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# Values, principles and research priorities for the implementation of type 2 diabetes prevention after gestational diabetes: a global consensus from Asia, Africa, Americas, Europe and Oceania

## Short title: Research priorities for preventing type 2 diabetes after gestational diabetes

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### Conflict of interest

All authors declare no conflict of interest.

### What's new

- Research evidence has demonstrated efficacious prevention of type 2 diabetes in women with a history of gestational diabetes, but implementation is poor, particularly in low- and middle-income countries. Progress is hindered by a lack of knowledge on the implementation priorities as experienced by clinicians and women who had GDM in the real-world setting, particularly those from these regions.
- The clinicians and women with lived experiences of GDM have voted the top implementation research priority as addressing the stress and mental well-being of women who had GDM
- These priorities should be supported by principles and values of universal access, context-specificity, evidence-based practices, and equity-driven.

- Addressing the identified priorities taking into consideration the principles and values will improve the implementation success of diabetes prevention among individuals with a history of gestational diabetes, including in the regions at greatest need.

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## Abstract

**Aims:** The implementation of type 2 diabetes prevention after gestational diabetes (GDM) ~~are~~is poor despite research evidence on efficacy. This is limited by the lack of knowledge of the priorities in real-world settings from the perspectives of local clinicians and women with lived experiences, particularly those from underserved populations. We report here a global consensus on the values, principles, and research priorities for the implementation of type 2 diabetes prevention in individuals after gestational diabetes (GDM), from the perspectives of clinicians and women from Asia, Africa, Oceania, the Americas and Europe.

**Methods:** A team of health professionals and researchers from ~~the~~ five continents formed the Cardiometabolic Health Implementation Research in Postpartum individuals (CHIRP) team. The CHIRP team undertook a priority setting process using the Modified Delphi and Nominal Group Technique. Health professionals and women with a lived experience of GDM from five continents were invited to participate. Values, principles and research priorities were voted by all participants.

**Results:** A total of 100 consumers and health professionals from 11 countries across the five continents participated in the consensus process. The top-ranked values and principles were 'universal access', 'evidence-based', 'equity-driven'. The top-ranked research priorities were 'stress and mental well-being', 'information on exercise and diet', 'lactation and breastfeeding', 'exercise after childbirth' and 'physical environment for healthy eating'.

**Conclusions:** Addressing mental wellbeing through strategies that are universally accessible, evidence-based and equity-driven, will increase the success of the real-world implementation and knowledge translation of type 2 diabetes prevention in women with a history of GDM in global settings.

**Keywords:** Type 2 diabetes; Gestational diabetes; Priority setting; Global consensus

## Introduction

Diabetes is a significant disease that is projected to affect over 1.31 billion people globally by 2050, ~~which is~~ an increase of 781 million from 2021 <sup>1</sup>. It not only interacts with and worsens other cardiometabolic and renal diseases, but also leads to significant morbidity and mortality <sup>1</sup>. Type 2 diabetes accounts for more than 90% of the global diabetes prevalence. It is attributed to socio-behavioural risk factors such as poor diet, high BMI, low physical activity, environmental factors, alcohol, tobacco use and living environments such as food availability and food insecurity <sup>1</sup>. The greatest burden of diabetes is borne by low- and middle-income countries, as well as marginalised populations in high-income countries <sup>2</sup>. Geographic location and social status are significant predictors of diabetes prevalence, morbidity, and mortality. According to the Global Burden of Disease Study 2021, the highest age-standardised type 2 diabetes rates at the super-region level were observed in North Africa and the Middle East (9.3%; 95% UI 8.7–9.9), and at the regional level, in Oceania (12.3%; 95% UI 11.5–13.0) <sup>1</sup>. By 2045, three out of four adults with type 2 diabetes will reside in low- and middle-income countries <sup>3</sup>.

Gestational diabetes mellitus (GDM) is dysglycemia first detected ~~in~~ during pregnancy. The global prevalence of GDM is 14%, varying across regions from 7% in North America and the Caribbean to 20.8% in Southeast Asia and 27.6% in the Middle East and North Africa <sup>4</sup>. Women with a history of GDM have a tenfold increased risk of developing type 2 diabetes <sup>5</sup>, but these risks are unevenly distributed across population groups. In Australia, women of Asian background with previous GDM are approximately twice as likely to develop type 2 diabetes than women of Anglo-Celtic origin <sup>6</sup>. Similarly, in the US, Black and Hispanic women also have higher risks of developing type 2 diabetes after GDM than non-Hispanic White women <sup>7</sup>.

