

ORIGINAL ARTICLE

Reliability of GSHS Questionnaire Among School Children and Adolescents
in Kampala, Uganda

Ndagire Catherine T.^{1*}, Muyonga John H.², Nakimbugwe Dorothy²

¹Department of Food Innovation and Nutrition, Faculty of Agriculture and Environmental Sciences, Mountains of the Moon University, Fort Portal, Uganda.

²School of Food Technology, Nutrition and Bio-engineering, Makerere University, Kampala Uganda.

DOI: [https://doi.org/10.70851/jfines.2025.2\(2\).26.34](https://doi.org/10.70851/jfines.2025.2(2).26.34)

ABSTRACT

The Uganda Global School-based Health Survey (GSHS) measures behaviors and protective factors related to causes of mortality and morbidity among youth and adults in Uganda. This study aimed at assessing test-retest reliability of, and factors associated with reliability of the fruit and vegetable (FV) consumption and physical activity (PA) items of the adapted Uganda GSHS questionnaire among 8-19-year-old school children and adolescents in Kampala district, Uganda. The test-retest reliability of the FV consumption and PA items was determined on a sample of 621 children and adolescents aged 8-19 years, using Cronbach's alpha. Association between reliability and strata defined by gender, age category, education level and type of school was also examined by chi square statistic. The reliability of the FV consumption and PA items was supported by Cronbach's alpha coefficients of 0.80 and 0.72, respectively, indicating "good reliability." Full consistency in FV consumption items was higher among secondary school participants (45%) compared to primary school participants (15%), 15–19-year-olds (43%) compared to 8–9-year-olds (19%) and 10–14-year-olds (21%), and private school participants (34%) compared to public school participants (24%). Similarly, full consistency for PA items was greater in secondary schools (34%) than in primary schools (0.7%), among 15–19-year-olds (30%) than 8–9-year-olds (0.0%) and 10–14-year-olds (12%), and in private schools (21%) than public schools (15%). The items therefore have the potential to measure the effects of nutrition interventions on children and adolescents because of their stability in making comparisons over time.

Article history

Received;

11 December 2024

Revised;

12 March 2025

Accepted;

17 April 2025

Keywords

Fruit and Vegetable
consumption, Physical
Activity, Test-retest
Reliability, Global
School-based Health
Survey (GSHS)

*Corresponding author

E-mail: catherinendagire@gmail.com (Ndagire Catherine T.)

Peer review under responsibility of Journal of Food Innovations,
Nutrition, and Environmental Sciences.

A Publication of EcoScribe Publishers company Limited,
Uganda.

All the articles published by [Journal of Food Innovation, Nutrition, and Environmental Sciences](#) are licensed under a [Creative Commons Attribution 4.0 International \(CC-BY\) License](#) Based on a work at <https://jfines.org>



1. Introduction

Fruits and Vegetables (FVs) are essential components of healthy diets, to meet the requirements of growth, development and maintenance throughout one's life cycle (Arumugam et al., 2021). Adequate FV intake promotes health and prevents chronic diseases (Woodside et al., 2023) and is associated with a lower risk of cancer, coronary heart disease, stroke and other chronic diseases, all of which are major causes of mortality and morbidity (Nyanchoka et al., 2021). There is evidence that childhood FV consumption behavior continues into adolescence (Lytle et al., 2000) and that food preferences and eating habits established in childhood and adolescence tend to be maintained into adulthood (Mikkilä et al., 2004). Thus, inadequate FV consumption during childhood and adolescence may play an important role in developing Cardio Vascular Diseases in adulthood. This makes increasing FV consumption among children and adolescents an important public health strategy with potentially positive implications for long term health.

In spite of the importance of an adequate intake of FVs during childhood and adolescence, large population groups, including children and adolescents in most Western countries, Asian countries, Costa Rica (Peltzer & Pengpid, 2012) and many African countries (Peltzer & Pengpid, 2010) eat far less than the recommended amount of FVs. There is therefore need for programs to promote increased FV consumption during childhood and adolescence. Accurate (valid) and consistent (reliable) measurement of dietary intake and patterns of eating behavior is important when evaluating the effectiveness of public health interventions to improve diets (National Obesity Observatory, 2010). Such tools are central in monitoring trends of food and beverage consumption in children and adolescents (Pérez-Rodrigo et al., 2015). Short food questionnaire items are appealing to measure dietary intakes (Golley et al., 2017) as they are easy to implement and analyze. While reliable, valid, and easy-to-implement tools are required to assess FV intake as part of behavior change-focused nutrition programs, their availability is limited (Zhang & Reicks, 2017). The Uganda Global School-based Health Survey (GSHS) questionnaire (Twa-Twa & Oketcho, 2005) has short questions on FV consumption that could monitor interventions in children and adolescents. However, reliability of these items among children and adolescents in Uganda is not known. Since dietary intake data among children and adolescents is prone to random error, due to within subject variation such as age, cognition and weight status among others (Collins et al., 2010), it is important to investigate factors affecting reliability of FV items of Uganda's GSHS questionnaire among children and adolescents in Uganda.

