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Research Agenda Brief

RESEARCH AGENDA TO ADDRESS GAPS IN DATA COLLECTION, ANALYSIS AND REPORTING ON ANTHROPOMETRIC INDICATORS IN CHILDREN UNDER 5 YEARS OLD

Hair obstructions in height/length measurement and clothing and heavy jewellery obstructions in weight measurement in population-based surveys

Statement of the problem

Anthropometric data are largely derived from population-based surveys, which typically collect child height/length using measuring boards, and weight using digital weighing scales designed for field use. The collection of height/length measurements using a portable board requires the child's head to be positioned directly against the board, such that that the board makes contact with the scalp. When hair ornaments, hair styles or other headwear are not removed or modified to ensure that the board is positioned directly against the scalp, this can result in erroneous heights/lengths being recorded into datasets. Erroneous height/length measurements may also be recorded if shoes are not removed and erroneous weight measurements may recorded due to the added weight of clothing or heavy jewellery.

In practical terms, hair obstructions would increase the measured length/height of the child, and thus have the potential to underestimate the prevalence of stunting and overweight and overestimate the prevalence of wasting. Extra clothes and heavy jewellery would increase the measured weight and thus can overestimate the prevalence of overweight and underestimate the prevalence of wasting and underweight.

The WHO-UNICEF 2019 guidelines for data collection, analysis and reporting on anthropometric indicators recommend that hair ornaments, hair styles or other headwear be undone or removed and that a child be undressed to the minimum prior to obtaining measurements.[1] It is also recommended that data collectors record on the survey questionnaire whether each child was "undressed to the minimum" and whether there was any interference in measuring the height/length.

There remains a lack of clarity and/or consistency regarding what constitutes interference, how to mitigate such interference in situations when it is not possible to follow current guidance (e.g., caregivers' refusal to remove obstruction), and the recording of metadata during the survey. It is also unclear what should be done with the data when there is interference to better interpret anthropometric estimates and whether and how adjustments should be made.

The degree of interference caused by hair ornaments, hairstyles, headwear, clothing and heavy jewellery is unknown, both in terms of prevalence of the problem across and within countries, as well as the degree of error that such interference can cause in different settings. There are also no global standard trainings or operational instructions available to address the identification and mitigation of interference of height/length and weight measurements in a systematic manner. For example, hair braids that have a downward or sideways direction may not interfere with measurement, while braids that are at the top of the scalp would interfere. Some survey implementers have also indicated trying to push down the hair with the board head piece, but such attempts to flatten the hair obstruction can result in improper positioning of the child, such that the neck is no longer straight. Use of a pin or ruler to measure the amount of interference from hair ornaments, hairstyles or headwear has also been reported by some survey implementers, with the value subtracted from the overall height/length, but this practice may pose challenges and has not been validated.[2] For weight, the appropriate amount of undressing for children of varying ages, cultures and in different climates is not universally agreed upon. In some instances, surveys have tried to weigh clothing of similar weight to those being worn by a child and subtract this from the weight measurement, but this approach has also not been validated.[3,4,5]

This brief describes a research agenda for addressing the potential error in anthropometric parameters caused by hair (ornaments, hairstyles or headwear), clothing and heavy jewellery interference in population-based surveys. The research proposed in this brief is intended to support anthropometric measurement for children under 5 years of age. A secondary priority is school-aged children, adolescents and adults. The same research questions and approaches would apply to these populations.

Research questions and approach:[6]

1 What is the magnitude in centimetres for hair interference and in kilograms for clothing or heavy jewellery interference?

2 How prevalent is hair, clothing or heavy jewellery interference during measurements?

3 What magnitude and prevalence of hair, clothing or heavy jewellery interference would result in a meaningful impact on anthropometric Z-scores and prevalence estimates?

4 What methods, if any, should be employed to mitigate or adjust for hair, clothing or heavy jewellery obstructions in height/length or weight measurements?

5 What protocols or instructions should be used to address hair, clothing or heavy jewellery interference?

Proposed research approach for improving the collection of age information for children under 5 years of age in population-based surveys

Research topic 1

Magnitude of interference

APPROACH 1

Type of research
Mixed method review: Estimate the magnitude of hair, clothing and heavy jewellery interference to be expected in different settings and seasons.

Outcomes
Primary: Summary statistics of the magnitude of interference, by type.

Secondary (1): Stratification of primary outcome by age, setting and season.

Secondary (2): Expert opinion on the extent of interference by type and age in different settings and seasons.

Data source(s)
A systematic search of peer review and grey literature. An online survey and/or key informant interviews with stakeholders.

APPROACH 2

Type of research
Primary data collection: Measure the height/length and weight of children and quantify the level of interference.

Outcomes
Primary: Summary statistics of the magnitude of interference, by type.

