Report on

The first meeting of the WHO Technical Advisory Group on Gestational Weight Gain (TAG-GWG)

Virtual meeting
20 and 22 June 2023
Report on

The first meeting of the WHO Technical Advisory Group on Gestational Weight Gain (TAG-GWG)

Virtual meeting
20 and 22 June 2023
Report of the first meeting of the WHO Technical Advisory Group on Gestational Weight Gain: virtual meeting, 20 and 22 June 2023
Table of Contents
ACRONYMS AND ABBREVIATIONS  i

1. INTRODUCTION .........................................................................................................................................................1

2. TWO-DAY MEETING SUMMARY ........................................................................................................................................2

  2.1 Summary of Day 1 .................................................................................................................................................. 2

  Session 1: WHO Global Gestational Weight Gain Standards project .................................................................3
  Session 2: TAG-GWG *modus operandi* ..................................................................................................................3
  Question and answers about Sessions 1 and 2 ..............................................................................................................5
  Session 3: Eligibility criteria and acquired data ..........................................................................................................7
  Final discussion .........................................................................................................................................................8

  2.2 Summary of Day 2 .................................................................................................................................................. 9

  Session 1: Summary of the TAG-GWG feedback on the study-level eligibility criteria .......................................9
  Discussion of Session 1 ............................................................................................................................................9
  Session 2: TAG-GWG working groups (WG) establishment ..................................................................................12
  Session 3: Guidelines on publications .....................................................................................................................13
  Questions and answers about Session 3 ....................................................................................................................13
  Next steps ............................................................................................................................................................14

ANNEX 1. Meeting participants ....................................................................................................................................15
ANNEX 2. Meeting agenda .............................................................................................................................................16
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td>COI</td>
<td>Conflict of Interest</td>
</tr>
<tr>
<td>DOI</td>
<td>Declaration of interest</td>
</tr>
<tr>
<td>DSS</td>
<td>Data Sharing Standards</td>
</tr>
<tr>
<td>GDPR</td>
<td>General Data Protection Regulation</td>
</tr>
<tr>
<td>GWG</td>
<td>Gestational weight gain</td>
</tr>
<tr>
<td>HICs</td>
<td>High-income countries</td>
</tr>
<tr>
<td>KI</td>
<td>Knowledge Integration</td>
</tr>
<tr>
<td>LMICs</td>
<td>Low- and middle-income countries</td>
</tr>
<tr>
<td>MCA</td>
<td>Department Maternal, Newborn, Child and Adolescent Health and Ageing</td>
</tr>
<tr>
<td>NFS</td>
<td>Department of Nutrition and Food Safety</td>
</tr>
<tr>
<td>PI</td>
<td>Principal investigator</td>
</tr>
<tr>
<td>SRH</td>
<td>Sexual and Reproductive Health and Research</td>
</tr>
<tr>
<td>TAG-GWG</td>
<td>Technical Advisory Group on Gestational Weight Gain</td>
</tr>
<tr>
<td>WG</td>
<td>Working group</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

The World Health Organization (WHO) initiated a normative process to develop global gestational weight gain (GWG) standards and optimal GWG ranges based on these standards to reduce the risk of maternal and infant adverse outcomes. This normative process will address the lack of evidence-based public health tools for monitoring GWG that apply to women of all body mass index (BMI) levels and geographic locations.

This project is led by the WHO Departments of Nutrition and Food Safety (NFS) and Sexual and Reproductive Health and Research (SRH), with contributions of the Department of Maternal, Newborn, Child and Adolescent Health and Ageing (MCA), in partnership with a research group (further referred to as Partner Working Group), including scientists from the Federal University of Rio de Janeiro (Brazil), Cornell University (USA), and the University of British Columbia (Canada). The Steering Committee is composed of some members of these institutions (referred as WHO Secretariat and External members in Annex 1).

The project also relies on the expertise of a multidisciplinary Technical Advisory Group on Gestational Weight Gain (TAG-GWG). The terms of reference of the TAG-GWG were set out in a WHO’s call for experts on March 2023. The TAG-GWG is a regional-balanced group of experts with a range of technical knowledge, skills, and experience on:

- Maternal and child health/nutrition
- Obstetrics, Gynaecology, and Perinatology (researchers and clinical practitioners)
- Nutritional epidemiology
- Perinatal epidemiology
- Medical statistics
- Public Health

Each TAG-GWG member filled a declaration of interest (DOI) prior to the appointment and were asked to declare any conflict of interest before the meeting. The main focus of the TAG-GWG is to advise on developing the GWG standards and optimal ranges. More specifically, their advice is sought, but not limited, for:

- the development of a detailed research protocol, which will encompass the definition of the eligibility criteria for determining a sample that is as prescriptive as data and evidence allows,
- the methods and approaches to develop the global GWG standards and optimal ranges.

The development and outcome of these activities will be communicated and discussed with the WHO/UNICEF Technical Expert Advisory Group on Nutrition Monitoring (TEAM).
This report includes the summary of key topics discussed during the first meeting of the TAG-GWG held virtually on 20 and 22 June 2023 (See the agenda in Annex 2) and outlines the preliminary components of the TAG-GWG workplan for the period 2023-2025.

2. TWO-DAY MEETING SUMMARY

The objective of the meeting was to introduce the TAG-GWG members to the GWG Steering Committee of the Development of Global GWG Standards project, to present the timeline and tentative three-year workplan, and to discuss key technical details and *modus operandi*.

