



Thank you for the opportunity to provide a submission to the Inquiry on Diabetes. This submission will respond to the terms of reference as related to prediabetes and type 2 diabetes.

Background

Defeat Diabetes is a digital program that aims to help people living with prediabetes and type 2 diabetes (T2DM) achieve better glycaemic control and remission through therapeutic carbohydrate restriction (TCR). Remission is classified as living with an HbA1c of <6.5 and diabetes medication-free for three months.

Defeat Diabetes is accessible online and via a mobile app. It was developed by a team of doctors and dietitians using the latest gold-standard research.

The program uses simple language in the form of videos, infographics and articles to equip patients with a deeper understanding of their condition:

- What is T2DM?
- How diet impacts the development and progression of T2DM
- How people living with T2DM can modify their diet to improve glycaemic control and achieve remission

The program is self-paced, and patients work through curated resources and educational tools divided into core 'lessons'. Each lesson's content focuses on a key medical, nutritional or lifestyle topic and is led by a medical expert with actions and quizzes to cement learning. This foundation of understanding is supported by practical pathways to implement TCR in everyday life, with a library of simple low carb recipes and weekly meal plans developed by dietitians to keep members at less than 50g of carbs daily to achieve glycaemic control.

Patients are further supported in their journey towards remission by tracking progress towards their goals and an online community of members and medical professionals, monthly live online nutrition clinics and webinars from medical experts on related topics.

Membership to Defeat Diabetes is \$129 per annum or \$59 for three months. To date, more than 9000 Australians have completed the program. A clinical study using the program is underway in partnership with La Trobe, with results pending in 2024.

We will address the five points contained in the Terms of Reference.

1. The causes of diabetes (type 1, type 2 and gestational) in Australia, including risk factors such as genetics, family history, age, physical inactivity, other medical conditions and medications used



High blood sugar leading to diabetes, is the major cause of blindness in Australia today. It is the cause of most surgical amputations. It is the main reason thousands of Australians depend on kidney dialysis for survival. It is a major cause of both stroke and heart attack. High blood sugar levels, as seen in patients with T2DM, are nothing short of a personal catastrophe.

But what causes high blood sugar?

The most simple answer is defective removal. That is, the sugar we eat, which ends up in our blood, cannot be removed through normal processes. In a healthy person, before blood sugar levels get too high, the body releases insulin, which allows sugar to leave the bloodstream and be absorbed by the body. In the most common type of diabetes, type 2, insulin doesn't work as it should. The amount of insulin is often normal or even high, but it can't do its job. This is called insulin resistance. Left untreated, high blood sugar levels can damage the pancreas, which makes insulin. This leads to a situation where insulin is not working properly, and the pancreas produces very little. From the perspective of blood sugar levels, this is a disaster, with many complications of diabetes likely to follow.

So why are we experiencing unprecedented incidence of T2DM?

Unfortunately, across the globe, we are consuming more and more sugar through obvious channels, such as ultra-processed foods, but also our increased intake of carbohydrates as recommended by dietary guidelines. When digested, carbohydrates are broken down into sugar (glucose) in the bloodstream. When we have too many carbs converting into sugar, as described above, our body struggles to provide insulin to prompt cells to absorb the sugar, and so begins the path to prediabetes and type 2 diabetes, often developing over a period of years. This is why type 2 diabetes is referred to as a disease of carbohydrate intolerance.

The food pyramid in Australia instructs us to consume up to 65%, or around 300g of our caloric intake, as carbohydrates. This is a slow death sentence for someone with a carbohydrate intolerance disease.

After all, you wouldn't advise a person with a nut allergy to eat a bag of peanuts daily, would you?

2. New evidence-based advances in the prevention, diagnosis and management of diabetes, in Australia and internationally

There is substantial evidence supporting TCR in the management of type 2 diabetes. This submission will focus on the success of low carb digital programs in managing T2DM.

1. The study from the UK by Saslow et al. (2018) reviewed results from the Low Carb program on diabetes.co.uk, which has had over 400,000 participants. Of the 743 participants in the study with a starting HbA_{1c} at or above the type 2 diabetes threshold of 6.5%, 195 (26.2%) reduced their HbA_{1c} to below the threshold while



taking no glucose-lowering medications or metformin. Of the participants taking at least one hypoglycemic medication at baseline, 40.4% (289/714) reduced one or more of these medications. Almost half (46.40%, 464/1000) of all participants lost at least 5% of their body weight. Overall, glycemic control and weight loss improved, especially for participants who completed all 10 program modules. For example, participants with elevated baseline HbA_{1c} ($\geq 7.5\%$) who engaged with all 10 weekly modules reduced their HbA_{1c} from 9.2% to 7.1% ($P < .001$) and lost an average of 6.9% of their body weight ($P < .001$).