Studies have shown that up to 58% of type 2 diabetes cases were preventable with diet and exercise health behaviour change interventions <sup>8</sup>. A slightly more modest but significant benefit in the prevention of type 2 diabetes has also been demonstrated in women with a history of GDM, with 26% reduction in T2DM and no significant differences between high-income and middle-income countries <sup>9-11</sup>. Despite the solid evidence on prevention in certain countries, the reach of these prevention programs is dismal in real-world settings. In the US, only 0.4% of those at high risk for diabetes and 4.9% of those with diagnosed prediabetes were referred to a prevention program <sup>12</sup>. The reach of real-world prevention programs is likely even more minute in low- and middle-income countries, extrapolating from the scarcity of prevention studies in those settings. A recent systematic review of non-pharmacological diabetes prevention programs found only five studies from low- and middle-income countries and none from low-income ones <sup>13</sup>. A comprehensive map to guide implementation strategies that is relevant to population groups from a range of geographical regions is urgently needed, including those with the highest burden of disease. Inadequate knowledge at the empirical, applied, translational and implementational levels for various population groups is a limiting factor in slowing the growing disparities of type 2 diabetes particularly in women with a history of GDM <sup>14,15</sup>. The priorities for the implementation of diabetes prevention in women with a history of GDM in various regions, along with the values and principles that guide and constraints implementation, is not known.

Reducing diabetes disparities through effective implementation requires equitable partnerships that engages in community participatory research <sup>16</sup>. To address this gap, we present a consensus report on values, principles, and research priorities for diabetes prevention in women with a history of GDM by clinicians and women with GDM experiences from diverse backgrounds. The purpose of this report is to guide the development of implementation and research strategies on type 2 diabetes prevention

after GDM that are applicable to a range of geographical regions including in areas with the greatest need of these initiatives.

## **Methods**

### *Study participants*

Individuals from all five main continents (Asia, Africa, Oceania, Americas and Europe) were invited to participate to ensure the voices of traditionally under-represented geographical regions in diabetes research, such as Africa and Asia, ~~was~~ ~~were~~ present<sup>13</sup>. A regional leader was recruited for each geographic region based on research and/or clinical experience in diabetes research and management. A team of health professionals and researchers (1 psychologist, 2 dietitians, 1 endocrinologist, 1 obstetrician and 1 gynaecologist), formed the Cardiometabolic Health Implementation Research in Postpartum individuals (CHIRP) research team, which served as the activity steering committee.

Participants were recruited by regional leaders through public advertisement, snowball recruitment, personal and professional networks. Participants included individuals with prior GDM (consumers) and health professionals providing care to such patients (allied or community health, medical, general practitioner/family physician, primary care, policy, and public health). The eligibility criteria were: health professionals needed to be involved in the provision of healthcare to postpartum individuals; consumers needed to have given birth within the last five years and had a history of GDM without current diabetes (corresponds to the period of greatest risk of developing type 2 diabetes following index GDM pregnancy)<sup>5</sup>. Regional leaders were instructed to recruit a cohort who are diverse in terms of the PROGRESS characteristics for equity (place of residence, race/ethnicity/culture/language, occupation, gender/sex, religion, education, socioeconomic status, and social capital)<sup>17</sup>, so that individuals with a higher risk of type 2 diabetes, lower engagement with healthcare services or lower health literacy would have priority. Each region aimed to recruit a total of 20 participants with equal representation of consumers and health professionals to allow for meaningful consensus to be reached<sup>18,19</sup>.

Interpreters (Malayalam in India and Amharic in Africa) were provided for individuals who could not communicate in English. Translation needs were determined by the regional leaders who recruited the participants. The pre- and post-workshop surveys and workshop slides were translated into languages by native speakers. Interpreters also provided real-time translation during the workshop to facilitate in-language discussions.

