Dietary education and support for people with type 2 diabetes in Australia

A report prepared for the parliamentary inquiry into diabetes, 2023.

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Points of reference addressed are:

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

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

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

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Type 2 diabetes is Australia's biggest concern

In Australia, as of June 2023, 86.7% of all diabetes are people living with type 2 diabetes (T2D).[1] There are 1,258,209 people living with T2D and 182 new cases are registered with the National Diabetes Service Scheme (NDSS) each day.[2] This data only relates to people voluntarily registered with the NDSS, with evidence suggesting another 10-20% of those living with T2D are unregistered,[3] representing another 130,481 to 260,962 people. Furthermore, data suggest 18-20% of Australian adults may be living with undiagnosed T2D,[4, 5] equating to another 4.8 to 5.3 million people. Screening for people at high risk of diabetes is recommended every three years, but only half of those at risk are being screened.[4]

Prediabetes can precede a T2D diagnosis by a decade.[6] Therefore, prediabetes is an equally important consideration. In terms of prediabetes, there are approximately two million people living with prediabetes in Australia.[7] The highest risk factors for prediabetes are overweight/obesity, high blood pressure and altered cholesterol.[4] It is highly probable that many people with these risk factors have undiagnosed prediabetes. Therefore, the number of people with prediabetes is likely underestimated. In addition, it is important to note, the lowest diabetes screening occurs for those already diagnosed with prediabetes.[4]

Regardless of whether a person has prediabetes or T2D, the primary goal of treatment is to reduce blood glucose levels back into, or as close to the normal healthy range as possible.[8, 9] This is critically important because high blood glucose causes damage to the vessels and organs throughout the body, leading to serious and costly complications, such as cardiovascular disease, vision loss, foot ulcers and limb amputations, kidney issues, nerve problems, and even death.[3, 9, 10] The damage that occurs to vessels and organs leading to complications, begins in prediabetes.[6, 11] Diabetes complications lead to increased hospitalisations. Annually, there are approximately 1.1 million hospitalisations from T2D.[12] In 2018, there were approximately 15,048 deaths directly associated with T2D.[13] This figure is underestimated, as deaths from diabetes are under-reported.[13]

T2D represents approximately 83% of healthcare expenditure in diabetes.[3] Public hospital admitted patient services account for the largest proportion of expenditure in T2D, followed by the pharmaceutical benefits scheme.[5] Estimated annual costs per person with T2D are $3,564 to $4,390,[14, 15] with complications doubling expenditure.[14] In addition, there are associated costs such as government subsidies, loss of labour and taxation revenue that have been estimated to cost above ten billion dollars per annum.[14, 16] The projected cost forecast for diabetes in Australia in 2051 is $50 billion per annum.[17] T2D is a *very* serious concern for Australia's health system and economy.

Current treatment and programs

Medical practitioners (GPs) are the primary touch point for people with prediabetes and T2D, where they receive a diagnosis and attend regular check-ups.[18] Currently, the standard medical approach to treating high blood glucose is to prescribe glucose-lowering medication.[18] Annually, there are over 15 million prescriptions dispensed for diabetes.[12, 19] Medication can be useful and sometimes necessary, however, for the past decade, researchers have been advocating for dietary modification to be used as a first line therapy.[20] There is a compelling reason for this—diet is critically important for people with T2D and prediabetes. In fact, the impact of improving a person's nutrition can be profound, offering greater glucose-lowering benefits to diabetes medications.[8, 21] In addition, dietary

modification can help improve other clinical outcomes such as weight, blood pressure, cholesterol, and overall metabolic function.[8, 21]

In Australia and globally, medical care guidelines stipulate that GPs should encourage dietary modification at every stage of T2D.[8, 9, 18] Currently, in Australia however, diet/nutrition is grossly underemphasised as a T2D treatment strategy; as unfortunately, numerous challenges limit access and availability to dietary education and support.

