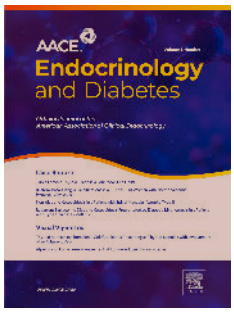
Journal Pre-proof



Potential impact of revising the diagnostic criteria for gestational diabetes on maternal and child health outcomes at five years

Qiliang Liu, MBChB, Jane E. Harding, DPhil, Greg D. Gamble, MSC, Carl Eagleton, MBChB, Lisa Dawes, MD, Caroline A. Crowther, MD

PII: S3050-9157(26)00165-7

DOI: https://doi.org/10.1016/j.aed.2026.06.019

Reference: AED 646

To appear in: *AACE Endocrinology and Diabetes*

Received Date: 25 February 2026

Revised Date: 13 May 2026

Accepted Date: 26 June 2026

Please cite this article as: Liu Q, Harding JE, Gamble GD, Eagleton C, Dawes L, Crowther CA, Potential impact of revising the diagnostic criteria for gestational diabetes on maternal and child health outcomes at five years, *AACE Endocrinology and Diabetes* (2026), doi: https://doi.org/10.1016/j.aed.2026.06.019.

Title Page

Potential impact of revising the diagnostic criteria for gestational diabetes on maternal and child health outcomes at five years.

Running title: New GDM criteria, 5-year outcomes

Qiliang Liu (MBChB)[1,2], qiliang.liu@auckland.ac.nz

Jane E. Harding (DPhil)[1], j.harding@auckland.ac.nz

Greg D. Gamble (MSC)[1], gd.gamble@auckland.ac.nz

Carl Eagleton (MBChB)[1,2], carle@adhb.govt.nz

Lisa Dawes (MD)[1,2], l.dawes@auckland.ac.nz

Caroline A. Crowther (MD)[1], c.crowther@auckland.ac.nz

[1]Liggins Institute, University of Auckland, New Zealand; 85 Park Road, Grafton, Auckland, New Zealand 1021

[2]Te Whatu Ora Te Toka Tumai Auckland, Auckland, New Zealand; Private Bag 92024, Auckland Mail Centre, Auckland 1142.

Corresponding author:

Professor Caroline A. Crowther, MD

Liggins Institute, University of Auckland

85 Park Road, Grafton

Private Bag 92019, Auckland Mail Centre, Auckland 1142, New Zealand

Phone: +64 9 373 7599 ext 86011

Email: c.crowther@auckland.ac.nz

Acknowledgements

We thank all the participants and their families who took part in the GEMS Follow-Up Study. We acknowledge the following members of the GEMS Follow-Up Study Group who contributed to data collection and study management: Coila Bevan; Luling Lin; Patricia Meagher-Lundberg; Oluwatoyin I. Oladimeji; Christopher J. McKinlay; Barry Milne; Penny Neave; Phyllis Ohene-Agyei; Karaponi Okesene-Gafa; Rajesh Shah; Deborah Samuel; Altanzurkh Turbat; Jack Wang.

Funding and assistance

This study was funded by a grant from the Health Research Council of New Zealand (HRC), grant 19/690, and a clinical research training fellowship from the HRC, ref 25/002.

Ethical approval

Ethical approval was granted by the Northern B Health and Disability Ethics Committee (20/NTB/297).

CRediT authorship contribution statement

Qiliang Liu: Formal analysis; Investigation; Writing - original draft, Writing - review & editing. Jane E. Harding: Conceptualization; Funding acquisition; Methodology; Project administration; Supervision; Writing - review & editing. Greg D. Gamble: Conceptualization; Data curation; Formal analysis; Funding acquisition; Methodology; Supervision; Writing - review & editing. Carl Eagleton: Supervision; Writing - review & editing. Lisa Dawes: Supervision; Writing - review & editing. Caroline A. Crowther: Conceptualization; Funding acquisition; Methodology; Project administration; Supervision; Writing - review & editing.

Data sharing

Participants in this study did not provide consent for their data to be shared beyond the scope of the original research therefore no data is available for sharing.

Declaration of interests

We have no conflicts of interest to declare.

Impact of revising the diagnostic criteria for gestational diabetes on maternal and child health at five years

AIMS

To assess the impact of the revised New Zealand glycaemic criteria for GDM diagnosis on longer-term maternal and child health.

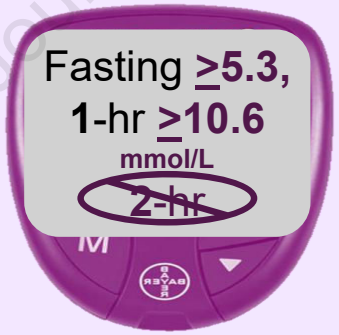
METHODS

Analysis of maternal and child outcomes, at five years, from the GEMS Follow-up Study [1]

DIAGNOSTIC CRITERIA

Current New Zealand Criteria[2]

Revised New Zealand Criteria



RESULTS

At five-year follow-up

Women and their children treated for GDM, impacted by the diagnostic criteria changes, (either additionally diagnosed or missed by the revised criteria), compared to those unexposed to GDM, had:

Increased maternal type 2 diabetes & prediabetes

Lower mean child BMI z-score (Missed-Group)

More “fair” or “poor” caregiver-reported health (Additional-Treated-Group)

CONCLUSIONS

The revised criteria will identify more women at risk of future diabetes but exclude another high-risk group currently diagnosed and treated for GDM, which may adversely impact their long-term health.

1. Liu Q, Harding JE, Gamble GD et al. Five-year follow-up of maternal and child health after gestational diabetes mellitus diagnosed using different glycaemic criteria: The GEMS follow-up study. Diabetes Res Clin Pract. 2025 Dec;230:112966. doi: 10.1016/j.diabres.2025.112966. Epub 2025 Oct 26. PMID: 41151679.
2. Simmons DR, J; Reid, R; Campbell, N. Screening, diagnosis and services for women with gestational diabetes mellitus (GDM) in New Zealand: a technical report from the National GDM Technical Working Party. N Z Med J. 2008;121(1270):74-86.

TITLE PAGE

Potential impact of revising the diagnostic criteria for gestational diabetes on maternal and child health outcomes at five years.

Qiliang Liu (MBChB)[1,2], qiliang.liu@auckland.ac.nz

Jane E. Harding (DPhil)[1], j.harding@auckland.ac.nz

Greg D. Gamble (MSC)[1], gd.gamble@auckland.ac.nz

Carl Eagleton (MBChB)[1,2], carle@adhb.govt.nz

Lisa Dawes (MD)[1,2], l.dawes@auckland.ac.nz

Caroline A. Crowther (MD)[1], c.crowther@auckland.ac.nz

[1]Liggins Institute, University of Auckland, New Zealand; 85 Park Road, Grafton, Auckland, New Zealand 1021

[2]Te Whatu Ora Te Toka Tumai Auckland, Auckland, New Zealand; Private Bag 92024, Auckland Mail Centre, Auckland 1142.

Corresponding author:

Professor Caroline A. Crowther, MD

Liggins Institute, University of Auckland; 85 Park Road, Grafton

Private Bag 92019, Auckland Mail Centre, Auckland 1142, New Zealand

Phone: +64 9 373 7599 ext 86011; email: c.crowther@auckland.ac.nz

Sources of Support:

This study was funded by a grant from the Health Research Council of New Zealand (HRC), grant 19/690, and a clinical research training fellowship from the HRC, ref 25/002.

Short running head/title: Revised GDM criteria, health at 5-years

Patient Consent Statement: This study is a secondary analysis of the GEMS follow-up study, for which participants provided written informed consent.

Acknowledgements:

We thank all the participants and their families who took part in the GEMS Follow-Up Study. We acknowledge the following members of the GEMS Follow-Up Study Group who contributed to data collection and study management: Coila Bevan; Luling Lin; Patricia Meagher-Lundberg; Oluwatoyin I. Oladimeji; Christopher J. McKinlay; Barry Milne; Penny Neave; Phyllis Ohene-Agyei; Karaponi Okesene-Gafa; Rajesh Shah; Deborah Samuel; Altanzurkh Turbat; Jack Wang.

STRUCTURED ABSTRACT

Objectives: New Zealand diagnoses gestational diabetes (GDM) using fasting plasma glucose (FPG) ≥5.5 mmol/L and/or 2-h post-load glucose (PLG) ≥9.0 mmol/L. Revised criteria lower the FPG to ≥5.3 mmol/L and replace the 2-h with 1-h PLG ≥10.6 mmol/L. Whether these changes affect long-term maternal and child health is unknown.

Methods: Participants were grouped by their oral glucose tolerance test results as meeting the revised criteria (Additional group), the current criteria (Missed group), both criteria (Both-Criteria group), or neither criteria (Non-GDM group).

Results: At five years, women in the Additional-Treated and Missed groups had rates of type 2 diabetes/prediabetes higher than the Non-GDM group (36.5% and 29.6% vs 8.7%; $P<0.001$), although similar to the Both-Criteria group. Women in the Missed group had lower BMI than the Both-Criteria group (27.1 vs. 30.5 kg/m^2; $P=0.008$). More children in the Additional-Treated group than in the Non-GDM group were reported to have poorer health, while lower BMI z-scores were observed in children in the Missed group (0.06 vs 0.54; $P=0.024$). Participants in the Additional-Untreated group had more maternal cardiometabolic and child neurodevelopmental concerns than the Non-GDM group. After adjustment for maternal ethnicity, most between-group differences were unchanged, although differences in maternal BMI were attenuated and child BMI z-scores more pronounced.

Conclusions: The revised criteria will identify additional women at risk of future diabetes but exclude another high-risk group currently diagnosed and treated for GDM, potentially compromising their and their children's longer-term health.