On the first day, The NFS Director, Dr Francesco Branca, welcomed all the participants of the meeting, which included members of the TAG-GWG members who were able to participate and the GWG Steering Committee, as well as two external observers (See the participants and regrets of the meeting in Annex 1).

The GWG Steering Committee delivered presentations on key topics during the two-day meeting with several sessions of questions from the TAG-GWG members, which were answered by members of the GWG Steering Committee.

The main topics addressed during the meeting were:

1. Introduction to the Development of the WHO global GWG Standards project
2. TAG-GWG *modus operandi*, including the main roles of the chair and co-chair
3. Study-level eligibility criteria
4. TAG-GWG working groups (WG) establishment
5. Guidelines on publications

Specifically, the second day of the meeting included a presentation summarizing TAG-GWG members’ feedback to the technical background document (i.e., study-level eligibility criteria), which they received two weeks before the meeting. A summary of each proposed criterion from which the TAG-GWG members commented, additional comments from the TAG-GWG members during the meeting, and the GWG steering committee decisions are presented in the tables below.

2.1 Summary of Day 1

This first TAG-GWG meeting was chaired by Dr Elaine Borghi and co-chaired by Professor Gilberto Kac. The meeting was recorded, but participants were asked if there were any objections beforehand. Then, some good etiquette practices for virtual meetings were kindly requested.

TAG-GWG members introduced themselves, shared their expected contributions to the Development of Global GWG Standards project, and were asked to declare any *conflict of interest* (COI). None of the TAG-GWG members declare any COI.

Thereafter the proposed agenda for Day 1 was presented.

---

Session 1: WHO Global Gestational Weight Gain Standards project

The GWG Steering Committee introduced TAG-GWG members to the WHO Global GWG Standards project, including the objectives, rationale, and the two main outcomes:

1. Global GWG Standards that can be used in all countries and settings for monitoring GWG across all pre-pregnancy body mass index (BMI) levels, and
2. Optimal GWG ranges based on the new standards.

The organizational flowchart was also presented, composed of the GWG Steering Committee and two Technical Advisory Groups (TAG-GWG and TEAM).

The two phases of the project, corresponding to each of the main outcomes, were described as follows:

- **Phase 1.** Development of global GWG standards according to gestational age and stratified by pre-pregnancy BMI;
- **Phase 2.** Identification of ranges on the GWG curves associated with the lowest risks of adverse maternal and infant outcomes.

It was added that at the end of these phases, WHO plans to update existing recommendations for GWG monitoring during the antenatal care period.

The approach to be used in each phase of the project was introduced to the TAG-GWG (see Table 1 on page 4), as well as specific advice and contributions expected from the TAG-GWG through research questions.

This session was finalized with the presentation of the five milestones and the timeline from May 2023 to September 2025.

Session 2: TAG-GWG modus operandi

The session began with the presentation of the process followed by the GWG Steering Committee to establish the TAG-GWG, which is composed of external experts acting in a personal capacity (i.e., not representing any external entity, authority, or government) representing the six WHO geographical regions (Figure 1).

It was outlined that the **focus of the TAG-GWG** is to provide advice on technical and/or scientific issues of identified topics. Still, they can also offer strategic advice if required and not make decisions for or speak on behalf of the WHO. In addition, it was emphasized that the TAG-GWG members should represent their personal views and may not seek or accept

![Figure 1. Geographical representativeness of the TAG-GWG members according to WHO regions. AFRO — African Region; AMRO — Region of the Americas; SEARO — South-East Asian Region; EURO — European Region; EMRO — Eastern Mediterranean Region; WPRO — Western Pacific Region](image-url)
instructions from any entity or authority and that all recommendations by TAG-GWG should be based on a broad consensus among the members before submitting to WHO.

**Table 1.** Approach to be used in phases 1 and 2 in developing Global GWG Standards.

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Definition of study-level and individual-level eligibility criteria</td>
<td>1. Definition of optimal GWG ranges based on the standards</td>
</tr>
<tr>
<td>2. Proposed data acquisition (i.e., systematic searches and global call for data) and harmonicization strategies of key variables</td>
<td>▪ Literature review to identify methods to define optimal ranges</td>
</tr>
<tr>
<td>3. Gestational weight gain calculation</td>
<td>▪ Definition of maternal and child outcomes to be considered in the analyses</td>
</tr>
<tr>
<td>▪ Definition of the type of GWG to be used</td>
<td>▪ Definition of data acquisition strategies</td>
</tr>
<tr>
<td>▪ Definition of the initial weight to be used to calculate GWG</td>
<td>▪ Data analyses and sensitivity analyses</td>
</tr>
<tr>
<td>▪ Sensitivity analysis plan</td>
<td></td>
</tr>
<tr>
<td>4. Identification of statistical GWG outliers</td>
<td></td>
</tr>
<tr>
<td>▪ Definition of methods to flag outliers (i.e., cross-sectionally and longitudinally)</td>
<td></td>
</tr>
<tr>
<td>▪ Definition of criteria to remove/include values considered outliers</td>
<td></td>
</tr>
<tr>
<td>5. Heterogeneity assessment of GWG</td>
<td></td>
</tr>
<tr>
<td>▪ Definition of methods to evaluate heterogeneity (i.e., cross-sectionally and longitudinally)</td>
<td></td>
</tr>
<tr>
<td>▪ Definition of thresholds/criteria to consider the data homogeneous/not homogeneous</td>
<td></td>
</tr>
<tr>
<td>6. Development of the GWG standards</td>
<td></td>
</tr>
<tr>
<td>▪ Review of methods to construct GWG standards</td>
<td></td>
</tr>
<tr>
<td>▪ Development of the centile curves by pre-pregnancy BMI</td>
<td></td>
</tr>
<tr>
<td>▪ Sensitivity analyses</td>
<td></td>
</tr>
</tbody>
</table>

Notes: GWG – Gestational weight gain; BMI – Body mass index.