Some of these challenges include:

- Not enough dietitian/diabetes educator workforce to meet the growing demand of people with T2D.[22, 23]
- Inadequate Medicare reimbursement schemes for allied health - only five subsidised consultations with allied health professionals per year are provided.[24, 25] For people with T2D, these are primarily used to access podiatry and physiotherapy services, so majority of people with T2D never consult with a dietitian or diabetes educator and rely on their GP for nutrition advice.[25]
- The impact of diabetes education is undervalued in professional settings, leading to lack of referrals to programs or professionals.[26]
- Time, cost and labour of delivering education programs, particularly in face-to-face settings.[27]
- Lack of access and availability to dietary education and support in general, especially in regional, rural and remote areas.[23, 26, 28]
- Approximately 40% of Australians with T2D never receive *any* form of education.[24]

In addition, one of the major issues Australia-wide is that GPs, health practitioners and organisations are advising people with T2D to eat according to the Australian Dietary Guidelines.[18, 29] As outlined in the Eat For Health Educators Guide,[30] the Australian Dietary Guidelines are designed for healthy populations. “This program does not apply to people with medical conditions requiring specialised dietary advice” (p.2).[30] Thus, the Australian Dietary Guidelines are *not* appropriate for people with T2D or prediabetes. Overall, there is currently widespread lack of education and knowledge regarding appropriate evidence-based diet/nutrition guidelines suitable for people with T2D and prediabetes, further detail on this outlined below.

From an individual perspective, people find diet one of the most challenging parts of diabetes self-management.[31] Research indicates numerous barriers in this area:[31-38]

- Not receiving any information about diet/nutrition
- Lack of knowledge and understanding
- Conflicting diet/nutrition information
- Difficulties with processing and recalling brief information provided by health professionals during time-limited appointments
- Perceived lack of knowledge among health practitioners
- Information being communicated with too much medical jargon
- And most importantly, being supported without stigma—another *major* issue across our healthcare system

At a broader level, dietary education and support is very limited. The Australian Government supports the NDSS to provide programs to registered NDSS recipients. In terms of

diet/nutrition, the NDSS provides basic education about carb counting; short topical education programs (CarbSmart—3 hours and ShopSmart—2 hours); and a 6-hour structured comprehensive self-management program (DESMOND/MyDESMOND). These programs are not based on the most recent evidence (Attachment 1); and being so short, they simply aren't enough to support sustained behaviour change and meaningful health improvements.[31] Despite being implemented nationwide for the past decade, recent evidence established that the NDSS lacks effectiveness data for the majority of the programs provided to the public.[39] Positively, steps are now being taken to capture NDSS program outcomes.[40] However, one major limitation is the lack of ability of NDSS programs to capture outcome-based data for clinical effectiveness,[39] which is the most valuable data to assess impact of interventions. Refer to Attachment 1 for an overview of evidence regarding NDSS programs.

Dietary treatment of type 2 diabetes is highly effective

It is important to emphasise that while it was once thought a person with T2D was destined to progressively get worse, evidence from the past decade has proven otherwise. People with T2D can improve and maintain improvements in key clinical outcomes—reducing blood glucose and haemoglobin A1c (HbA1c), weight and medication requirements.[41-49] Aside from bariatric surgery, the only way to achieve these positive outcomes is through dietary modification, namely very low-calorie diets and low carbohydrate diets (Table 1). Very low-calorie diets are not suitable at a population level, as they can be difficult to follow and frequently require medical supervision.[48] While effective, ketogenic diets can be difficult to follow and have generally shown low adherence.[41, 42, 45, 46] Conversely, less restrictive low carbohydrate diets offer more flexibility and have been found to be sustainable, making them a suitable option at a population level.[41, 42, 45, 46] In addition, low carbohydrate diets are highly effective for achieving improvements in key clinical outcomes.[41, 49]

Table 1: Definition of carbohydrates in the diet

Carbohydrate definition	**Carbohydrate g/day**	**Carbohydrate % of energy[a]**
Ketogenic	<50	<10
Low carbohydrate	50-129	10-<26
Moderate carbohydrate	130-225	26-45
High carbohydrate	>225	>45

[a]Based on a 2000-kcal/8368-kj diet[50]

Low carbohydrate diets are widely misunderstood. However, they are among the healthiest eating patterns for people with T2D and prediabetes,[31] promoting consumption of nutrient dense foods, minimal added sugars and refined grains, adequate dietary fibre and increased vegetable intake. The American Diabetes Association states that "reducing overall carbohydrate intake in individuals with diabetes has demonstrated the most evidence for improving glycaemia" (p.S72, Table 5.1, point 5.15). There is a large body of evidence that supports low carbohydrate diets among people with T2D to be the most effective dietary pattern to reduce blood glucose, HbA1c and weight; [31, 41-47] and improve cardiovascular risk factors, such as cholesterol (lower triglycerides and increased HDL) and lower blood pressure.[41, 42, 45, 51, 52] Notably, lower carbohydrate diets frequently lead to a reduction or cessation of medication requirements in people with T2D.[41-47] Reducing medication

requirements can not only significantly reduce burden on the healthcare system, but reduce considerable stress and burden from patients as well.[53] Importantly, since 2018, low carbohydrate diets have been accepted across international diabetes guidelines.[31, 54-59] As noted previously, the consensus in Australia, is to recommend people with T2D eat according to the Australian Dietary Guidelines—a high carbohydrate diet.[60] Currently, there is widespread lack of specialised knowledge among our professional workforce regarding appropriate dietary treatment for T2D and prediabetes.