### *The priority-setting framework*

A modified Delphi process and Nominal Group Technique were used to determine the values, principles and priorities that will underpin CHIRP's strategic plan<sup>20,21</sup>. This approach allowed for quantitative ranking of the priorities by individuals, ensuring the voice of each participant was captured, while facilitating dynamic conversations among and between consumers and health professionals in building consensus. The multi-step process is outlined in Figure 1. Priority assessment criteria were taken from the Child Health and Nutrition Research Initiative (CHNRI) which include answerability, effectiveness, deliverability, the maximum potential for improvement of health and well-being of postpartum mothers, and the effect on equity<sup>22</sup>.

### *Priority-setting items*

The list of the 12 values and principles and 28 research priorities are shown in Supplementary File 1. Principles and values were defined as the most important overarching themes that underpin all diabetes prevention efforts for individuals with prior GDM. Research priorities were defined as the

most pertinent issues affecting the participants in the context of diabetes prevention following a GDM pregnancy. These were collated from inputs including the Australia's National Women's Health Strategy 2020-2030, the Global Strategy for Women's, Children's and Adolescents' Health 2016-2030, NCD Alliance's A Call to Action: Women and Non-Communicable Diseases, systematic reviews on lifestyle management in postpartum individuals, past interviews of postpartum individuals and expert input from the CHIRP research team including regional leaders.

### *Priority-setting process*

#### *Round 1: Pre-workshop ranking*

Participants were emailed an online pre-workshop survey to collect basic demographic information (health professionals: gender, occupation, years of working experience, type of healthcare setting involvement in GDM; consumers: age, postpartum age, country of residence, race, ethnicity, education, occupation, private health insurance, history of GDM); followed by the modified Delphi item ranking exercise. Participants were asked to rank the priority-setting items taking the CHNRI criteria into consideration (where one was the highest-ranked priority and the remaining items were placed in descending order). Participants could also suggest additional priorities that were not listed.

#### *Round 2: Workshop group discussion*

Separate workshops for each continent were conducted virtually via Zoom (Version 5.11.3, Zoom Video Communications, San Jose, CA, USA, 2022) and Nominal Group Technique was employed for consensus development. Participants were split into small groups of 3-5 to discuss the pre-workshop rankings. Immediately following this discussion, participants came together to re-rank the priorities based on the issues discussed. Discussions were video recorded on Zoom. Recordings were professionally transcribed by GoTranscript (<https://gotranscript.com/>). Transcripts were open-coded and analysed for themes using reflexive thematic analysis<sup>23</sup>. Analyses were conducted on NVivo 12 (Lumivero, Denver, USA). A '6-stage' approach was followed to inductively generate themes. The open coding was performed by one team member (EI) with consultation from MM and SL. The team reviewed and developed codes and themes iteratively. This process supported researcher reflexivity during theme refinement, to help minimise biases and improve the trustworthiness of the results.

#### *Round 3: Final ranking and consensus*

The workshop priority-setting rankings output from each region was sent to participants via an online survey. Participants were asked to independently re-rank the priorities with reference to the CHNRI criteria and reflecting on the workshop discussions. Mean ranking scores were computed for each priority, where lower scores represented higher priority.

Demographic characteristics of the participants were presented in frequencies and proportions.

Rankings were determined as the average of scores (mean) provided by the participants.

Quantitative analyses were conducted in Microsoft Excel 2019.

## **Results**

### *Participants*

Participants came from eleven countries: Nigeria, Ethiopia, Rwanda (Africa); USA, Canada (Americas); India, United Arab Emirates (Asia); UK, Ireland, Denmark (Europe); and Australia (Oceania). ~~50~~<sup>Fifty</sup> consumers and 50 health professionals across the five geographical regions participated (Tables 1 and 2). The mean age of consumer participants was 33.6±3.3 years. ~~The~~<sup>A</sup> majority of consumer participants had children 1-year-old or less (56%), a graduate or postgraduate degree (82%), professional jobs (68%), and lacked private health insurance (52%) (Table 1). Most health professional participants were female (64%), clinicians (44%), residing in metropolitan or urban areas (82%), with



more than 10 years of working experience (68%), and worked with culturally and linguistically diverse populations (58%) (Table 2).