Keywords (maximum 6)

Gestational diabetes; diagnostic criteria; long-term outcomes

List of abbreviations

ASQ: Ages and Stages Questionnaire

BMI: body mass index

CI: confidence interval

FPG: fasting plasma glucose

GDM: gestational diabetes mellitus

MD: mean difference

OGTT: oral glucose tolerance test

PLG: post-load glucose

RR: relative risk

SD: standard deviation

SDQ: Strength and Difficulties Questionnaire

1. Introduction

Gestational diabetes mellitus (GDM), marked by impaired glucose tolerance first recognized during pregnancy, is associated with maternal and child complications that extend beyond the perinatal period [1]. Women with a history of GDM are at increased risk for developing type 2 diabetes and cardiovascular diseases later in life, while their children face increased risks of obesity, glucose intolerance and neurodevelopmental problems [1]. In the Hyperglycemia and Adverse Pregnancy Outcome study [2], elevated fasting plasma glucose (FPG) and 1-h post-load glucose (PLG) values were found to be better predictors of adverse perinatal outcomes than the 2-h PLG. Several subsequent cohort studies have demonstrated that elevated FPG and 1-h PLG values are independent predictors of long-term type 2 diabetes and cardiovascular risk profiles [3-5].

Given there is no consensus on the optimal glycaemic thresholds for diagnosing GDM, glycaemic diagnostic criteria vary internationally [1]. The current New Zealand diagnostic criteria for GDM, first proposed in 1991 [6] and endorsed in the New Zealand Ministry of Health guideline published in 2014 [7], recommend GDM be diagnosed if FPG $\geq$5.5 mmol/L and/or 2-h PLG $\geq$9.0 mmol/L on a 75 g oral glucose tolerance test (OGTT). A planned updated guideline, however, recommends lowering the FPG to ≥5.3 mmol/L and replacing the 2-h PLG with a 1-h PLG cutoff at ≥10.6 mmol/L. These changes were based on the greater predictive strength of FPG and 1-h PLG [2-5], and stakeholder feedback to limit testing time to improve acceptability of GDM screening for individuals [8]. Evidence on the long-term maternal and child health implications of diagnosing GDM based solely on an elevated FPG and/or 1-h PLG value is however lacking. This study aimed to compare the health, at five years after the birth, in women and their children who would be affected by these diagnostic criteria changes.

2. Subjects, Materials and Methods

2.1 Study Design and Setting

This study used data from the five-year follow-up of participants in the GEMS (Gestational Diabetes Mellitus Diagnostic Detection Thresholds) randomized trial [9]. Detailed information on the follow-up study design and results have been reported previously [10]. In brief, women and their children were recruited five years after the GEMS index birth. In the GEMS trial, all women had a 75 g, 2-h OGTT between 24 to 32 weeks' gestation, with FPG, 1-h PLG and 2-h PLG values measured. Participants eligible for the follow-up study included individuals who were diagnosed and received treatment for GDM by either the higher current New Zealand criteria [7] or the lower International Association of Diabetes in Pregnancy Study Groups criteria [11], individuals with OGTT results falling between these higher and lower criteria, who remained untreated for their mild gestational hyperglycemia due to randomization of this cohort to the higher criteria group, and a selection of participants who were not diagnosed with GDM using either criteria. Participants without GDM were randomly selected either at GEMS trial entry or at follow-up and were matched to women treated for GDM in either diagnostic criteria group by maternal age, body mass index (BMI) and ethnicity. Maternal and child health data were collected through participant questionnaires and linkage to routinely collected health records for consenting individuals. Ethical approval was granted by the Northern B Health and Disability Ethics Committee (20/NTB/297). Written informed consent was provided by participating women and caregiver of participating children.

2.2 Study Group Classification

Participants in the current study were classified into four groups based on their pregnancy OGTT results: 1) Additional group: women and their children who met the revised GDM diagnostic criteria, but did not meet the current criteria, 2) Missed group: participants who met the current diagnostic criteria but not the revised criteria, 3) Both-Criteria group: participants who met both GDM criteria, and 4) Non-GDM group: participants who met neither GDM criteria. Participants in the GEMS follow-up study who did not fit into any of these groups were excluded from this study.

2.3 Study Outcomes

Maternal outcomes at five-year follow-up included type 2 diabetes and/or prediabetes, hypertension, hyperlipidemia, overweight/obesity, BMI and renal impairment. Child outcomes included BMI, height and

weight z-scores, overweight/obesity (BMI z-score >2 standard deviations [SD] above the median for age less than five years [12], >1 SD for age greater than or equal to five years [13]), any neurodevelopmental impairment (any of: visual impairment, hearing impairment, developmental delay, cerebral palsy, autism spectrum disorder, attention deficit hyperactivity disorder), abnormal Ages and Stages Questionnaire (ASQ) score [14], emotional-behavioral difficulties (Total Difficulties Score ≥17 on the Strength and Difficulties Questionnaire [SDQ])[15], doctor-diagnosed diabetes, asthma, allergies, and caregiver-reported general health. The ASQ-3 [14] is a parent completed, standardized developmental screening tool that assesses five domains, including communication, gross motor, fine motor, problem-solving and personal-social functioning. Domain scores are calculated, with values more than two SDs below the age-specific cut-offs considered abnormal. The SDQ [15] is a brief, standardized behavioral screening measure that evaluates emotional symptoms, conduct problems, hyperactivity and inattention, peer relationships and prosocial behavior, with the Total Difficulties Score derived from all domains except the prosocial score.

2.4 Statistical Analysis

Baseline characteristics of participants in the Additional and Missed groups were compared to participants in the Both-Criteria and Non-GDM groups. For maternal and child health outcomes, participants exposed to treated GDM in the Additional group (Additional-Treated group), and those in the Missed group (all treated), were compared with outcomes of participants in the Both-Criteria (all-treated) and Non-GDM (all untreated) groups. Subgroup analyses examined outcomes between women and their children in the Additional group who were not treated for GDM (Additional-Untreated group), and those in the Additional-Treated and Non-GDM groups.

All analyses were performed using SAS® software version 9.4 (SAS Institute Inc., Cary, NC, USA). Continuous variables were expressed as mean ± SD, and categorical variables as counts and percentages (%). For analysis, generalized linear models were used. Binary outcomes were analyzed using either an identity-link function to estimate risk differences (RD), or a log-link function to estimate relative risks (RR), both with 95% confidence intervals (CIs). Continuous outcomes were analyzed using identity-link function to estimate mean differences (MD) with 95% CIs. Significance levels were adjusted using Bonferroni correction to account for the effect of multiple comparisons, where an initial alpha level of 0.05 was divided by four prespecified pairwise comparisons for each long-term outcome analysis to yield an adjusted significance level of $P<0.0125$ to control for Type I errors. Since this study analyzed follow-up data from participants in a randomized trial, the sample

size was predetermined by the size of the follow-up cohort, and no power calculation was performed. Effect estimates and 95% CIs are reported to describe the magnitude and precision of the findings.

Post hoc exploratory sensitivity analyses were conducted with adjustment for maternal ethnicity, which showed the greatest baseline between-group differences, for main outcomes: maternal type 2 diabetes or prediabetes, hypertension, BMI; and child BMI z-score, neurodevelopmental impairment, abnormal ASQ scores, emotional-behavioral difficulties and “Fair” or “Poor” caregiver reported general health.

3. Results

3.1 Baseline Characteristics

Among 1708 eligible mother-child pairs, 772 (71.6%) women and 737 (68.4%) children were followed up at five years following the GEMS index birth. Eligible women who participated, compared to those who did not, were slightly older at GEMS trial entry (32.27 vs 31.18 years; *P*=0.001), more likely to be of European and Māori ethnicity, and less likely to be Asian and Pacific (Table 1). Of the participants, 98 (12.7%) women and 91 (12.3%) children were in the Additional group, 54 (7.0%) women and 52 (7.1%) children in the Missed, 100 (13.0%) women and 100 (13.6%) children in the Both-Criteria, and 520 (67.4%) women and 494 (67.0%) children in the Non-GDM group (Figure 1, Table 2).

Out of 252 (32.6%) women who met any criteria for GDM, 38.9% (98/252; 95% CI 33.1% to 45.0%) met only the revised criteria and 21.4% (54/252; 95% CI 16.8% to 26.9%) met only the current criteria (RD 17.46%, 95% CI 9.59% to 25.33%). Overall, 49.5% (98/198; 95% CI 42.6% to 56.4%) of those meeting the revised criteria would have been missed by the current criteria, while 35.1% (54/154; 95% CI 28.0% to 42.9%) meeting the current criteria would no longer be diagnosed by the revised criteria.

3.1 Baseline characteristics of the Additional and Missed groups

Maternal age, parity, gestation at OGTT, and deprivation scores were similar across all groups (Table 2). Women in the Additional group, compared to women in the Non-GDM group, had higher BMI at first antenatal visit, with fewer of European and more of Pacific ethnicity. Women in the Additional group, compared to women in the Both-Criteria group, had less family history of diabetes, while other characteristics were similar. Women in the Missed group, compared to those in the Non-GDM group, were more likely to have a family history of diabetes and be of Asian ethnicity. Compared to the Both-Criteria group, women in the Missed group had lower BMI at first antenatal visit, used less pharmacotherapy antenatally for the management of GDM, particularly less insulin, and were less likely to be Pacific. Women in the Additional-Untreated and Additional-Treated groups were demographically similar, except the untreated group had more women of Pacific and fewer of Asian ethnicity (Table 4). Women in the Additional-Untreated group, compared to women in the Non-GDM group, had higher BMI and more overweight/obesity at first antenatal visit, were less likely to be European and Asian, more likely to be Pacific, and had a higher proportion residing in the most socioeconomically deprived areas (deciles 9-10).

Children in the Additional and Missed groups were slightly younger at follow-up than children in the Non-GDM group (Table 2). Child sex distributions were similar in all groups. Children in the Additional and Missed groups were born slightly earlier compared to those in the Non-GDM group, while those in the Additional group were born later compared to the Both-Criteria group. Children in the Missed group had lower mean birthweight z-scores than those in both the Non-GDM and Both-Criteria groups. Children in the Additional-Untreated group had higher mean birthweight z-scores than those in the Additional-Treated and Non-GDM groups, and were followed up at a younger age than children in the Non-GDM group (Table 4).