Appreciably, dietary treatment of T2D is something individuals need to self-manage on an everyday basis, and in order to do so, they need dietary education and support.[31] It is also recognised that diabetes education to facilitate behaviour change and maintenance is an ongoing requirement.[31] As outlined above, there are numerous challenges limiting access and availability to dietary education and support across Australia.

Digital health interventions need to be the way of the future

The only possible solution to address the numerous challenges of limited access and availability and provide the diet and nutrition support that is urgently needed, no matter where people are located, is by providing *effective* digital behaviour change interventions, as an adjunct to the care provided by GPs and/or multidisciplinary services.

In 2020-21, there were still reservations regarding the effectiveness of digitally-delivered diabetes education, as evidence was still emerging.[61, 62] However, globally, there is now strong evidence of the benefits, with positive health outcomes frequently outweighing in-person care.[31] The first systematic review of web-based T2D dietary interventions, published by Dr. Dening (author of this report) and colleagues in 2020,[63] has been among the emerging evidence cited by the American Diabetes Association, the past two years.[8, 53, 54] In terms of web-based dietary interventions for people with T2D, only a small number of randomised controlled trials have been conducted globally.[63]

Table 2. Overview of randomised controlled trials of web-based dietary interventions for T2D

Study overview	Intervention diet	Intervention group	Control group	Diabetes medication
Dening et al. 2023, N=98, 16 weeks, Australia	Low carbohydrate diet	–0.94% HbA1c –4.36 kg	–0.26% HbA1c –0.77 kg	Intervention group reduced medication, 25% reduced ≥20%. Control group increased medication.
Hansel et al. 2017, N=120, 16 weeks, France	National nutrition guidelines of France	–0.37% HbA1c –2.9 kg	0.23% HbA1c 0.2 kg	Not reported
Saslow et al. 2017, N=25, 32 weeks, United States	Ketogenic diet	–0.8% HbA1c –12.7 kg	–0.3% HbA1c –3.0 kg	No differences

*Table shows randomised controlled trials that have achieved significant clinical outcomes between groups. Results in the table indicate within group difference in intervention and control groups for clinical outcomes, with results favouring intervention groups receiving digital dietary education and support. BMI=body mass index; HbA1c=haemoglobin A1c; kg=kilogram; N=number of participants in trial.

Dr. Dening has led the world's most recent innovative multi-phase research investigating the effectiveness of a digital dietary program for people with T2D, authoring several papers with colleagues through Deakin University, which have been published in leading international journals.[35, 49, 63-65]

The T2Diet Study is the first in the world to:

- thoroughly explore and report user-centred design and development of a web-based dietary program for people with T2D
- evaluate a web-based low carbohydrate nutrition program for people with T2D using a randomised controlled trial design
- and, use mixed methods research to explore user experience and engagement in a digital dietary intervention for people with T2D

Importantly, the T2Diet Study achieved significant results in terms of clinical outcomes, as shown in Table 2; and has confirmed that well-designed digital dietary interventions are a highly effective method of delivering dietary education and support to people with T2D across wide geographical locations.

The results of the T2Diet Study are highly significant for Australia and internationally. Access and availability to diet/nutrition education and support is urgently needed, and digital health interventions, supported by robust research with proven clinical effectiveness, can be scaled at low cost to address this urgent need.[66, 67] In Australia, there is *very little* evidence for clinical effectiveness of digital health interventions for people with T2D,[18] including programs offered by the NDSS, as outlined above and in Attachment 1. This is a major concern, as the internet is the primary source of information, with 73% of Australians researching health information online.[68] However, there is widespread misinformation on the internet, with only 6% of Australians indicating they could find a trusted source.[68] As a nation, steps need to be taken to alleviate these issues to better support the health of our citizens.

The Government needs to prioritise facilitating access to clinically-proven digital programs

Currently, in Australia, there is only one scientifically-proven clinically-effective online diet/nutrition program for people with T2D—the T2Diet Program. Provided alongside standard care, the T2Diet Program is a results-oriented outcome-based solution that offers the potential to change the health of all Australians with T2D.