The specific activities expected from the TAG-GWG that were presented in this session are described below:

- Critical review of background documents
  - Protocols concerning approach and methodologies on data acquisition, eligibility criteria for studies, and individual-level inclusion in the reference sample
  - Protocol on methodology for the development of the GWG Standards (curves)
  - Plan of analysis for definition of the GWG optimal ranges
- Support search on data/evidence
  - Underlying pooled dataset containing information on key variables
- Systematic reviews to support the identification of studies and evidence to support the work on optimal GWG ranges
- Contribute to key publications
- WHO Secretariat will decide all publications content and lead authors
- Key contributors will be listed as authors “for the Technical Advisory Group on Gestational Weight Gain”.

Moreover, the most relevant items of the *code of conduct* expected from the TAG-GWG were explained: disclose all relevant interests and biases, report any material changes to disclosed interest, respect the confidential nature of meetings and decisions, and not make any public statements of the work without consent by WHO, not to engage in activities that may bring harm to WHO, to represent views in a personal and individual capacity, and actively and fully participate in discussions and deliberations.

Additionally, aspects related to the COI were discussed. First, it was emphasized that TAG-GWG members should update their DOIs before every meeting and that they are responsible for continuously disclosing any changes in their status of COI. Secondly, the TAG-GWG members were informed about the measures that would be taken in the event of a COI, such as:

- Conditional participation (minor COI): an expert continues in the TAG-GWG, but the conflict of interest is disclosed at the start and the meeting report.
- Partial exclusion (moderate COI): expert involvement is limited by a) excluding the expert from that portion of the meeting of work where the conflict was identified and b) excluding the expert from participating in the decision-making process.
- Total exclusion (significant COI): expert is excluded from the meeting or work altogether where the nature of the conflict of interest is too significant vis-à-vis the overall objective or were limiting the expert’s involvement to only a portion of the meeting or work is not feasible.

Thirdly, a few types of COI (i.e., direct, of others, bias, unfair of competitive advantage, and tobacco) were described to the TAG-GWG for their consideration.

The session was finalized with the TAG-GWG working modality proposal: 1) TAG-GWG will meet in person once a year and once virtually; 2) the quorum shall typically be two-thirds of the TAG-GWG members; and 3) TAG-GWG membership will be terminated in the event of any of the following situations:

- Expert fails to attend two consecutive TAG-GWG meetings;
- Change in affiliation that results in a COI; or
- Lack of professionalism (breach of confidentiality).

**Question and answers about Sessions 1 and 2**

The main issues discussed were:

- The first question raised by the TAG-GWG was regarding the terms Standards versus References. They defined as prescriptive a sample that includes women with pre-pregnancy that are considered unhealthy (e.g., underweight and obese) will distort the fundamental principles of “standards”, creating confusion to other standards that might come after child growth standards, for example.
The GWG Steering Committee acknowledged and clarified the following:

- It is written in several passages of the project documents that the approach will be “as prescriptive as possible”.
- The GWG Steering Committee recognised that the label “standards” is too strong, but also the word “references” or simply “charts” might decrease the value behind all the work that this project entails to ensure every woman in the globe can achieve the best weight gain pattern as possible that will lead to a healthy delivery, post-partum recovery, and healthy children.
- It was requested to the TAG-GWG to stick to “standards” for the moment, based on those principles (healthy weight gain, delivery, post-partum, and children, regardless of their pre-pregnancy BMI level), until everyone arrive to the point to know better what are the limitations behind the sample, evidence, variables covered by existing data, and impacts to be observed by the several factors to be explored/studied.

- The immediate question from the TAG-GWG was what will be the health outcomes (negative and positive) that will be important and possible (available evidence) to determine the “semi-prescriptive” sample? What are the KEY interventions to concentrate on?
- There was a question about the process that will follow for the work, specifically related to the finalization of the eligibility criteria.
  - The GWG Steering Committee clarified that:
    - The document on the study-level eligibility criteria is the first deliverable and timely needed, as it will impact the open global call for data soon to be advertised, especially the set of variables (mandatory and additional) that will be needed.
    - The discussions on this matter will be held on Day 2, hopefully advancing towards TAG-GWG recommendations. However, there will be opportunities for further discussions and TAG-GWG feedback via email.
    - Regarding other deliverables, the WGs will be formed to streamline workstreams that will feed into the next deliverables.
- Another point raised by the TAG-GWG was whether other stratifications, such as age, regions or other context-specific variables, will be considered in addition to pre-pregnancy BMI.
  - The GWG Steering Committee clarified that:
    - All evidence-based information should be considered for sensitivity analysis that will feed into final recommendations.
- The criteria to decide the homogeneity/heterogeneity of the pooled data is also a point raised by TAG-GWG.
  - It was clarified by the GWG Steering Committee that:
    - Analyses are also planned to investigate those, and it should be clearly specified in the protocol, especially on criteria to be used for driving evidence-based recommendations to WHO.

Finally, the GWG Steering Committee indicated that all discussions and decisions will be duly documented.
Session 3: Eligibility criteria and acquired data

This session included presentations about updates on the study-level eligibility criteria, data acquisition strategies, the global call for data, as well as data governance and harmonization.