3.2 Five-year outcomes

In the Additional group, 52 (53.1%) participants had received GDM treatment (Additional-Treated) while 46 (46.9%) had not (Additional-Untreated). At five years post-index birth, women in both the Additional-Treated and Missed groups had higher prevalence of type 2 diabetes or prediabetes compared to women in the Non-GDM group (36.5% and 29.6% vs 8.7%; $P<0.001$; Table 3). BMI was lower in women in the Missed group than women in the Both-Criteria group (27.1 vs 30.5 kg/m^2; MD -3.40, 95% CI -5.94 to -0.87), while other metabolic and renal outcomes were similar across all groups. Children in the Missed group had a slightly lower mean BMI z-score than those in the Non-GDM group (0.06 vs 0.54; MD -0.48, 95% CI -0.89 to -0.06). Children in the Additional-Treated group were more likely to have had "fair" or "poor" caregiver-reported general health than those in the Non-GDM group (6.5% vs 2.0%; RR 3.94, 95% CI 1.08 to 14.37). Other child outcomes were similar between groups.

3.3 Subgroup comparisons between the Additional-Untreated versus Additional-Treated and Non-GDM groups

Women in the Additional-Untreated group, compared to women in the Non-GDM group, had higher rates of prediabetes (26.1% vs 8.1%; RR 3.23, 95% CI 1.83 to 5.70), hypertension (30.4% vs 16.0%; RR 1.91, 95% CI 0.17 to 3.08) and higher BMI (31.1 vs 28.7 kg/m^2; MD 2.46, 95% CI 0.17 to 4.74; Table 4), although rates of type 2 diabetes were similar. Children in the Additional-Untreated group were more likely than those in the Non-GDM group to have neurodevelopmental impairment (35.7% vs 19.0%; RR 1.88, 95% CI 1.20 to 2.94) and emotional-behavioral difficulties (SDQ ≥17, 9.4% vs 2.2%; RR 4.36, 95% CI 1.21 to 15.69). All maternal and child outcomes were similar between those in the Additional-Untreated and Additional-Treated groups.

3.4 Post hoc analyses

Adjustment for maternal ethnicity did not change the between-group differences in maternal type 2 diabetes or prediabetes, hypertension, or selected child outcomes at five-year follow-up (Table 5). However, between-group differences in maternal BMI at follow-up were attenuated (global $P = 0.137$), particularly between women in the Missed and Both-Criteria groups (aMD -2.20, 95% CI -4.43 to 0.02). Differences in mean child BMI z-scores between the Missed and Non-GDM groups and in "Fair" or "Poor" child general health status between the Additional-Treated and Non-GDM groups were also attenuated (Table 5). Most comparisons between participants in the Additional-Untreated group and those in the Additional-Treated and Non-GDM groups were unchanged (Table 6). However, differences in maternal BMI (aMD -0.24, 95% CI -2.29 to 1.82) and child emotional-behavioral difficulties (aRR 3.43, 95% CI 0.90 to 13.18) between individuals in the Additional-Untreated and Non-GDM groups were attenuated, and differences in child BMI Z-scores became more pronounced (aMD -0.53, 95% CI -0.94 to -0.11).

4. Discussion

This study assessed the potential impacts of using the revised New Zealand GDM diagnostic criteria on long-term maternal and child health. At five-year follow-up, women in both the Additional-Treated and Missed groups had higher rates of type 2 diabetes or prediabetes, while those in the Additional-Untreated-Group experienced worse maternal cardiometabolic health, and their children worse neurodevelopmental outcomes compared to those without GDM. Children exposed to treated GDM in the Additional group showed a tendency toward poorer caregiver-reported health than those not exposed to GDM, while children in the Missed group had a slightly lower BMI z-scores at five years compared with those not exposed to GDM. These findings suggest that a diagnosis of GDM in participants meeting only one of either the revised or current GDM criteria in New Zealand has important implications for their long-term health.

Comparing our findings with other studies evaluating the progression to type 2 diabetes after GDM is challenging, as no country currently endorses GDM diagnostic criteria based solely on FPG and 1-h PLG values, as proposed in the revised New Zealand criteria. At five-year follow-up, the rates of type 2 diabetes or prediabetes in our Additional-Treated group (36.5%) and Missed group (29.6%) are somewhat higher than the 24.2% national rate of any diabetes manifesting at 10 to 20 years following GDM diagnosed by the current New Zealand criteria [16]. The 10.0% rate of type 2 diabetes in women in the Both-Criteria group at five-year follow-up is also slightly higher than a rate of 7.4% in a Canadian population-based study [4] using the Diabetes Canada criteria (meeting at least one of FPG $\geq$5.3 mmol/L, 1-h PLG $\geq$10.6 mmol/L, 2-h PLG $\geq$9.0 mmol/L) [17]. This difference may be explained by the larger proportion of women with non-European ethnicities in our cohort compared to both studies, in whom the risks for type 2 diabetes is higher [4, 16]. Our findings of the lack of between-group differences in most child anthropometric outcomes around five years of age, regardless of their maternal GDM diagnoses based on different glycaemic criteria, are consistent with previous follow-up studies [18, 19]. The young age of children in our follow-up may also have contributed, as associations between maternal GDM and child adiposity are typically not observed in early childhood but become more evident from age seven years onwards [20].

At five years following the index birth, both type 2 diabetes and prediabetes were more prevalent in women diagnosed with and treated for GDM based either solely on an elevated 2-h PLG (the Missed group), or on an elevated FPG and/or 1-h PLG in the revised criteria (the Additional-Treated group), than in women without

GDM. Our findings are in keeping with previous systematic reviews reporting increased risks for future type 2 diabetes and impaired glucose tolerance in women following GDM regardless of the diagnostic criteria used, compared to those without such a history [21, 22]. We found that several well-established risk factors for the development of later diabetes were present in women in both the Additional and Missed groups. These include greater insulin use for the management of GDM, indicating more severe insulin resistance [23], and higher maternal BMI at the first antenatal visit and at follow-up in the Additional group [23, 24]. The higher proportion of Pacific women in the Additional group and Asian women in the Missed group are established ethnic risk factors for type 2 diabetes [25]. However, the persistence of higher rates of type 2 diabetes or prediabetes in the Missed and Additional-Treated groups after adjustment for maternal ethnicity suggests that these elevated risks are not fully explained by ethnicity alone. Thus, the revised criteria identified an Additional group of women with risks for future diabetes comparable to women in the Both-Criteria group, suggesting the diagnosis and long-term follow-up for diabetes and cardiometabolic risks would be appropriate for this high-risk population.

Women in the Missed group, all of whom were diagnosed and treated for GDM based only on an elevated 2-h PLG, also had long-term diabetes risks equivalent to those in the Both-Criteria group. This finding is in keeping a study reporting that elevated 2-h PLG values on a diagnostic OGTT had a strong correlation with long-term type 2 diabetes risks [23]. Women in the Missed group had lower BMI at their first antenatal visit compared to those in the Both-Criteria group, which likely contributed to their lower BMI at five-year follow-up. This may explain the lower mean birthweight z-score of their infants [26], in addition to the lower BMI z-scores of their children at five years of age [27] compared to children not exposed to GDM. These differences in maternal and child BMI may partly reflect the ethnic composition of the Missed group, which included a higher proportion of Asian participants who typically have lower BMI [28]. Consistent with this, these differences were attenuated after adjustment for maternal ethnicity. Nevertheless, women in the Missed group still carry a risk for type 2 diabetes or prediabetes at five-year follow-up higher than women without GDM, and similar to that for women in the Both-Criteria group. With use of the revised criteria, poorer outcomes may be expected if their gestational hyperglycemia is not detected and treated [18, 19]. After their pregnancy these women would not be recommended to have annual glycated hemoglobin testing after GDM [7], which may delay the diagnosis and management of future diabetes, with adverse effects on their long-term health [29].

Of all women in our study who met either the revised or current GDM diagnostic criteria, who were therefore at high risk for future diabetes, over one-third of women were only diagnosed by the revised criteria. Women in the Additional-Untreated group had higher rates of prediabetes and hypertension, and their children higher rates of neurodevelopmental impairments at five years, compared to participants without GDM. These findings support the additional identification and follow-up of individuals in the Additional group detected by the revised criteria as they are at increased risk of later adverse health outcomes. However, maternal and child outcomes at five-year follow-up were similar between the Additional-Untreated and Additional-Treated groups. Therefore, while our findings support risk stratification and follow-up of the Additional group, we do not have evidence from this study that GDM treatment during pregnancy modifies long-term outcomes in this population.

Strengths of this study include it being the first to assess GDM diagnosis utilizing the revised FPG and 1-h PLG-based glycaemic criteria in New Zealand. The multicenter, prospective design of the GEMS Follow-Up Study, involving a diverse New Zealand cohort including five-year outcome data for both the mothers and children, enhanced the generalizability of our findings. This study has several limitations. The Missed group in our study did not include untreated participants, whose outcomes are especially relevant to evaluating the proposed revised diagnostic criteria. Several subgroup analyses, particularly in the Missed, Additional-Treated and Additional-Untreated groups, were based on relatively small sample sizes and/or low event counts so some effect estimates may be imprecise, with wide CIs that limit interpretation of the true magnitude of any association. Non-significant findings, especially for secondary outcomes with sparse event counts, should be interpreted as inconclusive due to limited statistical power rather than representing evidence of no effect. Differential loss to follow-up, with European and Māori overrepresented and Asian and Pacific underrepresented in the assessed cohort may have introduced selection bias. Given the strong association between ethnicity and cardiometabolic risks, this may have affected the group-specific estimates, although post hoc sensitivity analyses adjusting for ethnicity suggested that this effect was small.

The planned revised GDM diagnostic criteria in New Zealand would identify an additional group of women at high-risk for future diabetes but would exclude another similarly high-risk group currently receiving treatment for GDM and post-GDM surveillance for type 2 diabetes. Diagnostic approaches that identify both groups, such as retaining the 2-h PLG values on diagnostic OGTTs alongside the revised FPG and 1-h PLG thresholds, similar to the Diabetes Canada criteria [17], would enhance identification of women at increased risk of adverse

outcomes both during pregnancy and in the years afterwards. Overall, failure to diagnose and monitor women and their children in either the Additional or Missed group may delay detection of future maternal diabetes and adversely impact longer-term maternal and child outcomes.