The T2Diet Program is a structured comprehensive low carbohydrate nutrition program based on the latest evidence, along with innovative digital health and behaviour change methodologies designed to support literacy levels, engagement, uptake and positive health outcomes in people with T2D. The program underwent multiple phases of research and user-centred design and development[35, 64, 65]; including a rigorous blinded randomised controlled trial—gold standard research for assessing clinical effectiveness.[49]

Results from the T2Diet Study randomised controlled trial conducted through Deakin University,[49] demonstrated remarkable improvements in the health of Australian participants with T2D, recruited from the general community across wide geographical locations, including metropolitan, regional, rural and remote areas. T2Diet Program participants improved key clinical outcomes, with significant reductions in blood glucose, weight, body

mass index and medication requirements. In contrast, the control group that received standard care exhibited minimal health improvements and increased medication dependency (refer to Table 2 above).

Every person with T2D in Australia needs access to *effective* digital behaviour change interventions, such as the T2Diet Program, so they can experience significant improvements in their health. However, Australia currently lacks systems for recognition and swift implementation of scientifically-proven clinically-effective digitally-delivered programs into schemes such as the NDSS or Medicare. Without the Governments support, these highly effective programs cannot be provided equitably to *all* Australians, which could be a missed opportunity to dramatically improve the health of our citizens.

In the United Kingdom, the National Health Service (NHS) has an Innovation Accelerator program, which provides support to scale effective digital programs across England's healthcare framework to benefit patients and staff.[69] This program has seen multiple evidence-based digital programs for T2D implemented throughout the NHS framework.[70-72] In Australia, we *urgently* need to improve access and availability of diet/nutrition education and support for people with T2D and prediabetes. Therefore, creating pathways to swiftly uptake *effective* digital behaviour change programs into the national healthcare framework should be a primary priority for the Australian Government.

Conclusion

This report has highlighted the immense problem we face. Too many Australians are living with T2D and prediabetes, which is having a major impact on Australia's health system and economy. Overall, current treatment strategies are not supporting people effectively. We need to adopt a completely different strategy. As outlined above, there are significant and numerous challenges limiting access and availability of diet/nutrition education and support Australia-wide. To rectify these issues, will take a significant amount of time and resources. However, we urgently need to improve access and availability of diet/nutrition education and support for people with T2D and prediabetes NOW. Therefore, the only possible solution to overcome the challenges is to provide *effective* digital behaviour change interventions. Incorporating scientifically-proven clinically-effective digital behaviour change programs into the suite of services currently subsidised through the NDSS or Medicare, should be a primary priority for the Australian Government, as it will make a significant positive impact for individuals, the healthcare system and the economy.

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Abbreviations

GP: general practitioner

HbA1c: haemoglobin A1c

NDSS: National Diabetes Service Scheme

NHS: National Health Service

T2D: type 2 diabetes

Attachment 1 Overview of evidence on NDSS diet/nutrition programs

ATTACHMENT 1: Overview of evidence on NDSS diet/nutrition programs

Carb Counting - classified as 'Basic Education'

The NDSS website provides basic education about carb counting. Resources advise the Australian Dietary Guidelines—a high carbohydrate diet, recommending women consume 30-45 grams of carbohydrate per meal and men consume 45-60 grams per meal.[1, 2] As noted in the report, these guidelines are not suitable for people with type 2 diabetes and are misaligned with current evidence for dietary treatment and management of type 2 diabetes. In addition, basic education is not aimed at achieving behaviour change that leads to meaningful health improvements.[3]

CarbSmart - classified as 'Topic Specific' education

CarbSmart was developed by Diabetes WA in 2016, and was implemented widely across Australia in July 2017.[4] The program was reviewed in 2018, however, no content changes were made. Resources advise the Australian Dietary Guidelines—a high carbohydrate diet.[5] The CarbSmart program is delivered face-to-face in small groups of approximately five people over a 3-hour period. More recently the program has also been delivered online.

One peer-reviewed study regarding CarbSmart assessed pre-post and three month follow up data from 4.5 years of implementation.[4] Since no data had been collected for the exact number of CarbSmart deliveries, the estimate was that 550 CarbSmart sessions had taken place from 2016-2020, including a total of 4,656 participants. Four per cent of participants (n=188) provided three month follow up data. The three outcomes measured were participant satisfaction, knowledge and confidence. Other outcome measures changed over time—from 2016-2018 'diabetes empowerment' was measured; from 2019-2020 'patient activation' was measured, although both forms of data were treated the same on assessment. The authors concluded the CarbSmart program was effective for improving outcomes after the 3-hour period, which were maintained at three months in the 188 participants that were assessed.