The presentation of the proposed study-level eligibility criteria included a description in-depth of the list of criteria for studies to be included in the pooled dataset and overall information on the list of mandatory and important (desirable) variables.

During the data acquisition strategies presentation, it was explained to the TAG-GWG that a systematic review was performed for low- and middle-income countries (LMICs), based on the Harvard GWG pooling project. In contrast, for high-income countries (HICs), a systematic search and an additional search of known HIC studies were performed. The review process applied for the list of studies from LMICs and HICs was presented. This presentation ended with the next steps, which included an overview of the main goals to be achieved during the first year.

The TAG-GWG was then informed that a set of key documentation are being developed for the global call for data, such as a data sharing standards (DSS) file with a template to minimize the harmonization burden and a data sharing agreement for studies that do not have this. It was also communicated that an open call for data on GWG will be published on the WHO website and that TAG-GWG members were encouraged to spread the global call with and through their network.

Regarding data governance, the structure of the WHO GWG repository was presented, which has three levels (Figure 2). It was also clarified that all the microdata sets that will be shared will be housed in a secured WHO-managed SharePoint environment (an online, secure document repository developed and maintained by Microsoft®) and that this repository is private and compliant with General Data Protection Regulation (GDPR).

---

**Figure 2.** WHO Gestational Weight Gain (GWG) Repository

Figure 2 explanation included the following content:

- The first two levels (orange and green) are only accessible to the WHO Steering Committee. WHO staff not working on the GWG project and other researchers who supply data to the project will not get access to these levels.
- The third level (blue, purple, and red) is only accessible to the study’s principal investigator (PI) or data provider supplying data to the GWG project.
It was added that data providers or PI will only have access to folders related to the study shared and that they will not be able to get access to other folders (e.g., the data provider given access to the blue folder will not get access to the purple or red folders even though they are on the same level). It was stressed that data access will be limited to the people explicitly outlined in each study’s data sharing agreement. The three steps of the dataset sharing workflow was also presented: 1) signing data agreement; 2) shared folder invitation; and 3) verification link.

It was stated that the data governance group meets nearly every week to develop a plan for data acquisition and a database structure. In addition, it was stated that efforts were done to starting acquiring data from 56 studies within the Knowledge Integration (KI) from the Bill and Melinda Gates Foundation, and other studies identified. Data not yet obtained will be sought out by WHO through its standard procedures, according to the nature of the study.

The session ended with some examples representing the data harmonization approach to will be used in this exercise.

Final discussion

In the final discussion, the main issues raised by the TAG-GWG members were:

a. There was a question regarding the use of administrative data in the pooled dataset, and the presenter clarified that the use of administrative data is envisioned and reflected in the eligibility criteria document.

b. There was also a question regarding the possibility for the TAG-GWG members to suggest other studies not identified in the initial review and any plans to update the Harvard GWG pooling project review. The GWG Steering Committee clarified that both eligibility criteria and the list of studies are just initial to kick-off the work and will evolve with contributions from TAG-GWG, which is what WHO is requesting.

c. There was a suggestion to show detailed characteristics of the studies excluded in the initial review to evaluate the need to be more flexible in the proposed criteria. The presenter clarified this is just an initial exploration to give an idea, but both criteria and the list of studies will evolve, and re-analysis will be performed and well documented once the final eligibility criteria is available.

d. There was also a comment regarding the lack of data on the first trimester of pregnancy and the need for more flexibility on this criterium, especially for low- and middle-income countries. The suggestion is well taken, and a more flexible approach can be followed if TAG-GWG’s final recommendation includes this modification.

The TAG-GWG members recommended several references, which were added to the TAG-GWG Sharepoint (Technical Advisory Group on GWG - Documents - All Documents [sharepoint.com]). Also, the WHO Secretariat shared the email for contact (nfsdata@who.int) and other useful links: Technical Advisory Group on Gestational Weight Gain (TAG-GWG) (who.int) and Nutrition and Food Safety (who.int)
2.2 Summary of Day 2

The second day of the meeting was also recorded because participants did not refer to any objections. Also, good etiquette practices for virtual meetings were reminded. Thereafter the proposed agenda for Day 2 was presented.

The meeting started with a summary of the discussions during Day 1. A set of key points raised in the first meeting were clarified. Then the procedures for nominating the TAG-GWG chair and co-chair were presented, and it was informed that the rotation period would be annual. The chair and co-chair’s main tasks were described as follows:

- Chair TAG-GWG meetings (will alternate)
- Meet with the GWG Steering Committee and WGs to discuss agenda and post-meeting debriefs
- Liaise with the GWG Steering Committee TAG-GWG WGs between meetings to provide updates on the progress of the work
- Coordinate feedback from TAG-GWG members towards drafting recommendations

Session 1: Summary of the TAG-GWG feedback on the study-level eligibility criteria

A first version of the study-level eligibility criteria was shared with the TAG-GWG members for their feedback. During the meeting, the TAG-GWG feedback on the study-level eligibility criteria was presented and discussed by topic. All these comments were taken into consideration by the GWG Steering Committee and an updated version of the eligibility criteria document was produced and shared with the TAG-GWG for a final round of comments. The final document is available (see Annex 3).

Discussion of Session 1

The discussion was focused on five main topics: 1) Self-reported pre-pregnancy weight and height; 2) Gestational age estimation; 3) Weight measurements; 4) Sample size; and 5) Mandatory variables. It was established a fixed time to discuss each topic to adhere to the time stipulated in the agenda. Some questions were elaborated to stimulate the discussion (Table 2).

