.

A cluster randomised controlled trial of an online intervention to improve healthy food purchases from school canteens: Study Protocol

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Background: In Australia, poor diet is a leading cause of disease burden and improving child nutrition is a health priority. School canteens represent an ideal setting in which to deliver public health nutrition interventions. Online canteens, where parents or students order and pay for their child’s lunch online, represent a novel and attractive opportunity to deliver interventions to improve healthy food purchases at scale with high fidelity.

Aim: Given the increasing use of online canteens, the researchers sought to investigate the efficacy of using an online canteen system to deliver a consumer behavior intervention to improve the healthiness of canteen lunch order purchases for primary school students. This presentation comprehensively describes the study protocol for a cluster randomized trial investigating this research question.

Methods: Ten NSW schools currently using an online canteen will be randomised in a 1:1 ratio to receive either the intervention or control (standard online ordering only). The intervention will include a suite of consumer behavior strategies to encourage healthy food purchase including i) availability (increasing availability of healthy items), menu labelling, placement and prompting. Intervention efficacy will be assessed through between group comparison of the nutritional value of lunch order purchases, as recorded by the online ordering system at baseline (6 month period pre-intervention) and follow up (6-month period post-intervention commencement). Specifically, the trial will assess the total kilojoule, saturated fat, sugar and sodium content of food and beverages purchased of online lunch orders and ii) the proportion of foods purchased of high (green) and low (red) nutritional value as determined by state canteen policy.

Conclusion: The proposed trial represents the first randomized trial internationally to examine the efficacy of an online intervention on improving healthy food purchases from a primary school canteen.
Community junior sport sponsorship: Children’s responses to unhealthy food vs. pro-health sponsorship options

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Background: Participation in community junior sport delivers many health benefits to children; however, exposure to unhealthy food sponsorship in these settings may promote unhealthy food choices to children, and ultimately contribute to poor health outcomes.

Aim: To explore children’s responses to sponsorship of community junior sport by unhealthy food brands, and investigate the utility of alternative, pro-health sponsorship options.

Methods: Experimental design whereby 1,000 students in grades 1 to 3 from Melbourne metropolitan primary schools will be randomly assigned to one of four sponsorship conditions: (i) unhealthy food branding; (ii) healthy food branding; (iii) non-food branding; (iv) obesity prevention campaign branding. All participants will initially be exposed to an image of a merchandise set for their favourite sport branded with the logo corresponding to their assigned condition – thus simulating the process of enrolling in a local sports club and receiving branded merchandise at the start of the season. Following exposure to the intervention, participants will complete a series of questions assessing their brand awareness, brand attitudes, and preference for food sponsor products.

Results: Data collection for this study is underway and will be completed in July. Results will be available for presentation at the conference. For the analysis, logistic regression will be used to examine the effects of sponsorship condition on the proportion of students with top-of-mind awareness and preference for the (a) unhealthy food sponsor product and (b) healthy food sponsor product respectively. Analysis of variance will be used to test for mean differences in ratings of the unhealthy and healthy food sponsor products by condition.

Conclusion: This timely study will yield practical evidence on the utility of alternative, pro-health sport sponsorship options. Such evidence could help inform population-based strategies to modify the community junior sport sponsorship environment so as to foster healthy eating by children.

“The Change Program” – an Australian general practitioner delivered weight management program, results of a six month pilot implementation trial

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Introduction
General practitioners (GPs) need support and structured tools to assist them in managing patients with obesity. This six month implementation pilot based on Normalisation Process Theory aimed to assess the feasibility and acceptability of a weight management program (The Change Program) delivered by GPs within primary care.

Methods
The pilot study consisted of a single arm trial based on Normalisation Process Theory. GPs (n=12) across five practices (four urban, one rural) were recruited via email and then recruited their own patients (n=23). GPs were interviewed at time zero and 6 months and patients were interviewed at the end of the pilot. In addition, patients completed online surveys at time zero, 3 months and 6 months. Anthropometric data was collected using a file-based template.

Findings
Qualitative data analysis identified that GPs appreciated the structure of The Change Program and found it differed significantly from their usual consultation practices. They reported a significant increase in their confidence in managing obesity. Integration within daily practice would require activation of practice management systems to make the program sustainable. Patients found that establishing a constructive, collaborative working relationship with their GP was fundamental to their ongoing involvement in the program as well as meeting their weight loss and lifestyle change goals. Intention-to-treat analysis demonstrated that patients lost an average of 3.2% (SD 3.7, median 1.8%) of their body weight at 6 months with a range from -3.2% to 10.5%. Patients also provided feedback for improving The Change Program patient handbook.

Conclusion
This pilot study demonstrated that a GP-led weight management program is feasible and acceptable to GPs and their patients and suggested that a key determinant of success was to build on the values of person-centred primary healthcare. The positive results of this pilot confirm that a trial to assess overall effectiveness is needed.
Does eating more at night influence weight?

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Background: Although a belief commonly held by society, it is unclear whether eating a greater proportion of energy in the evening contributes to the development of obesity.

Aim: This systematic review investigates the association between the proportion of daily energy intake consumed in the evening and weight outcomes in adults.

Methods: A search of seven major databases yielded 6975 results published from 1928-2016. Of these, 94 full texts were reviewed and 13 studies were eligible for inclusion in the review. Studies were included if the primary outcomes were weight and BMI. Eligible studies needed to specify the proportion of daily energy intake consumed during the evening. As there is no consensus regarding the definition of ‘evening’ intake, we used broad definitions including; energy consumed after 19:00, energy consumed during and after the evening/main meal or the definition used by the authors. Eligible studies were cross sectional, cohort longitudinal and randomised controlled trials.

Results: Complete results for this review will be available by the conference dates.

Discussion: Understanding the relationship between the distribution of daily energy intake and weight may help to shape dietary recommendations for obesity prevention and treatment for the general population and also specific groups such as night workers.

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Roux-en-Y Gastric bypass in the management of Prader-Willi Syndrome: An Australian Perspective

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Three patients (one female and two males) with Prader-Willi Syndrome (PWS) due to a micro-deletion on chromosome 15p have received a Roux-en-Y gastric bypass (RYGB) in Adelaide since May 2013. Length of follow up is between 3 years and 6 months with two being greater than 2 years.

The first patient was a female (age 40, BMI 55.2kg/m²) who had obstructive sleep apnoea (OSA) and central sleep apnoea (treated with BiPap), type 2 diabetes mellitus (T2DM) (treated orally with Metformin), hypogonadism (treated with topical testosterone) and chronic lower limb oedema. The second patient a male (age 30; BMI 46.7kg/m²) had poorly controlled T2DM, OSA, and chronic lower limb oedema with recurrent ulceration and infection. The third patient, a male (age 22, BMI 47.7 kg/ m²) had hypogonadism (treated with topical).

<table>
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*Patient 3 data is 4 months post surgery

All patients have shown a marked decrease in leg oedema, much improved diabetes control (patients 1 and 2) and self-reported improvements in satiation. Bariatric surgery is not currently considered a treatment for PWS however the degree of success seen within these patients should allow for national trial.
Utility of the oxygen uptake efficiency slope in participants with overweight/obesity and type 2 diabetes

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Background: Higher cardiorespiratory fitness is associated with a reduced risk of all-cause and cardiovascular disease mortality in healthy individuals. This relationship is also true for those with type 2 diabetes (T2D). Cardiopulmonary exercise tests to determine cardiorespiratory fitness (measured as peak oxygen uptake [VO2peak]) may not always be achievable in those with T2D. Intrinsic factors such as lack of motivation or peripheral fatigue, along with limitations in personnel required to supervise the exercise test in high-risk individuals, limit the utility of the test. The oxygen uptake efficiency slope (OUES) represents the efficiency of the body to extract oxygen from ventilation and measuring this during submaximal efforts may be a valid measure of cardiorespiratory fitness. The aim of this study was to compare the association between submaximal OUES and VO2peak in participants with T2D.

Methods: Eight adults (59±7 years) with overweight/obesity (BMI=37.5±6.1kg/m²) and T2D (glycated haemoglobin [HbA1c] 63±11 mmol/mol) completed a maximal graded cardiopulmonary exercise test on a treadmill. VO2peak was determined as the mean of the three continuously high ten second measurements attained during the test. The OUES was calculated as the slope of oxygen uptake against the logarithm of total ventilation for the entire test [VO2 (L/min) = m(logVE) + B, where m = OUES]. Correlation between VO2peak and the OUES was determined via Pearson’s correlation coefficient. Statistical significance was set at p < 0.05. Values are reported as means ± SD.

Results: Participants’ VO2peak was 2.4±0.5 L/min and OUES 2.1±0.9. The correlation between VO2peak and the OUES was strong and significant (r = 0.8; p = 0.019).

Conclusion: The OUES displayed a strong and significant association with VO2peak. This suggests that the OUES may offer a valid submaximal measure of cardiorespiratory fitness in overweight and obese participants with T2D.

Trial Registration: Australian New Zealand Clinical Trials Registry ACTRN12615000475549.

How do very low energy diet brands available in Australia compare in terms of nutritional content and cost?

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Very low energy diets (VLEDs) effectively induce rapid weight loss but may not contain adequate macronutrients or micronutrients for individuals with varying nutritional requirements. Adequate protein intake during weight loss appears particularly important to help preserve fat free mass and control appetite, and low energy and carbohydrate content also contribute to appetite control with VLEDs. As obesity disproportionately affects those of lower socioeconomic status, cost is also an important consideration. Therefore, the purpose of this study was to compare the cost and nutritional content (with a focus on protein) of all available VLED brands in Australia. Cost was determined by averaging the price (in Australian Dollars) of all flavors for each brand, and then calculating the cost proportionally to expected consumption (e.g. higher ratio of shake to bar or soup intake). Nutritional content was extracted and compared between brands and to the Recommended Dietary Intake (RDI) or adequate intake (AI) of macronutrients and micronutrients for men and women aged 19-70 years or >70 years. Eight brands of VLED products were identified (KicStart™, Optislim®). Optifast®, Proslim, Tony Fergusson®, Dr MacLeod’s®, Cambridge®, Vita Diet). The average cost per product varied widely, from $2.33 for KicStart™ to $4.43 for Cambridge®, which would result in a weekly difference of $44.10 if three products are consumed per day. All brands contained less protein than the requirements for males, larger individuals (BMI>35kg/m²) and adults >70 years. Even brands with the highest daily protein content, based on consuming three products/day (KicStart™ and Optislim®), ~60g/day, only met protein requirements of the smallest and youngest women for whom a VLED would be indicated. Considering multiple options to optimise protein content, we propose that adding pure powdered protein is the most suitable option because it minimizes additional energy, carbohydrate and cost of VLEDs.
Parental body shape at midlife and its association with adult offspring weight measures

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Parental weight has been shown to be a strong determinant of offspring weight status. This study used cross-sectional self-reported and measured data from Stage 3 (2008-10) of the North West Adelaide Health Study (baseline 1999-2003, n=4056), a longitudinal cohort of Australian adults, to investigate the association between midlife parental body shape and four indicators of obesity and fat distribution. The analysis used pictograms for recall of parental body shape, and measured body mass index (BMI), waist circumference (WC), waist hip ratio (WHR) and waist height ratio (WHtR) of adult offspring (n=2128). Compared to both parents being a healthy weight, offspring were more likely to be overweight or obese if both parents were an unhealthy weight at age 40 (OR 2.14, 95% CI 1.67-2.76). Furthermore, those participants whose mother was an unhealthy weight were more likely to be overweight or obese themselves (OR 1.50, 95% CI 1.14-1.98). There were similar but lower results for those with an overweight/obese father (OR 1.44, 95% CI 1.08-1.93). The effect of one or both parents being overweight or obese tended to be stronger for daughters than for sons across BMI, WC and WHR. BMI showed the strongest association with parental body shape (OR 2.14), followed by WC (OR 1.78), WHR (OR 1.71) and WHR (OR 1.45). WHR (42-45%) and BMI (35-36%) provided the highest positive predictive values for overweight/obesity from parental body shape. This study showed that in this population, parental obesity increased the risk of overall obesity and central adiposity for adult offspring, particularly for daughters. Pictograms could potentially be used as a screening tool in primary care settings to promote healthy weight among young adults.

Hunger and emotional eating after laparoscopic adjustable gastric banding: A path analysis predicting weight loss at 2 years post-surgery

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Levels of post-operative hunger have been associated with weight-loss after LAGB (1,2). Dietary restraint has shown relationships with hunger cues and eating behaviours, as have stress, eating self-efficacy and emotional eating (3,4,5,6). A path analysis model tested how pre-surgical dietary restraint may influence post-operative hunger and how perceptions of hunger affect eating self-efficacy, eating behaviours, and ultimately weight-loss across 24 months.

Participants were 147 patients (127 females, 27 males) about to undertake laparoscopic adjustable gastric banding surgery (LAGB). Questionnaires concerning eating behaviours and cognitions (cognitive restraint, hunger, eating self-efficacy, and emotional eating) and stress were completed prior to and at 12 months post-surgery. Weight was measured prior to and at 12 and 24 months post-surgery.