In addition to many children and adolescents' diets in developing countries being inadequate with respect to FV intake, their Physical Activity (PA) levels have also decreased and sedentary behaviors such as television viewing and playing video/computer

games have increased (Wachira, 2021). The prevalence of physical inactivity, a recognized determinant for chronic disease is increasing among children and adolescents in developing countries (Reilly et al., 2022). This increases the risk of coronary heart disease, stroke and other major cardiovascular risk factors such as obesity, high blood pressure, low high-density lipoprotein cholesterol (HDL-C) and diabetes (Barone Gibbs et al., 2021). Conversely, PA has been highlighted as the main therapeutic tool for combating cardiovascular disease risk in children and adolescents (Calcaterra et al., 2022). In children and adolescents, PA is a preventive measure to reduce the risk of future cardiovascular diseases, improving several risk factors including: reducing low-density lipoprotein cholesterol (LDL-C) and triglyceride levels; raising HDL-C; improving insulin sensitivity and; lowering blood pressure (Lin et al., 2022). Increasing PA is crucial to reduce mortality and morbidity associated with non-communicable diseases and can also improve quality of life, particularly for those who have a chronic disease (Lin et al., 2022).

In Uganda 82.3% of students aged 13-15 years were reported to have insufficient physical activity i.e., a total of less than 60 minutes per day (Twa-Twa & Oketcho, 2005), highlighting a need for interventions aimed at increasing PA levels among children and adolescents. The design of effective intervention programmes for promotion of PA requires valid and reliable measures of PA (Argiropoulou et al., 2004). While both objective and subjective methods have been suggested to evaluate PA levels in children and adolescents, subjective methods such as PA questionnaires are preferred in large epidemiological studies (Bervoets et al., 2014). PA questionnaires are cheap and easy to administer to large groups of people and can assess all of the dimensions of PA enabling behavior patterns to be examined (Sallis & Saelens, 2000). The PA items in the Ugandan GSHS questionnaire (Twa-Twa & Oketcho, 2005) could measure PA in children and adolescents. However, reliability of these items among that target population in Uganda is not known. PA questionnaires differ in terms of mode of administration (i.e., self-administered vs. interview), complexity, length, and difficulty of scoring (Washburn et al., 1990) and consequently their reliability. The purpose of this study was to evaluate the test-retest reliability of the FV and PA items of the Uganda's GSHS questionnaire among school children and adolescents aged 8-19 years in Kampala, Uganda.

In Uganda, the GSHS questionnaire was used in 2003 to conduct a health behavior study that involved secondary school students aged 13-15 years. The study measured behaviors and protective factors related to causes of mortality and morbidity among youth and adults in Uganda. Its' purpose was to provide data for planning, measuring trends, evaluation and, making national and international comparisons of health behaviors of school children.

2. Methodologies

2.1 Subjects

Students aged 8-19 years were recruited as participants for this study from primary and secondary schools in Kampala city, Uganda. In order to recruit a representative sample, participants were selected by multiple-stage sampling in the order of city, division, school and class. Eleven representative schools were eventually selected to reflect the population distribution in Kampala district schools. Study procedures were approved by Makerere University School of Biomedical Sciences Higher Degrees, Research and Ethics Committee and Uganda National Council for Science and Technology with approval numbers: SBS 291 and HS 1950 respectively.

2.2 The FV consumption and the PA items of the Ugandan GSHS questionnaire

The questionnaire used in the study was developed by officials drawn from the Uganda's Ministry of Health; Ministry of Education and Sports; and World Health Organization (WHO). The final questionnaire had 54 core questions provided by WHO/CDC (Centre for Disease Control), 36 questions selected from the expanded core questions, and 3 country specific questions. The questionnaire and methodology were pre-tested in one district in Uganda, where meanings of some words and phrases which students found hard to understand were simplified without changing the original meaning of the question. The questionnaire contained 93 items addressing: demographics, alcohol and other drug use, dietary behaviors including FV consumption, hygiene, mental health, PA, sexual behaviors that contribute to HIV infection, other STI and unintended pregnancy, tobacco use, violence and unintentional injury (Twa-Twa & Oketcho, 2005).