REFERENCES

1. Sweeting, A., et al., *A clinical update on gestational diabetes mellitus.* Endocr Rev, 2022. **43**(5): p. 763–793.
2. HAPO Study Cooperative Research Group, *The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study.* Int J Gynecol Obstet, 2002. **78**(1): p. 69–77.
3. Parrettini, S.R., L; Caroli, A; Bini, V; Calafiore, RT; Elisabetta., *Gestational diabetes: A link between OGTT, maternal-fetal outcomes and maternal glucose tolerance after childbirth.* NMCD, 2020. **30**(12): p. 2389–2397.
4. Hiersch, L., et al., *Oral glucose tolerance test results in pregnancy can be used to individualize the risk of future maternal type 2 diabetes mellitus in women with gestational diabetes mellitus.* Diabetes Care, 2021. **44**(8): p. 1860–1867.
5. Retnakaran, R., et al., *The postpartum cardiovascular risk factor profile of women with isolated hyperglycemia at 1-hour on the oral glucose tolerance test in pregnancy.* NMCD, 2011. **21**(9): p. 706–712.
6. Simmons, D.R., J; Reid, R; Campbell, N., *Screening, diagnosis and services for women with gestational diabetes mellitus (GDM) in New Zealand: a technical report from the National GDM Technical Working Party.* N Z Med J, 2008. **121**(1270): p. 74–86.
7. Ministry of Health, *Screening, diagnosis and management of gestational diabetes in New Zealand: a clinical practice guideline.*, in *Ministry of Health Clinical Practice Guideline*. 2014: Wellington: Ministry of Health. .
8. Te Whatu Ora Health New Zealand, *[Final Draft]. Testing for, diagnosing and managing gestational diabetes (diabetes of pregnancy). Te whakamātau, te tautohu me te whakahaere i te mate huka hapūtanga.* 2025.
9. Crowther, C., et al., *Lower versus higher glycemic criteria for diagnosis of gestational diabetes.* N Engl J Med, 2022. **387**(7): p. 587–598.
10. Liu, Q., et al., *Five-year follow-up of maternal and child health after gestational diabetes mellitus diagnosed using different glycaemic criteria: The GEMS follow-up study.* Diabetes Research and Clinical Practice, 2025: p. 112966.
11. Metzger, B., et al., *International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy.* Diabetes Care, 2010. **33**(3): p. 676–82.
12. World Health Organization, *Body mass index-for-age (BMI-for-age)*. 2024.
13. World Health Organization, *BMI-for-age (5-19 years)*. 2024.
14. Squires, J.T., E; Bricker, D; Potter, L., *Ages & Stages Questionnaires (ASQ)-3 User's Guide.* 2009.
15. Goodman, R. *Scoring the strengths and difficulties questionnaire for age 4-17 or 18+*. 2016 [cited 2023; Available from: https://socwel.ku.edu/sites/socwel/files/documents/Research%20Projects/Family%20First/Survey%20Measures/SDQ_English(USA)_4-17scoring_repaired%20-%20Remediated.pdf.
16. Daly, B., et al., *Increased risk of cardiovascular and renal disease, and diabetes for all women diagnosed with gestational diabetes mellitus in New Zealand—A national retrospective cohort study.* J Diabetes, 2024. **16**(4): p. e13535.
17. Houlden, R.L., *Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada: Introduction.* Can J Diabetes, 2018. **42**(Suppl 1): p. S1–5.
18. Landon, M., et al., *Mild gestational diabetes mellitus and long-term child health.* Diabetes Care, 2015. **38**(3): p. 445–452.
19. Gillman, M., et al., *Effect of treatment of gestational diabetes mellitus on obesity in the next generation.* Diabetes Care, 2010. **33**(5): p. 964–968.
20. Baptiste-Roberts, K., et al., *Gestational diabetes and subsequent growth patterns of offspring: the National Collaborative Perinatal Project.* Matern Child Health J, 2012. **16**: p. 125–132.
21. Vounzoulaki, E., et al., *Progression to type 2 diabetes in women with a known history of gestational diabetes: systematic review and meta-analysis.* BMJ, 2020. **369**.
22. Benhalima, K., et al., *The risk for glucose intolerance after gestational diabetes mellitus since the introduction of the IADPSG criteria: a systematic review and meta-analysis.* J Clin Med, 2019. **8**(9): p. 1431.
23. Chivese, T., S.A. Norris, and N.S. Levitt, *Progression to type 2 diabetes mellitus and associated risk factors after hyperglycemia first detected in pregnancy: A cross-sectional study in Cape Town, South Africa.* PLoS Med, 2019. **16**(9): p. e1002865.
24. Lee, H., et al., *Prevalence of type 2 diabetes among women with a previous history of gestational diabetes mellitus.* Diabetes res and clin pract, 2008. **81**(1): p. 124–129.

25. Lee, A.J., et al., *Gestational diabetes mellitus: clinical predictors and long-term risk of developing type 2 diabetes: a retrospective cohort study using survival analysis.* Diabetes Care, 2007. **30**(4): p. 878–883.
26. Frederick, I., et al., *Pre-pregnancy body mass index, gestational weight gain, and other maternal characteristics in relation to infant birth weight.* Matern. Child Health J, 2008. **12**: p. 557–567.
27. Cai, L., et al., *Association between the full range of birth weight and childhood weight status: by gestational age.* Eur J Clin Nutr, 2019. **73**(8): p. 1141–1148.
28. Bowers, K., et al., *Gestational diabetes, pre-pregnancy obesity and pregnancy weight gain in relation to excess fetal growth: variations by race/ethnicity.* Diabetologia, 2013. **56**: p. 1263–1271.
29. American Diabetes Association, *The prevention or delay of type 2 diabetes.* Diabetes Care, 2002. **25**(4): p. 742–749.
30. Ministry of Health. *Ethnicity data protocols for the health and disability sector.* 2004; Available from: https://www.fmhs.auckland.ac.nz/assets/fmhs/faculty/tkhm/tumuaki/docs/ethnicity-data-protocols.pdf.
31. Atkinson, J.S., C; Crampton, P. *NZDep2019. Index of Deprivation: Interim Research Report.* , U.o. Otago, Editor. 2019.

FIGURE CAPTIONS

Figure 1. Flow chart of participants.
[a]Met only the revised criteria, did not meet the current criteria.
[b]Met only the revised criteria, did not meet the current criteria and received treatment for GDM.
[c]Met only the current criteria, did not meet revised criteria.
[d]Met both the current and revised criteria.
[e]Met neither the current nor the revised criteria.

TABLES

Table 1. Maternal baseline characteristics at GEMS Trial entry of those who were and were not followed up at five years.

	Followed up (n=772)	**Not followed up (n=306)**	***P* value***
Age at trial entry, years (±SD)	32.27 ± 4.98	31.18 ± 4.85	0.001
Primiparity at GEMS trial, n (%)	376 (48.7)	145 (47.4)	0.70
BMI at first antenatal visit, kg/m^2 (±SD)	29.04 ± 6.52	29.61 ± 6.81	0.20
Overweight/obesity, n (%)	554 (71.8)	232 (75.8)	0.17
Family history of diabetes, n (%)	312 (40.4)	136 (44.4)	0.23
Gestation at OGTT, weeks (±SD)	27.44 ± 1.71	27.60 ± 1.87	0.17
FPG, mmol/L (±SD)	4.63 ± 0.60	4.68 ± 0.72	0.22
1-h PLG, mmol/L (±SD)	8.42 ± 2.11	8.42 ± 1.97	0.98
2-h PLG, mmol/L (±SD)	6.98 ± 1.96	7.13 ± 1.94	0.28
Ethnicity,[a] n (%)			
European	253 (32.8)	39 (12.8)	<0.0001
Pacific	110 (14.3)	60 (19.6)	
Māori	50 (6.5)	9 (2.9)	
Asian	316 (40.9)	172 (56.2)	
Other[b]	43 (5.6)	26 (8.5)	

Results are number (%) or mean (±SD).

*Statistical significance defined as $P<0.05$.

[a] Self-reported ethnicity at GEMS trial entry, prioritized using Ethnicity New Zealand Standard Classification[30].

[b] Included African, Middle Eastern, and South American.

Abbreviations: BMI, body mass index; FPG, fasting plasma glucose concentration; OGTT, oral glucose tolerance test; PLG, post-load glucose concentration; RD, risk difference; SD, standard deviation.

Table 2. Baseline characteristics among the Additional, Missed, Non-GDM and Both-Criteria-Groups at five-year follow-up.

	Additional group (n=98)	Missed group (n=54)	Non-GDM group (n=520)	Both-Criteria group (n=100)	RD/MD (95% CI), pairwise comparison *P* values*				Global *P* values*
					Additional vs. Non-GDM†	Additional vs. Both-Criteria†	Missed vs. Non-GDM†	Missed vs. Both-Criteria†	
Maternal characteristics									
Age at GEMS trial entry, years (±SD)	31.9 ± 5.8	32.2 ± 4.4	32.4 ± 4.9	31.9 ± 4.8	-0.50 (-1.58, 0.57), 0.760	-0.002 (-1.39, 1.39), 0.998	-0.24 (-1.64, 1.16), 0.731	0.26 (-1.40, 1.91), 0.761	0.688
Primiparity at index birth (%)	46 (46.9%)	32 (59.3%)	245 (47.1%)	53 (53.0%)	0.18 (-10.61, 10.97), 0.974	6.06 (-7.87, 19.99), 0.393	-12.14 (-25.96, 1.67), 0.085	-6.26 (-22.64, 10.12), 0.453	0.275
BMI at first antenatal visit, kg/m^2 (±SD)	30.8 ± 7.2	27.2 ± 5.2	28.5 ± 5.9	31.0 ± 8.5	2.29 (0.90, 3.68), 0.007	-0.15 (-1.94, 1.65), 0.999	-1.28 (-3.08, 0.53), 0.507	-3.72 (-5.85, -1.59), 0.004	<0.001
Overweight/obesity (%)	77 (78.6%)	38 (70.4%)	363 (69.8%)	76 (76.0%)	8.76 (-0.28, 17.81), 0.058	2.57 (-9.11, 14.25), 0.666	0.56 (-0.12, 0.13), 0.931	-5.63 (-20.43, 9.17), 0.456	0.201
Family history of diabetes (%)	42 (42.9%)	27 (50.0%)	185 (35.6%)	58 (58.0%)	7.28 (-3.36, 17.92), 0.180	-15.14 (-28.93, -1.35), 0.031	14.42 (0.44, 28.40), 0.043	-8.00 (-24.50, 8.50), 0.342	<0.001
Gestation at OGTT (±SD)	27.5 ± 1.9	27.4 ± 1.5	27.5 ± 1.7	27.3 ± 1.5	0.01 (-0.36, 0.38), 0.939	0.14 (-0.34, 0.61), 0.579	-0.03 (-0.52, 0.45), 0.887	0.09 (-0.48, 0.65), 0.766	0.928
FPG, mmol/L (±SD)	5.0 ± 0.4	4.5 ± 0.4	4.4 ± 0.4	5.6 ± 0.8	0.54 (0.45, 0.64), <0.001	-0.61 (-0.74, -0.48), <0.001	0.08 (-0.05, 0.21), 0.605	-1.07 (-1.23, -0.93), <0.001	<0.001
1-h PG, mmol/L (±SD)	10.3 ± 1.7	9.3 ± 0.8	7.5 ± 1.6	11.1 ± 1.8	2.83 (2.49, 3.16), <0.001	-0.77 (-1.21, -0.33), <0.001	1.88 (1.44, 2.32), <0.001	-1.72 (-2.24, -1.20), <0.001	<0.001
2-h PG, mmol/L (±SD)	7.1 ± 1.2	9.6 ± 0.7	6.2 ± 1.3	9.5 ± 2.4	0.92 (0.61, 1.24), <0.001	-2.40 (-2.80, -1.99), <0.001	3.44 (3.04, 3.85), <0.001	0.13 (-0.35, 0.61), 0.603	<0.001

