

Participant Insights From a Family-based Meal Kit Delivery Intervention

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ABSTRACT

Objective: To explore the lived experiences of prediabetic participants in an in-home, family-based meal kit delivery intervention for 12 weeks. Delivered foods followed a plant-dominant pattern, including small meat portions, to encourage long-term adoption of this pattern.

Methods: Qualitative in-depth individual interviews (n = 21) were undertaken online with 7 pilot participants, at 3-time points (preintervention, during intervention, and postintervention). Three online focus groups were also undertaken postintervention with 12 participants.

Results: Postintervention, most participants reported positive changes in eating patterns and mindset changes enabling future healthier eating. The deliveries inspired enthusiasm for tastier cooking and family involvement. Although participants indicated they felt well-being improvements, they often became focused on the outcome of their physical test results (eg, weight), leading to some disappointment and feelings of failure.

Conclusions and Implications: Participant engagement with the intervention was high, but other underlying emotions, outside diet behavior, can affect long-term adoption outcomes. This has implications for designing future interventions.

Key Words: Family-based intervention, meal kit delivery, participant insights, prediabetic status (*J Nutr Educ Behav.* 2023;000:1–11.)

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INTRODUCTION

Metabolic health diseases, in particular type 2 diabetes, continue to be a major concern in many countries, with a continuing cost on individuals/families, the health care system, and the economy.¹ Poor nutrition can play a primary role in the risk of developing obesity, metabolic syndrome, and other noncommunicable diseases. Specifically, diet characteristics such as high fat, high sodium, and processed fast food intake are strongly correlated with negative health measures and health behaviors,² whereas high fruit and vegetable intake, and more frequent cooking at home³ are strongly correlated with positive health measures and health behaviors.^{4,5} Some

population groups are more at risk of such diseases because of structural inequities impacting eating/food preparation behaviors.^{6,7} Thus, nutrition education and interventions are important to enable more positive health behaviors, ultimately reducing preventable health diseases. Healthy eating interventions for families in the home environment continue to grow,⁸ and include the delivery of food to households to improve food security for families with low income,^{9,10} cost of health care,¹¹ adolescent food preparation skills,¹² and healthy at-home food preparation.¹³

This research, among people at risk of cardiometabolic disease, is located in New Zealand where health statistics indicate that many within

the population are not meeting recommendations associated with positive health behavior.^{14,15} In the most recent New Zealand Health Survey, 34% of New Zealand adults were persons with obesity; an increase of 3% from the previous year.¹⁵ Diabetes is more commonly found among Māori, Pacific Island and South East Asian people.¹⁴

The research is located within the *He Rourou Whai Painga* (HRWP) program, a multiyear, multicenter dietary intervention to explore whether people at risk of cardiometabolic disease will benefit from a changed dietary pattern, which includes family behavior change support, and includes the representation of participants from the Indigenous Māori populations. The intervention is designed to help enhance existing cooking-at-home processes and ease barriers. It involves the exploration of family-network support as being the main behavior change driver. The entire family (or those willing to participate) as a group, receive the intervention materials, stemming from the understanding that disease has an impact on more than just the

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affected individual. This allows the index person to be supported rather than isolated. In addition, increasing the education of the entire family may positively affect their food choice behaviors as a communal group. This research brief reports on the participant research substudy undertaken within the HRWP pilot study before the proposed main HRWP intervention. Below, we outline the specific aims of our participant substudy and provide background on the HRWP pilot intervention.

The Participant Substudy

Responding to the call for more, transdisciplinary research,¹⁶ our research explored participants' lived experiences, perceptions, emotions, and attitudes to a pilot dietary intervention. It was designed to gain qualitative insight into potential barriers and enabling factors for pilot participants, as they experienced the 12-week meal kit intervention, including exploring self-reported behavioral change through familial support networks. It explored (1) pre-intervention perceptions of health and wellness, motivations, expectations, habitual diets, cooking practices, lifestyles; (2) intervention and postintervention perceptions of progress, including key lessons, experiences, and concerns with adopting the dietary pattern, as well as compliance, barriers and enablers of behavior change; and (3) how family involvement might serve as a supportive mechanism to help enact behavioral changes.

The HRWP Pilot Intervention

The HRWP pilot study took place to establish the feasibility and acceptability of conducting the proposed HRWP main intervention, including recruitment processes, and variables to include in the primary outcome (metabolic syndrome severity score) for implementation in the main study. Thirty index participants and their family were purposively recruited as per the HRWP pilot ethics approval procedures (New Zealand Health and Disability Ethics Committee). Twenty of these were

recruited through the Centre for Endocrine, Diabetes and Obesity Research, and 10 through a marae (Māori community focal points for New Zealand's Indigenous peoples). All pilot participants received weekly deliveries of food from a commercial meal kit provider, My Food Bag (Auckland, New Zealand), for 12 weeks. Participants ordered their weekly food from a selected range of options consistent with the dietary pattern created by the specialist diabetes dietitian. The foods followed a plant-dominant eating pattern including vegetables, legumes, fruits, unrefined cereals, nuts, together with lean protein from seafood, and small portions of lean meat and dairy. The plant rich dietary pattern accords with the Acceptable Macronutrient Distribution Ranges for the reduction of chronic disease risk outlined in the Nutrient Reference Values for Australia and New Zealand. Other nutritional features include a high-intake of dietary fiber, monounsaturated and omega-3 polyunsaturated fatty acids, and antioxidants (polyphenols). Plant-dominant diets have been shown to improve metabolic, cardiovascular, and well-being profiles in people at risk of cardiometabolic disease in the context of the Mediterranean diet.¹⁷ We acknowledge that the Mediterranean diet is often vaguely defined in the literature, and is just 1 example of a healthy, plant-based eating pattern also encapsulated by other dietary patterns.^{18,19} The delivery, at no cost, was intended to cover 75% of weekly household intake consumption for the 12-week intervention phase to encourage participants to incorporate these eating patterns into their own meal preparation before the intervention ended, as well as to allow room for personal choices. It included the ingredients and recipes for 5 family dinners (with preparation times of between 20 and 45 minutes), a fruit box, and an extras box containing breakfast, lunch, and snack options.