For the FV consumption and the PA test/re-test studies, respondents were asked questions on socio-demographic variables including: age, sex, level of education, class attended in school, sex of students who attend the school and residence of students who attend the school. The FV consumption tool had 2 items on frequency of FV consumption in the past 30 days. The PA tool had 7 items that captured: number of days on which respondents were physically active for at least 60 minutes per day in the past 7 days, number of days on which respondents were physically active for at least 60 minutes per day during a typical or usual week, time spent in sedentary behaviors, number of days the respondent walked or rode a bicycle to and from school during the past 7 days, time respondents usually spent to and from school each day during the past 7 days, number of days respondents did exercises to strengthen or tone their muscles during the past 7 days and how respondents felt after physical activity.

2.3 Administration of questionnaires

All participants were given the first administration (first test) followed by the re-test after two weeks. Two weeks is sufficient amount of time to eliminate the influence of the first test responses on the results of the re-test (Štefan et al., 2017). Participants completed the set of questionnaires with the guidance of trained instructors. The participants were asked to recall their recent FV consumption and PA behaviors and complete the instruments correctly. On average, both interviews during the first test and the re-test lasted 15 to 20 minutes. The study constituted of 621 respondents who completed both the first (test) and the second (re-test) interviews.

2.4 Data analysis

Subjects' characteristics were presented as frequencies and proportions. Cronbach's alpha was used to assess test-retest reliability of the FV and PA items of the questionnaire. Cronbach's alpha values between 0.7-0.9 were considered representative of a good reliability, while values above 0.9 were considered representative for a very good reliability (Chirita-Emandi et al., 2015). Chi-square (X^2) was used to determine the significance of association of selected factors with consistence in responding to FV consumption and PA items in the first and the re-test surveys. All statistical analyses were performed using the STATA 12.0 software program at $p < 0.05$ level of statistical significance.

3. Results and Discussion

3.1 Subjects' socio-demographic characteristics

Majority (54%) of participants were female and most of the respondents were aged 15-19 years. There were 332 secondary and 289 primary school participants. Majority of participants were from privately owned schools (Table 1).

Table 1. Socio-demographic characteristics of study participants

Item	Characteristics	n (%)
Gender	Male	287 (46.22)
	Female	334 (53.78)
Age category	8-9 years	68 (10.95)
	10-14 years	271 (43.64)
	15-19 years	282 (45.41)
Education level	Primary school	289 (46.54)
	Secondary school	332 (53.46)
Type of school	Public school	209 (33.66)
	Private school	412 (66.34)

3.2 Consistence of participants' responses to the FV items between the two surveys

Between the first and the re-test of FV consumption items, 64.57% of respondents were consistent for half or all the items (**Fig. 1**). **Table 2** presents estimates of reliability for the assessed items. Reliability of the combined fruit and vegetable consumption items was acceptable with an average Cronbach's alpha coefficient of 0.80. The item on vegetable consumption alone exhibited higher reliability compared to that on fruit consumption between the two interviews, with an average Cronbach's alpha coefficient of 0.76 and 0.74 respectively. The re-test fruit consumption item exhibited the highest correlation coefficient values of 0.83 as item-test correlation. The least correlation with the rest of the tool was exhibited by the vegetable consumption item of the first test with the lowest correlation coefficient of 0.76.

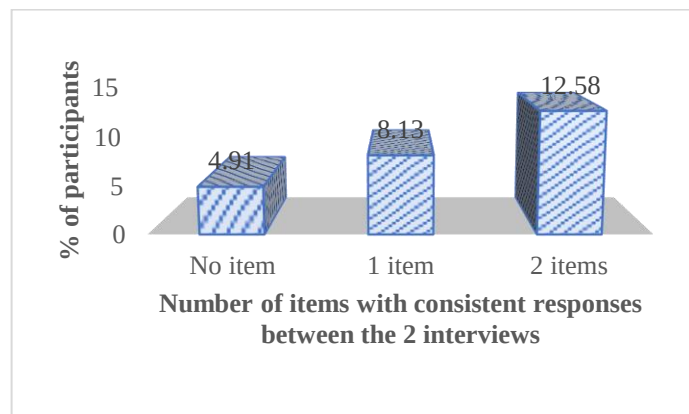


Fig. 1. Consistence of participants' responses to the FV items between the first and the re-test surveys

Consistency of participants responding to the FV consumption items between the two interviews varied significantly with education level, age category and type of school (**Table 3**). Full consistency was more in secondary school (45%) than primary (15%) school, more in 15–19-year-olds (43%) than 8–9-year-olds (19%) and 10–14-year-olds (21%) and more among private (34%) than public (24%) school participants.