Any pharmacotherapy for GDM‡ (%)	41 (78.9%)	35 (64.8%)	4 (0.8%)	87 (87.0%)	78.08 (66.93, 89.22), <0.001	-8.15 (-21.09, 4.78), 0.216	64.05 (51.27, 76.82), <0.001	-22.19 (-36.55, -7.82), 0.003	<0.001
Insulin treatment‡ (%)	21 (40.4%)	14 (25.9%)	3 (0.6%)	55 (55.0%)	39.81 (26.43, 53.18), <0.001	-14.62 (-31.16, 1.93), 0.083	25.35 (13.62, 37.08), <0.001	-29.07 (-44.32, -13.83), <0.001	<0.001
Ethnicity (%)									
European	20 (20.4%)	14 (25.9%)	196 (37.7%)	23 (23.0%)	-17.28 (-26.30, -8.27), <0.001	-2.59 (-14.09, 8.90), 0.658	-11.77 (-24.19, 0.66), 0.064	2.93 (-11.40, 17.25), 0.689	<0.001
Pacific	23 (23.5%)	4 (7.4%)	62 (11.9%)	21 (21.0%)	11.55 (2.69, 20.40), 0.011	2.47 (-9.12, 14.07), 0.676	-4.52 (-12.05, 3.02), 0.240	-13.59 (-24.22, -2.97), 0.012	0.077
Māori	11 (11.2%)	2 (3.7%)	32 (6.2%)	5 (5.0%)	5.07 (-1.52, 11.66), 0.132	6.22 (-1.36, 13.81), 0.108	-2.45 (-7.90, 3.00), 0.378	-1.30 (-7.91, 5.32), 0.701	0.296
Asian	36 (36.7%)	31 (57.4%)	203 (39.0%)	46 (46.0%)	-2.30 (-12.75, 8.14), 0.665	-9.27 (-22.94, 4.41), 0.184	18.37 (4.51, 32.23), 0.010	11.41 (-5.03, 27.85), 0.174	0.037
Other	8 (7.7%)	3 (5.6%)	27 (5.2%)	5 (5.0%)	2.97 (-2.79, 8.73), 0.311	3.16 (-3.75, 10.08), 0.369	0.36 (-6.05, 6.77), 0.912	0.56 (-6.91, 8.02), 0.884	0.783
New Zealand deprivation category§ (%)									
1-2	10 (10.2%)	6 (11.1%)	88 (16.9%)	12 (12.0%)	-6.72 (-13.53, 0.10), 0.053	-1.80 (-10.56, 6.96), 0.687	-5.81 (-14.81, 3.18), 0.205	-0.89 (-11.43, 9.66), 0.869	0.148
3-4	17 (17.4%)	13 (24.1%)	120 (23.1%)	13 (13.0%)	-5.73 (-14.07, 2.61), 0.178	4.35 (-5.65, 14.35), 0.394	1.00 (-10.99, 12.98), 0.870	11.07 (-2.12, 24.27), 0.100	0.047
5-6	20 (20.4%)	12 (22.2%)	107 (20.6%)	23 (23.0%)	-0.17 (-8.89, 8.55), 0.970	-2.59 (-14.09, 8.90), 0.658	1.65 (-9.99, 13.28), 0.782	-0.78 (-14.62, 13.06), 0.912	0.950

7-8	20 (20.4%)	9 (16.7%)	88 (16.9%)	21 (21.0%)	3.49 (-5.13, 12.10), 0.428	-0.59 (-11.90, 10.71), 0.918	-0.26 (-10.72, 10.21), 0.962	-4.33 (-17.10, 8.44), 0.506	0.715
9-10	28 (28.6%)	13 (24.1%)	106 (20.4%)	29 (29.0%)	8.19 (-1.42, 17.79), 0.095	-0.43 (-13.06, 12.20), 0.947	3.69 (-8.25, 15.63), 0.544	-4.93 (-19.41, 9.56), 0.505	0.150
Child baseline characteristics	**(n = 91)**	**(n = 52)**	**(n = 494)**	**(n = 100)**					
Female sex (%)	50 (55.0%)	25 (48.1%)	221 (44.7%)	52 (52.0%)	10.21 (-0.93, 21.35), 0.073	2.95 (-11.23, 17.12), 0.684	3.34 (-10.95, 17.63), 0.647	-3.92 (-20.69, 12.85), 0.646	0.226
Gestational age at birth, weeks (±SD)	38.7 ± 1.2	38.3 ± 1.5	39.2 ± 1.5	38.1 ± 1.7	-0.54 (-0.88, -0.20), 0.002	0.58 (0.15, 1.01), 0.008	-0.90 (-1.34, -0.47), <0.001	0.21 (-0.29, 0.72), 0.406	<0.001
Birthweight z-score (±SD)	0.2 ± 1.0	-0.3 ± 0.9	0.1 ± 0.9	0.1 ± 1.1	0.09 (-0.13, 0.30), 0.415	0.11 (-0.17, 0.38), 0.444	-0.39 (-0.66, -0.11), 0.006	-0.37 (-0.69, -0.05), 0.025	0.030
Age at follow-up, years (±SD)	5.0 ± 0.8	5.1 ± 0.8	5.8 ± 1.0	5.0 ± 0.8	-0.83 (-1.05, -0.62), <0.001	0.02 (-0.25, 0.29), 0.891	-0.68 (-0.95, -0.41), <0.001	0.17 (-0.15, 0.49), 0.301	<0.001

Results are number (%) or mean (±SD).

† The second groups in these pairwise comparisons are the reference groups.

‡ Treatment effects are given as RD with 95% CIs.

§ Derived from the New Zealand Socioeconomic Deprivation Profile[31] according to address of participating women at Follow-Up. Decile 1 is the least deprived and decile 10 is the most deprived.

* Statistical significance following Bonferroni correction for prespecified pairwise comparisons, defined as $P<0.0125$.

Abbreviations: BMI, body mass index; FPG, fasting plasma glucose; GDM, gestational diabetes; MD, mean difference; n, numerator/total no. of infants with positive outcomes; N, denominator, total no. of infants with available data for outcome analysis; OGTT, oral glucose tolerance test; PG, post-load glucose; RD, risk difference; SD, standard deviation.

Table 3. Associations between maternal and child outcomes at five years following the index birth between the Additional-Treated, Missed, Non-GDM and Both-Criteria groups.

	Additional-Treated group (n=52)	Missed group (n=54)	Non-GDM group (n=520)	Both-Criteria group (n=100)	RR/MD (95% CI), pairwise comparison *P* values*				Global *P* values*
					Additional-Treated vs. Non-GDM†	Additional-Treated vs. Both-Criteria†	Missed vs. Non-GDM†	Missed vs. Both-Criteria†	
Maternal outcomes									
Type 2 diabetes or prediabetes (%)	19 (36.5%)	16 (29.6%)	45 (8.7%)	45 (45.0%)	4.22 (2.68, 6.65), <0.001	0.81 (0.53, 1.24), 0.331	3.42 (2.08, 5.63), <0.001	0.66 (0.41, 1.05), 0.080	<0.001
Type 2 diabetes (%)	4 (7.7%)	5 (9.3%)	3 (0.6%)	10 (10.0%)	13.33 (3.06, 58.11), <0.001	0.77 (0.25, 2.36), 0.644	16.05 (3.93, 65.48), <0.001	0.93 (0.33, 2.59), 0.883	<0.001
Prediabetes (%)	15 (28.9%)	11 (20.4%)	42 (8.1%)	35 (35.0%)	3.57 (2.13, 5.99), <0.001	0.82 (0.50, 1.37), 0.453	2.52 (1.38, 4.61), 0.003	0.58 (0.32, 1.06), 0.075	<0.001
Hypertension (%)	8 (15.4%)	6 (11.1%)	83 (16.0%)	20 (20.0%)	0.96 (0.49, 1.88), 0.363	0.77 (0.36, 1.64), 0.493	0.70 (0.32, 1.52), 0.314	0.56 (0.24, 1.31), 0.177	0.550
Hyperlipidemia (%)	17 (32.7%)	15 (27.8%)	131 (25.2%)	39 (39.0%)	1.30 (0.85, 1.97), 0.221	0.84 (0.53, 1.33), 0.454	1.10 (0.70, 1.74), 0.674	0.71 (0.43, 1.17), 0.181	0.025
Overweight/obesity (%)	35 (67.3%)	29 (53.7%)	324 (62.3%)	71 (71.0%)	0.86 (0.66, 1.10), 0.231	0.97 (0.78, 1.20), 0.758	1.13 (0.99, 1.30), 0.076	0.76 (0.57, 1.00), 0.046	0.125
BMI, kg/m^2 (±SD)	29.9 ± 8.2	27.1 ± 6.0	28.7 ± 7.6	30.5 ± 8.2	1.20 (-1.00, 3.41), 0.284	-0.69 (-3.50, 2.12), 0.628	-1.51 (-3.66, 0.64), 0.168	-3.40 (-5.94, -0.87), 0.008	0.033
Renal impairment (%)	2 (3.9%)	1 (1.9%)	8 (1.5%)	4 (4.0%)	2.50 (0.54, 11.49), 0.239	0.96 (0.18, 5.15), 0.963	1.20 (0.15, 9.48), 0.860	0.46 (0.05, 4.11), 0.487	0.364
Child outcomes	**(n = 49)**	**(n = 52)**	**(n = 494)**	**(n= 100)**					