Secondary: Stratification of primary outcome by age, setting and season.

Data source(s)
Small-scale studies (multi-centre or individual) in controlled and field environments. Prioritize study sites based on where interference is expected to be the largest problem.

Research topic 2

Prevalence of interference

Type of research
Mixed method review: Estimate the prevalence of hair, clothing and heavy jewellery interference that cannot easily be mitigated.

Outcomes
Primary: Prevalence of interference by type.

Secondary: Stratification of primary outcome by age, setting and season.

Data source(s)
A systematic search of peer review and grey literature. An online survey and/or key informant interviews with stakeholders.

Subjective opinion of fieldworkers recorded in survey questionnaires.

Information is needed from diverse settings where it is expected that the interference will meaningfully impact anthropometric Z-scores and prevalence estimates.

Consider additional industries for sources of information, such as anthropology and the fashion industry.

Research topic 3

Impact of interference on anthropometric estimates

Type of research
Secondary analysis: Simulation modelling and analysis of existing data to assess the impact of interference in height/length and weight measurements on anthropometric estimates.

Outcomes
Primary (1):
Anthropometric Z-scores

Primary (2):
Anthropometric prevalence estimates

Secondary (1):
Stratification of primary outcomes by age and Z-score levels.

Defining what constitutes a meaningful impact is dependent on the type of anthropometric estimate and should be determined a priori.

Data source(s)
The simulated population can be generated from the WHO Growth Reference data or from research studies or surveys that contain high quality anthropometric data that include varying population nutrition profiles.

Existing data sources/data sets where magnitude of interference was estimated (e.g., National Health and Nutrition Examination Survey [NHANES]).

Research topic 4

Mitigation or adjustment

APPROACH 1

Type of research
Mixed method review: Conduct a landscape assessment to identify all possible mitigation or adjustment approaches to address interference on height/length and/or weight measurements.

Outcomes
Primary: : Identification of mitigation and adjustment approaches.

Data source(s)
A systematic search of peer review and grey literature. An online survey and/or key informant interviews with stakeholders.

APPROACH 2

Type of research
Primary data collection: Efficacy studies comparing (a) no mitigation/adjustment; (b) set adjustment applied based on qualitative assessment of interference (yes/no); (c) height/length and weight interference using a chart and a chart-based adjustment is applied; and (d) real-time mitigation strategies (e.g., ruler for hair and taking weight of clothing) and a measured adjustment is applied.

Outcomes
Primary (1): The level of inaccuracy present in each study arm.

Primary (2): Differences in anthropometric Z-scores and prevalence estimates in each study arm.

Secondary (1): Stratification of the primary outcomes by age.

Data source(s)
Small-scale studies (multi-centre or individual) in a controlled environment.

APPROACH 3

Type of research
Primary data collection: Effectiveness studies comparing experts with field workers for (a) no mitigation/adjustment; (b) set adjustment applied based on qualitative assessment of interference (yes/no); (c) height/length and weight interference using a chart and a chart-based adjustment is applied; and (d) real-time mitigation strategies (e.g., ruler for hair and taking weight of clothing) and a measured adjustment is applied.

Outcomes
Primary (1): The level of inaccuracy present in each study arm compared to the expert.

Primary (2): Differences in anthropometric Z-scores and prevalence estimates in each study arm compared to the expert.

Secondary (1): Stratification of the primary outcomes by age.

Secondary (2): Cost-effectiveness for each height/length and weight mitigation strategy.

Data source(s)
Small-scale studies (multi-centre or individual) in a field environment from diverse settings, including in low- and middle-income countries.

Prioritize study sites based on where interference is greatest; this could be informed by expert opinion.