The reliability of FV consumption items was adequate with a Cronbach's alpha coefficient of 0.80 representative of "good reliability" (Chirita-Emandi et al., 2015). These findings are consistent with those reported by Gorgulho and others who found internal consistency of the Revised Brazilian Healthy Eating Index at a coefficient of Cronbach's alpha value of 0.7 among a similar population of 12 and above year-olds in São Paulo, Southeastern Brazil (Gorgulho et al., 2012). The results are also similar to those reported on the child nutrition questionnaire among Australian school children aged 10–12 years (Ortega et al., 2007). The highest item-test correlation of 0.83 of the re-test

fruit consumption item indicates that this item is more correlated with the other items of the entire scale. The least correlation with the rest of the tool, that was exhibited by the vegetable consumption item of the first test, with the lowest correlation coefficient of 0.76 indicates that this item is least correlated with the other items of the entire scale.

Between the first and the re-test interviews of PA items, 63.2% of respondents were consistent with 4 or more of the 7 items (**Fig. 2**). Overall, the Cronbach's alpha coefficient of the PA items was 0.72 (**Table 4**). The item: "how do you feel after physical activity?" exhibited highest reliability between the two interviews at an average Cronbach's alpha coefficient of 0.72 in both the first and the re-test administrations. The item: "during a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day?" exhibited lowest reliability with a Cronbach's alpha coefficient of 0.68. Based on item-test correlation, the "during a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day?" item of the first test had the highest correlation coefficient values of 0.64. The "how do you feel after physical activity?" item of the first test exhibited the lowest correlation coefficient of 0.2.

Consistency of participants responding to the PA items between the two interviews varied significantly with education level, age category and type of school (**Table 5**). While there were more consistent responses for FV items, the trends of consistency of responding to the FV consumption and PA items were similar. Full consistency with the PA items was more in secondary school (34%) than primary (0.7%) school, more in 15–19-year-olds (30%) 8–9-year-olds (0.0%) and 10–14-year-olds (12%) and more in private (21%) than public (15%) school participants.

Reliability of the PA items was reported to be satisfactory with a Cronbach's alpha coefficient of 0.72 representative of "good reliability" (Chirita-Emandi et al., 2015). The results from this study were comparable to those from a sample of school children aged 9 to 11 years attending a school in Cartagena, Colombia, for test-retest reliability of the Physical Activity Questionnaire for school children at Cronbach's coefficients of 0.73 during the first measurement and 0.78 on the second (Herazo-Beltrán & Domínguez-Anaya, 2012). The results are also similar to those reported about reliability of the modified child and adolescent PA and nutrition survey questionnaire with a Cronbach's coefficient of 0.7 (Strugnell et al., 2014). Findings in this study rated more favorably than those on the telephone-administered International Physical Activity Questionnaire in an Italian pilot sample that reported a standardized Cronbach's alpha of 0.6 (Mannocci et al., 2014). For the PA items based on item-test correlation, the "during a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day?" item of the first test was more correlated with the entire scale with the highest correlation coefficient values of 0.64. This could be because the item captures data on PA behavior like most of the

Table 2. Reliability of the FV consumption items among school aged children

Item	Sign	Item-test correlation	Item rest correlation	Cronbach's alpha coefficient
F1	+	0.7849	0.6000	0.7529
V1	+	0.7601	0.5725	0.7658
F2	+	0.8261	0.6605	0.7220
V2	+	0.7849	0.6087	0.7487
Test scale mean (standardized items)				0.7983

F = During the past 30 days, how many times per day did you usually eat fruit, such as ripe bananas, mangoes, oranges, guavas, avocado, or pawpaw?

V = During the past 30 days, how many times per day did you usually eat vegetables, such as dodo (*amaranthus*), gobe (cowpea (*vigna unguiculata*) leaves), ntula (*solanum incunum*), sukuma wiki (*Brassica oleracea var acephala*), bbuga (*amaranthus blitum*), or nakati (*solanum aethiopicum*)?