The participants underwent physical testing at their clinic visits, before and after the intervention. This consisted of fasting blood samples for hemoglobin A1c, fasting glucose and lipids, and clinical measurements for

weight, waist circumference and blood pressure. These were obtained to give an estimate of the magnitude of change observed in the metabolic syndrome severity score over the 12 weeks of the pilot study and to assess if the minimal clinically important difference was met. Families had some input into weekly meal planning in conjunction with the dietitian regarding preferences and were able to determine the meal order and degree of adherence to the recipe. Participants were informed that they needed to purchase the residual for their weekly requirements.

METHODS

Study Design: The Participant Substudy

A qualitative research approach was used to explore lived experiences.²⁰ The study used the interpretivist paradigm as a methodological framework to analyze and interpret the exploratory data collected from 1) in-depth interviews and 2) focus groups. These are commonly employed methods in the health behavior domain. The interpretivist paradigm allows researchers to interpret a phenomenon of interest with an understanding of the world from subjective experiences and the reality of individuals.²¹

Recruitment and Sample

The authors obtained ethics approval as part of the New Zealand Health and Disability Ethics Committee's approval for the wider HRWP pilot study and recruitment took place in November 2021. In their clinic visit, all pilot participants were asked if they would like to be invited for the participant substudy. The researchers for this study, then invited those interested by an email invitation, and sent the participant information and consent form to those who confirmed their interest. Seven female participants were recruited for the in-depth individual interviews. They all resided in Wellington, New Zealand, a city with well-established cultural and socioeconomic diversity. The [Table](#) shows the details of the in-depth individual interviews.

Table. Participant Characteristics: In-depth Individual Interviews

Characteristics	n = 7
Age (y)	
25–34	1
35–44	1
45–54	2
55–64	3
Ethnicity	
Asian	2
Māori	1
New Zealand European	1
New Zealand European/Māori	2
Pacific Islander	1
Family Details	
Lives with spouse	2
Lives with spouse and ≥ 1 children	3
Single parent	1
Lives with extended family	1

All members of the pilot intervention were then invited to partake in the final phase of this research in online focus groups. Three online focus groups were conducted in March 2022 involving 12 participants in total. One of these focus groups consisted of 4 female Māori participants recruited from the marae group. The other 2 focus groups consisted of New Zealand Europeans (aged 45–64 years), including 1 male participant.

Data Collection

Participants for the substudy were informed with a participant information sheet and subsequently provided their signed consent to participate. Data were collected via semistructured interviews undertaken online using a video-conferencing service. Online interviews were necessary because of coronavirus disease 2019 lockdown procedures being in place. In-depth individual interviews were undertaken with 7 participants, with each participant completing 3 interviews: preintervention (immediately before starting the program), during intervention (approximately 6 weeks after start), and postintervention (after week 12). The focus groups took place after week 12, following the same recruitment processes outlined above for the individual interviews. Individual interviews were on

average 45 minutes long and the focus groups were 60 minutes long. The interview guides were based on previous literature on dietary intervention, nutrition education, and health and cooking behavior. The exploratory areas of questioning were: (1) typical daily eating patterns, views on healthy food (preintervention); (2) reasons for joining the study; (3) impressions of the delivered foods (eg food quality, likes, dislikes, enjoyment); (4) changes in cooking processes; (5) how the family coped (any new family roles in cooking); (6) challenges during the journey; (7) any changes/improvements in health/family's health; (8) experiences after the program stopped (shopping, cooking); (9) what was learned, changes in views of healthy food, confidence with ongoing adoption of the pattern; (10) any additional support needed; (11) views on the intervention study overall, meeting of expectations, enjoyment of participation, any other suggestions for future studies. The interviewers used probing to explore emerging concepts in a deeper and richer manner. Interviews were video and audio-recorded for analysis purposes and all participants were advised of the confidential nature of their data, and that the use of any verbatim comments would be anonymous. Incentives (\$150 at the completion of the 3 interviews) and (\$80 for focus

group participation) were provided to participants as a thank you for their contribution.

Analysis

Data were transcribed using Otter.ai automated transcription software (Otter Voice Meeting Notes, 2024, Otter.ai) and then manually checked and edited for accuracy by members of the research team. Thematic analysis was then conducted using open and axial coding to identify primary patterns and major themes emerging from the data.²² A group of 3 researchers was involved in an iterative coding process using constant comparison²³ to identify and contest key themes and ideas, to interpret contrasts between participants, and discuss the reasons for these differences. The analysis of the data was enhanced by reference to field notes and collaboration by 3 researchers, with any discrepancies between researchers resolved by open discussion including reference back to the original interviews.

RESULTS

The findings are discussed below for each of the 3 time points for the in-depth individual interviews, followed by the focus groups.

Preintervention Interviews

The preintervention interviews allowed participants to discuss their existing beliefs about health and wellness, their current practices and lifestyles, motivations, and expectations about the forthcoming intervention. Participants revealed their established routines and habits and gave insights into the mundane roles eating and meal preparation played in their lives. Participants described food as having an everyday immediacy, which meant there was often pressure associated with preparing regular meals, for example, being a working parent. Lacking time and organization were often recognized as reasons for poor food choices and easy convenient options. Although 2 participants reported that they ate breakfast, others chronicled a typical pattern of experiencing hunger at

lunch time, which led to inappropriate choices on the basis of what was available out of the home. Within this was shown a lack of knowledge/concern about portion control.