### *Round 1: Pre-workshop ranking*

The top-ranked items from Rounds 1, 2 and 3 are presented in Tables 3 and 4 respectively. In Round 1, *Universal Access* ranked highest for principles and values, while *Stress and Mental Wellbeing* ranked highest for research priorities. Additional research priorities included: family-based approach; consumer-driven priorities and solutions; value for money; healthy meal preparation based on locally available food; creating awareness in the community; educating women and their families on the possibility of preventing type 2 diabetes through lifestyle measures; point-of-care testing to facilitate opportunistic screening in the community and at the general practitioner; and promotion of interdisciplinary health professional education.

### *Round 2: Workshop group discussion*

*Universal Access* was ranked first in the workshops (Table 3). *Universal Access* was understood by the participants as equitable access to care and resources across all population groups within each respective region. Disparities in diabetes prevention after GDM were identified relating to geographic location, such as rural populations in Africa, and financial barriers such as the lack of free-at-point-of-access in the Americas. *Equity-driven* overtook *Evidence-based* following workshop discussions. Equity in diabetes prevention for women was considered a human rights issue. Specifically, equity-driven approaches ensure that every person who requires services can access those services regardless of their background, socio-economic status or any other discriminatory factor. The importance of *Evidence-based* was described as the need for context-specific evidence from similar settings instead of translating evidence generated from high-income countries to low- and middle-income countries. *Country-led solutions* were interpreted as country-specific solutions as well as country-wide solutions. Country-specific solutions allow for specific solutions that consider the contexts and norms within specific countries. Country-wide solutions were thought to improve access by distributing resources equitably. However, most acknowledged that the diversity within a country (e.g., India) may limit the effectiveness of a top-down, country-led approach. To address this, a region-led approach within a country was suggested instead. *Sustainability* was deemed important due to the issues relating to short-lived, discontinued public health initiatives.

In terms of research priorities, *Stress and Mental Well-being* was ranked first in the workshops (Table 4). Poor mental health among mothers was highlighted as a prevalent issue and with impact on an individual's capacity to enact healthful behaviours. *Information on Exercise and Diet* was ranked second because participants recognised that health behaviour change was one of the most important components in preventing type 2 diabetes. There was consensus that the provision of this information was lacking in healthcare settings. While *Mother's Sleep* and *Infant Sleep* were ranked separately, they were discussed in tandem as mother's sleep was often contingent on their infant's sleep. Mother's sleep was discussed as necessary for physical and mental health, and the ability to manage stress, maintain overall wellbeing and undertake healthful behaviours. The role of *Lactation and Breastfeeding* in the prevention of type 2 diabetes was also acknowledged. However, there was some misinformation about breastfeeding (e.g., eating and drinking a lot to increase milk flow) by individuals with GDM and issues around the lack of breastfeeding support were raised.

Additional workshop-generated research priorities were: continuity of care (preconception period through to pregnancy and postpartum); interventions that work in light of social determinants of health (i.e., food security, built environment); pharmacotherapy; novel biomarkers; digital and technical solutions/innovation; studying system-level designs to combat inequity; implementation research addressing effectiveness, reach, engagement, scalability and sustainability; prevention research including health behaviour change or pharmacotherapy. Thematic analysis of participants' discussion on each of the ranked items is shown in Supplementary Table 1.

### Round 3: Final ranking and consensus

The final independent ranking generated the top five values and principles and top ten priorities list. The top-ranked values and principles were *Universal access; Evidence-based; Equity-driven; Country-led solutions; and Sustainability*. While *Stress and Mental Well-being* and *Information on Exercise and Diet* remained as the top two priorities, *Lactation and Breastfeeding* emerged as the third priority in the final ranking. *Exercise after Childbirth* and *Physical Environment for Healthy Eating* also entered the top five priorities. These ranking changes may reflect the workshop discussions that occurred.