Results showed a negative relationship between presurgical dietary restraint and post-surgical hunger reduction, such that patients with the lowest pre-surgical restraint experienced the greatest hunger reduction at 12 months post-surgery. Lower hunger then predicted improvement in emotional eating which was partially mediated by eating self-efficacy. Improvement in emotional eating at 12 months post-surgery subsequently predicted better weight-loss between 12 and 24 months. Improvement in emotional eating was not explained by reduced levels of stress.

Improved eating behaviours are important predictors of weight-loss in LAGB. These results suggest that other pre and post-surgical mechanisms such as dietary restraint, hunger, and eating self-efficacy may influence the manner in which eating behaviours are expressed. In order to enhance outcomes for patients, future research should examine the pathways involved in improved eating behaviours after bariatric surgery.

Dietary sugar knowledge and attitudes and their relation to free sugar intake and practices among adults: A systematic review

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Objectives: Excess free sugar consumption increases the risk of developing non-communicable diseases. Two potentially relevant antecedents of individuals’ health behaviour are knowledge and attitudes. We conducted a systematic review: (1) to identify factors influencing adults’ dietary sugar knowledge and attitudes; and (2) to determine if there is an association between adults’ dietary sugar knowledge and attitudes and free sugar intake or dietary practices.

Methods: 15 electronic databases were searched from inception for relevant articles. Peer-reviewed and grey literature published in English language and involving adults (>=18 years) were eligible for inclusion. The process of study selection followed by their quality assessments was conducted using the PRISMA guidelines and Effective Public Health Practice Project tool respectively. Findings were summarised using meta-narrative synthesis.

Results: A total of 3287 papers were identified of which 21 studies (11 for each objective) were included. Receiving nutrition education from health professionals (such as nurse, diabetes educator, or dietician) and advertising were associated with higher sugar knowledge and positive attitudes towards lower sugar consumption. In addition, lower current and past use of sugar-sweetened beverages and exposure to sugar-specific food labelling were associated with positive attitudes towards lower sugar consumption. Individuals’ attitudes towards high dietary sugar consumption were influenced by their peers. Inconsistent associations were found concerning the role of dietary sugar knowledge and attitudes in determining free sugar intake or dietary practices. The overall quality of evidence was weak.

Conclusion: Sugar consumption is complex. The findings of the available literature on determinants of dietary sugar knowledge and attitudes, and role of knowledge and attitudes in determining sugar consumption are inconclusive. More research with robust study designs investigating the role of broader determinants are warranted. This will enable the development of effective interventions and policies to promote healthy behaviours.

Voluntary exercise improves metabolic and hepatic phenotypes in dietary but not metabolic obesity in male mice.

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Background Increasing physical activity reduces obesity complications. In female mice with dietary or metabolic obesity, exercise maintains insulin sensitivity, reduces adipose inflammation, and improves liver histology1. Male gender is associated with a worse metabolic phenotype in mice. We therefore tested whether exercise can delay onset of obesity, and ameliorate metabolic phenotype in male mice by improving adipose morphology and function.

Methods Male Alms1−/− (foz/foz) NOD.B10 mice and Wt littermates (8/group), fed atherogenic (high fat/sugar/cholesterol) diet, were caged in pairs until 24 week-old. Half the cages were fitted with an exercise wheel and cycle computer. Blood, liver, and lumbar/epididymal/mesenteric white adipose tissue were removed.

Results Wt mice ran ~8km/day, whereas foz/foz mice ran ~1.5km/day; foz/foz mice were notably less active and showed a decrease in wheel use towards the end of study. Exercise delayed but failed to prevent development of severe obesity in foz/foz mice; all foz/foz mice weighed ~57g at Week 24. Exercising Wt mice weighed less than non-exercising counterparts (~34g vs. ~44g; P<0.05). There were also reductions in liver and adipose depot weights in exercising Wt mice (P<0.05), but not in foz/foz mice. Exercise improved hyperglycemia and insulin sensitivity in Wt but not foz/foz mice. Exercise improved morphometry and reduced inflammatory recruitment in all adipose compartments in Wt mice, but failed to improve adipose dysfunction in foz/foz mice. Hepatic lipid partitioning was less in exercising Wt but not foz/foz mice vs. non-exercising; exercise normalized liver histology and abolished fibrosis in Wt mice.

Conclusions Exercise confers meta-protective effects in mice with dietary obesity (atherogenic diet-fed Wt) by reducing adipose inflammation and improving adipose morphology, and this corrects fatty livers. Diabetic mice with metabolic obesity (atherogenic diet-fed foz/foz) were reluctant to use the wheel, perhaps secondary to excessive weight gain, and resultant mild exercise failed to confer benefits on the metabolic phenotype.

Parent-focused childhood overweight and obesity eHealth interventions: a systematic review and meta-analysis

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Introduction: eHealth interventions have shown promise in assisting with lifestyle behaviour change and offer the advantage of broad-reach access. Many previous eHealth studies in children and adolescents have demonstrated positive results in relation to weight, physical activity or diet. However, there have been no previous reviews which have specifically investigated the effectiveness of parent-focused eHealth obesity interventions.

Methods: Seven databases were searched from 1995-2015. Randomised controlled trials which reported BMI / BMI z-score were included. Secondary outcomes included diet, physical activity and screen time.

Results: Eight articles on seven eHealth interventions, using the mediums of internet, interactive voice response and telemedicine were included. Participant age ranged from 5-15 years and study size ranged from 35-1013 dyads. One study reported a significant improvement in weight/adiposity (waist-to-hip ratio). Three studies demonstrated significant improvements in at least one dietary measurement and three studies showed significant improvements in at least one physical activity measurement. A meta-analysis demonstrated no significant difference in the effects of parent-focused eHealth obesity interventions compared to a control on BMI/BMI z-score (SMD -0.15, 95% CI -0.45 to 0.16, Z=0.94, P=0.35).

Conclusion: While over half of the studies demonstrated significant improvements in diet or physical activity, only one found a significant change in weight/adiposity. As many studies were small, they may have been inadequately powered. There were no studies on children under the age of five. It is recommended that larger studies be conducted, particularly those which target younger age groups.

Treatment seeking people with obesity still in need of nutrition education

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Objective: A better understanding of the general nutrition knowledge among obese patients (OP) will inform the design of effective weight management education programs. This study assessed general nutrition knowledge in OP seeking treatment and compared this to a community sample (CM) with participants from the healthy weight (HW), overweight (OW) and obese (OB) range.

Methods: Participants were a convenience sample of OP attending a tertiary weight loss clinic and the general community (CM) (aged>34 years). BMI was measured in OP and self-reported in CM. Nutrition knowledge was measured using a validated, General Nutrition Knowledge Questionnaire (GNKQ) assessing four domains: dietary recommendations, sources of nutrients, choosing everyday foods and the diet–disease relationships. The influence of demographic characteristics (age, gender, education) on general nutrition knowledge was also assessed.

Results: A total of 472 participants (OP: 211; CM: 261) were recruited. OP were older (OP:53.0±9.8; CM 49.1±10.0y; p<0.0005) and had a higher BMI (OP: 45.0±9.2; CM: 26.8±6.1 kgm-2; p<0.0005) than CM. BMI distribution in CM was 47.5% HW, 32.2% OW and 20.3% OB. Total GNKQ scores were significantly higher in CM (OP: 65.0±16.9; CM:79.4±12.7%; p<0.005) even after adjustment for demographic characteristics. OP scored significantly lower than CM across all four knowledge domains.

Conclusions and Implications: General nutrition knowledge was lower in OP compared with CM and remained lower after adjustment for demographic characteristics. Nutrition miss-information disseminated via the wider weight loss industry or lower health literacy may explain these findings however, factors influencing general nutrition knowledge in OP warrants further investigation.
Feeding Thing 1 and Thing 2: a discordant twin analysis of toddler's fussy eating and maternal feeding practices

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Background: Early "fussy" eating behaviours are associated with reduced dietary variety, particularly for nutrient-dense foods. Previous research has assumed that parental feeding practices shape a child's fussy eating; however, a child-responsive model suggests that feeding practices may develop in response to a child's fussiness. We used a novel twin study design to test whether mothers vary their feeding practices for twin children who differ in their 'food fussiness', in support of a child-responsive model.

Methods: Participants were mothers and their 16 month old twin children (n=2026) from Gemini, a British twin birth cohort of children born in 2007. Standardized psychometric measures of maternal 'pressure to eat', 'restriction' and 'instrumental feeding', as well as child 'food fussiness', were completed by mothers. Within-family analyses examined if twin-pair differences in 'food fussiness' were associated with differences in feeding practices using linear regression models. In a subset of twins (n=247 pairs) who were the most discordant (highest quartile) on 'food fussiness' (difference score ≥.50), Paired Samples T-test were used to explore the magnitude of differences in feeding practices between twins. Between-family analyses used Complex Samples General Linear Models to examine associations between feeding practices and 'food fussiness'.

Results: Within-pair differences in 'food fussiness' were associated with differential 'pressure to eat' and 'instrumental feeding' (p<.001), but not with 'restriction'. In the subset of twins most discordant on 'food fussiness', mothers used more pressure (p<.001) and food rewards (p=.05) with the fussier twin. Between-family analyses indicated that 'pressure to eat' and 'instrumental feeding' were positively associated with 'food fussiness', while 'restriction' was negatively associated with 'food fussiness' (p<.001).

Conclusions: Mothers appear to adjust their feeding practices according to their perceptions of their toddler's emerging fussy eating behavior. Specifically, the fussier toddler is pressured and more likely to be offered food rewards than their less fussy co-twin.

Targeting and recruiting socioeconomically disadvantaged families for participation in child nutrition research

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Background: Parents, both through food choices and parenting behaviours, play a significant role in shaping their child's eating habits. Children from socioeconomically disadvantaged families are at particular risk of poor nutrition and obesity. The majority of studies in child feeding research consist of homogenous samples of mothers generally derived from privileged communities, while recruitment of fathers and low-income families has been challenging. The aim of the study was to explore the feasibility of various strategies to enhance participation in child nutrition research of families (including mothers and fathers) living in socioeconomically disadvantaged communities.

Methods: Recruitment focused on the Logan, Queensland, a disadvantaged community identified as an area of high developmental vulnerability (AEDC 2015). Recruitment included Early Child Education and Care (ECEC) service centres, playgroups and family services from February to July, 2016. Furthermore, a variety of engagement methods (hardcopy surveys, face-to-face, internet and via telephone) and choice of incentives (selection of vouchers) were examined and uptake or preferences of incentives were explored.

Results: Recruitment from 32 settings yielded N=273 participants (of which were n=117 mother-father pairs). To date, face-to-face recruitment at ECEC centres has been the most successful recruitment method (68.5% of the sample). Perceived enablers included forming collaborative relationships with community stakeholders, providing incentives and media support. Conversely, perceived challenges included inability to recruit non-English speaking families and return of unpaired surveys or recruitment of single parents (13.9% of the total sample). Recruitment continues to be monitored.

Conclusions: This study provides insight into potential engagement and recruitment strategies of families living in circumstances of disadvantage. Our data which focused on a single disadvantaged location suggests ECEC settings are significant sites for research engagement, particularly through face-to-face methods. Application of effective engagement and recruitment strategies is essential to enhance uptake of disadvantaged families in child nutrition research.
Relationships between parental feeding practices, infant weight concern, infant dietary behaviour and body weight: Findings from the Feeding A Baby (FAB) Study

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Obesity is a global problem that is challenging to prevent and expensive to treat. While early childhood interventions show promise in establishing lifelong healthy eating patterns, better understanding of how parental feeding practices develop is needed. The Feeding A Baby (FAB) study aimed to investigate the determinants of maternal feeding practices in transitioning from milk feeds to family foods and their relationship to infant dietary behaviour and body weight. A questionnaire was completed by 290 Queensland mothers of infants aged between 6 and 12 months. Logistic regression was used to describe the association between maternal feeding practices (restriction, pressure, monitoring), infant weight concern (underweight, overweight) and infant dietary behaviours (consumption of breastmilk, solids, vegetables, fruit and takeaway). Correlation and linear regression were used to identify relationships between maternal feeding practices, infant weight concern and infant weight. Mothers were found to be more concerned about underweight than overweight, tended to misjudge infants as being underweight and fail to recognise overweight and obese infants. Pressure feeding practices were associated with underweight concern, lower infant weight, early introduction of solid foods and lower fruit and vegetable intake. Restrictive feeding practices were related to overweight concern. Given the inaccuracy of maternal infant weight perceptions and the controlling feeding practices associated with weight concerns, interpreting healthy growth should be a fundamental component of strategies to support healthy infant feeding practices.

A Policy-Delphi Study for obesity prevention policy in Australia: Investigating the concepts of intrusiveness and autonomy.