I love food in general. My husband makes a mean Thai curry, which I'm quite partial to with lots of coconut cream and naan bread. ... Portion sizes can be quite astronomical in our family especially if it's something yum. We don't have an off switch.

Although participants knew to some extent what types of food were considered healthy, they did not feel they had sufficient knowledge to make a significant change in implementing new habits. Across the interviews participants had different knowledge levels, confidence, and interest in cooking at home. Some liked to be creative with meals and ingredients, whereas others chose to rely on simpler meals using rice or staples as fillers for the family meal. In 2 cases, at-home cooking was limited, and in 1 of these, the proximity of the McDonalds drive-thru meant that on most days some meals were sourced from this outlet for the younger teenage family member.

Yeah, mornings aren't great for me. So, I will skip lunch. Generally, I'm really busy. I work flexible hours so some days I'll go back to sleep when my son's gone to school. Other days I try to catch up with housework because I work weekends and evenings mostly. And then I will snack if there's fruits. I will pick a piece and go on with the day but it's usually the evenings that are really quite unhealthy. I am not an active person, very sedentary. I am expected to do a lot of paperwork, so I sit and snack. And I am generally tired. But I try to balance work and the family especially with my teenage son and a lot of the time we are tired in the evening. So, it's quick and easy foods or takeaway as last night it was KFC, which I try not to get but. ...

Personal preferences were apparent, such as the desire for strong

flavors, and 1 participant discussed her usual preparation of large pots of food in a cooking session, which then lasted the family for several days. Participants commonly reported a negative cycle of eating bad food, feeling bad, eating more bad food to feel better, demonstrating an emotional relationship with food. Across the interviews there were accounts of this unhealthy spiral. For a younger participant, a lack of motivation to go outside from the safety of her darkened room was described.

Also expressed in these preintervention interviews was the emotional need for satisfaction from food, and cravings for foods perceived as treats.

I mean, chocolate is fine. If you have a little bit. The dark ones, but I tend to go for, the milk chocolate. Which is not good. I like dessert. That's the problem with me. I like desserts. I feel like if I have my dinner and I don't have a dessert at the end of it, it feels like the meal is not completed.

The majority reported feeling things had got out of control with respect to their relationship with food with this feeling building overtime because of busy lifestyles and mindless eating. Many were concerned for the health of family members who they felt were in a worse condition than they themselves were. However, this seemed to conflict with the linking of food with a way of nurturing, rewarding, or showing love within the family. There was concern about how other family members would cope with a possible deprivation and this posed a personal conflict for 1 participant who wished to show herself still caring for the family, but in a new way, and hoped the program would give an impetus for change.

Our family revolves around food. Like food, food. Yeah. Gotta get the food! Yes. I was always brought up with if someone's hungry, you feed them. So and yeah, me telling my mum. "Hey Mum, don't eat that. Do you need that? Do you really have to take that second piece?" Um, so I thought this way if we can get back into,

especially me and my husband and the kids, we can learn how to make better choices and probably have more variety because we eat pretty much the same stuff all the time.

When discussing motivations for joining the program, participants all directly wanted to make changes in their habitual patterns of eating to gain better health outcomes given their prediabetic condition. There was a desire to gain more knowledge about the right way to eat, using a more sensible approach:

So, a lot of a lot of the money we spend at the moment is just wasteful. It's yeah, on junk food and quick and easy snacks for the kids like pies and stuff. We were laughing the other day that we don't buy fruit anymore because it gets wasted.

For some, underlying this was a way to improve self-esteem because of longstanding issues with weight loss. At this preintervention stage, the majority were wanting weight loss, but also understood that the bigger aim was to improve their overall health, particularly because of their prediabetic diagnosis, and learn new habits for the entire family. In general, because of these important motivations, participants reported both apprehension and excitement before commencing the intervention.

During Intervention

At the midpoint interviews (approximately 6 weeks from the participant's commencement of the program) the majority reported that, despite the intervening holiday period, they were delighted to be making changes to their eating patterns. Although lapses did occur, such as overeating at special events (eg, birthdays/seasonal events) or forgetting to take a packed lunch to work, participants claimed they were better able to manage because of obtaining a healthier mindset, including greater self-control and better knowledge to also inform others about healthier options and substitutions. As one participant noted,

“Very well. Like I’m quite amazed myself at how well it’s going.”

Having food delivered with preset recipes took away the stress of meal planning and this served as an initial kick-start for changes to be made. In general, although not sticking 100% to the program, such as eating chocolate bars on occasions, they reported significant improvement in their understanding of portion sizes, healthful foods, and eating on a regular basis.

The boys would normally have literally a half a kilo piece of steak. He (teenage son) made sure it was under 200 grams for everyone. Which was good for him.

So, it introduces us to not just the recipes themselves but also the proportions. Because we are heavy meat eaters. We didn’t know we could get full with half the amount of meat. Like I didn’t know that 600 grams of meat could be quite filling even for family of 4, because we easily ate more than that, lots more. So, yeah, that was a revelation that we did not expect.

All were now eating breakfast, and the inclusion of oat porridge was felt to be a significant positive change that set up the rest of the day. Furthermore, in fear of losing the gains already made, sensible strategies had been set in place to allow realistically for some degree of Christmas celebrations, and many reported they looked forward to getting back to the greater discipline of the program.