Table 2. Questions to start the discussion of each of the five topics.

<table>
<thead>
<tr>
<th>Topic</th>
<th>TAG-GWG comments</th>
</tr>
</thead>
</table>
| Self-reported pre-pregnancy weight and height: should we use self-reported pre-pregnancy weight and height? | - A TAG-GWG member asked permission to bring others attention to the numbers (sample size) of the eligible studies. Is there an estimation for the sample size that the WHO requires for a study to be considered eligible?  
- The GWG Steering Committee answered there will be a specific session later to discuss sample size. Also, The GWG Steering Committee brought to the discussion the importance of more debate about quantity and quality regarding the data from the studies WHO hopefully will have and asked TAG-GWG members to concentrate on the key question.  
- Another TAG-GWG member provided a link on the chat. She suggested using the Delphi process for more transparency in the discussions and to reach a consensus.  
- The GWG Steering Committee answered on the chat that using Delphi is a good idea before the recommendations are defined.  
- The same TAG-GWG member said in the chat that she agreed to use self-reported pre-pregnancy weight. Otherwise, data will be dramatically reduced. |
- Another TAG-GWG member suggested having a validation study to use pre-pregnancy weight as an initial weight, comparing it with a gold standard. This would provide a better justification for using pre-pregnancy weight.
- The GWG Steering Committee answered that few studies will provide measured pre-pregnancy weight to be used as a gold standard. The validation method for self-reported pre-pregnancy weight can be debated within the WG. It was reminded that some studies already evidenced the agreement between self and measured pre-pregnancy weight, and this also would be addressed within the WG. Also, it was emphasized that we would like recommendation from the TAG-GWG regarding the decision to use self-reported pre-pregnancy weight as an initial weight.
- A TAG-GWG member mentioned she explored this issue in a previous research and found a good agreement between self-reported and measured weight in the first trimester. She reminded all that if we consider the measured weight in the first trimester as the initial weight, it will not be possible to calculate the cumulative weight gain in the first trimester.
- Another TAG-GWG member agreed to use self-reported weight as initial weight. Although she raised attention to some points: there is a need to check if the self-reported would change the trajectory of the weight gain and there are different factors related to measured or self-reported weight among countries that should be addressed.
- A TAG-GWG member also raised similar concerns about the differences between HICs and LMICs. He suggested using validation method and a sensitivity analysis for this.
- Another TAG-GWG member agreed with the others about all the limitations of self-reported pre-pregnancy weight. However, she believes it is still a good variable to use based on her previous experience. She also brought to the attention that most of the pre-pregnancy weight provided in clinical setting data would be self-reported. She finalized saying that, later, a sensitivity analysis can help solve many of these concerns.
- Another TAG-GWG member said that we need to carry out a transparent process regarding protocols, whatever decision we make on this. He agreed to use the pre-pregnancy weight a priori and addressed the need to establish a protocol to guide our decision. Also, performing a sensitivity analysis will help with this.

### Gestation age estimates: should we use the LMP date without US confirmation?

- A TAG-GWG member said that if we require the United States to confirm gestational age, this could introduce selection bias, as the United States is most likely to be available in developed countries. This is also a matter of quantity versus quality. If we sacrifice the data quality, attempting to have better quantity, we may need to apply a weighting method. Having those studies with only LMP would make our data more representative.
- Another TAG-GWG member agreed that some countries would be under-represented as they do not have this data and that LMP has limitations. Although there is a need for confirmation by the United States, we need quality data.
- Another TAG-GWG member agreed to use the US confirmation, aiming to preserve the quality of the data.
- Another TAG-GWG member also agreed to the comments made. She agreed with Molin regarding her concern about the generalizability of the data. Maybe we need to consider LMP if there is a geographical under-representation and apply sensitivity analysis.
- The GWG Steering Committee related that since WHO is trying to develop standards, it is better to consider standard measurements and what WHO already recommends. The GWG Steering Committee believes using only LMP (without ultrasound confirmation) would bring up errors.

### Weight measurements: Should we consider fewer than three measurements? Should we consider accepting a study that lacks a weight measurement in the first trimester, conditional on having more weight measurements in the

- A TAG-GWG member said that as we are attempting to design pooled global data, the requirement of three weight measurements would not be justified. Considering his point of view, two weight measurements would be enough to calculate GWG, and that GWG would contribute to a datapoint at whatever time of gestational age. In addition, neither 1 measured weight per trimester nor 5 measured weights for administrative data are necessary. His overall point of view is that those requirements are too restrictive.
- Another TAG-GWG member agreed with the previous TAG-GWG member regarding at least two weight measurements being enough. However, this decision depends on the study design and the outcomes WHO are considering.
- The GWG Steering Committee asked to the first TAG-GWG member who asked to this question to clarify his point of view. Is he considering enough the initial and final measured weights, or would there be 2 measured weights besides the initial one?
### Sample size: what is the reasonable sample size for a study to be considered eligible to be included in the pooled dataset?