### Discussion

This global priority-setting exercise for the prevention of type 2 diabetes in individuals with previous GDM identified the key values, principles and research priorities through the engagement of health professionals and consumers across five continents. Five principles and values and ten priorities were identified. The highest ranked value and principle for type 2 diabetes prevention after GDM was 'Universal Access'. This was consistently ranked as the most important value and principle in each round of the consensus activity. 'Universal Access' was closely linked to equitable access to care and resources in the discussions. This may explain 'equity-driven' being ranked the next most important principle and value. Limited access to diabetes prevention services is a known issue for developed countries (<5% population reached) and the reach is unknown for developing ones<sup>12</sup>. Individual and systems barriers include lack of awareness of prevention programs, lack of consultation time preventing discussions on prevention, lack of medical reimbursement schemes for preventive services, perceived role of practice by health professionals among others<sup>24</sup>. The small proportion of the population that engages with these services is likely to be those with social advantage. Social disadvantages such as lower education, Indigenous populations, Black or Hispanic ethnicity, having high BMI or a mental health disorder are all associated with lower engagement with postpartum follow-up after GDM<sup>25,26</sup>. The lower engagement with preventive and health behaviours along the socioeconomic gradient contributes to disparities in diabetes<sup>27</sup>. According to Hart's inverse care law, access to good quality healthcare is inversely proportional to the needs of the population served<sup>28</sup>. Health professionals and consumers from all regions worldwide highlighted the criticality of placing universal access as the most important cross-cutting theme in diabetes prevention to prevent growing health disparities in diabetes between social and power strata. Health programs and policies need to remove barriers to service access for all, to ensure universal access and equity of care.

Although 'Evidence-based' is conventionally regarded as the cornerstone of all interventions by the scientific community, it was ranked after 'Universal Access' and 'Equity-Driven' as a guiding principle and value for diabetes prevention. Some participants felt that there was already sufficient evidence base for diabetes prevention from previous trials<sup>8,29-31</sup>, and noted that the gaps in evidence were around effective implementation. However, there is an absence of diabetes prevention studies in low-income countries, and limited studies in middle-income countries<sup>13</sup>. This was highlighted by participants from Africa who pointed out that interventions targeting a specific population should derive their evidence base from a comparable population and setting. Future research could consider type II effectiveness-implementation trials in low- and middle-income countries, which would simultaneously test the tailored intervention's effectiveness and the implementation strategy's impact<sup>32</sup>.

'Stress and Mental Wellbeing' was consistently ranked across rounds as the most important research priority for diabetes prevention following GDM. Mental health was emphatically and consistently reported by consumers as the enabler of all other health behaviours. Poor mental health is a predictor of low engagement in postpartum follow-up care after GDM or hypertensive disorder pregnancy<sup>26</sup>. A

source of poor postpartum mental health in women with recent GDM may be due to the long-lasting legacy of stigma, and emotional and psychological stress experienced during a GDM-affected pregnancy<sup>33,34</sup>. Challenges with balancing domestic responsibilities and self-care were also cited as a source of mental distress particularly in non-White women<sup>34</sup>. GDM is associated with an increased risk of poor mental health<sup>35</sup>. Further, women with ethnically diverse or low-income backgrounds are at higher risk of postpartum depression following GDM<sup>36</sup>. While mental health outcomes are collected in selected trials in women after GDM<sup>37</sup>, no interventions to date targeting women with a history of GDM include mental health interventions. This represents an important knowledge gap that should be addressed in future trials. Considering the key role of mental health in diabetes prevention for individuals with recent GDM, it should be the primary focus in diabetes prevention programs for this population.

‘Information on diet and Exercise for Postpartum Individuals to prevent cardiometabolic diseases’ was the second most important priority identified. This is in line with the central role of diet and exercise in all diabetes prevention programs. Issues were raised regarding inadequate health behaviour change advice provided by healthcare providers to prevent type 2 diabetes following GDM pregnancies. The barriers to providing health behaviour change advice are well documented and include the health system fragmentation and funding model, the general practitioner’s role and knowledge, and perceived patient attitudes towards health behaviour change<sup>38</sup>. Health system changes are needed to incentivise prevention and build health professional capacity to deliver preventive support. Addressing barriers and providing tailored solutions while delivering diet and exercise information was deemed important to empower individuals with prior GDM. This is particularly relevant given the many known barriers to health behaviour change during the postpartum period. Further research in person-centred approaches underpinned by behavioural change skills is needed to enable diet and exercise behavioural changes to prevent diabetes in different populations.