The positive experience arose from both the quantity and quality of the food, which exceeded expectations. The main meals were largely considered to be delicious, of high quality, interesting flavors, and easy to prepare.

“The first thing we noticed was that the quality of the meat was of a really good standard. The vegetables are very good as well.”

What has helped a lot is that it’s also given me some ideas of certain dressings that you can use, you know, healthier options, but

also things that you can throw together quite easily. Some of the recipes are so quick and simple. And that’s great. Like last night we had tabouli, which is not true tabouli, but it’s made with vegetables and it was yummy. . . .and it’s really convenient because it’s the sort of food you can have it the next day, it’s still really tasty and still fresh.

Family involvement was evident with instances of teenagers taking over cooking duties and many participants were excited to be eating again as a family.

“[Teenage son] has been cooking a lot of our dinners this week. . . Like he’s actually been really enjoying it.”

Because I do like the process of cooking, I like the feeling of feeding everyone. The result is everyone’s reactions really, and I do like to cook with my sisters.

The adequate quantity and portion size of the food deliveries was a surprise, as many participants had expected that the intervention would require a severely restricted intake. In particular, new understandings were claimed about making substitutions. The observation of the way smaller cuts of meat still provided or even improved satiety was widely noted. Participants were actively experimenting with new adaptations (eg, making tortilla chips from wraps to substitute for potato chips). However, some degree of self-supplementation by the purchase of other foods (eg, meats) from outside the intervention were noted, particularly by 1 participant. She was not eager to cook every night, preferring to maintain the established pattern of preparing large meat-based dishes 3 times a week for the family to partake in as needed.

Some participants discussed the lack of clear guidelines regarding eating outside the main meal. Some participants perceived there was not enough variety and direction for snacks and lunches, and there was confusion about how to cook vegetarian options which were new to them, such as legumes and lentils. Mild frustration was expressed that there was nowhere to ask such questions or find

support for logistical issues such as breakages, and the lack of variety in the snacks and lunches. There was often the perception of an oversupply of snacks delivered, for example, hummus and crackers, and participants were sharing with family and friends, hoarding in their cupboards, or potentially overeating.

The possibility of sabotage from wider family networks was noted by 2 participants who were reluctant to share their experiences, in case other people undermined their efforts.

Um, I try not to, because although I am excited about it, and I do tend to share, I’ve noticed sort of sideways glances, maybe a bit of jealousy, yeah, so I try not to, now.

Although participants had contact with the clinical team, at 3 clinic, or marae visits, and via 2 phone calls, having more personalized support from the intervention team was suggested by these participants as a way to help to maintain adherence and empower them going forward, such as having social networks to learn from, or to support them.

All but 1 participant reported feeling significantly more energized physically and better emotionally, such as experiencing less moodiness.

Massive changes, actually, I feel very light and myself. I feel I’m sleeping better too. . . I mean, it’s just happened recently. And it’s the change in my diet.

Several participants were told they had lost weight after measurements were re-taken in their clinic visit, and overall health improvement was reported as extending to their wider family. Although gratitude for the opportunity of being on the program was expressed, some participants wanted more tracking of blood tests/measures to track how they were faring at the half-way point. During the intervention, the relationship with food was discussed as improving from before the intervention, with considerations about the health of a food now being central and

involving for the family, rather than the habitual and mundane patterns noted in the preintervention.

It's going great, it's easy to prepare. A lot of food I didn't use to like, I now eat, because of different ways to cook, I mean back in the day everything was just boiled and bland, so I can't believe I'm actually enjoying eating asparagus.

It's taken away a lot of the stress, because I know there is something healthy at home, and yeah, it's especially recently, when thinking about portion sizes, and how I'm doing, I guess its reframed a lot of my way of life. So simple, but so effective.

Postintervention

The final interviews provided overall insight into the way participants and their families had engaged with the intervention, and why, or why not, they perceived the experience to be helpful in building toward healthier, sustainable patterns once deliveries stopped.

Five of the 7 participants claimed they were able to stay involved and actively used the delivered foods across the full 12 weeks of food delivery. The time period was viewed as sufficient to make ongoing adaptations and they voiced their trust in the intervention itself.

I think the big benefit for me is the fact that it's kind of made me break some habits, bad habits that I've had in the past. I think it's because I've been on the pilot program and decided, well, I'm going to do this, I'm going to do it as it should be done. And that I think has helped to kind of just to break some of the bad habits of the past year. So absolutely I'm wrapped. Yeah. . . . it clearly tells me that 12 weeks is a sufficient amount of time to change some bad habits maybe.

After 12 weeks, these 5 participants claimed to have experienced what they called a 're-set' in their thinking, describing this as a greater awareness of their intake and having a positive, and more mindful way of

looking at their eating style. This included increased knowledge about portion control, regular meals, and healthy foods, and better ways of behaving around food when under stress.

"So before this, I didn't really, it didn't sort of strike me what are the foods I'm taking? whether they're good or bad."

I've gotten a lot more insight into food that I never had. And I'm a lot more willing to try different things. Yeah, I still can't get over how you can have 1 tiny piece of steak and you cut it horizontally and then cook it. And it's enough for 2 people. And it's actually quite filling. So it's definitely taught me portion size, like you don't have to have a big steak each.

Yeah, definitely. So even like now with shopping, I just tend to avoid things that I probably would have picked up before but just saying "Well, no, we'll get a little bit of extra something else just to make up for what we might have had before". . . . Just knowing how I felt for the last 12 weeks. It kind of just wants you to keep going and doing the same things.