1 = First interview, 2 = Re-test

Table 3. Factors influencing consistence in responding to FV consumption items among School children in Uganda

Factors	Levels	Full consistency	No or partial consistency	Chi square P- value
Sex	Male	30.31	69.69	P = 0.912
	Female	30.72	69.28	
Education level	Primary	14.53	85.47	P = 0.000
	Secondary	44.88	55.21	
Age category	8-9 years	19.12	80.88	P = 0.000
	10-14 years	21.40	78.60	
	15-19 years	42.55	57.45	
Type of school	Public	23.92	76.08	P = 0.009
	Private	34.22	65.78	
Total		30.76	69.24	

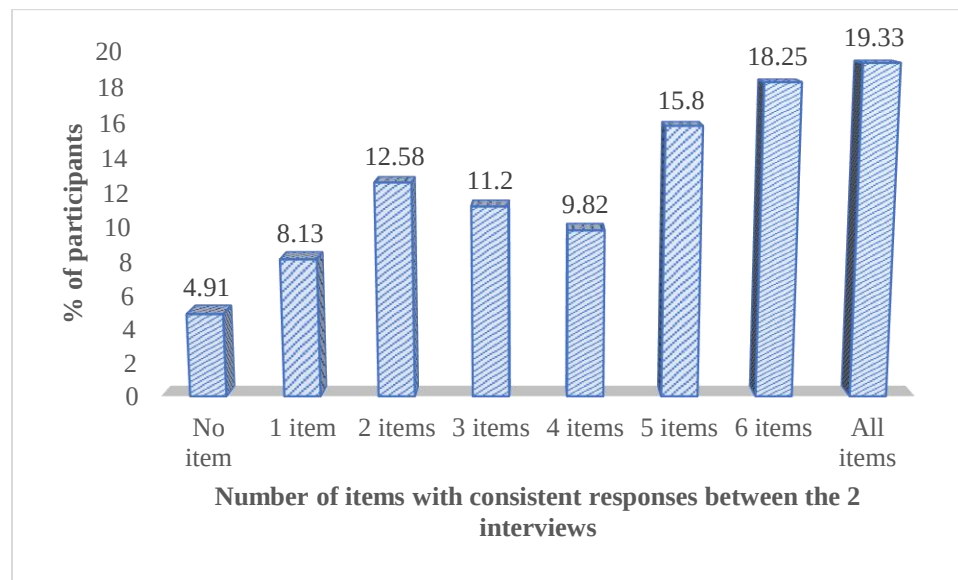


Fig.2: Participants' consistence with responding to the PA items between the first and the re-test

Table 4. Reliability of the tool in assessing the responses on physical activity among school children

Items	Sign	Item-test correlation	Item-rest correlation	Cronbach's alpha coefficient
A1	+	0.6333	0.5058	0.6843
B1	+	0.6389	0.5191	0.6832
C1	+	0.3301	0.2275	0.7181
D1	+	0.5113	0.3422	0.7086
E1	+	0.3664	0.2264	0.7198
F1	+	0.5079	0.3713	0.7031
G1	+	0.2041	0.1440	0.7236
A2	+	0.6314	0.5039	0.6845
B2	+	0.5933	0.4646	0.6907
C2	+	0.2925	0.1960	0.7205
D2	+	0.6314	0.3697	0.7044
E2	+	0.5933	0.2047	0.7220
F2	+	0.2925	0.3304	0.7083
G2	+	0.5348	0.1259	0.7244
Test scale mean (standardized items)				0.7229

A-During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?
B-During a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day?
C-How much time do you spend during a typical or usual day sitting and watching television, playing computer games, talking with friends, or doing other sitting activities, such as playing cards or *mweso* (a traditional board game in Uganda) or reading novels?
D-During the past 7 days, on how many days did you walk or ride a bicycle to and from school?
E-During the past 7 days, how long did it usually take for you to get to and from school each day?
F-During the past 7 days, on how many days did you do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight lifting?
G-How do you feel after physical activity?
1 = First interview, 2 = Re-test

Table 5. Factors influencing consistence in responding to PA items among school children and in Uganda

Factors	Categories	Full consistency	No or partial consistency	Chi ² P value
Sex	Male	17.48	82.52	P = 0.246
	Female	21.05	78.95	
Education level	Primary	0.69	99.31	P = 0.000
	Secondary	34.25	65.75	
Age category	8-9 years	0.00	100.00	P = 0.000
	10-14 years	11.55	88.45	
	15-19 years	30.32	69.68	
Type of school	Public	15.47	84.53	P = 0.039
	Private	21.05	78.04	
Total		19.33	80.67	

items. On the other hand, the “how do you feel after physical activity?” response of the first test item is least correlated with the rest of the tool since it exhibited the lowest correlation coefficient of 0.2. This could be because this item captures data on emotional state not PA behavior like the rest of the items.