Saslow LR, Summers C, Aikens JE, Unwin DJ Outcomes of a digitally delivered low-carbohydrate Type 2 diabetes self-management program: 1-year results of a single-arm longitudinal study JMIR Diabetes 2018;3(3):e12

2. A further study by Summers et al. demonstrated that glycemic control and weight loss improved on the digital program, particularly for participants who completed more than nine core lessons over 12 months. The mean HbA_{1c} went from 58.8 mmol/mol at baseline to 54.0 mmol/mol, representing a mean reduction of 4.78 mmol/mol (SD 4.60; $t_{31}=5.87$; $P < .001$). Results showed an average total body weight reduction of 4.17%, with an average weight reduction of 3.85 kg (SD 2.49; $t_{31}=9.27$; $P < .001$) at the 12-month follow-up point.

Summers C, Tobin S, Unwin D. Evaluation of the low carb program digital intervention for the self-management of type 2 diabetes and prediabetes in an NHS England general practice: single-arm prospective study. JMIR Diabetes. 2021 Sep 9;6(3):e25751. doi: 10.2196/25751.

3. In the USA, the digitally delivered Virta Health program has published results annually, with the latest papers showing results after 2 years. The 2-year results demonstrated the use of any glycemic control medication (excluding metformin) among participants declined (from 55.7 to 26.8%), including insulin (-62%) and sulfonylureas (-100%). There was also a resolution of diabetes (reversal, 53.5%; remission, 17.6%) in the treatment group.

Athinarayanan SJ, Adams RN, Hallberg SJ, et al. Long-term effects of a novel continuous remote care intervention including nutritional ketosis for the management of type 2 diabetes: a 2-year non-randomized clinical trial. Front Endocrinol 2019 Jun 5;10:348. doi: 10.3389/fendo.2019.00348

- a. After 3.5 years, this abstract by McKenzie et al. showed that 50.2% of diabetes medications and 71.4% of diabetes medications other than metformin were discontinued. 45.5% (65/143) of participants achieved HbA_{1c} $< 6.5\%$ with either no medication (34/65, 52%) or only metformin (31/65, 48%) at 3.5 y; 37.8% of participants maintained this status from 1 through 3.5 y of treatment. 22% of participants achieved diabetes remission at 3.5 y, and 17.5% maintained remission status from 2 through 3.5 y of treatment. This demonstrates that clinically meaningful improvements across multiple



markers of metabolic risk can be sustained in patients with T2D who selected treatment with this treatment regimen for 3.5 y.

McKenzie A, Athinarayanan S, Adams R, Volek J, Phinney S, Hallberg S. SUN-LB113 A Continuous Remote Care Intervention Utilizing Carbohydrate Restriction Including Nutritional Ketosis Improves Markers of Metabolic Risk and Reduces Diabetes Medication Use in Patients With Type 2 Diabetes Over 3.5 Years. J Endocr Soc. 2020 May 8;4(Suppl 1):SUN-LB113. doi: 10.1210/jendso/bvaa046.2302. PMID: PMC7208790

- b. After 5 years, there were persistent improvements in weight from 116.4 to 107.6 kg, fasting insulin from 25.8 to 24.5 mIU/L (, and HOMA-IR from 9.1 to 6.6 (all adjusted p-values <0.05). Total diabetes medications were reduced 46.6%, and 59.9%, excluding metformin, were deprescribed. The percentage of patients prescribed diabetes medications significantly decreased at 5 years (from 85.2% to 71.3%; p<0.01). Despite less medication use, HbA1c improved from 7.5 to 7.2% (-0.3%, 95%CI [-0.6, 0.0], unadjusted p-value<0.05) .

They concluded that “over 5 years follow-up, the VLCI with CRC showed excellent retention, sustained clinically significant weight loss, and stable glycemic control with reduced dependency on antidiabetes medications.”