Two participants, who in the first preintervention interview had described their poor family eating patterns, such as frequent takeaway consumption and minimal home cooking, appeared to have made the biggest self-perceived improvements brought about from their new understandings. For example, 1 participant took enormous pride in the progress of her son who, via full engagement with the intervention, took control of his eating:

It has changed him drastically, his behaviors, since I was able to change that "no" into a "yes." He's now realized that he has control over his eating, and he's putting restrictions on himself, . . . he eats healthy. Saturdays is a cheat day. But that's only if he's been to the gym. So, he's putting these restrictions on himself. Yeah, it's been a huge transformation for him. And out of all of the

experience that we went through on the journey, that is the best thing for me to see and be witnessing everyday his change is amazing. . . . Before I was worried about what I put in the pantry, and it was very restrictive what he was allowed to eat. But now it's just "Yes. Go for it", and "Yes eat as much as you like" because it's all healthy. It's awesome.

This improvement was intertwined with this participant's own sense of optimism.

"Energetic, sort of just alive and able to deal with life's challenges. Let's say capable. Yes. Feeling capable."

For another participant, the success was personal and arose from a newfound sense of confidence and control from a more patient approach rather than previous starving and then bingeing behavior.

Because it was a goal of mine to become healthier. Through this it has helped, motivate me, or just clicked, you know, in my head. What I shouldn't and should be eating. Like, if I eat chocolate now, I don't eat the whole bar of chocolate. Whereas now I'm conscious. Like, I'll have a little bit and then just put the rest in the freezer and have it for another day.

I'm very, very glad I did the program. Yeah, it was a good starter. And hopefully I will continue throughout the winter seasons. So, starting going to the gym, you know, regularly. Now that I've got my food intake sorted, I'm continuing to learn. Yeah. And then just integrate it slowly, instead of what I usually do.

The convenience and ease of preparation of the food kit meals was viewed as a major enabler to build better habits, but it was also the prescribed nature of the meals that took away the stress of planning and thinking for one-self. As one participant said,

So much better not having to think about it, you've given us this, it's what you're eating that's what you got to eat. That helped a lot for me, I don't think we would

have changed our eating habits if we hadn't done the study....I think I'll just miss having this food delivered to me every Monday morning and then I'm set up for the week.

However, this also engendered emotion because of a dependence with the deliveries and the certainty they provided, as well as the flavors which many participants did not feel they could replicate.

The final few weeks. There was a lot of sadness. My son and I got so yeah, used to food being delivered. I still haven't sort of made a commitment to keep it going. But you know, we're doing we're just sort of trying to go on our own speed right now. But the last few weeks was a little bit sad. ...There were a lot of instructions. And I really appreciated the step by step. One thing that I thought would have been great also was to learn how to make the mayonnaises and the dressings that they had in the box. They came in the little packets. That would have been good to know how to sort of create those on our own. I think there was that.

Conversely, the meal kit intervention with a weekly delivery was not always favorably received because of dealing with waste and food not perceived to be fresh.

I try to use them all, I tried my best to not waste any. But if I have a choice, I would prefer it to be fresh like maybe delivery not once a week but maybe twice you know, so that you know the things don't keep for like 6 days and then after that are not that fresh anymore.

It was also clear that the second 6 weeks were more challenging for several participants and motivation was discussed as falling away because of boredom with the types of food options being delivered especially for snacks and lunches. For example, a participant was surprised at how much repetition occurred across the final 6 weeks in supplies. When participants were discussing their future food shopping plans, they indicated

that they would now look to shop according to a new, healthier pattern, but within this, also look to include greater variety than they had received while on the intervention.

Yes, I'll be buying more salads, and more different types, like coleslaw, and mixing in tuna.... But not the wheat crackers every week, maybe other types, like rice crackers.

For the 2 participants who were not able to maintain participation across all 12 weeks a variety of barriers were discussed. An overriding factor for one of these participants was the disruption and lack of support within her immediate family. She was left disappointed and was unsure if she could build on the early gains. Although she was trying to stay with the new recipes, she was frustrated with her family who were not proactive and reverted to heavy meals, laden with sauces, unless she was organizing food for them. She felt that more support in the final 6 weeks, such as a Facebook page, would have helped her see if others were also having issues. For the other participant, who in the first interview had discussed her lack of enjoyment with cooking meals, found cooking every night, because of the nature of the delivery kit meals, was onerous. She made adjustments, such as combining meals and also bulking up the meat quantity with her own purchases, to continue to prepare meals as she had done before the intervention.

The postintervention interviews also showed the way participants had built up their own implicit hopes about improvements in their physical test results. A lack of understanding about what the test results meant regarding physical changes arose. For example, a participant who had not always strictly followed the meal plans claimed she was disappointed and had become depressed with the test results as they showed little change in her blood results, despite other improvements in weight loss.

I was thinking maybe the support of a dietitian is what I might need. That was targeted

specifically for me. That was actually the first thing I thought of when the blood results came out. I thought...who do I need, who do I call? Do I need a nutritionist or dietitian, because I didn't know the difference. And I started asking around from friends. And they didn't know either. So, I'm kind of floundering. So. And then I went back to my Keto groups and started like relearning it..Like I'm trying my best. But I don't know where to go next. I just, don't know.

One participant was also disappointed with her overall health results, recording a high blood pressure reading and higher cholesterol. She felt that some foods (eg, feta cheese) did not suit her personally and she would return to her previous habits which she perceived as more aligned to her heritage while making changes to lower fat and sugar intake.

Yes, I think I am. I am glad. I think it's sort of given me some perspective on you know, what, what sort of food I should be doing. I should be you know, going forward. Which type of food I should be eating, And which one's more suitable for me, personally. I mean, it's good to experience all these other types of food but I think I will be able to focus more on the food that suits me.