The good reliability exhibited by the assessed FV consumption and PA items could be attributed to their short and unambiguous nature enabling respondents to clearly understand and respond consistently. On the other hand, the variation in consistence in responding to questionnaire items with age category and level of education can be attributed to variation in age. Consistency in responding to questionnaire items increases with increasing age (Lumeng et al., 2005). Children have low cognitive capability, literacy skills and limited memory while adolescents have full cognitive capability, higher literacy skills and better memory (Livingstone & Robson, 2000). This enables the adolescents to better comprehend the questions and respond critically and consistently. In Uganda, primary schools majorly comprise children less than 13 years while secondary schools majorly comprise adolescents 13 years and above. This can explain the higher consistency in secondary schools than primary schools.

The short (two weeks) test-retest interval probably contributed to the good reliability of the items studied by minimizing the effects of actual changes in the children's behaviors during the study period (Myr et al., 2015). The interval is assumed to be long enough for respondents not to remember their previous responses yet short enough for behaviors not to change significantly, thus ensuring independence of the two surveys (Dal Grande et al., 2012). However, sometimes the short time interval presents an uncontrollable risk that participants remember the questions well enough to respond based on their previous responses rather than considering the questions individually and responding based on the current behavior (Cade et al., 2002).

While acceptable reliability of the questionnaire was found among the study participants, the authors acknowledge the following possible limitations:

- Social Desirability Bias: Participants may have provided socially desirable responses, regarding FV consumption and PA, which could affect reliability.
- Recall Bias: The reliance on self-reported data is prone to recall bias, especially among younger children.

Conclusion

The FV consumption and the PA items of Uganda's GSHS questionnaire had good test-retest reliability in the studied population thus the items are reliable for use among children and adolescents aged 8-19 years in Uganda. However, consistence in responding to questionnaire items varied with age category, level of education and type of school. The good questionnaire

reliability indicates that the items are reliable for this population in Uganda. This will strengthen the conclusions reached from data from GSHS in Uganda. Although good reliability levels were achieved it should be noted that this does not equate to good validity. Further studies are required to establish the validity of these items against reference techniques such as food diaries and accelerometers for PA behavior. Nonetheless we conclude that these items provide reliable tools for assessing FV consumption and PA behaviors. Thus, they can be used to monitor changes in these parameters and measure the effectiveness of FV consumption and PA interventions. The instruments are low in cost and easy to administer and analyze; moreover, they could be modified appropriately to fit the needs of other populations as well. While the study found Cronbach's alpha values within the acceptable range indicating good reliability of the questionnaire, there is still room for improvement to very good reliability with Cronbach's alpha values of 0.9 and above through improving the questionnaire's design.

Acknowledgements

This study was supported by the International Atomic Energy Agency (IAEA).

Conflict of interest

The authors declare no conflict of interest.

References

- Argiropoulou, E. C., Michalopoulou, M., Aggeloussis, N., & Avgerinos, A. (2004). Validity and reliability of physical activity measures in greek high school age children. *Journal of Sports Science & Medicine*, 3(3), 147–159.
- Arumugam, T., Sona, C. L., & Maheswari, M. U. (2021). *Fruits and vegetables as Superfoods : Scope and demand*. 10(3), 119–129.
- Barone Gibbs, B., Hivert, M.-F., Jerome, G. J., Kraus, W. E., Rosenkranz, S. K., Schorr, E. N., Spartano, N. L., & Lobelo, F. (2021). Physical Activity as a Critical Component of First-Line Treatment for Elevated Blood Pressure or Cholesterol: Who, What, and How?: A Scientific Statement From the American Heart Association. *Hypertension*, 78(2). <https://doi.org/10.1161/HYP.0000000000000196>
- Bervoets, L., Van Noten, C., Van Roosbroeck, S., Hansen, D., Van Hoorenbeeck, K., Verheyen, E., Van Hal, G., & Vankerckhoven, V. (2014). Reliability and Validity of the Dutch Physical Activity Questionnaires for Children (PAQ-C) and Adolescents (PAQ-A). *Archives of Public Health*, 72(1), 47. <https://doi.org/10.1186/2049-3258-72-47>
- Cade, J., Thompson, R., Burley, V., & Warm, D. (2002). Development, validation and utilisation of food-frequency