- **A TAG-GWG member** explored the issue of the study sample size to construct a standard itself and the importance of the sensitivity analysis in this process. He mentioned that the WHO suggests 200 as a sample size. Also, he raised another issue regarding the precision we may get on considering a particular sample size.
- **The GWG Steering Committee** commented on the sample size criteria explaining that it would be 100 individuals from any (not all) BMI category.
- **Another TAG-GWG member** said the data distribution would be more important than the sample size. We need to make sure the pooled data are representative of geographical area. She suggested that if the pooled data may not be appropriately representative, a correction method could be applied, perhaps using weighting methods to balance the region contribution.
- **Another TAG-GWG member** brought the challenge to construction standards to women with obesity. He also discusses that to construct a global standard, studies from all countries would not be needed. From his perspective, the sample size is more important than a general geographical representation.
- **A TAG-GWG member** suggested using a dataset held by WHO to answer many of the raised questions. According to her, this pooled RCTs dataset has data on healthy women's gestational weight gain.
- **The GWG Steering Committee** emphasized that WHO will consider all the comments. Also, confirmed the information given by Eric regarding the number of 200 for the sample size for standard purposes and that WHO will apply different analyses to guide our decisions on the sample size.
- **A TAG-GWG member** commented on the differences between systematic measurement error and bias. These bias issues need to be addressed in a different context in terms of associations with outcomes.

### Mandatory variables: should we include additional mandatory variables such as hypertensive disorders of pregnancy, gestational diabetes, stillbirth, neonatal death, and unplanned caesarean delivery?

- **A TAG-GWG member** said that if we do not consider gestational diabetes (GDM) as a mandatory variable, we may end up with a chart that does not represent a “normal” GWG. This variable is closely related to GWG and can impact weight gain trajectory. She suggested including GDM and hypertensive disorders as mandatory variables.
- **The GWG Steering Committee** explored the possibility of missing data on this issue. These are very important variables, but there will be many studies missing these data.
- **Another TAG-GWG member** agreed with the GWG Steering Committee that many studies will not have this information. From his point of view, to get data to construct the chart it is needed minimal variables, such as weight, gestational age, etc. After that, to reach the second objective, we need to link it with outcomes, making it crucial to get variables considered “key” outcomes. He finalized, saying it is important to get information from studies regarding GDM and other variables related to GWG.
- **Another TAG-GWG member** agreed with the other TAG-GWG member on not considering these variables as mandatory.
After receiving TAG-GWG feedback and the fruitful discussions during the first TAG-GWG meeting, the original proposed study-level eligibility criteria document was edited.

**Session 2: TAG-GWG working groups (WG) establishment**

The structure and operationalization were presented to the TAG-GWG members highlighting that the process to join a group is voluntary. Ideally, the number of members across the three groups should be balanced; each group should have a leader selected within the group; and, recommendations by the WGs will be submitted to the TAG-GWG. For the first year of the project, three WGs were proposed to the TAG-GWG. The objectives and expected outputs of each WG is described in **Table 3**.

**Table 3. Objectives and expected outputs by working group of the first year**

<table>
<thead>
<tr>
<th>Working Group</th>
<th>Objective</th>
<th>Expected outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual-level eligibility criteria</td>
<td>• Propose individual-level eligibility criteria to be considered in the development of the GWG standards</td>
<td>• Recommend a list of individual-level criteria to be applied to define the sample for the development of GWG standards/charts//references</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Review/adjust the list of criteria taking into consideration the availability of the data in the eligible studies</td>
</tr>
<tr>
<td>Identification and harmonization of datasets</td>
<td>• Propose additional search strategies to identify eligible studies for the pooled dataset</td>
<td>• Propose state-of-art methods/approaches to harmonize key variables from different datasets (e.g., gestational age, pre-pregnancy body mass index), including the hierarchy of methods to be used in the process</td>
</tr>
<tr>
<td></td>
<td>• Provide feedback to harmonization strategy (e.g., key variables, units, levels) – <em>WHO will carry out the harmonization process based on those recommendations</em></td>
<td>• Provide guidance on the utilization of methods available for the combination of datasets without access to the individual participant for the development of GWG standards</td>
</tr>
<tr>
<td>Methods for the development of the GWG standards</td>
<td>• Propose methodological approaches to develop the GWG standards</td>
<td>Propose recommendations on:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Agreement on analyses to define the initial weight to be used to calculate cumulative GWG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Methods to flag statistical outliers (cross-sectional and longitudinal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Methods for quantifying heterogeneity when pooling data from multiple sources for the same country</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Statistical models to be considered for the development of the GWG standards, including diagnostic and validation procedures to be adopted in each model</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sample size to model the GWG centiles considering the proposed methods accompanied with rationale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Methodological approaches to prevent data imbalances, particularly by geographic distribution, across pre-pregnancy BMI levels, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Methods for assessing inter-country heterogeneity and recommended sensitivity analyses to guide WHO decisions on the presentation of the centiles</td>
</tr>
</tbody>
</table>

Two additional groups were proposed for the second and third year: 4) Methods for the definition of optimal GWG ranges; 5) Tools for dissemination of the standards. It was stated that, ideally, the WGs
should have four TAG-GWG members each and each TAG-GWG member should be at least in one WG. Also, it was encouraged that the TAG-GWG members sent an order of priority of their participation in the WGs to the WHO Secretariat email address. The deadline provided for volunteering to the WGs was 3 July 2023, and it was mentioned that WHO Secretariat will send a reminder.

Session 3: Guidelines on publications

The presentation stated that material that represents official WHO views should be issued under WHO corporate authorship only and WHO will decide on which materials will be published. Regarding all peer-reviewed publications, it was stated that these should be planned and approved by WHO, and responsibilities should be defined in advance. In case individuals have made a substantial intellectual contribution (e.g., literature review, conceptualization, methodology, discussion) to the development of a publication, they person should be authors or included in the acknowledgments, at WHO discretion. In addition, all publications will be “for the WHO Technical Advisory Group on Gestational Weight Gain” and will include the list of TAG-GWG members. It was informed to the TAG-GWG that all publications will go through WHO clearance processes.