Participants who had not had the results they had hoped for (eg, weight gain from baseline, higher blood pressure than at baseline), reported that no-one had explained their results and what they meant in the context of their health condition and family history. Thus, they were unsure as to how to continue with dietary changes and felt the need to research further for themselves. It was apparent that success was measured in different ways by participants. They also noted feeling better with more energy, alertness, improved sleep, less bloated, as well as an improved self-image. However, when this was not backed up with physical test results, the concrete measures dominated the self-evaluation and led to feelings of failure

being expressed, despite subjectively improved feelings of well-being.

However, overall most participants were pleased to have taken part in the study and were grateful for the food and the opportunity to learn, recognizing their gains from a new pattern of eating rather than a restricted diet plan. Most importantly, the newfound advantages of opportunities to cook and eat as a family were recorded as the most transforming aspect of the intervention experience.

Postintervention Focus Groups

The findings from the 3 focus groups held at the end of the intervention echoed the interview findings. The greater likelihood of success came from a full embracement of the intervention from the participants and their family, and a strong commitment to make other changes afforded by the opportunity of partaking in the intervention. They reported new favorite recipes they were recreating, or ways of cooking and new skills adoption. Similar findings also occurred in terms of the negative aspects of the intervention including issues with food waste and increasing boredom after 12 weeks because of the lack of variety in snacks and meals. A more basic demonstration of fundamental cooking skills was seen as being helpful especially for members of the marae group because of their lack of earlier socialization with cooking skills.

I think I would like to have been shown how to use the different ingredients. Because like, honestly, I was brought up on spaghetti, and Weet-Bix and golden syrup sandwiches. So yeah, adding the spices, adding the different foods together would have been really cool if I could have watched a video of someone actually cooking the meal. And then I was like, oh, okay, cool.

The majority of focus group participants, and their families, wanted to continue with this healthy way of eating although some were concerned about costs of the types of food that they had been receiving—especially, lean meats, such as steak, and with the escalation of fruit and

vegetable prices. In particular, the experiences of the Māori participants in the marae focus group brought out additional challenges for Indigenous participants in terms of the cost of living and of cooking skills.

For me, it will come down to affordability because literally, you know, the price of food at the moment is so expensive. And I don't think, you know possibly we could, but I even struggle sometimes...but I don't think a lot of families would be able to carry on eating like that. Because yeah, it's just too expensive these days.

Again, the need for closer, personal support was voiced.

Because I'm sure lots of us struggled through it. So, it would have been great to hear, you know, rather than email, a phone call from anybody that was running the study to say, "Oh, how are you doing?" Anything like that would have been great. Rather than by email all the time.

DISCUSSION

Our research aimed to explore the lived experiences of prediabetic participants as they took part in a pilot family intervention involving meal kit delivery. We found, across the in-depth individual interviews (preintervention, during intervention, and postintervention), all but 2 participants maintained their participation across the 12 weeks and claimed new understandings about healthier eating patterns. Changing eating behavior within the family home can be challenging and existing intervention studies differ in methodologies and outcomes for long-term behavior change.⁸ As found in previous studies involving the provision of full meal kits, participants respond positively,^{12,24,25} and short-term behavioral changes were shown.

Participants enjoyed the quality and flavors of the foods provided, and a planned program, with ingredients and recipes at hand, meant less mental effort in making choices. Other known barriers of at-home preparation, such as low food preparation knowledge and lack of cooking

skills,³ were shown to be alleviated for several participants. Those participants who started with very poor diets (eg, frequent takeaway consumption and a lack of in-home cooking) claimed new knowledge about eating patterns and the biggest self-perceived success to help break entrenched habits. This formed a valuable starting point to build further confidence and gave impetus to gaining a better resolve.

However, some disadvantages of the weekly food kit deliveries were raised such as problems with oversupply and waste, unwanted ingredients, and the perception that produce should be purchased more regularly than once a week. For 1 participant an emotional dependence had been built on the food delivery and its association with improvements in the healthier eating pattern. Having had free access to the fruit and vegetables several participants were unsure if they could maintain this given their budgets, a known barrier to the selection of nutrient dense foods.²⁶

Consistent with previous research, support to make healthy food choices remains a key aspect of behavior change. Family Systems Support Theory²⁷ has been widely studied as a central theory for interpreting nutritional behavior, and the multiple aspects of family interrelationships were seen to overlay many of the experiences and anticipated behavioral outcomes. Building on the findings of a previous 4-week meal kit intervention,¹² the engagement of younger family members helping to unpack, plan and taking the lead in preparing the meals, added to the positive response to the study with family role changes, and improved social cohesion and communication. Implicit in this was the belief that positive health change could occur by developing healthier meal practices.^{28,29} Conversely, poor relationships and discouragement affect progress, and the impact of a nonsupportive spouse was decisive in the lack of long-term success as shown in a study of couples with diabetes.³⁰

Not understanding portion sizes has been previously reported as an issue for prediabetic and diabetic adults,³¹ and participants in the

current pilot study spoke about their new knowledge of a way to eat which involved for example, smaller portions of meat. However, rather than giving them a sense of deprivation, which they had initially expected at the outset of the trial, the new pattern allowed holistic experiences of more energy and better feelings of well-being from controlling portions of certain foods while enjoying larger servings of foods that gave satiety (eg, breakfast oats). This suggests the importance of conveying information at the outset of an intervention about expected feelings of well-being improvement rather than a sense of restriction, which can be inferred by the term intervention diet.