Research topic 5

Protocols to address interference

Type of research
Qualitative: Undertake a Delphi method to obtain consensus on approaches that are to be included in a protocol on how to address hair, clothing or heavy jewellery interference.
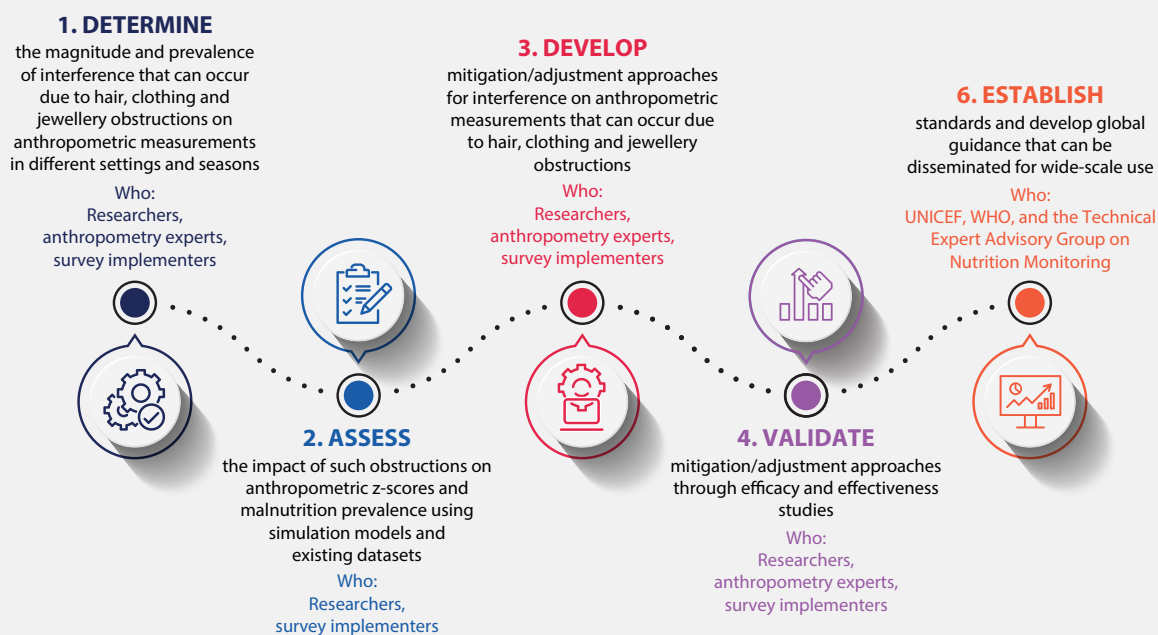
Outcomes
Primary: Consensus on approaches and final protocol for addressing hair ornaments, hairstyles, headwear, clothing or jewellery interference in population-based surveys.

Data source(s)
Questionnaire administered to a panel of experts in two or more rounds, followed by a virtual or in-person meeting.

Research roadmap

Physical obstructions in weight and height measurements of children under 5 years of age due to hair, clothing and jewellery have been a long-standing concern. Understanding the extent to which this impacts the accuracy of anthropometric estimates and whether mitigation or adjustment is warranted is a high priority. A roadmap towards the establishment of global guidance on this topic is presented below, along with the input needed from key stakeholders to address different aspects of the research agenda.

1. DETERMINE
the magnitude and prevalence of interference that can occur due to hair, clothing and jewellery obstructions on anthropometric measurements in different settings and seasons
Who:
Researchers, anthropometry experts, survey implementers

2. ASSESS
the impact of such obstructions on anthropometric z-scores and malnutrition prevalence using simulation models and existing datasets
Who:
Researchers, survey implementers

3. DEVELOP
mitigation/adjustment approaches for interference on anthropometric measurements that can occur due to hair, clothing and jewellery obstructions
Who:
Researchers, anthropometry experts, survey implementers

4. VALIDATE
mitigation/adjustment approaches through efficacy and effectiveness studies
Who:
Researchers, anthropometry experts, survey implementers

6. ESTABLISH
standards and develop global guidance that can be disseminated for wide-scale use
Who:
UNICEF, WHO, and the Technical Expert Advisory Group on Nutrition Monitoring

[1] Recommendations for data collection, analysis and reporting on anthropometric indicators in children under 5 years old. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2019.

[2] National Health and Nutrition Examination Survey (NAHNES) Anthropometry Procedures Manual. Centers for Disease Control and Prevention. January 2018.

[3] Censi L, Spinelli A, Roccaldo R, Bevilacqua N, Lamberti A, Angelini V, Nardone P, Baglio G. Dressed or undressed? How to measure children's body weight in overweight surveillance? Public Health Nutr. 2014 Dec;17(12):2715-20. doi: 10.1017/S1368980013003030. Epub 2013 Nov 15. PMID: 24477177.

[4] Roche ML, Gyorkos TW, Sarsoza J, Kuhnlein HV. Adjustments for weighing clothed babies at high altitude or in cold climates. Glob Public Health. 2015;10(10):1227-37. doi: 10.1080/17441692.2015.1037326. Epub 2015 May 20. PMID: 25991563.

[5] Tuan T, Marsh DR, Ha TT, Schroeder DG, Thach TD, Dung VM, Huong NT. Weighing Vietnamese children: how accurate are child weights adjusted for estimates of clothing weight? Food Nutr Bull. 2002 Dec;23(4 Suppl):48-52. PMID: 12503231.

[6] Questions to be answered in order before proceeding to the next. In other words, if outcomes for 1 and 2 indicate this problem affects very few countries and where it occurs prevalence is small, then may recommend that local survey organizers address as they see fit and not have a global standard protocol, thereby not answering question 3 or 4.

If interested in joining this effort

or if you have any questions or comments, please contact the TEAM Working Group on Anthropometric Data Quality at: nfsdata@who.int and sdg2.2@unicef.org.