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The World Health Organisation has urgently called for government leadership to tackle childhood obesity. Unfortunately there is no silver bullet, and conflicting stakeholder opinions enhance the difficulty of prioritising policies to reduce obesity. There is societal concern around implementing intrusive strategies and subsequently developing a ‘nanny state’, which has deterred governments from taking action. An investigation into the ‘intrusiveness’ of obesity policy options, as a barrier to potentially successful strategies, is warranted to further understand its role in delaying action. Priority Setting Partnerships (PSP) have been employed in the UK as a patient-centred method to prioritise treatment uncertainties for various medical conditions. Our research builds on the core values of this method, to develop a Policy-Delphi Study which unites the consumer, policymaker and public health practitioner to prioritise policy options of varying levels of intrusiveness, in isolation from the vested interest of industry. The primary aim is to identify how stakeholders perceive the intrusiveness of policy options for obesity prevention, and further understand the relevance of the construct in the prioritisation of, and resistance to, obesity policy. Final data collection will be complete by October 2016, and qualitative and quantitative methods of analysis will identify the intrusiveness of ten top priorities for obesity prevention policy in Australia, from an integrated public and political perspective. Importantly, the study will provide insight on the extent to which evidence for effectiveness, intrusiveness and autonomy govern prioritisation of policy options by stakeholders.

The effect of influencing autonomy for obesity prevention: A review and meta-analysis of school based interventions.

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Ethical concern around governments controlling individual choice reduces political action to implement restrictive policies for obesity. This research builds on the concept recently proposed by Griffith & West ¹ to investigate the influence of enhancing or diminishing autonomy on effectiveness of interventions. We conducted a review of 56 school-based RCTs for obesity prevention. Interventions were sub-grouped according to their influence on autonomy, and their effect on weight status explored. A meta-analysis demonstrated an association between autonomy and effect size. When sub-grouped by influence to autonomy, those which negatively influenced autonomy and those which positively influenced autonomy produced a similar effect size (-0.15[-0.21,-0.09], -0.16[-0.25,-0.07]). However, those which were least intrusive and solely informed choice, were least effective (-0.10[-0.24,-0.03]). This suggests that regardless of whether we positively or negatively influence autonomy, the interventions that are the extremes may be most effective. Where many potential options exist, a framework for categorising obesity prevention interventions by their influence on autonomy may be beneficial to prioritise effective strategies for policy makers.

¹ Griffiths & West (2015) http://dx.doi.org/10.1016/j.puhe.2015.08.007
A prospective plan to investigate the roles of parental- and child-based self-determined motivation in family-oriented hospital-based therapies for childhood obesity

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There are many Childhood Obesity (CO) treatment programs, and much research into CO, but very few programs have directly investigated the role of motivation in the success of treatment outcomes. Self-determination theory (SDT) is a widely-used theory of human motivation, which focuses both on the quality, as well as the quantity, of a given individual’s motivation.

The purpose of this study is to investigate the role of motivation on the efficacy of a clinical, hospital-based, family-orientated, group-based, CO intervention program. This study aims to determine parent and child motivation regarding weight loss, and to examine the relationships between motivational variables at both pre and post-intervention stages and how this may impact on post-intervention weight loss outcomes. We also aim to explore changes over the duration of the program in the children’s motivation profile, and also the parent’s motivation profile for their own, and their child’s, weight loss.

The children and their families are participants in the Changes in Lifestyle are Successful in Partnership (CLASP) program at Princess Margaret Hospital for Children, in Western Australia. Parents and children are assessed for their regulatory capabilities and their motivation to adhere to the program’s structure and recommendations. We will measure the children’s and parents’ perceptions of need support and need satisfaction in relation to (a) their experiences with the CLASP support staff and (b) their experiences with each other in relation to their general supportive behaviour and their engagement in weight loss activities. Children and parents will also report their own weight loss motivation in line with SDT concepts, and parents will report their motivation for promoting their child’s weight loss. The results of this study will form part of a larger study, and provide a greater understanding of the mechanisms that underpin the efficacy of tertiary childhood obesity intervention programs.

Improvement in SF-36-derived health utility score with liraglutide 3.0 mg versus placebo over 3 years in prediabetes

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Objectives: Liraglutide 3.0 mg is a glucagon-like peptide-1 (GLP-1) analogue currently licensed for weight management in people with obesity (PWO), or overweight with a weight-related comorbidity. This analysis aimed to investigate the effects of liraglutide 3.0 mg (n=1505) versus placebo (n=749), added to a reduced calorie diet and increased physical activity, on health utility in PWO or overweight with comorbidity, over 3 years.

Methods: The study was a 3-year, randomised, double-blind, placebo-controlled, parallel-group, multi-centre, multinational trial (NCT01272219). Participants were ≥18 years with prediabetes (no type 2 diabetes) and either obesity (BMI ≥30 kg/m²) or overweight (BMI ≥27 kg/m²) with hypertension or dyslipidaemia. Health-related quality of life was assessed via the Short-Form 36v2 (SF-36) health survey, completed at baseline and 3 years. Health utility (Short-Form 6D; SF-6D) was scored directly from the SF-36 using a validated algorithm. As sensitivity analyses, SF-36 scores were mapped to the EuroQol-5D (EQ-5D) index and the SF-36 Physical (PCS) and Mental (MCS) Component Summary scores were analysed.

Results: At Week 160, individuals on liraglutide 3.0 mg had greater weight loss from baseline (-7.1±8.4%) compared with placebo (-2.7±7.2%); estimated treatment difference (ETD) -4.3% [95%CI -4.9;-3.7], p<0.0001. SF-6D score at baseline [mean (SD)] was 0.76 (0.11) and 0.75 (0.11), and at Week 160 change from baseline was 0.02 (0.12) and 0.01 (0.12) for liraglutide 3.0 mg and placebo, respectively. At Week 160 ETD was 0.014 [95%CI 0.002; 0.025], p=0.0182. The EQ-5D score supported these findings, with a higher score for liraglutide 3.0 mg versus placebo; ED 0.007 [95%CI 0.002; 0.013], p=0.0116. Change in SF-36 PCS score was significantly higher (better) at Week 160 compared with placebo: ETD 0.87 [95%CI 0.17; 1.58], p=0.0156.

Conclusion: Liraglutide 3.0 mg is associated with improved health utility compared with placebo for weight management in people with prediabetes over 3 years.
Fathers’ interest in participating in a healthy eating program – preference for online and family-focused programs

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Background: In child obesity research and nutrition interventions that aim to reduce child obesity risk the specific inputs of fathers are under-represented. Yet studies that have included fathers suggest that they play a unique role in the feeding environment and child health outcomes. This study aimed to assess fathers’ interest in participating in healthy eating programs and specifically to identify their preferred intervention focus and mode of delivery.

Methods: Recruitment of fathers was via a university email list and two community-based family research cohorts. Fathers (N=436) aged 37±6 years (34% university educated; 89% living with child) of 2-5 year old children (mean age 3.5±0.9 years, 53% boys) completed questions identifying their confidence and knowledge of healthy eating, willingness to participate in healthy eating programs, with focus on type and mode of delivery.

Results: Most fathers (≥80%) knew what and how much their children should eat and were confident about providing healthy food. Interest was greater in learning about healthy eating for the child (67%) than themselves (51%). Fathers preferred a focus on the family (58%), compared to individual (32%), group (24%) or fathers-only (23%) programs. Perceived usefulness varied between online (45%), written information (28%), information DVD (28%), interactive social network (11%) and mobile phone (5%) programs. University educated fathers rated the online program and written information as more useful compared to fathers with no university degree (p<0.05).

Conclusion: Successful access and engagement of fathers in child feeding interventions might increase via an online and family-focused program that focuses on learning about healthy eating for the child. This is in line with other research indicating that fathers prefer to be targeted in interventions to support their family, rather than undergoing a “self-help” program.

Metabolic improvement from switching to saccharin or water following chronic consumption by rats of 10% sucrose solution

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High consumption of sugar-sweetened beverages (SSBs) is acknowledged as a risk factor for weight gain and metabolic disease. A common strategy for reducing this risk is to switch from consumption of SSBs to ‘diet’ beverages containing non-nutritive sweeteners (NNS). However, research on the effects of NNS is mixed: While a majority of studies indicate no harm, some animal and cross-sectional data suggest NNS confer increased risk of metabolic disease. The present experiment modelled whether the switch from SSB to NNS beverages described above conferred positive outcomes on behavioural and metabolic measures. Thus, in Stage 1, thirty adult female rats received ad-libitum access to 10% sucrose solution in addition to chow and water for 4 weeks. In Stage 2, rats were switched either to 0.1% Saccharin (Suc-Sacch) or to Water (Suc-Water) or remained on 10% Sucrose (Suc-Suc) for a further 4 weeks. Weight gain in Stage 2 was reduced for Suc-Sacch and Suc-Water groups relative to the Suc-Suc group. At cull, the Suc-Suc group showed poorer insulin sensitivity and greater g/kg fat than Suc-Water and Suc-Sacch groups. There were no group differences in either fasting glucose or liver and plasma triglyceride content. Short-term recognition memory, assessed using the place/object task, found no group differences but poorer performance overall on the hippocampal-dependent place task, consistent with all rats’ access to sucrose in Stage 1. These results show beneficial effects on weight gain, insulin resistance and adiposity after switching from Sucrose to either Saccharin or Water. Our and others’ past research suggests that Stage 2 may have been too short to observe group differences on other measures.
IL-22 Therapy Reverses High Fat Diet Induced Colonic Epithelial Cell Stress and Inflammation.

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In Type 2 diabetes β-cell dysfunction is accompanied by adverse cellular responses to high concentration of lipids and glucose, oxidative stress, endoplasmic reticulum (ER) stress and local inflammation. Furthermore, prolonged high fat diets (HFD) induce low-grade chronic intestinal inflammation in mice, and diets high in saturated fat are a risk factor for the development of human inflammatory bowel diseases. Previously we showed that IL-22 is a natural regulator of β-cell insulin biosynthesis and secretion, protecting the β-cell from stress, preventing hypersecretion of poor quality insulin, and suppressing innate islet inflammation. To further investigate extra-pancreatic effects of IL-22 we hypothesized that HFD-induced endoplasmic reticulum (ER)/oxidative stress occur in intestinal secretory goblet cells, triggering inflammatory signalling and reducing synthesis/secretion of proteins that form the protective mucus barrier.

A prolonged HFD was accompanied by an increase in circulating triglyceride levels in-vitro in cultured intestinal goblet cells. Non-esterified long-chain saturated fatty acids directly increased oxidative/ER stress leading to protein misfolding. We noted an increase in the intestinal inflammatory cytokine signature, alongside compromised mucosal barrier integrity, loss in the tight junction protein, claudin-1 and increased serum endotoxin levels when mice were kept on HFD for 22 weeks. Obese mice treated with IL-22, not only had an improvement in hyperglycaemia but this was accompanied by reduced ER/oxidative stress in the intestine which overall led to an improvement in the integrity of the mucosal barrier. IL-22 treatment also reversed microbial changes associated with obesity and diabetes with an increase in Akkermansia muciniphila and decrease in E. coli and Prevotella spp. Consistent with epidemiological studies, our experiments suggest that HFDs are likely to impair intestinal barrier function, particularly in early life, which partially involves direct effects of free fatty acids on intestinal secretory cells, and this can be reversed by IL-22 therapy.

Dietary intake of New Zealand European women with different body composition profiles – the women’s EXPLORE study

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Introduction: Dietary intake is a significant contributor in determining body composition; body fat content may vary as a result in women within the same BMI category. The aim was to investigate dietary intakes of young New Zealand European (NZE) women with different body composition profiles (BCP).

Methods: Post-menarche, pre-menopausal NZE women (16-45 years) (n=231) completed a validated 220-item, self-administrated, semi-quantitative food frequency questionnaire (FFQ) assessing dietary intake over the previous month. Body mass index (BMI, kg/m²) was calculated from height and weight; body fat percentage (BF%) was measured using air displacement plethysmography (BodPod). Participants were categorised into three BCPs: normal BMI (18.5-24.9 kg/m²), normal BF% (<30%)(NN); normal BMI, high BF% (≥30%)(NH); high BMI (≥25 kg/m²), high BF% (HH). Micronutrient and macronutrient intakes were examined.

Results: Insufficient intakes of multiple nutrients were observed for many women (vitamin D, 55%; iron, 82%; calcium, 28.5%; folate, 48%; fibre, 28%). Percentage of energy intake was outside the acceptable macronutrient distribution range (AMDR) for carbohydrate (below the AMDR, mean±SD 41.9±7%) and saturated fat (above the AMDR, 13.9±3.5%). Fewer serves of fruit and vegetables and more of diet soft drinks, chocolate bars and cooking oil were consumed by the HH BCP; they also had lowest calcium (1159.5mg/d) and highest energy (9296kJ/d), total (89.4g/d) and saturated (36.5g/d) fat intakes. No significant associations were found with BF%. Vitamins A, E, D, and zinc intakes were adequate, and comparable between BCPs.