‘Lactation and Breastfeeding’ was the third most important research priority identified. Meta-analysis demonstrates a relative type 2 diabetes risk reduction of about 30% with breastfeeding<sup>39</sup>. Participants in our study reported that implementing this advice was challenging for certain population groups where cultural norms regard breastfeeding as harmful to the mother. Breastfeeding was also discussed as a potential postpartum stressor and as such can play an important role in mental health. Greater support is needed in individuals with prior GDM, who are less likely to initiate breastfeeding, more likely to introduce formula and have shorter breastfeeding duration<sup>40</sup>.

#### *Future directions*

The workshops displayed a sense that sufficient evidence exists for the aforementioned diabetes prevention priorities to be ranked as important, but the challenge is in the implementation. ~~Research for a commonly generates solutions to achieving greater effectiveness or reaching singular population sub-groups.~~ Greater research focus on the implementation and translation of postpartum diabetes prevention evidence into practice is needed. Addressing inequities in T2DM in women requires intervention targeting each life stage, including prevention of GDM preconception, screening for GDM in pregnancy, follow-up and prevention of T2DM and recurrent GDM in the postpartum period. Efforts in each stage will contribute towards addressing inequity. As such, in countries where access to GDM screening is not universal (Supplementary Table 2), efforts are needed to increase access to GDM screening *efforts* while strengthening T2DM prevention after GDM.

#### **Strengths and Limitations**

There are several strengths to this study. First, consumers and health professionals were both included in the priority-setting exercise. Consumers had an equal voice as health professionals by being placed initially in different discussion groups to avoid any power dynamic influences and the subsequently combined group allowed for dialogue between the groups from their identified positions. Second, participants represented all five continents in this global consensus. Surveys were provided in local languages and local research assistants were engaged as translators to address language barriers allowing participation by individuals who would otherwise have missed out. Third, established methodologies of Delphi and Nominal Group Techniques were used to achieve consensus while ensuring the voice of each participant was captured. These steps provided a voice to populations that have previously not had the opportunity to shape diabetes research.

This study has some limitations. First, although full representation was sought from each continent, only one to three countries per continent were engaged and not all priority populations within each country were represented. In each country, there is a unique list of population groups experiencing social disadvantages and intersectionality in various dimensions including race/ethnicity/culture/language, place of residence, occupation, religion, education, socioeconomic status, migration status, social capital and many others <sup>17</sup>. The current study advanced diversity, equity and inclusivity in T2DM prevention research in the geographical dimension. This represents a step forward in addressing the gap of a complete absence of T2DM prevention research in women after GDM in low-income countries, a small number of studies in middle-income countries and an overrepresentation of studies in high-income countries to date <sup>10</sup>. Implementation strategies to address inequity will require local effort to address the unmet needs of one priority population at a time.

Second, since our recruitment was through professional networks and snowballing, the participants were likely to be those more motivated to see changes. Third, the democratic concept of speaking up to authority (researchers and clinicians), voting according to individual preference, and ranking research priorities require high levels of literacy and self-efficacy. This may explain a bias towards attracting participants with high levels of education in this study. [This might have skewed priorities toward literacy-dependent interventions. Future studies should explore the perspectives of those from diverse educational backgrounds to ensure more inclusive solutions.](#) Fourth, we dropped fraudulent participants identified during Round 2 which reduced the sample size of consumers in the Americas. Although this reduced our sample size, it is unlikely to have affected the quality of the data because they were identified and dropped. It is not uncommon for research participants to misrepresent themselves for financial incentives. Further research evaluating the experiences of the study participants across different cultural contexts is currently underway. There is a need to develop consensus-building methods that are rigorous and yet appropriate for populations with variable literacy levels as well as purposive sampling approaches that will ensure the representation of those with lower levels of literacy. There is a need for continued commitment by funders, researchers, and the medical community to seek out the voices of individuals from every population group.