BMI z-score (±SD)	0.18 ± 1.38 [n = 49]	0.06 ± 1.59 [n = 50]	0.54 ± 1.35 [n = 477]	0.41 ± 1.69 [n = 96]	-0.36 (-0.78, 0.06), 0.093	-0.23 (-0.72, 0.26), 0.355	-0.48 (-0.89, -0.06), 0.024	-0.35 (-0.84, 0.14), 0.158	0.060
Height z-score (±SD)	0.47 ± 1.25	0.67 ± 1.48	0.41 ± 1.26	0.34 ± 1.39	0.06 (-0.32, 0.44), 0.760	0.14 (-0.31, 0.59), 0.545	0.25 (-0.13, 0.63), 0.195	0.33 (-0.12, 0.77), 0.147	0.521
Weight z-score (±SD)	0.41 ± 1.18	0.44 ± 1.44	0.61 ± 1.15	0.48 ± 1.52	-0.20 (-0.56, 0.17), 0.287	-0.07 (-0.49, 0.36), 0.762	-0.17 (-0.53, 0.19), 0.349	-0.04 (-0.45, 0.38), 0.852	0.498
Overweight/obesity, n/N (%)	3/49 (6.1%)	5/50 (10.0%)	66/477 (13.8%)	13/96 (13.5%)	0.44 (0.14, 1.36), 0.154	0.72 (0.31, 1.71), 0.460	0.45 (0.13, 1.53), 0.200	0.74 (0.28. 1.97), 0.542	0.477
Any neurodevelopmental impairment‡, n/N (%)	10/46 (21.7%)	5/51 (9.8%)	92/484 (19.0%)	14/99 (14.1%)	1.14 (0.64, 2.04), 0.649	1.54 (0.73, 3.22), 0.252	0.52 (0.22, 1.21), 0.128	0.69 (0.26, 1.83), 0.457	0.288
Any abnormal ASQ score§, n/N (%)	5/36 (13.9%)	4/36 (11.1%)	39/373 (10.5%)	12/72 (16.7%)	1.33 (0.56, 3.16), 0.521	0.83 (0.31, 2.21), 0.712	1.06 (0.40, 2.81), 0.902	0.67 (0.23, 1.95), 0.455	0.472
Emotional-behavioral difficulties¶, n/N (%)	2/40 (5.0%)	1/39 (2.6%)	8/372 (2.2%)	1/77 (1.3%)	2.33 (0.51, 10.61), 0.276	3.85 (0.35, 42.23), 0.267	1.19 (0.15, 9.33), 0.867	1.97 (0.12, 31.65), 0.628	0.655
Diabetes, n/N (%)	0/48 (0.0%)	0/52 (0.0%)	0/493 (0.0%)	0/100 (0.0%)	NE	NE	NE	NE	>0.999
Asthma, n/N (%)	17/48 (35.4%)	10/52 (19.2%)	131/493 (26.6%)	28/100 (28.0%)	1.33 (0.88, 2.01), 0.169	1.26 (0.77, 2.08), 0.353	0.72 (0.41, 1.29), 0.272	0.69 (0.36, 1.31), 0.251	0.328
Caregiver-reported allergies, n/N (%)	13/43 (30.2%)	14/50 (28.0%)	128/470 (27.3%)	24/95 (25.3%)	1.11 (0.69, 1.79), 0.668	1.20 (0.67, 2.13), 0.539	1.03 (0.64, 1.64), 0.908	1.11 (0.63, 1.96), 0.721	0.940
General health status "Fair" or "Poor", n/N (%)	3/46 (6.5%)	1/51 (2.0%)	8/483 (1.7%)	4/97 (4.1%)	3.94 (1.08, 14.37), 0.038	1.58 (0.36, 6.86), 0.538	1.18 (0.15, 9.31), 0.872	0.48 (0.05, 4.22), 0.502	0.153

Results are number (%) or mean (±SD).

† The second groups in these pairwise comparisons are the reference groups.

‡ Defined as any of: visual impairment, hearing impairment, language delay, motor delay, cognitive delay, unspecified developmental delay, cerebral palsy, autism spectrum disorder, attention-deficit hyperactivity disorder.

§ Defined as scoring below the cut-off in one or more of the five areas including communication, gross motor, fine motor, problem-solving and personal-social of the ASQ.[14]

¶ Defined as total difficulties score ≥17 on Strengths and Difficulties Questionnaire.[15]

*Statistical significance following Bonferroni correction for prespecified pairwise comparisons, defined as $P<0.0125$.

Abbreviations: ASQ, Ages and Stages Questionnaire; CI, confidence interval; MD, mean difference; n, numerator/total no. of infants with positive outcomes; N, denominator, total no. of infants with available data for outcome analysis; RD, risk difference; RR, relative risk; SD, standard deviation.

Table 4. Subgroup analysis: associations between maternal and child outcomes at five-years following the index births between participants in the Additional group, who were untreated for GDM, versus those treated and those without GDM by either criteria.

	Additional-Untreated group, (n=46)	Additional-Treated group (n=52)	Non-GDM group (n=520)	RD/RR/MD (95% CI)			
				Additional-Untreated vs. Additional-Treated†	*P* value*	Additional-Untreated vs. Non-GDM†	*P* value*
Maternal baseline characteristics							
Age at GEMS trial entry, years (±SD)	32.0 ± 6.5	31.8 ± 5.2	32.4 ± 4.9	0.21 (-1.80, 2.23)	0.835	-0.39 (-1.92, 1.14)	0.618
Primiparity at index birth (%)	20 (43.5%)	26 (50.0%)	245 (47.1%)	-6.62 (-26.31, 13.26)	0.518	-3.64 (-18.62, 11.35)	0.634
BMI at first antenatal visit, kg/m^2 (±SD)	31.1 ± 7.3	30.6 ± 7.2	28.5 ± 5.9	0.45 (-1.99, 2.88)	0.719	2.53 (0.68, 4.38)	0.008
Overweight/obesity (%)	38 (82.6%)	39 (75.0%)	363 (69.8%)	7.61 (-8.50, 23.72)	0.354	12.80 (1.14, 24.47)	0.032
Family history of diabetes (%)	18 (39.1%)	24 (46.2%)	185 (35.6%)	-7.02 (-0.27, 0.13)	0.482	3.55 (-0.11, 0.18)	0.636
Gestation at OGTT, weeks (±SD)	27.5 ± 1.8	27.5 ± 2.0	27.5 ± 1.7	0.03 (-0.66, 0.73)	0.923	0.03 (-0.50, 0.56)	0.904
FPG, mmol/L (±SD)	5.0 ± 0.4	5.0 ± 0.4	4.4 ± 0.4	0.03 (-0.15, 0.15)	0.997	0.54 (0.43, 0.66)	<0.001
1-h PG, mmol/L (±SD)	10.5 ± 1.6	10.1 ± 1.7	7.5 ± 1.6	0.38 (-0.25, 1.00)	0.242	3.02 (2.55, 3.50)	<0.001
2-h PG, mmol/L (±SD)	7.1 ± 1.3	7.1 ± 1.1	6.2 ± 1.3	0.42 (-0.51, 0.52)	0.987	0.92 (0.53, 1.32)	<0.001
Any pharmacotherapy for GDM‡ (%)	2 (4.4%)	41 (78.9%)	4 (0.8%)	-74.50 (-87.09, -61.91)	<0.001	3.58 (-2.37, 9.53)	0.238
Insulin treatment‡ (%)	2 (4.4%)	21 (40.4%)	3 (0.6%)	-36.04 (-50.65, -21.43)	<0.001	3.77 (-2.17, 9.71)	0.213
Ethnicity (%)							
European	10 (21.7%)	10 (19.2%)	196 (37.7%)	2.51 (-13.5, 18.57)	0.759	-15.95 (-28.60, -3.30)	0.014
Pacific	15 (32.6%)	8 (15.4%)	62 (11.9%)	17.22 (0.47, 33.98)	0.044	20.69 (6.83, 34.54)	0.004
Māori	7 (15.2%)	4 (7.7%)	32 (6.2%)	7.53 (-5.16, 20.21)	0.244	9.06 (-1.54, 19.67)	0.094
Asian	10 (21.7%)	26 (50.0%)	203 (39.0%)	-28.26 (-46.37, -10.15)	0.002	-17.30 (-29.96, 4.64)	0.020
Other	4 (8.7%)	4 (7.7%)	27 (5.2%)	1.00 (-9.92, 11.92)	0.857	3.50 (-4.88, 11.88)	0.412