Conclusion: Pre-menopausal NZE women are at risk of nutritional deficiencies (iron, vitamin D, folate, calcium, dietary fibre) due to poor intakes, irrespective of body fatness. On average, NZE women do not follow dietary guidelines; consuming diets low in carbohydrates and high in saturated fat. Targeted interventions should be developed to improve NZE women’s dietary quality, particularly reducing energy and fat intakes of those with excess adiposity.

The infant feeding practices of Chinese immigrant mothers in Australia: a qualitative exploration

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Background and Significance: The Australian Infant Feeding Guidelines recommend exclusive breastfeeding for the first six months of life and that solid foods be introduced at around six months while continuing breastfeeding. A majority of Australians are not meeting this guideline and new immigrant populations are potentially most at risk. Evidence suggests that Chinese immigrant mothers in Australia are more likely to introduce infant formula and solid foods earlier. Shorter duration of exclusive breastfeeding is associated with higher risks of overweight in Chinese children. A better understanding of the facilitators and barriers to achieving best practice in infant feeding is needed to support at risk populations achieve best early feeding outcomes.

Methods: This qualitative study describes Chinese immigrant mother’s infant feeding experiences and explores factors influencing their early feeding choices. Semi structured interviews were conducted with 36 Chinese immigrant mothers who had children aged 0 to 12 months, living in Melbourne, Australia. Interviews were conducted in Chinese, using an interpreter, or in English, and audio recorded. Recordings were transcribed and analysed thematically.

Results: Eight themes were identified. Key themes included Chinese immigrant mothers were supportive of exclusive breastfeeding, however breastfeeding problems and conflicting views about infant feeding and growth from grandparents reduced many mothers’ confidence to breastfeed exclusively. For many new mothers, anxiety that exclusive breastfeeding provided insufficient nourishment prompted the introduction of formula before six months of age. Most mothers delayed introducing solid food to five to six months in the belief that this prevented the development of allergic diseases and gastrointestinal problems.

Conclusion: Chinese immigrant mothers in Australia need support to increase their confidence to breastfeed exclusively. To achieve this, culturally sensitive guidance is needed and the contradictions in advice given by Chinese grandparents and health professionals on infant feeding practices and healthy infant growth need to be recognised and addressed.

Obesity prevention in infants: A qualitative study exploring the influence of the Growing healthy program on infant feeding behaviours.

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Introduction: Infant feeding behaviours associated with obesity, such as formula feeding, feeding beyond satiety and early introduction of solids are potentially modifiable. Providing support to parents to promote healthy infant feeding using mobile phone apps (mHealth interventions) is a novel, yet untested approach. This qualitative paper explores the mechanisms by which an mHealth program (Growing healthy) may influence mothers’ uptake of healthy infant feeding practices in the first nine months of life.

Methods: The 300 participants in the Growing healthy program were invited to participate in individual semi-structured telephone interviews when their infants were aged 6-12 months. Interviews explored the impact of the program on breastfeeding, best practice formula feeding and timing of introduction of solids - including the effect on key behavioural mediators such as participants’ capability (e.g. knowledge), opportunity (e.g. support and advice) and motivation (e.g. plans and emotions). Interviews were audiotaped, transcribed and thematic analysis performed.

Results: A total of 44 Mothers of infants aged 6-12 months were interviewed. Participants thought the program influenced their capability around feeding decisions, with videos considered more useful in guiding practical skills than written information. Participants also felt that the app provided a convenient, trustworthy and “round-the-clock” source of information enhancing support with infant feeding. Push notifications linking to information in the app encouraged healthy infant feeding practices as messages were timely and concordant with current feeding experiences. Participants reported less impact of the app on their motivations regarding feeding. When the information provided in the app was consistent with advice received by health professionals, uptake of appropriate infant feeding behaviours was higher.

Conclusions: This study provides new information about the mechanisms by which a novel mHealth intervention can influence healthy infant feeding practices to prevent excess weight gain in early childhood.
NADPH oxidase modulates leptin effects on gastric vagal afferent mechanosensitivity.

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Leptin, produced locally in the stomach modulates peripheral gastric vagalafferent satiety signals by a paracrine mechanism of action. In lean, standard laboratory diet (SLD) fed mice, leptin potentiates gastric vagal afferent mucosal receptor responses to mucosal stroking. In contrast in mice with high fat diet (HFD)-induced obesity leptin has no effect on mucosal receptors and inhibits the response of tension receptors to stretch, an effect not observed in lean mice (J Physiol 2013;591:1921-34). The mechanism for this switch in effect of leptin in gastric vagal afferents is unknown. Within the hypothalamus there is evidence to suggest that reactive oxygen species (ROS) production mediates the effect of leptin (Nat Med 2011;17:1121-7). Therefore we determined whether: 1) NOX mRNA and protein are expressed in vagal afferent neurones; and 2) we can mimic leptin effects in HFD conditions by inhibiting NADPH oxidase (NOX), the enzyme responsible for the synthesis of ROS.

The relative expression of NOX isoforms in vagal afferent neurones was NOX2>>NOX4>DUOX2>DUOX1>NOX1>NOX3. In addition, traced gastric vagal afferent neurones were NOX2 positive. Single fibre recordings of gastric vagal afferent tension and mucosal receptors were obtained from lean mice fed ad libitum. Leptin (1nM) potentiated gastric vagal afferent mucosal receptor responses to mucosal stroking; an effect blocked by the NOX inhibitor apocynin (1mM). Leptin had no effect on gastric vagal afferent tension receptors. However, in the presence of apocynin leptin reduced tension receptor responses to stretch.

In conclusion, NOX inhibition mimics the effect of leptin on gastric vagal afferent in HFD-induced obesity. Thus the switch in effect of leptin is likely due to disruption of leptin-NOX signalling pathways.

Nutritional adequacy of diets for adolescents with overweight and obesity: considerations for dietetic practice

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Background & Aims: Adolescents have unique nutrient requirements due to rapid growth and development. High rates of obesity in adolescents require a variety of diet interventions to achieve weight loss under clinical supervision. The aim of this study is to examine the nutritional adequacy of energy restricted diets for adolescents.

Methods: Three popular diets were modelled for 7 days and assessed by comparing the nutrient profile to the Australian Nutrient Reference Values. Three diets were: [1] a standard energy restricted diet based on current dietary guidelines; [2] a hypocaloric diet aimed at increasing protein and improving carbohydrate quality; and [3] a modified alternate day fasting diet.

Results: Initial modelling revealed limiting nutrients (i.e. not meeting the recommended intakes) across the diets. Subsequent modelling was required to achieve nutritional adequacy for all three diets. The dietary guidelines diet design met most nutrient targets except essential fatty acids prior to subsequent modelling, however this diet also provided the highest energy (8.8 MJ). Leptin, produced locally in the stomach modulates peripheral gastric vagal afferent satiety signals by a paracrine mechanism of action. In lean, standard laboratory diet (SLD) fed mice, leptin potentiates gastric vagal afferent mucosal receptor responses to mucosal stroking. In contrast in mice with high fat diet (HFD)-induced obesity leptin has no effect on mucosal receptors and inhibits the response of tension receptors to stretch, an effect not observed in lean mice (J Physiol 2013;591:1921-34).

Conclusions: Energy restricted diets need careful consideration to meet nutritional requirements of adolescents. A variety of eating patterns can be adapted to achieve nutritional adequacy and energy restriction, however health practitioners need to consider adequacy when prescribing diet interventions for weight loss during adolescence.

Does chronic treatment with a thiazolidinedione increase brown fat thermogenesis in humans?

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Increasing energy expenditure via brown adipose tissue (BAT) thermogenesis is a possible therapeutic strategy to treat obesity and its associated co-morbidities. The thiazolidinedione class of anti-hyperglycemic drugs increase BAT differentiation in pre-clinical experimental models and therefore potentially increase BAT thermogenic capacity. Thus, the aim of the study was to determine if pioglitazone treatment for 4 weeks increases BAT activity in response to acute cold exposure in humans. In a double-
blinded, placebo-controlled, parallel design trial, 14 lean (BMI <25 kg/m²), un-medicated male participants who exercise <2 hours per week and were free of overt cardiovascular and metabolic disease were randomised to receive placebo (lactose) or pioglitazone (45mg/day) for 28 days. After unblinding in September 2016, this presentation will report the primary outcome measure of the change in BAT activity in response to acute cold exposure, assessed before and after the interventions by measuring glucose uptake with ¹⁸F-fluorodeoxyglucose Positron Emission Tomography-Computerised Tomography (PET-CT). BAT activity will be measured in regions of supraclavicular adipose tissue with radiodensity corresponding to BAT and reported as maximum and mean standardised glucose uptake value (SUVmax and SUVmean). Energy expenditure, cardiovascular responses (blood pressure and heart rate), core temperature, blood glucose, plasma non-esterified fatty acids and plasma noradrenaline will also be reported basally and in response to acute cold exposure along with body composition before and after the intervention. Outcomes from the study will expand our understanding of human BAT physiology and inform the development of therapeutic approaches that target energy expenditure via BAT.

**251**

**Do Early Years’ Educators foster positive body image in very young children?**

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Over 1 000 000 Australian children < 12 years spend on average 28 h/week in care. Early Years’ Educators (EYE) are positioned to influence many aspects of children’s wellbeing including nutrition, obesity and body image (BI) development. Evidence suggests BI concerns emerge in children as young as 3 years and maybe unintentionally transmitted through parents/caregivers, or by EYE.

This study explored the knowledge, attitudes and behaviours of EYE in relation to BI development of young children (2-3y). An online survey was developed and included adapted standardised measures of body appreciation, knowledge of BI development and feeding practices. This was completed by 187 EYE nationally.

EYE understood the concept of BI, and reported positive Body Appreciation Scores. They recognised their role in fostering positive BI of the young children they taught (83%) and reported confidence in their ability to access support in dealing with BI issues (67.4%), and 80% felt they had the capacity to understand BI concerns in young children. Knowledge scores were high (78% ± 8%), however, 32% of EYE believed they should judge when a child was full, 68% felt that dieting was a healthy behaviour and 20% agreed that ‘special foods’ (discretionary foods) should be given to a child when they were upset, demonstrating problematic attitudes and behaviours related to the food environment by some EYE.

Despite the lengthy time that children spend with EYE, their role in developing BI has not previously been explored. Current knowledge, attitudes and behaviours of EYE vacillate and have the potential to greatly influence the development of BI in young children. Provision of resources and professional development to ensure quality teaching and learning experiences need to be developed to ensure EYE play a role in positive BI development.

**252**

**Effect of rice cooking methods on postprandial glycaemic response, satiety and palatability, and chewed particle size distribution**

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**Aim:** Diets, which produce a low glycaemic response, are relevant to prevention and management of obesity and diabetes. The aim was to investigate the effect of rice products and cooking-storing methods on postprandial blood glucose and the changes in satiety and palatability.

**Methods:** The randomised, cross-over experimental trial investigated the glycaemic responses, satiety and palatability (Visualised Analogue Scale (VAS)) scores of 28 healthy participants after consumed three rice samples (140g±0.3g), freshly cooked medium-grain-white, freshly cooked parboiled, and reheated parboiled (24-hour storage at 4 ºC and reheated to 65 ºC), in each study visit. Postprandial blood glucose was recorded at 0, 15, 30, 45, 60, 90 and 120 minutes after rice consumption. Satiety (VAS score) was reported at 0, 30, 60, 90, and 120 minutes. Palatability (VAS score) was reported immediately after consumption. Glycaemic responses, satiety, and palatability among three rice samples were compared using repeated-measure-analysis of variance (ANOVA).

**Results:** The overnight cold-stored and reheated parboiled rice resulted in a significantly lower blood glucose concentration trajectory (42%; P=0.01) than freshly cooked medium-grain white rice and 12% lower (P=0.01) than freshly cooked parboiled rice. Longer chewing time (6.34 seconds/10 g) was observed in reheated parboiled rice compared with freshly cooked medium-grain white (P=0.026) and higher palatability (visual appeal 2-fold higher (P=0.001), smell 1-fold higher (P=0.047), taste 1.5-fold higher (P=0.018), and overall palatability 2-folder higher (P=0.002)). No significant differences in satiety were observed (P>0.05).

**Conclusion:** The effect of reheating on the glycaemic response, chewing time and palatability shown in the present study may be considered a positive effect with regard to glycaemic regulation. Reheated parboiled rice replacing freshly cooked medium-grain white or parboiled rice in the habitual diet may reduce glycaemic overload in the daily diet.

There is no conflict of interest in this study.
The prevalence of weight cycling and associations with weight change and health outcomes (over 12 years)

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Introduction: Weight cycling is thought to be harmful for health, although evidence is conflicting. Here we have examined the prevalence of weight cycling in a representative population sample of women and evaluated the association with weight change and health outcomes 12 years later.

Methods: The Australian Longitudinal Study of Women’s Health is a prospective study of factors shaping the health and well-being of Australian women. These analyses used data from the mid cohort, at survey two (aged 47-52 years) (1998) and survey six (2010). Weight cyclers were defined as those women who lost or gained 5 kg three times or more. The other outcomes investigated were: CESD-10 scores and the mental health and physical component scores from the SF36 questionnaire. Generalised linear modelling was used to investigate percentage weight change and health variables by weight cycling group.