## **Conclusion**

Health professionals and consumers from across five continents have identified several key priorities for diabetes prevention programs targeting individuals with a history of gestational diabetes mellitus. These priorities include stress management, mental well-being, holistic and empowering approaches to diet and exercise interventions, as well as culture-specific lactation and breastfeeding education. Future research should focus on hybrid type 2 effectiveness-implementation trials in low- and middle-income countries to generate context-specific evidence base. There is also a need for evidence on effective mental health interventions for mothers after GDM. Given that there is sufficient evidence

on diet and exercise information to prevent T2DM, policy makers and health systems should enable its implementation through incentivising prevention and increasing workforce capacity to deliver the prevention of T2DM. There is also a need for greater breastfeeding support for women with a history of GDM. It is crucial that these priorities are supported by principles and values such as universal access, context-specificity, evidence-based practices, and equity-driven approaches. By addressing these priorities through these principles and values, we can adopt an upstream-thinking approach and take a necessary step toward reducing the growing disparities in diabetes among individuals with a history of GDM.

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Table 1: Demographic characteristics of consumers

	Number (%) n = 50
<b>Region</b>	
Africa	8 (16.0)
Americas	2 (4.0)
Asia	14 (28.0)
Europe	10 (20.0)
Oceania	16 (32.0)
Mean age (years)	33.6±3.3
<b>Age of youngest child</b>	
1 year or less	28 (56.0)
2 years	6 (12.0)
3 years	6 (12.0)
4 years	7 (14.0)
5 years	2 (4.0)
<b>Education level</b>	
Secondary/high school	5 (10.0)
Diploma/Advanced diploma	3 (6.0)
Graduate/postgraduate degree	41 (82.0)
Not stated	1 (2.0)
<b>Occupation</b>	
No paid job/homemaker	8 (16.0)
Clerical or trade job	2 (4.0)
Associate professional job	5 (10.0)
Professional job	34 (68.0)
Not stated	1 (2.0)
<b>Private health insurance</b>	
Yes	24 (48.0)
No	26 (52.0)

Table 2: Demographic characteristics of health professionals

Characteristics	Number (%) n = 50
<b>Region</b>	
Africa	10 (20.0)
Americas	7 (14.0)
Asia	16 (32.0)
Europe	8 (16.0)
Oceania	9 (18.0)
<b>Number of years since qualification</b>	
5 years or less	3 (6.0)
6 – 10 years	12 (24.0)
More than 10 years	34 (68.0)
<b>Gender</b>	
Male	18 (36.0)
Female	32 (64.0)
<b>Area of practice</b>	
Primary care	2 (4.0)
General practice	10 (20.0)
Allied health	2 (4.0)
Community health	2 (4.0)
Public health	7 (14.0)
Clinician	22 (44.0)
Other	4 (8.0)
<b>Area of residence</b>	
Metropolitan/Urban	41 (82.0)
Rural	8 (16.0)
Remote	1 (2.0)
<b>Working with this population<sup>a</sup></b>	
Culturally and linguistically diverse population	29 (58.0)
Indigenous populations	14 (28.0)
Rural population	22 (44.0)

<sup>a</sup>Multiple responses

Table 3: Top rankings of principles and values underlying research for diabetes prevention after gestational diabetes by all participants across geographical regions

Principles and Values	Round 1 rank	Round 2 rank	Round 3 mean (SD)	Round 3 rank
Universal access	1	1	1.6 (0.5)	1
Evidence-based	2	3	2.0 (1.4)	2
Equity driven	5	2	3.5 (1.7)	3
Country-led solutions	3	4	3.8 (1.0)	4
Sustainability	4	5	4.8 (2.4)	5



Table 4: Top rankings for research priorities for diabetes prevention after gestational diabetes by all participants across geographical regions

Research priorities	Round 1 rank	Round 2 rank	Round 3 mean (SD)	Round 3 rank
Stress and mental well being	1	1	1.2 (0.4)	1
Information on exercise and diet for postpartum individuals to prevent cardiometabolic diseases	5	2	2.4 (0.9)	2
Lactation and breastfeeding	4	5	5 (1.4)	3
Exercise after childbirth	2	6	5.3 (3.3)	4
The physical environment for healthy eating e.g., food policy, food labelling law	9	7	5.5 (3.7)	5
Mother's sleep	3	3	7.0 (3.2)	6
Sedentary behaviour after childbirth	7	9	7.2 (3.6)	7
Infant's sleep	6	3	7.6 (3.0)	8
Planning and organisational skills	8	8	8.8 (5.0)	9

Figure 1. The consensus development process for CHIRP (Cardiometabolic Health Implementation Research in Postpartum individuals) values, principles and implementation research priorities

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