Athinarayanan SJ , Vantieghem M, Mckenzie AI, Hallberg S, Roberts CGP, Volk BM, Adams RN, Ratnet RE, Volek J, Phinney S.; Five-year weight and glycemic outcomes following a very-low-carbohydrate intervention including nutritional ketosis in patients with type 2 diabetes. Diabetes 2022;71(Supplement_1):832-P

4. Defeat Diabetes

Defeat Diabetes has commissioned a research project under the supervision of Professor George Moschonis, Director of the Human Nutrition & Dietetics Research Lab at La Trobe University, Melbourne. The study is entitled “Effectiveness of digitally delivered continuous care intervention (Defeat Diabetes) on the self-management of type 2 diabetes. A 12-month single-arm, pre-post intervention study” and is being conducted by PhD student Despina Kolivas. The protocol has been published.

Kolivas D, Fraser L, Schweitzer R, Brukner P, Moschonis G. Effectiveness of a Digitally Delivered Continuous Care Intervention (Defeat Diabetes) on Type 2 Diabetes Outcomes: A 12-Month Single-Arm, Pre–Post Intervention Study. Nutrients. 2023; 15(9):2153. <https://doi.org/10.3390/nu15092153>

Recruitment is nearly complete, and preliminary 6-month results will be available at the end of 2023.



In the meantime, Defeat Diabetes surveyed the initial cohort of subscribers from January 2021 after three months of adherence to the Defeat Diabetes Program.

The results from the survey were as follows:

- 63% of those with type 2 diabetes were in remission, and all others had reported significant decreases in blood glucose levels
- 100% of participants previously taking insulin were able to discontinue its use
- Nearly 30% of participants had reduced or stopped diabetes management medications
- 100% of subscribers who tracked waist measurement reported a decrease in waist size, with 80% reporting a waistline measurement decrease of five centimetres or more (a clothing size)
- 62% of subscribers reported an overall feeling of health and wellbeing improvement after three months
- 84% of participants declared that the program had changed their views on what 'healthy eating' means
- 38 per cent of participants felt an increase in energy levels after three months.

3. The broader impacts of diabetes on Australia's health system and economy

Diabetes is the cause of more than 1 million hospitalisations annually in Australia, including 19,000 Emergency Department visits. The AIHW suggests the cost of managing patients is up to \$2 billion for type 2 diabetes.

However, in the UK, a partnership between the NHS and diabetes.co.uk, a for-profit program that uses TCR to assist with T2DM management and remission, has seen considerable cost-savings in treating patients. Dr David Unwin, a UK GP, has shown that adopting a low carb approach to the management of type 2 diabetes resulted in a reduction in spending on pharmaceuticals of greater than GBP £50,000 (AUD \$98,000) in his practice compared to neighbouring practices (*BMJ Nutrition, Prevention & Health 2020;0. doi:10.1136/bmjnph-2020-000072*).

Our own member-reported stories support this. Many Defeat Diabetes members have been able to reduce or come off medication entirely, have seen blood sugar levels return to the prediabetic range and have reported the abeyance of joint aches, fatty liver and more.

Michelle K

Michelle had osteoarthritis in her left knee, excruciating inflammation, and pain in her ankles, wrists, elbows and hips. Unable to exercise how she used to, she gained weight and was diagnosed with type 2 diabetes. After following the Defeat Diabetes Program for a year, she's lost 25 kgs, reduced her HbA1c from 7.9 to 5.8 and achieved type 2 diabetes remission. She also reports her joint symptoms are gone: "I don't have the pain anymore. Even my bursitis is so much better. I haven't had pain in my shoulders for two years now."



Iain M

Iain, a GP, struggled with type 2 diabetes and unsuccessfully tried various diets and medications. He found the Defeat Diabetes Program and decided to try it. Since following the program, he's experienced positive changes in his health, including 9 kg weight loss and increased energy. The persistent pain in his Achilles heel has gone, and he was able to start exercising again. With his HbA1c reduced from 9.9 to 3.1, he's achieved type 2 diabetes remission.

David V

David craved sweet food, drank more beer than usual, and gradually (and inevitably) put on weight during the pandemic. He developed type 2 diabetes and was put on Metformin by his GP, who told him T2DM was progressive and irreversible. Refusing to accept this, he found the Defeat Diabetes Program, which helped him lose 30 kg in 12 months and reduce his HbA1c from 20 to 5, putting his diabetes in remission. He's also off medication entirely, "The Defeat Diabetes Program has taught me everything I need to improve my blood glucose control."