- questionnaires - a review. *Public Health Nutr.*, 5(4), 567–587. <https://doi.org/10.1079/PHN2001318>
- Calcaterra, V., Vandoni, M., Rossi, V., Berardo, C., Grazi, R., Cordaro, E., Tranfaglia, V., Carnevale Pellino, V., Cereda, C., & Zuccotti, G. (2022). Use of Physical Activity and Exercise to Reduce Inflammation in Children and Adolescents with Obesity. *International Journal of Environmental Research and Public Health*, 19(11), 6908. <https://doi.org/10.3390/ijerph19116908>
- Chirita-Emandi, A., Dobrescu, A., Papa, M., Puiu, M., & Emandi, A. C. (2015). Reliability of Measuring Subcutaneous Fat Tissue Thickness Using Ultrasound in Non-Athletic Young Adults MEASURING SUBCUTANEOUS FAT TISSUE USING ULTRASOUND. *Maedica -a Journal of Clinical Medicine* *Maedica A Journal of Clinical Medicine Journal of Clinical Medicine Maedica A Journal of Clinical Medicine*, 10(103), 204–209.
- Collins, C. E., Watson, J., & Burrows, T. (2010). Measuring dietary intake in children and adolescents in the context of overweight and obesity. *International Journal of Obesity*, 34(7), 1103–1115. <https://doi.org/10.1038/ijo.2009.241>
- Dal Grande, E., Fullerton, S., & Taylor, A. W. (2012). Reliability of self-reported health risk factors and chronic conditions questions collected using the telephone in South Australia, Australia. *BMC Medical Research Methodology*, 12(1), 108. <https://doi.org/10.1186/1471-2288-12-108>
- Golley, R. K., Bell, L. K., Hendrie, G. A., Rangan, A. M., Spence, A., McNaughton, S. A., Carpenter, L., Allman-Farinelli, M., de Silva, A., Gill, T., Collins, C. E., Truby, H., Flood, V. M., & Burrows, T. (2017). Validity of short food questionnaire items to measure intake in children and adolescents: a systematic review. *Journal of Human Nutrition and Dietetics*, 30(1), 36–50. <https://doi.org/10.1111/jhn.12399>
- Gorgulho, B., Marchioni, D. M. L., Da Conceição, A. B., Steluti, J., Mussi, M. H., Nagai-Manelli, R., Teixeira, L. R., Da Luz, A. A., & Fischer, F. M. (2012). Quality of diet of working college students. *Work*, 41(SUPPL.1), 5806–5809. <https://doi.org/10.3233/WOR-2012-0958-5806>
- Herazo-Beltrán, A. Y., & Domínguez-Anaya, R. (2012). [The reliability of a questionnaire regarding Colombian children's physical activity]. *Revista de Salud Publica (Bogota, Colombia)*, 14(5), 802–809.
- Lin, Y., Fan, R., Hao, Z., Li, J., Yang, X., Zhang, Y., & Xia, Y. (2022). The Association Between Physical Activity and Insulin Level Under Different Levels of Lipid Indices and Serum Uric Acid. *Frontiers in Physiology*, 13. <https://doi.org/10.3389/fphys.2022.809669>
- Livingstone, M. B., & Robson, P. J. (2000). Measurement of dietary intake in children. *The Proceedings of the Nutrition Society*, 59(2), 279–293.
- Lumeng, J. C., Zuckerman, M. D., Cardinal, T., & Kaciroti, N. (2005). The Association between Flavor Labeling and Flavor Recall Ability in Children. *Chemical Senses*, 30(7), 565–574. <https://doi.org/10.1093/chemse/bji050>
- Lytle, L. a, Seifert, S., Greenstein, J., & McGovern, P. (2000). How do children's eating patterns and food choices change over time? Results from a cohort study. *American Journal of Health Promotion: AJHP*, 14(4), 222–228. <https://doi.org/10.4278/0890-1171-14.4.222>
- Mannocci, A., Bontempi, C., Colamesta, V., Ferretti, F., Giral di, G., Lombardi, A., Meggiolaro, A., Miani, A., Miccoli, S., Rosso, A., Saulle, R., Unim, B., Boccia, A., & La Torre, G. (2014). Reliability of the telephone-administered international physical activity questionnaire in an Italian pilot sample. *Epidemiology Biostatistics and Public Health*, 11(1), 1–9. <https://doi.org/10.2427/8860>
- Mikkilä, V., Räsänen, L., Raitakari, O. T., Pietinen, P., & Viikari, J. (2004). Longitudinal changes in diet from childhood into adulthood with respect to risk of cardiovascular diseases: The Cardiovascular Risk in Young Finns Study. *European Journal of Clinical Nutrition*, 58(7), 1038–1045. <https://doi.org/10.1038/sj.ejcn.1601929>
- Myr, R., Bere, E., & Øverby, N. (2015). Test-retest reliability of a new questionnaire on the diet and eating behavior of one year old children. *BMC Research Notes*, 8(1), 16. <https://doi.org/10.1186/s13104-014-0966-y>
- National Obesity Observatory. (2010). *Review of dietary assessment methods in public health*.
- Nyanchoka, A. M., Van Stuijvenberg, M. E., Tambe, A. B., & Mbhenyane, X. G. (2021). Fruit and vegetables consumption patterns and risk of chronic disease of lifestyle among university students in Kenya. *Proceedings of the Nutrition Society*, 80(OCE1). <https://doi.org/10.1017/s0029665121000021>
- Ortega, F. B., Ruiz, J. R., & Sjostrom, M. (2007). Physical activity, overweight and central adiposity in Swedish children and adolescents: the European Youth Heart Study. *International Journal of Behavioral Nutrition and Physical Activity*, 4, 61–71. <https://doi.org/10.1186/1479-Received>
- Peltzer, K., & Pengpid, S. (2010). Fruits and vegetables consumption and associated factors among in-school adolescents in seven African countries. *International Journal of Public Health*, 55(6), 669–678. <https://doi.org/10.1007/s00038-010-0194-8>
- Peltzer, K., & Pengpid, S. (2012). Fruits and vegetables consumption and associated factors among in-school adolescents in five Southeast Asian countries. *International Journal of Environmental Research and Public Health*, 9(10), 3575–3587. <https://doi.org/10.3390/ijerph9103575>
- Pérez-Rodrigo, C., Escarriaza, B. A., Escarriaza, J. A., & Allué, I. P. (2015). Evaluación de la ingesta en niños y adolescentes: problemas y recomendaciones. *Nutricion Hospitalaria*, 31(s03), 76–83. <https://doi.org/10.3305/nh.2015.31.sup3.8755>
- Reilly, J., Aubert, S., Brazo-Sayavera, J., Liu, Y., Cagas, J., & Tremblay, M. (2022). Surveillance to improve physical