New Zealand deprivation category[§] (%)							
1-2	4 (8.7%)	6 (11.5%)	88 (16.9%)	-2.84 (-14.77, 9.09)	0.640	-8.23 (-17.00, 0.55)	0.066
3-4	6 (13.0%)	11 (21.2%)	120 (23.1%)	-8.11 (-22.90, 6.68)	0.282	-10.03 (-20.44, 0.37)	0.059
5-6	8 (17.4%)	12 (23.1%)	107 (20.6%)	-5.69 (-21.56, 10.19)	0.482	-3.19 (-14.70, 8.33)	0.587
7-8	11 (23.9%)	9 (17.3%)	88 (16.9%)	6.61 (-9.48, 22.69)	0.420	6.99 (-5.78, 19.76)	0.283
9-10	17 (37.0%)	11 (21.2%)	106 (20.4%)	15.80 (-2.06, 33.66)	0.083	16.57 (2.17, 30.97)	0.024
Child baseline characteristics	**(n=42)**	**(n=49)**	**(n-494)**				
Female sex (%)	24 (57.1%)	26 (53.1%)	221 (44.7%)	4.08 (-16.44, 24.60)	0.696	12.41 (-3.22, 28.03)	0.120
Gestational age at birth, weeks (±SD)	39.0 ± 1.2	38.4 ± 1.2	39.2 ± 1.5	0.60 (-0.01, 1.20)	0.055	-0.22 (-0.68, 0.25)	0.355
Birthweight z-score (±SD)	0.38 ± 0.98	-0.03 ± 0.96	0.07 ± 0.93	0.40 (0.01, 0.79)	0.042	0.31 (0.01, 0.60)	0.043
Age at follow-up, years (±SD)	5.0 ± 0.8	5.0 ± 0.8	5.8 ±1.0	-0.05 (-0.46, 0.36)	0.821	-0.86 (-1.17, -0.54)	<0.001
Maternal five-year outcomes	**(n=46)**	**(n=52)**	**(n=520)**				
Type 2 diabetes or prediabetes (%)	13 (28.3%)	19 (36.5%)	45 (8.7%)	0.77 (0.43, 1.40)	0.390	3.27 (1.90, 5.60)	<0.001
Type 2 diabetes mellitus (%)	1 (2.2%)	4 (7.7%)	3 (0.6%)	0.28 (0.03, 2.51)	0.253	3.77 (0.40, 35.67)	0.247
Prediabetes (%)	12 (26.1%)	15 (28.9%)	42 (8.1%)	0.90 (0.47, 1.74)	0.761	3.23 (1.83, 5.70)	<0.001
Hypertension (%)	14 (30.4%)	8 (15.4%)	83 (16.0%)	1.97 (0.90, 4.33)	0.087	1.91 (0.17, 3.08)	0.009
Hyperlipidemia (%)	14 (30.4%)	17 (32.7%)	131 (25.2%)	0.93 (0.51, 1.68)	0.811	1.21 (0.76, 1.92)	0.422
Overweight/obesity, n/N (%)	33/46 (71.7%)	35/50 (70.0%)	324/507 (63.9%)	1.02 (0.79, 1.33)	0.852	1.12 (0.93, 1.36)	0.240
BMI, kg/m^2 (±SD)	31.1 ± 7.6	29.9 ± 8.2	28.7 ± 7.6	1.25 (-1.96, 4.47)	0.441	2.46 (0.17, 4.74)	0.035
Renal impairment (%)	1 (2.2%)	2 (3.9%)	8 (1.5%)	0.57 (0.05, 6.22)	0.638	1.41 (0.18, 11.10)	0.742
Child five-year outcomes	**(n=42)**	**(n=49)**	**(n=494)**				
BMI z-score (±SD)	0.24 ± 1.05 [n = 39]	0.18 ± 1.38 [n = 49]	0.54 ± 1.35 [n = 477]	0.07 (-0.46, 0.60)	0.805	-0.29 (-0.73, 0.14)	0.185

Height z-score (±SD)	0.50 ± 0.96	0.47 ± 1.25	0.41 ± 1.26	0.03 (-0.45, 0.51)	0.902	0.09 (-0.32, 0.50)	0.666
Weight z-score (±SD)	0.46 ± 0.90	0.41 ± 1.18	0.61 ± 1.15	0.05 (-0.40, 0.51)	0.815	-0.14 (-0.52, 0.23)	0.447
Overweight/obesity, n/N (%)	1/39 (2.6%)	3/49 (6.1%)	66/477 (13.8%)	0.42 (0.04, 4.00)	0.445	0.19 (0.03, 1.31)	0.090
Any neurodevelopmental impairment[¶], n/N (%)	15/42 (35.7%)	10/46 (21.7%)	92/484 (19.0%)	1.64 (0.82, 3.28)	0.157	1.88 (1.20, 2.94)	0.006
Any abnormal ASQ score[#], n/N (%)	6/33 (18.2%)	5/36 (13.9%)	39/373 (10.5%)	1.31 (0.43, 3.97)	0.629	1.74 (0.79, 3.81)	0.167
Emotional-behavioral difficulties[|], n/N (%)	3/32 (9.4%)	2/40 (5.0%)	8/372 (2.2%)	1.88 (0.32, 10.88)	0.478	4.36 (1.21, 15.69)	0.024
Diabetes, n/N (%)	0/42 (0.0%)	0/48 (0.0%)	0/493 (0.0%)	NE	NE	NE	NE
Asthma, n/N (%)	13/42 (31.0%)	17/48 (35.4%)	131/493 (26.6%)	0.87 (0.48, 1.59)	0.656	1.16 (0.72, 1.88)	0.529
Caregiver-reported allergies, n/N (%)	13/42 (31.0%)	13/43 (30.2%)	128/470 (27.2%)	1.02 (0.53, 1.96)	0.943	1.14 (0.71, 1.83)	0.598
General health status “Fair” or “Poor”, n/N (%)	0/42 (0.0%)	3/46 (6.5%)	8/483 (1.7%)	NE	NE	NE	NE

Results are number (%) or mean (±SD).

[†] The second groups in these pairwise comparisons are the reference groups.

[‡] Treatment effects are given as RD with 95% CIs.

[§] Derived from the New Zealand Socioeconomic Deprivation Profile[31] according to address of participating women at Follow-Up. Decile 1 is the least deprived and decile 10 is the most deprived.

[¶] Defined as any of: visual impairment, hearing impairment, language delay, motor delay, cognitive delay, unspecified developmental delay, cerebral palsy, autism spectrum disorder, attention-deficit hyperactivity disorder.

[#] Defined as scoring below the cut-off in one or more of the five areas including communication, gross motor, fine motor, problem-solving and personal-social of the ASQ.[14]

[|] Defined as total difficulties score $\geq$17 on Strengths and Difficulties Questionnaire.[15]

*Statistical significance defined as $P<0.05$.

Abbreviations: ASQ, Ages and Stages Questionnaire; BMI, body mass index; CI, confidence intervals; FPG, fasting plasma glucose; GDM, gestational diabetes; MD, mean difference; n, numerator/total no. of infants with positive outcomes; N, denominator, total no. of infants with available data for outcome analysis; NE, non-estimable; OGTT, oral glucose tolerance test; PG, post-load glucose; RD, risk difference; RR, relative risk; SD, standard deviation.

Table 5. Post hoc analyses for selected five-year maternal and child outcomes, unadjusted and adjusted for maternal ethnicity.

	RR/MD† (95% CI), pairwise *P* values*				Adjusted global *P* value**
	Additional-Treated vs. Non-GDM†	Additional-Treated vs. Both-Criteria†	Missed vs. Non-GDM†	Missed vs. Both-Criteria†	
Maternal outcomes					
Type 2 diabetes or prediabetes (%)					
Unadjusted[a]	4.22 (2.68, 6.65), <0.001	0.81 (0.53, 1.24), 0.331	3.42 (2.08, 5.63), <0.001	0.66 (0.41, 1.05), 0.080	<0.001
Adjusted[b]	3.72 (2.42, 5.72), <0.001	0.85 (0.56, 1.28), 0.423	3.53 (2.17, 5.76), <0.001	0.80 (0.48, 1.31), 0.367	<0.001
Type 2 diabetes (%)					
Unadjusted[a]	13.33 (3.06, 58.11), <0.001	0.77 (0.25, 2.36), 0.644	16.05 (3.93, 65.48), <0.001	0.93 (0.33, 2.59), 0.883	<0.001
Adjusted[b]	11.66 (2.69, 50.61), 0.001	0.75 (0.25, 2.29), 0.612	17.47 (4.28, 71.31), <0.001	1.22 (0.46, 3.26), 0.690	<0.001
Prediabetes (%)					
Unadjusted[a]	3.57 (2.13, 5.99), <0.001	0.82 (0.50, 1.37), 0.453	2.52 (1.38, 4.61), 0.003	0.58 (0.32, 1.06), 0.075	<0.001
Adjusted[b]	3.17 (1.92, 5.23). <0.001	0.84 (0.50, 1.40), 0.505	2.41 (1.33, 4.36), 0.004	0.60 (0.33, 1.09), 0.095	<0.001
Hypertension (%)					
Unadjusted[a]	0.96 (0.49, 1.88), 0.363	0.77 (0.36, 1.64), 0.493	0.70 (0.32, 1.52), 0.314	0.56 (0.24, 1.31), 0.177	0.550
Adjusted[b]	1.01 (0.52, 1.96), 0.99	0.75 (0.35, 1.61), 0.463	0.74 (0.34, 1.62), 0.451	0.55 (0.23, 1.31), 0.178	0.477
BMI (kg/m^2)					
Unadjusted[a]	1.20 (-1.00, 3.41), 0.284	-0.69 (-3.50, 2.12), 0.628	-1.51 (-3.66, 0.64), 0.168	-3.40 (-5.94, -0.87), 0.008	0.033
Adjusted[b]	1.37 (-0.55, 3.29), 0.164	0.10 (-2.31, 2.51), 0.935	-0.60 (-2.48, 1.27), 0.527	-2.20 (-4.43, 0.02), 0.052	0.137
Child outcomes					
BMI z-score					
Unadjusted[a]	-0.36 (-0.78, 0.06), 0.093	-0.23 (-0.72, 0.26), 0.355	-0.48 (-0.89, -0.06), 0.024	-0.35 (-0.84, 0.14), 0.158	0.060