Questions and answers about Session 3

- **A TAG-GWG member** asked to clarify about authorship of the ones who would make substantial contributions.
  - The GWG Steering Committee clarified that WHO will be the author on the official documents, such as Guidelines. TAG-GWG members could be authors in non-official documents, such as publications resulting from any working subgroup, as long as it is accepted by all TAG-GWG members. Also, in such kind of publications the “on behalf of WHO...” must be stated.

- **Another TAG-GWG member** asked about publications proposing by TAG-GWG members, giving, as an example, the many key questions raised in the current meeting that could be peer reviewed and be published. They asked about the process for it.
  - The GWG Steering Committee answered that the TAG-GWG could submit any proposal publication to WHO that is related to the TAG-GWG working on this initiative. WHO would do the clearance process. Also, any publication that comes up should include an information that it pertains to a future WHO product.

- **Another TAG-GWG member** raised a question regarding individual and group ideas for publications. At instance, there would be many TAG-GWG members with ongoing work related to GWG that could match the TAG’s group particular proposal idea.
  - The GWG Steering Committee answered that, in this case, the TAG-GWG member can still work on their peer-review publications and publish, taking into consideration that these publications should not result as a perceived or actual conflict of interest. Additionally, the content of these publications should not be break the confidentiality breach of the internal conversations coming from TAG-GWG, emphasizing that the TAG-GWG member must be free of any conflict of interest.

- **TAG-GWG member**: asked to clarify this issue, regarding the need to state a conflict of interest as a member of the TAG-WHO in any individual publication.
  - The GWG Steering committee said that this is a very delicate issue. The WHO invited TAG-GWG members based on their individual capacities. There is a code of conduct that must be taken by all the TAG-GWG members. Considering the intellectual contributions and exchanges within the groups, the TAG-GWG member that would feel, for any particular reason, at any time during this initiative,
Meeting report on the 1st WHO Technical Advisory Group on Gestational Weight Gain
20 and 22 June 2023

that he/she individual decisions would impact the integrity of the entire group, must inform the WHO Secretariat.

- **Another TAG-GWG member** asked about conflict of interest giving an example where a TAG-GWG member would be a co-author in a publication very related to what would be discussing within the TAG, such as GWG association with outcomes in different contexts.
  - *The GWG Steering Committee* explained that WHO cannot ask anyone to not take credit on current work or not engage on new one. However, depending of the severity of conflict of interest that the publication may cause, TAG-GWG member’s participation could be restricted by excluding the member from parts of meetings or requesting to abstain from voting on decisions that would be influenced by any opinion related to the individual primary research or ongoing work efforts.
  - Transparency regarding disclosure of interest will be always requested.

- **A TAG-GWG member** understood that WHO would guide the TAG-GWG members in what to consider an important conflict of interest and Femi confirmed this could be done.

- **A TAG-GWG member** made a question related to conflict of interest. They wanted to know if it is needed to declare a conflict of interest in a publication not related to WHO initiative, with a statement that one is a WHO TAG-GWG member.
  - *The GWG Steering Committee* answered that there is no need to declare a conflict of interest on this matter, and author should not to declare is a TAG-GWG member. This declaration is only needed in a WHO TAG-GWG publication.

- **A TAG-GWG member** suggested WHO to provide more guidance on this matter, perhaps with a list or guideline.
  - *The GWG Steering Committee* will look for something within WHO that could be shared with the TAG-GWG and serve as guidance on conflict of interest. Also, sometimes this kind of issue does not have prompt clear solutions and needs to be debated with WHO relevant departments (e.g. WHO Compliance, Risk Management and Ethics Department (CRE))

- **A TAG-GWG member** asked whether all the previous TAG-GWG work could configure any conflict of interest.
  - *The GWG Steering committee* reinforced that WHO will bring up with guidance on this matter. Also, it was addressed the confidentiality form taken by the TAG-GWG members and finalized reinforcing the WHO recommendations on conflict of interest and transparency.

Next steps

The TAG-GWG were informed about the next steps below:

- Finalize the eligibility criteria
- Launch the global call for data (mid-July 2023)
- Harmonize the data
- Review all submitted studies against the eligibility criteria
- Next TAG-GWG meeting (in-person in Geneva)
  - The 2nd TAG-GWG meeting is plan to be held in the second half of November
  - A Doodle poll will be shared shortly

The meeting was finalized with closing statements by Dr Elaine Borghi, reminding the deadline of the 30 June 2023 for feedback on the study-level eligibility criteria document and thanked all the participation of all the members in the first TAG-GWG on GWG meeting.
ANNEX 1. Meeting participants

TECHNICAL ADVISORY GROUP ON GESTATIONAL WEIGHT GAIN (TAG-GWG)