- activity of children and adolescents. *Bulletin of the World Health Organization*, 100(12), 815–824. <https://doi.org/10.2471/BLT.22.288569>
- Sallis, J. F., & Saelens, B. E. (2000). Assessment of Physical Activity by Self-Report: Status, Limitations, and Future Directions. *Research Quarterly for Exercise and Sport*, 71(sup2), 1–14. <https://doi.org/10.1080/02701367.2000.11082780>
- Štefan, L., Prosoli, R., Juranko, D., Čule, M., Milinović, I., Novak, D., & Sporiš, G. (2017). The reliability of the mediterranean diet quality index (KIDMED) questionnaire. *Nutrients*, 9(4). <https://doi.org/10.3390/nu9040419>
- Strugnell, C., Renzaho, A., Ridley, K., & Burns, C. (2014). Reliability and validity of the modified child and adolescent physical activity and nutrition survey (CAPANS-C) questionnaire examining potential correlates of physical activity participation among Chinese-Australian youth. *BMC Public Health*, 14(1), 145. <https://doi.org/10.1186/1471-2458-14-145>
- Twa-Twa, J. M., & Oketcho, S. (2005). *Global School-Based Student Health Survey 2003 Uganda country report*.
- Wachira, L.-J. (2021). Lifestyle Transition towards Sedentary Behavior among Children and Youth in Sub-Saharan Africa: A Narrative Review. In *Sedentary Behaviour - A Contemporary View*. IntechOpen. <https://doi.org/10.5772/intechopen.95840>
- Washburn, R. A., Goldfield, S. R., Smith, K. W., & McKinlay, J. B. (1990). The validity of self-reported exercise-induced sweating as a measure of physical activity. *American Journal of Epidemiology*, 132(1), 107–113.
- Woodside, J. V., Nugent, A. P., Moore, R. E., & Mckinley, M. C. (2023). Fruit and vegetable consumption as a preventative strategy for non-communicable diseases. *Proceedings of the Nutrition Society*, 186–199. <https://doi.org/10.1017/S0029665123002161>
- Zhang, Y., & Reicks, M. (2017). Test-retest reliability and convergent validity of two brief fruit and vegetable intake questionnaires among school-aged children. *Nutrients*, 9(7). <https://doi.org/10.3390/nu9070707>