ShopSmart - classified as 'Topic Specific' education

There seems to be no peer-reviewed data on the effectiveness of the ShopSmart program.

DESMOND - classified as 'Comprehensive' education

Comprehensive self-management education programs are not designed to specifically influence diet/nutrition behaviour, but the DESMOND program will be included here to demonstrate the limited evidence available, as it is one of the highest cost-to-deliver NDSS programs.

DESMOND is positioned as an evidence-based comprehensive self-management program, which was originally developed for people with type 2 diabetes in the UK, first published in 2008.[6] Surprisingly however, there is virtually no evidence for the clinical effectiveness of the program.

In the initial 12-month study,[6] several clinical outcomes were assessed at four, eight and 12 months, including blood glucose control measured via haemoglobin A1c (HbA1c), weight, cholesterol, blood pressure, and waist circumference; along with smoking status and physical activity. The results demonstrated no significant change in blood glucose control in participants, at any time point. Other outcomes showed minimal improvements—weight loss

at four months and 12 months, 0.72 and 1.01 kg, respectively; a reduction in triglycerides at 8 months, 0.33 mmol/l; and increased physical activity at four months. At 12 months, psychosocial measures such as diabetes related illness, knowledge and depression were improved.

An economic evaluation of the 12-month DESMOND trial showed the intervention was *not* cost effective, costing more than usual care.[7] Even so, the authors suggested the course would 'likely' be cost effective in real world settings. Data suggest otherwise, the course is very expensive to deliver, see below.

A three year follow up of DESMOND[8] showed no improvements in biomedical or lifestyle outcomes were maintained, although some psychosocial measures sustained improvements.

In Australia, the only peer-reviewed data that exists for DESMOND is a study assessing the effects of DESMOND on patient activation.[9] The results showed that after participation in the 6-hour face-to-face program, 70% of participants had increased patient activation.

The DESMOND program was later made digitally available in the UK, demonstrating improvements in self-efficacy and diabetes-related stress after four weeks of participation.[10, 11] Supported by the Australian Government in response to Covid-19, Australia adapted and released myDESMOND into a digital education program across Australia in 2020.[12] No peer-reviewed data regarding feasibility, participation levels or effectiveness of MyDESMOND has since been reported.

Positive steps forward

The first proposal for a level of standardisation for the quality, reporting and evaluation of NDSS programs was published in 2022.[3] In the proposed framework, four indicators and two outcomes were selected as the basis for evaluating programs provided by the NDSS. The four indicators were: 1) improved knowledge and understanding; 2) self-management; 3) self-determination; and 4) psychological adjustment). The two outcomes were: 1) improved clinical; and 2) reduced cost. The authors of the framework[3] confirmed the overall lack of effectiveness data for the majority of the NDSS programs provided to the public, along with limited evaluation of outcomes for programs such as DESMOND.

Positively, the University of Technology Sydney (UTS) is currently undergoing a three year evaluation of NDSS programs, 2021-2024.[5] According to the UTS report, in 2021-2022, 2,537 people attended the DESMOND program. The cost to deliver the 6-hour DESMOND program face-to-face was $956 per person.[5] No cost of delivering the myDESMOND program in Australia has been reported, but is planned for the 2022-2023 UTS report.[5] In 2021-2022, 1,784 people attended the 3-hour CarbSmart program and 1,527 people attended the 2-hour ShopSmart program. The cost to deliver topic specific programs such as CarbSmart and ShopSmart face-to-face is $529 per person; while online delivery is *estimated* at $162 per person.[5] No specific cost evaluation occurred for online program delivery, due to lack of data availability.[5]

Overall, the data represents survey responses following very short NDSS programs (2-6 hours). Therefore, one of the major limitations is lack of ability to collect outcome-based data for clinical effectiveness and economic evaluation. This limitation was acknowledged by the authors of the framework,[3] stating that "direct evaluation of clinical outcomes and cost was not feasible, given the available resources, accessibility of information, and scope of the

NDSS (e.g., Agents do not have access to medical records for evaluation of clinical outcomes)" (p.6).[5]

As outlined above, the NDSS programs are not based on the most recent evidence; and the cost of program delivery is very high given the NDSS programs lack outcome-based data for clinical effectiveness. Thus, one important factor arising from the report by UTS,[5] was the support for implementation of digital programs as an adjunct to healthcare services, in recognition they may be more cost-effective and have greater reach; as the difficulties in reaching people are widely recognised, particularly in rural and remote areas.

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