- Professor Annick Bogaerts (Belgium)
  Midwife, perinatal epidemiology, lifestyle interventions (RCT), mental health
- Professor Amel Fayed (Egypt)
  Public health and biostatistics
- Dr S. M. Tafsir Hasan, MD MSc (Bangladesh)
  Maternal Nutrition, public health
- Dr Kari Johansson (Sweden)
  Perinatal epidemiology
- Professor Lisa M. Bodnar (United States)
  Epidemiology, maternal nutrition, adverse pregnancy outcomes
- Dr Cinthya G. Muñoz-Manrique (Mexico)
  Maternal-neonatal mortality and morbidity in high-risk women
- Dr Eric Ohuma (Kenya)
  Medical statistician on maternal, newborn and child health
- Dr Jodie Dodd (Australia)
  Obstetrician and maternal foetal medicine specialist research – not available to participate
- Professor Vincent Jaddoe (Netherlands)*
  Paediatric Epidemiology
- Professor Aris Papageorghiou (Germany)
  Maternal and perinatal health, maternal disease in pregnancy, foetal diagnosis and therapy and ultrasound
- Dr Nandita Perumal (India)
  Perinatal epidemiology and global maternal and child health
- Professor Suzanne Phelan (United States)
  Kinesiology, public health, maternal and child nutritional assessment
- Dr Dayana Rodrigues Farias (Brazil)
  Nutritional epidemiology
- Professor Harshpal Singh Sachdev (India)
  Paediatrician, paediatrics and clinical epidemiology, maternal and child nutrition
- Professor Helena Teede (Australia)
  Public health, epidemiology, healthy gestational weight gain and health in women of reproductive age
- Dr Molin Wang (China)
  Epidemiology, biostatistics, gestational weight gain assessment

GWG STEERING COMMITTEE

WHO Secretariat

- Francesco Branca (NFS Director)*
- Elaine Borghi (MNF/NFS)
- Giovanna Gatica-Domínguez (MNF/NFS)
- Monica Flores-Urrutia (MNF/NFS)
- Richard Kumapley (MNF/NFS)
- Olufemi Taiwo Oladapo (SHR/MPH)
- Özge Tuncalp (SHR/MPH)
- Allisyn Carol Moran (MCA/MAH) – not available to participate
- Maurice Bucagu (MCA/MPH) – not available to participate

External members

- Gilberto Kac (Universidade Federal do Rio de Janeiro)
- Jennifer Hutcheon (University of British Columbia)
- Kathleen Maher Rasmussen (Cornell University) – not available to participate
- Mariana Arruda Silva (Universidade Federal do Rio de Janeiro)
- Thais Rangel Bousquet Carrilho (University of British Columbia)

EXTERNAL OBSERVERS

- Chika Hayashi (UNICEF/HQ)
- Edward Frongillo (University of South Carolina)

* Participated only on Day 1 (20 June 2023)
### ANNEX 2. Meeting agenda

#### Day 1: Tuesday, 20 June

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Facilitator</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00 – 14:10</td>
<td>Welcoming</td>
<td>Francesco Branca</td>
</tr>
<tr>
<td>14:10 – 14:50</td>
<td>Brief introductions of TAG-GWG members and GWG Steering Committee</td>
<td>Facilitator: Elaine Borghi</td>
</tr>
<tr>
<td>14:50 – 15:20</td>
<td>Session 1: WHO Gestational Weight Gain project</td>
<td>Elaine Borghi and Gilberto Kac</td>
</tr>
<tr>
<td>15:20 – 15:35</td>
<td>Session 2: TAG-GWG <em>modus operandi</em></td>
<td>Monica Flores-Urrutia</td>
</tr>
<tr>
<td>15:35 – 15:55</td>
<td>Questions and answers</td>
<td>Facilitator: Monica Flores-Urrutia</td>
</tr>
<tr>
<td>15:55 – 16:05</td>
<td><strong>Break</strong></td>
<td></td>
</tr>
<tr>
<td>16:05 – 16:40</td>
<td>Session 3: Updates from the Core Working Group</td>
<td>Thais Rangel Bousquet Carrilho</td>
</tr>
<tr>
<td></td>
<td>Eligibility criteria and acquired data</td>
<td>Giovanna Gatica-Domínguez</td>
</tr>
<tr>
<td></td>
<td>Open call for data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data governance</td>
<td></td>
</tr>
<tr>
<td>16:40 – 17:00</td>
<td>Discussion</td>
<td>Facilitator: Gilberto Kac</td>
</tr>
</tbody>
</table>

#### Day 2: Thursday, 22 June

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Facilitator</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00 – 14:05</td>
<td>Summary of Day 1 discussions</td>
<td>Elaine Borghi</td>
</tr>
<tr>
<td>14:05 – 14:10</td>
<td>Nomination of TAG-GWG chair and co-chair</td>
<td>Monica Flores-Urrutia</td>
</tr>
<tr>
<td>14:10 – 14:40</td>
<td>Presentation summarizing TAG-GWG members feedback on study eligibility criteria</td>
<td>Thais Rangel Bousquet Carrilho</td>
</tr>
<tr>
<td>14:40 – 15:40</td>
<td>Discussion</td>
<td>Facilitator: Gilberto Kac</td>
</tr>
<tr>
<td>15:40 -15:50</td>
<td><strong>Break</strong></td>
<td></td>
</tr>
<tr>
<td>15:50 – 16:20</td>
<td>TAG-GWG working groups establishment</td>
<td>Facilitators: Gilberto Kac and Elaine Borghi</td>
</tr>
<tr>
<td>16:20 – 16:30</td>
<td>Guidelines on publications</td>
<td>Monica Flores-Urrutia</td>
</tr>
<tr>
<td>16:30 – 16:40</td>
<td>Next steps</td>
<td>Giovanna Gatica-Domínguez</td>
</tr>
<tr>
<td>16:40 – 16:50</td>
<td>Q&amp;A and any other business</td>
<td>Richard Kumapley</td>
</tr>
<tr>
<td>16:50 – 17:00</td>
<td>Closing statement</td>
<td>Francesco Branca and Elaine Borghi</td>
</tr>
</tbody>
</table>
Meeting report on the 1st WHO Technical Advisory Group on Gestational Weight Gain

20 and 22 June 2023