The benefits of greater self-confidence from new understandings in an intervention³² were also evidenced and led to improved self-efficacy. Participants discussed a cycle of feeling better (ie, with more energy, improved sleep) which enabled more perceived mindful ways of thinking and behaving around food and improved emotional well-being.^{32,33} When under stress, an improved emotional food relationship was recognized by many participants, in which the cycle of a greater, plant-based food intake led to a clearer mind and better choices.

The way at-home cooking was experienced was also found to be intimately linked with participants' backgrounds and the importance of understanding underlying sociocultural factors cannot be over emphasized.³⁴ For example some foods were experienced as new and not best suited to their own health (eg, the inclusion of feta cheese) implying the importance of greater sensitivity and personalization for the types of foods introduced for different individuals.

The motivation for joining the pilot intervention study was overtly driven by participants' knowledge of their health condition (prediabetic), sometimes including the recognition of a family history. There was a desire to be proactive, but many admitted to not knowing how to change. This proved to be a strong, emotionally driven incentive to embrace the opportunity offered by the intervention. A novel finding for the study was

the way participants held a strong focus on their test results, postintervention. The building of expectations for health improvements, such as weight loss from being involved in the intervention, was common, despite this not being conveyed by the intervention personnel. For some participants, despite subjective feelings of well-being and hope, if these were not backed up by test results, this dominated their self-evaluation and led to a sense of disappointment and feelings of personal failure. Several participants described the results as meaningless and sought their own explanations and ways to support themselves through these difficulties. There was a desire to understand the rationale of how different eating patterns can help their metabolism and how they could ultimately obtain better results from the blood markers. Health advice can be sought from a wide range of sources for those with prediabetes and diabetes,³¹ but can appear fragmented and confusing, and there is a need for clear communication and support. Overall, interviewing longitudinally at 3 specific time points allowed the tracking of changes in motivations and behaviors, supporting the value of greater involvement of pilot participants.^{35,36}

The main limitation of this study is the small sample size, and, although it involved a series of interviews, it did not allow subsequent insight into the ongoing maintenance of healthy eating behaviors by participants once the 12-week intervention was completed.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Our research has implications for future research involving family dietary interventions, especially those using food kit deliveries. This small pilot study showed that individuals and their families gained from the direct and immediate experience of the delivery foods while also showing the diverse, personal ways participants engaged with the intervention. The emotionally driven expectations of participants were shown to underlie their food related behaviors and may impact long-term adoption of healthier eating patterns.

Participants were highly interested in looking for personal health/well-being changes and wanted direct feedback as they progressed over time. Future research could assess the way differently framed information about the impact of healthy eating on metabolic changes may affect long-term adoption. Research with larger samples is warranted to quantify influential psychologically nuanced factors that may drive behaviors over a longer time span. This could be linked with cross-sectional results data from physical health tests across a range of socioeconomic groups and include other external structural factors outside the home, such as perceived economic position and the food environment.

The types of food and flavors provided were a strong factor in the acceptance of the eating pattern, although some foods were culturally novel. Based on our findings and existing research,^{29,34} interventions need to ensure the preferences of participants from different cultures are discussed at the time of recruitment for an intervention, and allowances are made for differences in food practices, resources, and values.

Our research highlighted the role of different types of external support provided across an intervention to build not only nutritional literacy,³⁷ but also to assist with improving feelings of control, confidence and providing a wider sense of how to bring about change from experiential learning. In future interventions, communications about the expectations of the intervention need clarity and personalization in the initial stages. For example, removing the word diet from written and oral communication, to avoid triggering with feelings of restriction and weight loss is recommended. During an intervention, ways to encourage family involvement, including more direct information about the types of foods and their effects on improved health measures, can lead to more engagement and personal confidence for participants. Having a support group/contact during the intervention was very important for some participants, but not all, and further research is warranted regarding the way, and extent to which, participants may

wish to connect with others. The design of interactive websites for participants including brief, videos to explain medical terms/results such as the importance of healthy blood pressure, and ways to encourage adoption of the eating pattern is warranted. Ongoing support after the intervention is also seen as especially important for those coping with their lack of improvement and potential disappointment in physical testing results.