4. Any interrelated health issues between diabetes and obesity in Australia, including the relationship between type 2 and gestational diabetes and obesity, the causes of obesity and the evidence-base in the prevention, diagnosis and management of obesity; and

1. The Australian Dietary Guidelines

The guidelines clearly state that they are intended only for healthy Australians, recommending 45–65% of daily calories from carbs, 20–35% from fats and 10–35% from protein. No provision is made for people with chronic conditions, especially type 2 diabetes, a disease of carbohydrate intolerance. For people with type 2 diabetes, following a diet where 65% of energy is to be derived from carbs is a death sentence.

The guidelines demonise saturated fat despite overwhelming evidence that healthy saturated fat in animal products such as meat and dairy is not harmful. Yet since introducing high carb, low fat dietary guidelines, the Western world has become fatter and sicker. The AIHW reports, "Children, adolescents and young people aged 5–24 in 2017–18 were more likely to be overweight or obese than people of the same age in 1995. The oldest age group (15–24) was also more likely to be overweight or obese in 2017–18 than in 2007–08." They also highlight that two in three adults are now overweight or obese.

These figures reveal a ticking time bomb, an epidemic-in-waiting of chronic conditions demanding sensible dietary guidelines. A one-size-fits-all approach is no longer enough to safeguard the health of vulnerable Australians.



2. Food literacy

Data from the Australian Bureau of Statistics shows that fewer than 4% of adults and 1% of children eat the minimum recommended servings of vegetables.

Why is this? Food literacy is a core part of the problem. The current Australian curriculum splits food education into the health and physical education (HPE) and design and technologies streams. Nutrition principles are taught in the HPE stream and food skills (such as cooking) in the technologies stream. If a school has a year 7 or 8 home economics course, the two streams may be combined into one course.

The length of food education courses in secondary schools varies a lot, from none to one or two hours a week, often for a year or less. At senior levels, elective subjects are offered in various states and territories, such as Food Technology or Victoria's new food studies curriculum.

Research with home economics teachers in Queensland and elsewhere in Australia suggests time and resources need to be improved for teaching the diverse knowledge and skills associated with food.

This lack of food education means a new generation of young parents do not know how to cook. They rely on simple meals, convenience foods and snacks, but these foods are usually high in fat and salt, leading to obesity and other health problems. Then there is the rising demand for food delivery systems, such as Uber Eats, which has grown its business in Australia by 18% in just three years, delivering fast food to the doorstep of time-poor families and further decreasing the need for learned skills in the kitchen.

So, what is the solution? On the other side of the planet, England and Wales have introduced compulsory cooking programs requiring students to develop a meal repertoire consistent with the UK dietary recommendations and sustainably source school food.

Implementing a similar mandatory program for students in Australia could improve food literacy and lead to more home cooking and improved nutritional choices as they mature into adulthood.

5. The effectiveness of current Australian Government policies and programs to prevent, diagnose and manage diabetes.

Defeat Diabetes members living with type 2 diabetes say there is little readily available information on the efficacy or guidelines for using TCR in managing and remission of type 2 diabetes from healthcare professionals. And when turning to their GP, they are simply advised to follow the dietary guidelines.



This absence of knowledge among GPs on the role of TCR as a viable treatment path is supported by a 2019 RACGP study by Professor Mark Harris, "Smoking, nutrition, alcohol and physical activity (SNAP) guide."

The research was a systematic review of 24 studies, seven of which analysed the Australian curriculum from 2012–18.

The findings show that nutrition was insufficiently incorporated into medical education, regardless of country, setting or year of medical education. Medical students often receive little or no education on nutrition and its role in chronic disease management.

GPs do not present TCR as a viable alternative or complementary therapy to pharmacotherapy.

Dietitians, who play a critical role in the T2DM primary care team, are bound by Dietitians Australia to maintain the dietary guidelines, which, as we know, recommends 65% of caloric intake be from carbohydrates - even for people living with a disease of carbohydrate intolerance, such as T2DM.

We respectfully suggest three key areas for the Inquiry to consider that will allow more people living with type 2 diabetes to access TCR as a treatment plan:

1. Improve GPs' and diabetes educators' understanding of TCR by mandating a minimum number of hours of nutritional training.
2. Update the dietary guidelines to reflect the need for people with carbohydrate intolerance to reduce their carbohydrate intake as part of their daily recommended intake.
3. Learn from the UK's NHS approach and implement a digital TCR program within GP clinics and government organisations to make low carb type 2 diabetes remission accessible for all.