Results: The prevalence of weight cycling was 14.6%. 'Weight cyclers' on average had a higher BMI. Weight cyclers on average gained less percentage weight than those who had never lost weight over 12 years (mean difference -1.7 (-2.5 to -0.9). There was no difference in the association of overall mental health scores by group. However in the 'Weight Cyclers' group there were higher odds of women having depressive symptoms at survey six (OR 1.27 95% CI 1.04 to 1.55) than non dieters. There were significant higher odds of having lower physical component scores 12 years later in the dieters compared to all other groups.

Conclusions: The prevalence of weight cycling was low and was associated with less percentage weight loss 12 years later. There was some evidence to suggest an association with weight cycling and greater depressive symptoms 12 years later.

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Self-reported breastfeeding problems, use of infant formula and early cessation of breastfeeding: Similarities and differences between healthy and overweight mothers

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Women who enter pregnancy above a healthy weight tend to have poorer breastfeeding outcomes compared to healthy weight women. Differences between overweight and healthy weight women’s experience of specific breastfeeding-related problems and reasons for use of formula have not been systematically investigated. The present study compared self-reported breastfeeding problems in healthy weight and overweight mothers and the main reasons reported by mothers for use of infant formula during the first month postpartum. 477 Australian women enrolled in the New Beginnings: Healthy Mothers and Babies Study self-reported breastfeeding problems and reasons for use of infant formula during the first month postpartum. Pre-pregnancy BMI was calculated based on self-reported pre-pregnancy weight and measured height. Binary logistic regression analyses were used to compare pre-pregnancy weight groups (“healthy” [BMI <25 km/m²] and “overweight” [BMI ≥25 km/m²]) on self-reported breastfeeding problems and reasons for use of infant formula. Analyses were adjusted for covariates that differed between groups (P<.1). Frequency of breastfeeding problems was similar across weight status groups. “Not enough milk” was the predominant reason for giving infant formula and predicted breastfeeding cessation. Overweight women were more likely than healthy weight women to agree that infant formula was as good as breastmilk and less likely to agree that medical advice was important in the decision to use infant formula. Guidance regarding indicators of adequate milk supply and the potential risks of using infant formula may be important in supporting exclusive breastfeeding, particularly for overweight women.
O-1918 does not alter food intake, body weight or adiposity but reduces appetite hormones and increases certain pro-inflammatory cytokines in a diet induced obesity model

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Introduction:
O-1918 is a synthetic compound structurally similar to the plant constituent cannabidiol, and is an antagonist for GPR55 and GPR18. While the role of GPR18 in obesity is unknown, GPR55 knockout mice have increased adiposity and insulin resistance. In humans, the expression of GPR55 is increased in visceral fat and positively correlated with obesity and T2D. Both receptors are classified as putative cannabinoid receptors. The endocannabinoid system is involved in regulating energy homeostasis. Therefore modulation of these receptors may be a useful obesity target.

Aim:
To determine the role that O-1918 has on the regulation of body weight and circulating hormones and cytokines.

Methodology:
Male Sprague Dawley rats were fed a high fat diet (41% energy from fat) for 9 weeks to induce obesity, then treated with 1mg/kg of O-1918 or vehicle for a further 6 weeks. Weight and food intake were monitored daily. Body composition using EchoMRI was measured at baseline, during week-3 and week-6 of treatment. Following treatment, rats were anaesthetised, blood was collected via cardiac puncture and fat pads collected and weighed immediately post-mortem. Plasma concentrations of hormones and cytokines were determined using commercially available Bioplex Diabetes and Cytokine kits.

Results:
In obese rats, O-1918 treatment did not change food intake, body weight, body composition or fat pad weight compared to obese control. Despite no alteration in food intake or body weight, O-1918 reduced plasma leptin and ghrelin compared to obese control. O-1918 also increased pro-inflammatory cytokines including IL-1a, IL2, IL17a, IL18 and RANTES, some of which are linked with insulin resistance and T2D.

Discussion/Conclusion:
These results demonstrate that GPR55/GPR18 antagonist, O-1918 did not alter food intake, body weight or adiposity suggesting it is not an effective anti-obesity therapeutic. The changes observed in the circulating hormones and cytokines require further investigation into any tissue-specific effects.

Investigation into availability of kilojoule information in Victorian chain food outlets

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Background: Fast food is often high in fat and sugar and can be a significant contributor to weight gain. Provision of consistent nutrition information at point of purchase has been shown to be effective in reducing kilojoules purchased. Several Australian states have mandatory kilojoule labelling in chain outlets but Victoria does not. In the absence of local regulations we investigated whether Victorian chains were implementing kilojoule labelling consistent with other states.

Methods: This study was an instore survey of 129 chain stores in 5 areas across metro and regional Victoria. All fast food, café, takeaway drink and snack, supermarket and bakery chains covered by kilojoule menu labelling legislation in NSW and a major convenience store chain in the survey areas were assessed. Data collection involved observations of kilojoule labelling on menu boards, product tags and takeaway brochures. Stores were scored for consistency with NSW regulations around font size, legibility and labelling on all items.

Results: 94 of 129 stores surveyed were covered by the labelling legislation in NSW. Of the stores surveyed only 11% (n=14) provided kilojoule labelling consistent with NSW regulations. The most common inconsistencies were legibility (60%) and font size (56%). All (100%) fast food outlets and large supermarkets had some kilojoule information available instore. Some casual dining (40%), takeaway drink and snack outlets (75%) and coffee outlets (87%) had some kilojoule information instore. No (0%) bakeries or convenience stores had any kilojoule information instore. Overall only three of the 25 chains had labelling consistent with NSW regulations.

Conclusions/Recommendations: The study findings indicate kilojoule information is available in many Victorian food chains. However it is inconsistent and often difficult to read reducing its impact. Mandatory consistent kilojoule menu labelling and accompanying education is more likely to help consumers make healthier choices in chain food outlets.
Add health stars to reduce kilojoules? Effects of health star labelling on the kilojoule content of adults’ fast food meal selections

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Background: People substantially underestimate the energy content of fast food meals.

Aim: To test whether the addition of Health Star Rating (HSR) labelling to kilojoule (kJ) labelling on menus at fast food outlets would prompt consumers to select meals with fewer kJs.

Methods: A between-subjects experimental design, whereby 1,007 NSW adults aged 18-49 were allocated to one of four menu labelling conditions: (i) no labelling; (ii) kJ labelling; (iii) HSR labelling; and (iv) kJ + HSR labelling. Using an online methodology, respondents were presented with their menu boards and instructed to select an evening meal as they would at a fast food restaurant. Programming required participants to select at least one item overall, and up to five mains and sides, two drinks and three desserts. A one-way ANOVA, with Bonferroni adjustment, was conducted to test for differences in the total mean kJ content of respondents’ evening meal selections by menu labelling condition.

Results: Overall, the mean kJ content of meals selected did not differ significantly by menu labelling condition (p>0.05). This was consistent across demographic characteristics, BMI, perceived weight status, usual frequency of eating at fast food restaurants, and self-reported importance of nutrition when eating out. However, among respondents who reported using menu board nutrition information to assist meal selection (n=343, 34%), mean kJ content of meals differed significantly by condition (p=0.034). Respondents shown kJ + HSR menu labelling selected meals with a significantly lower kJ content compared to those shown HSR labelling only (4751 kJ cf. 5745 kJ, p=0.038).

Conclusion: For the sample as a whole, the addition of HSR to kJ labelling on menus did not afford a clear reduction in the mean kJ of meals selected. However, among the minority of respondents who made use of nutrition information, it enabled them to select less energy-dense meals.

Reduction in the risk of developing type 2 diabetes (T2D) with liraglutide 3.0 mg in individuals with prediabetes and obesity or overweight from the SCALE Obesity and Prediabetes randomised, double-blind, placebo-controlled trial

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Background: The 3-year part of this trial investigated the effect of liraglutide 3.0 mg, as an adjunct to diet + exercise, in delaying onset of T2D (primary endpoint) in adults with prediabetes and obesity (BMI ≥30 kg/m²) or overweight (≥27 kg/m²) with comorbidities.

Methods: Participants were randomised 2:1 to once-daily subcutaneous liraglutide 3.0 mg or placebo plus 500 kcal/day deficit diet and 150 min/week exercise. Efficacy data are observed means, with last observation carried forward for missing values. Clinicaltrials.gov ID: NCT01272219.

Results: Of 2254 randomised individuals with prediabetes (age 47.5±11.7 years, 76.0% female, weight 107.6±21.6 kg, BMI 38.8±6.4 kg/m²; mean±SD), 1128 completed 160 weeks (52.6% on liraglutide, 45.0% on placebo). At Week 160, mean weight loss (WL) was 6.1% with liraglutide vs. 1.9% with placebo (estimated treatment difference -4.3% [95%CI -4.9; -3.7], p <0.0001). More individuals achieved ≥5% WL (estimated odds ratio [OR] 3.2 [2.6;3.9]) receiving liraglutide vs placebo (49.6% vs 23.7%) and more achieved >10% WL (OR 3.1 [2.3;4.1]) (24.8% vs 9.9%), both p <0.0001. Based on the Kaplan-Meier plot of cumulative probability of a diagnosis of diabetes taking censoring into account, 3% of individuals in the liraglutide group vs. 11% in the placebo group were diagnosed with diabetes by week 160 while on treatment. At week 160, the estimated time to onset of diabetes was 2.7 times longer with liraglutide than with placebo while on treatment (95% CI 1.9; 3.9, p <0.0001), corresponding to a hazard ratio of 0.2. Liraglutide was generally well tolerated. Gallbladder-related events (2.9 vs 1.2/100 patient-years of observation [PYO]) and confirmed pancreatitis (0.29 vs 0.13 events/100 PYO) were low, but more frequent with liraglutide.

Conclusion: Liraglutide 3.0 mg, plus diet + exercise over 3 years was associated with greater weight loss and reduced risk of T2D compared to placebo.
A novel probiotic for glucose management: A randomised double-blind placebo controlled pilot study

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**Background:** Type 2 diabetes Mellitus (T2DM) is characterised by a persistent low-grade inflammatory response associated with the development of insulin resistance [1]. Variations in the type, diversity and metabolic capacity of gastrointestinal gastro-intestinal microbial communities have been shown to alter these metabolic and inflammatory pathways by shifting energy balance and storage and promoting metabolic endotoxaemia [2, 3].

**Aim:** The aim of this study is to assess the therapeutic effect of a novel probiotic on glucose metabolism in adults diagnosed with prediabetes and early T2DM.

**Methods:** Sixty adults with a BMI ≥25 kg/m² and diagnosed with pre-diabetes or T2DM (within the previous 12 months) have been enrolled in a double-blind controlled clinical trial and randomised to a multi-strain probiotic or placebo for 12 weeks. Both groups received lifestyle advice. Measurements and samples are collected at baseline and 12 weeks after treatment. Outcome measures include fasting plasma glucose, 2-hour glucose tolerance, insulin, lipids, inflammatory markers, gut permeability, and faecal microbial and metabolomics profiles.

**Results:** Recruitment is complete and the study will be concluded in September 2016. The primary outcome of fasting blood glucose will be reported as well as secondary outcomes including insulin sensitivity, lipid profiles and inflammatory and permeability markers.

**Discussion:** Intentional manipulation of gastro-intestinal microbial profiles may be useful for regulating T2DM and its associated metabolic disorders.

**Trial Registration**

Australian New Zealand Clinical Trials Registry: ACTRN12613001378718.

**Acknowledgements**

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**Competing interests**

LV and SC participate in research on probiotics at Medlab Clinical. The authors CM, IC and TP declare that there are no conflicts of interest.


Recruiting young women with obesity to weight management trials: barriers and enablers

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**Background and significance:** Young women are difficult to recruit to weight management trials (WMT). Limited research has explored these challenges. This study aimed to examine barriers and enablers influencing WMT participation by young obese women.

**Methods:** Young (18-35y) women with obesity (BMI >30-40kg/m²) were recruited to 90 min focus groups (3-5 participants/group) to discuss barriers and enablers influencing participation in WMT. Participants were required to have undertaken at least two previous serious weight loss attempts. Discussion was recorded and transcribed verbatim. Recruitment continued until thematic saturation occurred with qualitative content analysis conducted using NVivo.

**Major findings:** Eight groups (5 urban; 3 regional) including 27 women (16 urban; 11 regional) were conducted. Age and BMI was (mean±SD) 29.2±5.8y and 36.0±2.8 kg.m⁻² respectively. Barriers were psychological, physical or program-related. Strong psychological barriers included, feeling stigmatised about obesity, especially the fear of judgement by health professionals/researchers (or other participants) as well as the challenge of overcoming the denial of needing to lose weight. Physical barriers included the time commitment, other participation costs and access (transport/parking). Perceived program barriers included the lack of WMT tailoring to younger women and the need to eat specific foods. Financial incentives were a strong enabler. Advertising other WMT benefits (health, fitness, well-being) rather than weight loss and use of private (toilet door,
e-mail, e-newsletters, social media and websites with self-assessment of eligibility) rather than public advertising (noticeboards or flyers) was viewed positively. The words obesity, BMI or weight loss were identified as deterrents to participation.

Conclusions: Young women feel vulnerable to weight stigma and this is a barrier to WMT participation. Tailoring content to age-stage and considering time and access barriers was viewed as important. Positive health messages, financial incentives, self-eligibility assessment and ‘private’ advertising emerged as valuable recruitment strategies.

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**Is Food Porn Contributing to Obesity?**

**Helena Popovic**

1. Winning at Slimming, Burleigh Waters, QLD, Australia

In June 2012, a study in the journal *Obesity* examined the effect of pictures of food on the hormone, ghrelin. Ghrelin is a neuropeptide produced by cells of the gastrointestinal tract when the stomach is empty. The role of ghrelin is to act on cells in the hypothalamus to stimulate hunger. Ghrelin also causes secretion of gastric acid to prepare the stomach for food.

During the first week of the study, healthy young men were shown 50 neutral pictures followed by blood tests to measure their ghrelin levels. One week later, the same blood tests were repeated after the men were shown food pictures. Ghrelin levels and perceived hunger increased significantly after the men were shown food pictures versus neutral pictures. This research suggests that our hunger is constantly being stimulated by the sight of food in our environment: billboards, bus stops, supermarket posters, TV advertisements and glossy magazines. Wherever we look, we are likely to see food. As the saying goes, ‘A picture paints a thousand… calories.’ Food porn — those gorgeous, mouthwatering, close up, oozing, intimate, airbrushed food photos — are particularly potent in triggering the release of hormones that stimulate both hunger and pleasure.

People are even more susceptible to the effects of food porn when they're tired. A study in the *Journal of Clinical Endocrinology and Metabolism* demonstrated that people are more strongly induced to eat in response to food porn when they are sleep deprived.

Does this mean that everyone is doomed to be in a constant state of hunger?

This presentation examines the effect of food porn on our physiology and brain chemistry, and its contribution to obesity. It also discusses the antidote to being enticed to eat by images of beguiling bagels. The steps include awareness, substitute-visualisation, physical movement and a regular good night’s sleep.

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**There’s Nothing Left To Eat!**

**Helena Popovic**

1. Winning at Slimming, Burleigh Waters, QLD, Australia

The title of this abstract comes from my patients who lament that every food on the planet has been demonised. Meat gives you cancer, fish are full of metals, grains inflame your brain, dairy causes arthritis, carbs elevate your insulin, fat clogs your arteries, legumes are ‘anti-nutrients’ (contain lectins) and vegetables are poisoned with pesticides. The food pyramid has been turned upside down and Humpty Dumpty is still sitting on the fence. So what’s left?

Moderation and understanding bio-individually.

We now recognise that genes, microbiome and epigenetic factors play a major role in individual responses to different foods. We can no longer tell people ‘You are what you eat’ because we now know this is only part of the picture. We are what our genes, hormones, gut bacteria and fit or unfit bodies do with what we eat. Add that to the role of stress, socioeconomic factors and cultural beliefs in determining food choices, and you have a recipe for mass public confusion. It also doesn’t help that every blogger and celebrity is a nutritional expert, and personal stories with a sample size of one carry more clout than scientific data.

This presentation examines the need for health professionals to focus on delivering simple and consistent core messages that will help people make daily choices that lead to better health. We also need to agree on a uniform goal. Should we ditch the BMI in favour of waist circumference? Should we be focusing on improving fitness rather than reducing fatness? Remind people that happy meals are not real meals? We need to think outside the plate and rebrand health as a way of life, not a fad diet or annual detox. When health is reframed as a daily decision not a distant destination it empowers people to make positive changes.
Food Choices are about Values not Virtues

Helena Popovic¹

1. Winning at Slimming, Burleigh Waters, QLD, Australia

The language people use around food choices often carries a moralistic tone. My patients frequently tell me: ‘I’ve been good all month because I’ve been going to the gym.’ Or ‘I was bad last week because I ate a lot of junk.’ They are shocked when I tell them that people who exercise on a regular basis are no more virtuous or self-disciplined than people who don’t exercise. People who exercise simply put exercise higher up on their list of priorities than people who don’t exercise. We always make time for the things that are most important to us.

Negative self-judgement leads to poor self-image and a greater likelihood of self-soothing with food. The result is a self-perpetuating negative spiral. When people recognise that their food choices - in fact every decision they make - are a reflection of their values, rather than their virtues, it relieves much of the guilt and stress around eating and enables them to start the journey to self-compassion.

Most people in the Western world are living back to front: trying to fit healthy choices into a busy schedule rather than fit a busy schedule around health choices. How can we bring about a shift in perspective that assists people in giving greater priority to their health? Not just through lip service but through the way they live their lives?

This presentation examines how teaching people to live in alignment with their deepest values can have a profoundly positive impact on their health and lifestyle choices.

Pilot Study: The impact of substantial pre-conception weight loss in obese women on glucose control at 26-28 weeks of pregnancy

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Background: In Australia, 1 in 3 women of reproductive age are obese, but no pre-pregnancy weight loss interventions have been shown to reduce the risk of obesity-related pregnancy complications for both mother and child. The HAPO study (NEJM 2008;358:1991-2002) observed that small changes in maternal glucose at 26-28 weeks gestation are associated with significant changes in the rate of adverse pregnancy outcomes.

Aim: To determine if substantial pre-conception weight loss (10-15% body weight) in obese (BMI>30kg/m²) women reduces fasting glucose at 26-28 weeks gestation by ≥10% compared with modest (≤3%) weight loss.

Method: 78 women were randomised to either a lifestyle program expecting modest weight loss (MWL; ≤3% body weight; n=38), or a modified VLED program expecting substantial weight loss (SWL; 10-15% body weight; n=40). Attrition over the 12-week program was 20% (MWL 10/38 (25%), SWL 6/40 (15%)). Only completers were considered in the preliminary analysis. Subjects were followed for 12 months and if pregnancy occurred, maternal plasma glucose was measured at 26-28 weeks gestation. Of the 24 subjects who were >6 months post-intervention, 10 were pregnant and had completed 28 weeks gestation.

Results: Weight loss in the MWL (n=28) and SWL (n=34) groups was 2.1% and 13.1% respectively. Mean reduction in plasma glucose after 12 weeks was 1.24% (SE 1.40) in MWL and 9.12% (SE 1.83) in SWL group. Of those who achieved pregnancy (MWL=3, SWL=7), mean decrease in plasma glucose between the start of the weight loss program and 26-28 week gestation was 1.85% (SE 1.83) and 11.51% (SE 3.17) in the MWL and SWL groups respectively.

Conclusion: This pilot data suggests that, in obese women, pre-conception weight loss results in a decrease in fasting plasma glucose which is maintained into pregnancy. The reduction in plasma glucose is greater when substantial pre-pregnancy weight loss is achieved.
Liraglutide 3.0 mg in obese/overweight adults with or without prediabetes with baseline BMI <35 vs ≥35 kg/m² in the SCALE Obesity and Prediabetes 56-week randomized, double-blind, placebo-controlled trial

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Background: SCALE Obesity and Prediabetes (NCT01272219) randomized 3731 subjects (mean age 45 years, male 22%, mean BMI 38 kg/m², 61% with prediabetes) 2:1 to liraglutide 3.0 mg or placebo (PBO) as adjunct to diet and exercise (D&E) for 56 weeks.

Methods: This post-hoc analysis compared efficacy and safety results for subjects with BMI < vs ≥35 kg/m² at baseline. The treatment effect of liraglutide across baseline BMI subgroups was evaluated by statistical testing of interaction between treatment and baseline BMI subgroup.

Results: Baseline characteristics were similar between liraglutide and PBO subgroups (BMI< vs ≥35 kg/m²) except for body weight (90.1 and 89.9 kg; 115.1 and 115.0 kg) and prevalence of prediabetes (54.0 and 51.1%; 65.3 and 66.1%); both were higher with BMI ≥35 kg/m². At 56 weeks, greater mean and categorical weight loss were seen with liraglutide vs PBO in both subgroups (mean: −8.2 and −7.9%; −2.7 and −2.6%) as well as greater improvements in systolic BP, FPG, and IWQoL-Lite total score. These treatment effects of liraglutide were all independent of baseline BMI (< vs ≥35 kg/m²; p<0.05), except for the IWQoL-Lite physical function sub-score, which improved more with BMI ≥35 kg/m² (p=0.04).

Adverse events (AEs) and serious AEs were generally comparable across BMI subgroups. In both liraglutide subgroups (BMI< or ≥35 kg/m²), more subjects reported nausea (40 vs 40%) than PBO (15 vs 15%). Gallbladder disorders were similar in liraglutide subgroups (18 [2.1%] vs 37 [2.3%] subjects) but higher than PBO (3 [0.7%] vs 7 [0.9%] subjects). Similar results were seen for adjudicated events of acute pancreatitis (liraglutide: 2 [0.2%] vs 5 [0.3%] subjects; PBO: 0 vs 1 [0.1%] subject).

Conclusions: The effects of liraglutide 3.0 mg, as adjunct to D&E, on body weight, metabolic control and safety were similar in subjects with baseline BMI < and ≥35 kg/m².

Escalating prevalence of comorbid obesity and binge eating: 20-year cross sectional data from South Australia, 1995 to 2015

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Obesity and binge eating are health conditions that are often studied and treated separately. However, examination of the comorbid occurrence of these two public health concerns is important, because binge eating is known to contribute to the onset and maintenance of obesity and vice-versa. Method: Data from large cross-sectional representative community samples of people from South Australia in the years of 1995 (n=2,768), 2005 (n=2,813) and 2015 (n=2,746) were analyzed. Data collection was performed by Harrison Research using the Health Omnibus Survey. This structured, self-report interview comprises demographic and health-related questions, including height, weight and binge eating. Questions regarding binge eating were derived from the “gold standard” instrument for assessment of eating disorders, namely the Eating Disorders Examination, and assessed the frequency of participants’ binge eating episodes (overeating accompanied by a sense of loss of control over eating). Comparisons were conducted regarding the prevalence of obesity, recurrent binge eating (one or more episodes per week during the last three months) and their co-occurrence. Results: The prevalence of obesity increased from 1995 to 2005 (from 12.8% to 19.2%) and from 2005 to 2015 (from 19.2% to 25.2%). The prevalence of recurrent binge eating also increased from 1995 to 2005 (from 3.1% to 7.2%), and from 2005 to 2015 (from 7.2% to 13%). The prevalence of people with comorbid obesity and recurrent binge eating increased from 1995 to 2005 (from 0.8% to 2.7%), and from 2005 to 2015 (from 2.7% to 5%). Conclusion: There was an increase in South Australia during the 20 years from 1995 to 2015 in the independent prevalence of obesity and recurrent binge eating. However, the highest increase (6.2-fold) was in the prevalence of comorbid obesity with recurrent binge eating. More attention to factors triggering obesity and binge eating – as well as their simultaneous treatment – is indicated.
Hypertension and diabetes risks among adults with moderately increased BMI (23.0-24.9 kg/m²): findings from a nationwide survey in Bangladesh

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Body-mass index (BMI) is a proxy for fat accumulation in the body. Asian populations experience increased diabetes and cardiovascular diseases risks at lower BMI than the WHO recommended cut-off for overweight (25 - 29.9 kg/m²) and obesity (>30 kg/m²). Bangladesh guideline follows BMI 18.5 - 24.9 kg/m² for normal weight. This study aims at quantifying hypertension and type 2 diabetes risk in Bangladeshi adults with moderately increased BMI (23.0-24.9 kg/m²) i.e. those who are “at risk of overweight”.

Data from the most recent Bangladesh Demographic and Health Survey (BDHS 2011) were analysed. BMI, blood pressure, blood sugar and related information were collected from a nationally representative sample of 7,433 adults, aged ≥ 35 years. Modified Poisson regression models with robust error variance were used to calculate adjusted relative risk (ARR) for HTN or T2DM by BMI categories, with BMI 18.5 - 22.9 as the reference.

About 45% of Bangladeshi adults in this nationally representative population had BMI within 18.5 - 22.9 kg/m². About one-in-four (25%) had BMI ≥ 23 including 2% with BMI > 30.0 (obese). About 12% of Bangladeshi adults, both male and female, had BMI within 23.0-24.9 kg/m² (moderately increased), and showed increased hypertension (ARR 1.55-1.77) and diabetes risk (ARR 1.54-1.93), compared to the reference group (18.5 - 22.9 kg/m²). Apart from BMI, increased age (≥ 56 years), higher wealth and education were associated with increased hypertension and diabetes risks.

Our findings support the recommendation that calls for setting optimum BMI for Asian populations to 18.5-23.0 kg/m² for health promotion and public health interventions such as leisure time physical activity. WHO cut-offs for overweight (BMI 25.0-29.9 kg/m²) should be used to facilitate international comparisons. Future studies may explore BMI cut-offs when risk of malnutrition-related illnesses converts to risk of chronic disease for Asian populations.

Food literacy as a strategy to tackle unhealthy dietary behaviours among adolescents

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Background: High school setting has been identified as an ideal setting to teach adolescents about healthy dietary behaviours. This study explored home economics teachers’ views on the role of high schools in enhancing adolescents’ food literacy and promoting healthy dietary behaviours.

Methods: Semi-structured interviews with 22 home economics teachers were conducted. The interview questions focused on the perceived strengths, opportunities, limitations and barriers in enhancing adolescents’ food literacy and healthy dietary behaviours in high schools in Australia. Thematic data analysis was used to analyse the data. Five key themes have been identified from the interview transcripts: (1) standing of food-related life skills; (2) food literacy in the Australian school curriculum; (3) emphasis on resources; (4) building school to home nexus; and (5) learning through school canteens.

Results: Overall, home economics teachers stated that food literacy education was regarded by parents and other school staff to be a less important subject than Maths or English for adolescents to learn in high schools in Australia. Teachers indicated that most high schools offered one year compulsory food literacy education through home economics classes. However, teachers stated that the time was insufficient to develop sustainable food-related life skills and introduce broader concepts of food literacy such as environmental sustainability. The lack of financial resources and a largely non-supportive school food environment including school canteens were major factors that influenced food literacy education and improved dietary behaviours of adolescents.

Conclusion: Increased status of food literacy education in high schools would support adolescents to develop food-related life skills and mobilise them as agents of dietary behaviour change in the home setting.
Anti-obesity health warnings promote healthier dietary decision making.

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Background: Following successful use in tobacco control, health warnings on energy-dense, nutrient-poor foods and beverages have been proposed as a potential anti-obesity intervention.

Aim: To investigate the efficacy of health warnings in promoting healthy dietary choices, and examine how health warning design factors (positive versus negative message framing, text-only versus text-and-graphic warnings) influence their efficacy.

Methods: A mixed-effects experimental design was used, whereby 96 participants completed a novel dietary self-control priming task. Participants were randomly assigned to one of five health warning groups featuring the following health warnings formats: text-based with negatively framed messages (TN; n=16), graphic with negative framing (GN; n=16), text with positive framing (TP; n=16), graphic with positive framing (GP; n=16) and a message-free control group (C; n=32). Participants initially provided subjective health and taste ratings of snack food items. Participants were then required to choose items to consume at the end of the experiment prior to- and post- exposure to health warning messages. A measure of dietary self-control (DSC) was calculated based on the provided health and taste ratings. Linear mixed effects modelling was used to test the influence of health warning characteristics on DSC, while controlling for participant and stimulus related variance.

Results: A significant interaction effect between health warning group and decision stage condition (pre- and post- priming with health warning images) on DSC was found (p < .001). GN participants displayed significantly greater DSC than all other groups, while TN and GP participants showed greater DSC than TP and C participants, which did not differ.

Conclusions: Health warnings primed healthier dietary decision making and may be effective in reducing obesity. Negatively framed health warnings were more effective than positively framed health warnings, and graphic warnings promoted greater DSC than purely text-based health warnings.

What’s on the INSIDE matters - exploring and characterising the ‘Thin on the Outside Fat on the Inside’ (TOFI) profile across ethnicities: the TOFI_Asia study

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The New Zealand National Science Challenge (NSC) program is designed to address the biggest science-based challenges within the country as identified by government, researchers and the general public. Intended to have both a national and global footprint, the NSC High Value Nutrition (HVN) program has 5 priority research platforms comprising metabolic, gut and immune health plus food and consumer science. The Peak Nutrition for Metabolic Health (PANaMAH) platform is investigating metabolic susceptibility and resilience in the face of weight gain and obesity, with the long term aim of identifying nutrition interventions to prevent dysglycaemia and type 2 diabetes (T2D).

Apparent slim individuals may be more susceptible to development of T2D than those obese but resilient due to lipid overspill from safe peripheral stores into risky ectopic sites such as liver and pancreas1. The thin on the outside but fat on the inside ‘TOFI’ profile may explain why Asian Chinese and Indian populations are reported to be at greater risk of poor metabolic health than Caucasian counterparts at the same BMI and younger age2. TOFI_Asia aims to determine the metabolic profile that characterises and predicts susceptibility and resilience to T2D, in individuals with and without the TOFI profile, including early metabolic biomarkers that may predict later glucose response.

200 Asian Chinese and 200 European Caucasian adults (18 – 70 years; overweight BMI 25 – 50 kg/m²) will be enrolled into the TOFI_Asia study. T2D risk will be determined from HbA1c, and predictors of risk identified through (i) anthropometry and body composition using dual X-ray absorptiometry (DEXA, % fat) and 3 Tesla Chemical shift magnetic resonance imaging (MRI, pancreatic and liver fat) (ii) established plasma markers of metabolic risk including biochemistry, peptides, cytokines (iii) untargeted metabolomics and (iv) cardiorespiratory fitness using the YMCA submaximal fitness test3.

Mismatch in weight loss goals between patients with obesity and healthcare practitioners

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Background: National guidelines for the treatment of obesity consider weight loss of 5-10% a successful outcome, as it is associated with improvements in weight-related comorbidities [1]. The average weight loss achieved with lifestyle interventions and pharmacotherapy is in this range [1], but the results envisioned by people seeking treatment for obesity often exceed this [2]. We evaluated weight loss goals among participants enrolling in a dietary weight loss study.

Methods: 100 adults with obesity undertook an 8-week modified very-low-energy diet (VLED) program, which involved replacing 2 meals per day with a commercially available formulation (Optifast VLCD, Nestlé Nutrition) and consuming one low-carbohydrate meal per day (total daily energy intake approx. 3350 kJ/800 kcal per day), followed by a structured transition to regular foods and 12 month follow-up. Prior to starting the program, participants’ weight loss goals were assessed using the Goals and Relative Weights questionnaire [2], which asks participants to nominate a dream weight, and weights they would be happy with, accept, or be disappointed to achieve.

Results: The participants were 61 women and 39 men with (mean ± SD) age 48.2 ± 12.5 years, weight 113.5 ± 25.9 kg and BMI 39.8 ± 7.3 kg/m². The average reported “dream” weight was 78.0 ± 12.3 kg, and “disappointed” weight 101.7 ± 21.6 kg. Mean percentage weight losses required to achieve “dream”, “happy”, “acceptable” and “disappointed” weights were 29.8 ± 9.5, 22.3 ± 8.3, 16.5 ± 7.5 and 9.9 ± 5.7% respectively.

Conclusion: Weight loss of 10%, which would be considered a successful outcome by healthcare practitioners, is viewed as disappointing by people with obesity starting a weight loss program. Participants’ weight loss goals greatly exceed the average results achieved with even the most intensive non-surgical interventions.

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Prediction of Body Mass Index for the Adult Population of Australia: Age-Cohort Trend Analysis

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An upward trend in body mass index has been observed in the Australian adult population over three decades. This trend may not continue, as recent evidence for high-income countries suggests decelerating rates of increase or even a plateau. The objective of this paper is to evaluate the predictive performance of an existing two-factor age-cohort regression model and estimate it with the addition of new data.

Population-based cross-sectional datasets from 1980 to 2012 are used in the analysis, including Risk Factor Prevalence Surveys from 1980, 1983, and 1989, National Nutrition Survey 1995, Australian Diabetes, Obesity and Lifestyle Study 2000, National Health Survey 2007-2008, and National Nutrition and Physical Activity Survey 2011-2012. Previous analysis included data up to 2000, i.e. two additional datasets have been included in this study. Body mass index (BMI) is calculated from measured weight and height, for Australians aged 18 years and older who were not pregnant at the time of evaluation.

Age-adjusted trend is projected to be 2.47% increase per decade for males and 3.18% increase per decade for females, compared to 2.74% and 3.91% from earlier predictions. The respective mean BMI for men and women in 2025 is predicted to be 28.51 kg/m² (95% CI 27.90-29.13) and 28.13 kg/m² (95% CI 27.36-28.92), when age-standardised to population level in 2012. It is found that the average female BMI will become surpass that of males starting from the year 2045, rather than 2021 as predicted before. Due to the increase in sample size, the uncertainty around the point estimates has been reduced by approximately 30%.

Validation results indicate that previous predictions are fairly accurate when compared to the observed values in the latest surveys. There is evidence for a slowing trend for both genders. Further research is required to explicitly model the slowing down of BMI increase.
Can weight gain be prevented in women with breast cancer? A systematic review of intervention studies

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Weight gain is a common among women treated for breast cancer, particularly among women who are pre-menopausal at diagnosis and those undergoing chemotherapy. Obesity and weight gain have been associated with poor disease-specific and health-related outcomes. This review aimed to evaluate the effectiveness of weight gain prevention interventions for women diagnosed with breast cancer. Studies were identified through a systematic search of Pubmed, Embase, CINAHL and Scopus from inception to April 2016. A search of clinical trials registers was also conducted. Completed and ongoing trials evaluating a behaviourally based dietary intervention with or without physical activity and with a focus on weight gain prevention in women with breast cancer were reviewed. Weight change and body composition data were extracted. Within-group weight change of ±1kg and between-group weight differences of ≥2kg was defined as successful weight gain prevention. Five completed trials and six ongoing trials were identified. All completed trials were conducted in women undergoing chemotherapy treatment and recruited exclusively premenopausal or both pre- and postmenopausal women. Studies were primarily underpowered pilot trials, and all considered to have a moderate or high risk of bias. Within-group weight gain prevention was achieved in two studies, with intervention groups in two studies losing >1kg. Between-group (intervention vs control) weight change of ≥2kg was achieved by two studies. No trials assessed outcomes following the end-of-intervention or cost-effectiveness. Ongoing trials will further contribute to the evidence base by addressing some of the limitations in the existing evidence. This small but growing number of studies reviewed provides preliminary and promising evidence that weight gain can be prevented in women with breast cancer undergoing chemotherapy treatment. Future studies should assess outcomes following the end-of-intervention, promote resistance training, assess bone density and assess cost-effectiveness.

Can we change diet and physical activity in time-poor populations?

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Background: Adopting and maintaining healthy diet and physical activity (PA) behaviours can be difficult in populations like nurses, who have a stressful job, with long working hours and shift work. Irregular meal patterns, frequent snacking on energy-dense nutrient poor foods (EDNP), and inactivity is common in this group, with 62% of Australian and New Zealand nurses being overweight or obese. The aim of this study was to deliver a 3-month workplace intervention study to improve diet and PA behaviours in nurses, given the paucity of such studies in the literature.

Methods: The intervention was developed with input from the target population, and included pedometers, a smartphone app, and a dedicated Facebook group as intervention materials. Primary outcomes included diet (food frequency questionnaire) and PA (accelerometer). Secondary outcomes included weight, BMI, waist circumference, and blood pressure. All measurements were taken at baseline, end of the intervention (3-months) and follow-up (6-months).

Results: 47 nurses, 41.4±12.1 years old and 87% female working at two hospitals in Brisbane (Australia) participated in the study. At 3-months, total energy intake coming from fruit and vegetables increased by 3.8%, while it decreased for EDNP foods (-0.8%). There was a -0.5% decrease on time spent in moderate-to-vigorous PA, and a decreased in average daily steps (-500 steps/day). At 6-months, dietary outcomes were maintained, while daily steps and sedentary time slightly decreased from 3-months. There were small changes on weight and BMI at 3- and 6-months.

Conclusions: This intervention showed improvements on diet, potentially at the cost of PA behaviour. Participants indicated that changing both behaviours was too hard, suggesting that in time-poor and stressed populations changing one behaviour at the time could be more feasible and effective. Recruitment and retention barriers exist in this hard-to-reach group, which should be considered in future studies.
Sedentary behaviours and adiposity in 10-13 year olds: how long, how much and what?

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Background & Significance: The role of a healthy diet and physical activity in obesity prevention is well-established, but the importance of different constructs of sedentary behaviours is uncertain. This study sought to investigate relationships between volume, patterns and types of sedentary behaviour and adiposity in children.

Methods: An observational case-control study of obese and healthy-weight 10-13 year olds (130 male, 104 female) recruited via media advertisements was conducted. Adiposity was quantified using percent body fat measured using dual-energy X-ray absorptiometry and waist-to-height ratio (WHtR). Use-of-time was assessed using accelerometry and the Multimedia Activity Recall for Children and Adolescents (MARCA). Time (volume), type (television, videogame, computer, eating, passive transport) and bout length (patterns) of sedentary behaviours were measured. Moderate-to-vigorous physical activity, total daily energy expenditure, sleep, age, average annual household income and Tanner stage were included as covariates in partial least squares analyses, stratified by gender.

Major Findings: Television time ranked as the most important type of sedentary behaviour, demonstrating positive associations with adiposity in both genders. Prolonged bouts of sedentary behaviour and time playing computer/video games were positively correlated with adiposity, but only in boys. In girls, non-screen sedentary behaviour was inversely associated with adiposity. Total sedentary time was only inconsistently linked with fatness after appropriate adjustments.

Concluding statement: These data confirm that limiting television time is an important target for childhood obesity interventions. Furthermore, other characteristics of sedentary behaviour beyond total volume also show sex-specific associations with adiposity. Therefore, further research is needed to inform current volume-based sedentary behaviour guidelines.

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Raising Healthy Kids - The New Zealand Health Target for childhood obesity

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In New Zealand as in many other countries obesity rates have increased in all ages, genders and ethnic groups over the last 30 years. Obesity is particularly concerning in children as it is associated with a wide range of future health conditions, and can also affect a child’s immediate health, educational attainment and quality of life. This presentation describes development and implementation of the Childhood Obesity plan and the associated health target.

On the 30th June 2016 the New Zealand government launched a new health target called ‘Raising Healthy Kids’. This health target is one of two targeted interventions in the Childhood Obesity Plan that focuses directly on obese preschoolers and their families. The plan consists of a package of initiatives that aim to prevent and manage obesity in children and young people by focusing on:

- targeted interventions for those who are obese
- increased support for those at risk of becoming obese
- broad approaches to make healthier choices easier for all New Zealanders.

The emphasis is on healthy nutrition, positive and sustained behaviour change, tackling the obesogenic environment and being active at each life stage, starting during pregnancy and early childhood. The package brings together initiatives across government agencies, the private sector, communities, schools, families and whānau.

The new health target will see 95% of obese children identified at the B4School Check programme offered a referral to a health professional for clinical assessment and family based nutrition, activity and lifestyle interventions by December 2017. The target was selected as the existing B4 School Check focuses on a life course approach and early intervention, to ensure positive, sustained effects on health. As part of the B4School check almost 95% of 4 year old children will receive a comprehensive check and parents are offered advice and/or referred to services.
Healthy gestational weight gain: improving maternity professionals’ delivery of evidence-based care

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Guidelines exist to ensure consistency in the delivery of care to minimise health-related complications. Even when good evidence is available, professionals do not necessarily implement it resulting in an evidence-practice gap. Guidelines for the management of maternal obesity exist, however a 2011 study at our tertiary maternity hospital demonstrated varied staff knowledge of, and attitudes and adherence to these guidelines. We subsequently followed an implementation science approach to facilitate the translation of these guidelines into practice to ensure best practice delivery of care to pregnant women regarding gestational weight gain (GWG). The aim of this study was to re-assess staff knowledge, attitudes and behaviours around the management of GWG in our hospital following these service changes.

This cross-sectional, prospective online survey was distributed to staff in antenatal clinic. The survey assessed staff awareness of pregnancy-related weight complications, knowledge and application of specific guidelines, and a guideline adherence score was calculated.

Sixty-nine staff (44.8% response rate) completed the survey. Just over half (51.9%) stated they were familiar with clinical guidelines regarding weight management in pregnancy. Guideline adherence ranged from 3.7 ± 1.9 to 11.3 ± 1.0 /15 across different professional groups; significant improvements with adherence by dietitians were noted over time. Despite minimal change over time in the overall adherence score, compliance with individual elements of the guideline recommendations comprising the adherence score differed. Improvements in staff practices and attitudes are apparent since the first survey.

The delivery of evidence-based care is an iterative process of monitoring and improvement. This study has highlighted further improvements in guideline awareness and guideline elements are still required to improve the delivery of best practice antenatal GWG care.

Pregnancy outcomes in women with class III obesity according to gestational diabetes status

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Introduction: Previous studies have shown that the combination of obesity and untreated gestational diabetes mellitus (GDM) has a higher risk of adverse pregnancy outcomes compared with obesity alone. It is not known if obesity in combination with treated GDM also has an increased risk.

Objectives: To compare the maternal and neonatal outcomes of women with class III obesity (body mass index ≥ 40kg/m²), with and without GDM (treated with diet or insulin).

Methods: A retrospective cohort study of 307 class III obese women who had singleton deliveries at The Canberra Hospital between mid-2011 and mid-2014. Women with pre-existing diabetes were excluded. Maternal demographic and clinical data, including GDM diagnosis and treatment, and maternal and neonatal outcomes were obtained from the Birthing Outcomes System, clinic attendance records and patient medical records. Occurrence rates of large-for-gestational-age (LGA) neonates, preterm delivery, primary caesarean section and pregnancy-related hypertension were compared between groups according to GDM status using logistic regression.

Results: 240 women (78.2%) did not have diabetes, 28 (9.1%) had diet-treated GDM and 39 (12.7%) had insulin-treated GDM. LGA was observed in 42 (17.5%) women with no diabetes, 3 (10.7%) with diet-treated GDM and 13 (33.3%) with insulin-treated GDM. Relative to women with no diabetes and diet-treated GDM, the odds ratio for a LGA neonate for women with insulin-treated GDM was 2.3 (1.06-4.92) after adjustment for maternal age, BMI, parity, smoking during pregnancy and chronic hypertension (p<0.04). Differences in rates of preterm delivery, primary caesarean section and pregnancy-related hypertension according to diabetes status were not seen.

Conclusion: In class III obese women, insulin-treated GDM compared to diet-treated GDM and no diabetes was associated with a higher rate of LGA neonates. Diet only or insulin-treated GDM were not associated with a greater risk of other adverse maternal or neonatal outcomes.
Correlates of growth trajectories in early childhood: results from two cohorts of Australian children

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Background: Knowledge of growth trajectories and their determinants early in life have particular implications for designing future interventions to promote healthy growth. This study aimed to identify the modifiable child and maternal correlates of longitudinal growth trajectories from birth to age 42 months.

Methods: Secondary analyses of pooled data from the Melbourne Infant Feeding Activity and Nutrition Trial (InFANT) Program (n=540) and the InFANT Extend study (n=514) were conducted. Children’s height and weight were collected at birth, 3, 9, 18, and 42 months. Age- and gender-specific height, weight, and body mass index-for-age z-scores (HAZ, WAZ, and BAZ) were computed using World Health Organisation growth charts. Mixed effect modelling was performed to examine whether growth trajectories (changes in HAZ, WAZ and BAZ) from birth to age 42 months were influenced by birth weight, rapid weight gain (defined as an increase from birth to 9 months in WAZ ≥0.67) and maternal factors.

Results: Low birth weight infants had significantly lower HAZ, WAZ and BAZ than normal weight infants from birth to 42 months (P<0.001). Infants with rapid weight gain had significantly higher BAZ and WAZ, but not HAZ, when compared to those without rapid weight gain (P<0.01). Infants whose mothers were Australian born had higher HAZ than infants whose mothers were born overseas (P=0.02). Increased pre-pregnancy BMI was a significant predictor of changes in all three growth parameters (P<0.01). High maternal education was inversely associated with changes in WAZ and BAZ (P<0.01).

Conclusion: Our findings indicate that low birth weight, rapid weight gain, and several maternal factors are potential correlates of growth trajectories early in life. Recognising these early determinants provides the focus for the design of future intervention strategies to target most-at-risk groups for promoting healthy growth.

Simulating the effects of replacing sugar-sweetened beverages with beverage alternatives on obesity outcomes among Australian adults: a modelling study

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Background: Emerging studies indicate that replacing sugar-sweetened beverages (SSB) with beverage alternatives may be a feasible way of reducing SSB consumption and combating obesity prevalence. However, evidence as to the impact of beverage substitution on obesity is limited. This study aimed to investigate the associations between SSB consumption, its substitution with beverage alternatives, and obesity outcomes among the Australian population.

Methods: Data from adults participating in the 2011-12 National Nutrition and Physical Activity Survey (NNPAS) were used. Multivariate linear regression with adjustment for covariates was used to examine the associations between SSB consumption and body mass index (BMI) and waist circumference (WC), and substitution modelling was used to contemplate the effects of replacing SSB with water, coffee/tea, diet drinks, fruit juice, and milk on obesity outcomes.

Results: SSB intake (100g/day) was associated with higher BMI (β= 0.07kg/m², P<0.001) and WC (β=0.25cm, P<0.001). In models not assuming a linear dose-response trend, adults who consumed greater than one serve/day of SSB had higher BMI (β= 0.61kg/m², P<0.001) and WC (β= 1.7cm, P<0.001) than those who consumed less than one serve/day. Replacing 100g SSB with 100g water was inversely associated with BMI (β= -0.07kg/m², P<0.001) and WC (β= -0.26cm, P<0.001). Similarly, every 100g substitution of SSB with coffee/tea predicted 0.07 kg/m² decrease in BMI and 0.24cm decrease in WC (P<0.001). BMI and WC decreased by 0.09kg/m² and 0.25cm, respectively, when milk was substituted for SSB (P=0.001).

Conclusion: Our results suggest that SSB consumption is a significant predictor of obesity. Water, coffee/tea, and milk were better alternatives for SSB pertaining to obesity. The findings of this study underline the role of SSB consumption in promoting obesity, and will facilitate health researchers and policy makers to deliver sound recommendations towards SSB consumption and suitable alternatives.
Water consumption among Australian population: results from 2011-12 National Nutrition and Physical Activity Survey

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Background: Water consumption as a vital component of the human diet is under-researched in dietary surveys and nutrition studies.

Aim: To examine water consumption, dietary sources and sociodemographic, anthropometric and dietary correlates of water consumption among Australian population.

Methods: Day one dietary intake data from 2011-12 National Nutrition and Physical Activity Survey were used. Water consumption was examined by age, sex, sociodemographic, anthropometric and dietary factors.

Results: The mean (standard deviation) total water intakes for children aged 2-18 years were 2.10 (0.92) L/d for boys and 1.89 (0.77) L/d for girls, and for adults aged 19 years and over were 3.24 (1.40) L/d for males and 2.77 (1.03) L/d for females. Total water consumption increased with age in children, but decreased with age in adults (P<0.0001). The contributions of drinking water, other beverages and food moisture to total water intake were 43-45%, 28-25% and 29-30%, respectively, among children and 35-40%, 39-35% and 26-25% among adults. Full fat plain milk, fruit juice, regular soft drinks, and fruit drinks were the most commonly consumed beverages among children while the major beverage sources consumed by adults were alcoholic drinks, coffee, tea, and regular soft drinks. Higher total water consumption was associated with higher energy, sodium, fibre, fruit and vegetable intakes in both children and adults. No association was found between water consumption and body mass index and waist circumference, but longer physical activity duration, higher socioeconomic status and education level were associated with higher total water consumption.

Conclusion: The study findings provide useful insights pertaining to Australian’s water consumption patterns and can serve as a useful resource for nutrition counselling, refinement of dietary guidelines and public health policies, and guidance for public health campaigns.

Hypertriglyceridemia and Acute Pancreatitis in a Cohort of Overweight and Obese Patients

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Background: Hypertriglyceridemia (HTG>1.7mmol/l) commonly occurs with visceral obesity, metabolic syndrome and diabetes. The risk of hypertriglyceridemia-associated acute pancreatitis (HTGAP) increases with very high triglyceride levels (>5.6mmol/l) and is 12-fold in severe HTG (>11.2mmol/l). HTGAP accounts for 6% of all episodes of acute pancreatitis (AP).

Method: Data was collected on a retrospective cohort coded for HTG in two hospitals during 2010-15. The records for patients with HTG≥5.6mmol/l and a subset with HTGAP were reviewed and collated.

Results: 22 admissions with HTG occurred in 16 patients. All patients had BMI ≥25kg/m2; 12/16 (75%) were male; 6/16 (38%) had family history of dyslipidemia. Patients with type 2 (n=8, BMI=36.9kg/m2) were more overweight than type 1 (n=1, BMI=25kg/m2) and those without diabetes (n=7, BMI=30.0kg/m2). HTGAP was diagnosed in 14/22 of admissions in 11/16 of patients; 5/14 required ICU care. Overweight/obesity (100%), diabetes (45%) and alcohol use (63%) were common, with 78% having multiple risk factors. The HTGAP group had a similar risk profile to those with HTG alone: BMI (33.2 vs. 34.8kg/m2; p=0.6) peak triglyceride level (37.9 vs. 39.6mmol/l; p=0.9), diabetes (45% vs. 80%; p=0.31) and alcohol use (63% vs. 80%; p=1.0).

HTG was diagnosed between 5 and 86 hours following AP admission. Insulin infusion resulted in rapid improvement (peak triglyceride 37.9mmol/l to 9.8mmol/l; p<0.001). Medications (fibrates and omega-3) were added to very low fat diet. HTGAP accounted for 14 (0.8%) of our total 1685 AP admissions.

Discussion: Overweight/obesity is a common risk factor for HTG and HTGAP. Insulin resistance reduces lipoprotein lipase (LPL) action and increases VLDL production. Hydrolysis of triglyceride by pancreatic lipase produces excess unbound fatty acids that may damage acinar cells, precipitating HTGAP. All patients with AP should have HTG excluded at presentation. Insulin therapy activates LPL and reduces fatty acid production; early treatment reduces HTG and may improve outcome.