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REFERENCES

- World Health Organization. Diabetes. <https://www.who.int/health-topics/diabetes>. Accessed October 22, 2023.
- Cena H, Calder PC. Defining a healthy diet: evidence for the role of contemporary dietary patterns in health and disease. *Nutrients*. 2020;12:334.
- Reicks M, Kocher M, Reeder J. Impact of cooking and home food preparation interventions among adults: a systematic review (2011–2016). *J Nutr Educ Behav*. 2018;50:148–172.e1.
- Yahia EM, Celis MEM, Svendsen M. The Contribution of Fruit and Vegetable Consumption to Human Health. In: Yahia EM, ed. *Fruit and Vegetable Phytochemicals*, John Wiley & Sons; 2017:3–52.
- Wolfson JA, Bleich SN. Is cooking at home associated with better diet quality or weight-loss intention? *Public Health Nutr*. 2015;18:1397–1406.
- Solar O, Irwin A. A conceptual framework for action on the social determinants of health. <https://www.who.int/publications/i/item/9789241500852>. Accessed October 22, 2023.
- Mills S, White M, Brown H, et al. Health and social determinants and outcomes of home cooking: a systematic review of observational studies. *Appetite*. 2017;111:116–134.
- Snuggs S, Houston-Price C, Harvey K. Healthy eating interventions delivered in the family home: A systematic review. *Appetite*. 2019;140:114–133.
- Briefel RR, Chojnacki GJ, Gabor V, et al. A cluster randomized controlled trial of a home-delivered food box on food security in Chickasaw Nation. *J Acad Nutr Diet*. 2021;121:S46–S58.
- Fischer L, Bodrick N, Mackey ER, et al. Feasibility of a home-delivery produce prescription program to address food insecurity and diet quality in adults and children. *Nutrients*. 2022;14:2006.
- Berkowitz SA, Terranova J, Hill C, et al. Meal delivery programs reduce the use of costly health care in dually eligible Medicare and Medicaid beneficiaries. *Health Aff (Millwood)*. 2018;37:535–542.
- Utter J, Denny S, Farrant B, Cribb S. Feasibility of a family meal intervention to address nutrition, emotional wellbeing, and food insecurity of families with adolescents. *J Nutr Educ Behav*. 2019;51:885–892.
- Horning ML, Hill T, Martin CL, Hassan A, Petrovskis A, Bohlen L. The east side table make-at-home meal-kit program is feasible and acceptable: a pilot study. *Appetite*. 2021;160:105087.
- Ministry of Health. Diabetes. <https://www.health.govt.nz/your-health/conditions-and-treatments/diseases-and-illnesses/diabetes>. Accessed October 22, 2023.
- Ministry of Health. Obesity statistics. <https://www.health.govt.nz/nz-health-statistics/health-statistics-and-data-sets/obesity-statistics>. Accessed October 22, 2023.
- Bellows LL, Mena NZ, Reznar MM, Taylor CA, Sigman-Grant M. Strengthening nutrition education and behavior research for academicians and practitioners. *J Nutr Educ Behav*. 2022;54:84–93.
- Salas-Salvadó J, Guasch-Ferré M, Lee CH, Estruch R, Clish CB, Ros E. Protective effects of the Mediterranean diet on type 2 diabetes and metabolic syndrome. *J Nutr*. 2015;146:920S–927S.
- Burt K. The whiteness of the Mediterranean Diet: a historical, sociopolitical, and dietary analysis using critical race theory. *Crit Diet*. 2021;5:41–52.
- Davis C, Bryan J, Hodgson J, Murphy K. Definition of the Mediterranean diet; a literature review. *Nutrients*. 2015;7:9139–9153.
- Bisogni CA, Jastran M, Seligson M, Thompson A. How people interpret healthy eating: contributions of qualitative research. *J Nutr Educ Behav*. 2012;44:282–301.

21. Schutt RK. *Investigating the Social World: the Process and Practice of Research*. 9th ed. Sage Publications; 2018.
22. Strauss A, Corbin J. *Basics of Qualitative Research. Techniques and Procedures for Developing Grounded Theory*. Sage Publications; 1998.
23. Spiggle S. Analysis and interpretation of qualitative data in consumer research. *J Consum Res*. 1994;21:491–503.
24. Carman K, Sweeney LH, House LA, Mathews AE, Shelnutz KP. Acceptability and willingness to pay for a meal kit program for African American families with low income: a pilot study. *Nutrients*. 2021;13:2881.
25. Vos M, Deforche B, Van Kerckhove A, Michels N, Geuens M, Van Lippevelde W. Intervention strategies to promote healthy and sustainable food choices among parents with lower and higher socioeconomic status. *BMC Public Health*. 2022;22:2378.
26. Darmon N, Drewnowski A. Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: a systematic review and analysis. *Nutr Rev*. 2015; 73:643–660.
27. Kerr M, Bowen M. *Family Evaluation: the Role of the Family as an Emotional Unit That Governs Individual Behaviour and Development*. Penguin Books; 1988.
28. Pratt KJ, Skelton JA, Lewis KH, Taylor CA, Spees C, Brown CL. Family meal practices and weight talk between adult weight management and weight loss surgery patients and their children. *J Nutr Educ Behav*. 2020;52:579–587.
29. Rothpletz-Puglia P, Ryan E, Jones VM, et al. Family systems cultural and resilience dimensions to consider in nutrition interventions: exploring preschoolers' eating and physical activity routines during COVID-19. *J Nutr Educ Behav*. 2022;54:540–550.
30. Miller D, Brown JL. Marital interactions in the process of dietary change for type 2 diabetes. *J Nutr Educ Behav*. 2005;37:226–234.
31. Lawrence H, Nathan Reynolds A, Joseph Venn B. Perceptions of the healthfulness of foods of New Zealand adults living with prediabetes and type 2 diabetes: A pilot study. *J Nutr Educ Behav*. 2017;49:339–345.e1.
32. Bogomolova S, Zarnowiecki D, Wilson A, et al. Dietary intervention for people with mental illness in South Australia. *Health Promot Int*. 2018;33:71–83.
33. Toumpanakis A, Turnbull T, Alba-Barba I. Effectiveness of plant-based diets in promoting well-being in the management of type 2 diabetes: a systematic review. *BMJ Open Diabetes Res Care*. 2018;6:e000534.
34. Hu J, Amirehsani KA, Wallace DC, McCoy TP, Silva Z. A family-based, culturally tailored diabetes intervention for Hispanics and their family members. *Diabetes Educ*. 2016;42:299–314.
35. Cousineau T, Houle B, Bromberg J, Fernandez KC, Kling WC. A pilot study of an online workplace nutrition program: the value of participant input in program development. *J Nutr Educ Behav*. 2008;40:160–167.
36. Raber M, Crawford K, Baranowski T, et al. Meal planning values impacted by the cancer experience in families with school-aged survivors—a qualitative exploration and recommendations for intervention development. *Support Care Cancer*. 2020;28:1305–1313.
37. Marchello NJ, Daley CM, Sullivan DK, Nelson-Brantley HV, Hu J, Gibbs HD. Nutrition literacy tailored interventions may improve diet behaviors in outpatient nutrition clinics. *J Nutr Educ Behav*. 2021;53:1048–1054.

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