Adjusted[b]	-0.33 (-0.73, 0.07), 0.106	-0.17 (-0.63, 0.30), 0.478	-0.32 (-0.71, 0.08), 0.118	-0.16 (-0.62, 0.31), 0.511	0.068
Any neurodevelopmental impairment[‡] (%)					
Unadjusted[a]	1.14 (0.64, 2.04), 0.649	1.54 (0.73, 3.22), 0.252	0.52 (0.22, 1.21), 0.128	0.69 (0.26, 1.83), 0.457	0.288
Adjusted[b]	1.17 (0.65, 2.08), 0.602	1.56 (0.75, 3.25), 0.230	1.54 (0.74, 3.22), 0.246	0.70 (0.26, 1.90), 0.483	0.274
Any abnormal ASQ score[§] (%)					
Unadjusted[a]	1.33 (0.56, 3.16), 0.521	0.83 (0.31, 2.21), 0.712	1.06 (0.40, 2.81), 0.902	0.67 (0.23, 1.95), 0.455	0.472
Adjusted[b]	0.76 (0.32, 1.81), 0.537	0.75 (0.29, 1.94), 0.546	0.88 (0.33, 2.35), 0.791	0.60 (0.20, 1.80), 0.360	0.582
Emotional-behavioral difficulties[¶] (%)					
Unadjusted[a]	2.33 (0.51, 10.61), 0.276	3.85 (0.35, 42.23), 0.267	1.19 (0.15, 9.33), 0.867	1.97 (0.12, 31.65), 0.628	0.655
Adjusted[b]	2.39 (0.53, 10.86), 0.259	3.98 (0.38, 41.50), 0.246	1.58 (0.21, 11.93), 0.657	3.68 (0.24, 57.06), 0.350	0.495
General health status “Fair” or “Poor” (%)					
Unadjusted[a]	3.94 (1.08, 14.37), 0.038	1.58 (0.36, 6.86), 0.538	1.18 (0.15, 9.31), 0.872	0.48 (0.05, 4.22), 0.502	0.153
Adjusted[b]	3.58 (0.97, 13.22), 0.056	1.53 (0.35, 6.74), 0.568	1.24 (0.15, 10.08), 0.839	0.471 (0.05, 4.34), 0.504	0.350

[†]Treatment effects are given as MD with 95% CIs.

[*]Statistical significance following Bonferroni correction for prespecified pairwise comparisons, defined as $P<0.0167$.

[**]Global P value for comparisons across groups, statistical significance defined as $P<0.05$.

[a] Unadjusted effect estimates are duplicated from Table 3, presented here for comparison purposes.

[b] Adjusted for maternal ethnicity.

Abbreviations: ASQ, Ages and Stages Questionnaire; BMI, body mass index; CI, confidence intervals; FPG, fasting plasma glucose; GDM, gestational diabetes; MD, mean difference; RR, relative risk; SD, standard deviation.

Table 6. Post hoc analyses for selected five-year maternal and child outcomes among individuals in the Additional-Untreated, Additional-Treated, and Non-GDM groups, unadjusted and adjusted for maternal ethnicity.

	RD/RR/MD (95% CI)			
	Additional-Untreated vs. Additional-Treated†	***P* value***	**Additional-Untreated vs. Non-GDM†**	***P* value***
Maternal five-year outcomes				
Type 2 diabetes or prediabetes (%)				
Unadjusted[a]	0.77 (0.43, 1.40)	0.390	3.27 (1.90, 5.60)	<0.001
Adjusted[b]	0.63 (0.36, 1.10)	0.101	2.39 (1.38, 4.13)	0.002
Type 2 diabetes mellitus (%)				
Unadjusted[a]	0.28 (0.03, 2.51)	0.253	3.77 (0.40, 35.67)	0.247
Adjusted[b]	0.31 (0.03, 2.92)	0.300	4.28 (0.42, 43.65)	0.220
Prediabetes (%)				
Unadjusted[a]	0.90 (0.47, 1.74)	0.761	3.23 (1.83, 5.70)	<0.001
Adjusted[b]	0.71 (0.38, 1.34)	0.288	2.29 (1.29, 4.06)	0.005
Hypertension (%)				
Unadjusted[a]	1.97 (0.90, 4.33)	0.087	1.91 (0.17, 3.08)	0.009
Adjusted[b]	1.70 (0.77, 3.80)	0.189	1.94 (1.19, 3.16)	0.008
BMI, kg/m^2				
Unadjusted[a]	1.25 (-1.96, 4.47)	0.441	2.46 (0.17, 4.74)	0.035
Adjusted[b]	-1.73 (-4.63, 1.18)	0.240	-0.24 (-2.29, 1.82)	0.822
Child five-year outcomes				
BMI z-score (±SD)				

Unadjusted[a]	0.07 (-0.46, 0.60)	0.805	-0.29 (-0.73, 0.14)	0.185
Adjusted[b]	-0.20 (-0.74, 0.34)	0.461	-0.53 (-0.94, -0.11)	0.014
Any neurodevelopmental impairment[¶] (%)				
Unadjusted[a]	1.64 (0.82, 3.28)	0.157	1.88 (1.20, 2.94)	0.006
Adjusted[b]	1.86 (0.90, 3.84)	0.091	1.81 (1.13, 2.92)	0.014
Any abnormal ASQ score[#] (%)				
Unadjusted[a]	1.31 (0.43, 3.97)	0.629	1.74 (0.79, 3.81)	0.167
Adjusted[b]	1.50 (0.45, 5.02)	0.502	1.59 (0.70, 3.61)	0.267
Emotional-behavioral difficulties[ǀ] (%)				
Unadjusted[a]	1.88 (0.32, 10.88)	0.478	4.36 (1.21, 15.69)	0.024
Adjusted[b]	2.22 (0.37, 13.51)	0.380	3.43 (0.90, 13.18)	0.072

Results are number (%) or mean (±SD).

[†] The second groups in these pairwise comparisons are the reference groups.

[¶] Defined as any of: visual impairment, hearing impairment, language delay, motor delay, cognitive delay, unspecified developmental delay, cerebral palsy, autism spectrum disorder, attention-deficit hyperactivity disorder.

[#] Defined as scoring below the cut-off in one or more of the five areas including communication, gross motor, fine motor, problem-solving and personal-social of the ASQ.[14]

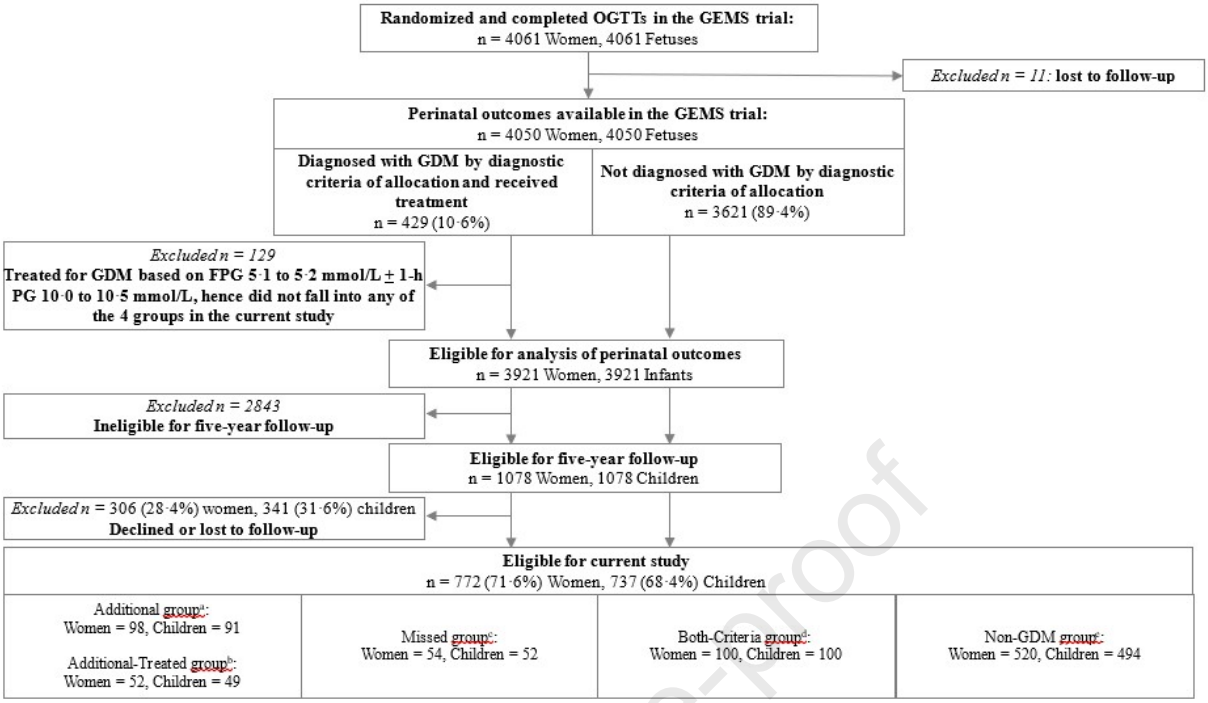
[ǀ] Defined as total difficulties score ≥17 on Strengths and Difficulties Questionnaire.[15]

[a] Unadjusted effect estimates are duplicated from Table 4, presented here for comparison purposes.

[b] Adjusted for maternal ethnicity.

*Statistical significance defined as $P<0.05$.

Abbreviations: ASQ, Ages and Stages Questionnaire; BMI, body mass index; CI, confidence intervals; FPG, fasting plasma glucose; GDM, gestational diabetes; MD, mean difference; RR, relative risk; SD, standard deviation.



Highlights

- The revised diagnostic criteria for gestational diabetes mellitus (GDM) in New Zealand include a fasting plasma glucose (FPG) concentration ≥5.3 mmol/L and 1-h post-load glucose (PLG) concentration ≥10.6 mmol/L on a 75 g oral glucose tolerance test, but with no 2-h PLG.
- This will identify additional women with an elevated FPG and/or 1-h PLG at high risk of diabetes at five-year follow-up but exclude women with only an elevated 2-h PLG, who face similar risks.
- Women only meeting the revised criteria, who are currently not identified as having GDM and therefore not treated, had worse cardiometabolic health at five years, and their children more neurodevelopmental impairments compared with women without GDM.

Clinical relevance

Revising the New Zealand gestational diabetes diagnostic criteria will identify additional women at high risk for future diabetes but miss other women who are currently diagnosed and treated, who have comparable risks. Failure to diagnose, treat and follow-up these women may adversely impact longer-term maternal and child outcomes.

Declaration of Interest Statement

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐ The author is an Editorial Board Member/Editor-in-Chief/Associate Editor/Guest Editor for this journal and was not involved in the editorial review or the decision to publish this article.

☐ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: