



Trained Cohorts of University Students are a Useful Resource for Conducting Dietary Surveys in Mongolia

Food and Nutrition Bulletin
2017, Vol. 38(2) 267-272
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DOI: 10.1177/0379572117700749
journals.sagepub.com/home/fnb



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Abstract

Background: Population-based dietary assessment is important for informing national nutrition policy. The developing country setting presents challenges for robust implementation of dietary surveys, yet effective nutrition interventions are often urgently required.

Objective: To develop and evaluate a low-cost approach to epidemiologic dietary assessment in Mongolia, involving the use of large cohorts of local public health and medical students as research assistants for collecting diet records.

Methods: From 2011 to 2016, over 200 Mongolian medical and public health university students were trained to collect paired summer and winter 3-day weighed diet records from urban and rural study populations across the geographic expanse of Mongolia. Students were supervised during data collection, and their performance and experience during training and data collection were qualitatively evaluated from their own perspectives as well as those of the investigators.

Results: Students collected detailed and thorough diet records and generally reported positive feedback regarding training and data collection. Frequent supervision of students during data collection proved to be extremely worthwhile. While rural participants were amenable to having students follow them, students faced several challenges in assessing the diets of urban participants. These challenges may best be addressed by separately training these participants beforehand.

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Conclusions: With adequate training and supervision, university students may be a useful and cost-effective resource for large-scale dietary surveys in regions where their use would be practical and culturally appropriate. Further research is warranted to study how well this approach may be adapted outside Mongolia and to other dietary assessment methods and technologies.

Keywords

Asia, dietary assessment, nutrition education, sustainability

Introduction

It is estimated that more deaths are attributable to poor diet than any other category of risk factors, accounting for 22% of global age-standardized mortality in 2015.¹ Two-thirds of these deaths occur in low- and middle-income countries, where investigation and amelioration of dietary imbalances is complicated by a lack of data on the diets of individuals.^{2,3} Increasing the quantity and quality of dietary surveys may elucidate links between diet and disease and enable locally tailored nutrition interventions in developing countries. One such country, Mongolia, stands out as having the second-highest estimated rate of age-standardized mortality attributable to diet¹ and very little dietary data with which to address this.

In this report, we describe an approach by which dietary assessment, using weighed diet records, may be collected in an inexpensive manner from study populations in limited resource settings. Description and evaluation of our approach is based on our experience conducting a multiple-wave nutrition survey between 2011 and 2016, in which we trained over 200 Mongolian medical and public health students (aged 18-24, 80% female) to collect paired summer and winter 3-day diet records from 320 urban and rural participants in 8 widely separated regions across the country: the *aimags* (provinces) of Bulgan, Dornod, Khovd, Khuvsgul, Omnogovi, Sukhbaatar, and Tuv and the municipality of Ulaanbaatar.

Description of the Approach

Recruitment of Students

At the start of each summer and winter field season (June and December, respectively), arrangements were made with faculty in the departments of public health and medicine at the Mongolian National

University of Medical Sciences to identify students interested in participating in an internship related to nutrition assessment. Students were also recruited by advertising the internship on school bulletin boards, requesting already recruited students to ask their peers, and contacting students who had been recruited in previous field seasons. Students were offered a small stipend which was dispensed after their fieldwork had been completed.

Didactic Training

The first day of training was led by 2 instructors, involved groups of 10 to 20 students, consisted of a PowerPoint presentation and 2 hands-on demonstrations, and lasted approximately 5 hours. Students were equipped with a digital kitchen scale, spare batteries, forms for collecting diet records, additional forms for collecting information on vitamin and mineral supplement use and unusual aspects of the participant's day, example diet records, suggested descriptors for different types of ingredients, and a condensed text version of the presentation for reference. The presentation covered the following 9 topics: (1) project background, (2) student-participant interaction, (3) introduction to diet records, (4) describing foods (followed by a hands-on demonstration and a short break), (5) weighing foods (followed by a second demonstration), (6) collecting estimated records, (7) useful tips, (8) recording supplement use, and (9) review.

In introducing the study, the instructors used lay terms to emphasize its rationale in the context of local burden of disease and the role of the student in collecting data to help curb this burden. Emphasis was placed on weighing and describing all consumed foods with as much detail as was practical and reasonably unobtrusive. The student was taught not to change the natural diet of the participant or allow them to alter their natural diet on account of

the student's presence, yet the student should not be so detached as to seem impolite. Instead, the student was asked to find a balance between being a diligent research assistant and a respectful guest. "Tricky" situations were discussed (eg, if the participant offers the student food or asks for help in cooking). Students were encouraged to talk to the participant for information regarding ingredients and cooking methods and to use the available food packaging.

Students were instructed to always record consumed portion masses and to record ingredient and prepared dish masses whenever possible. Ingredients could be weighed before or after cooking, with the stipulation that the student records the state the ingredient was in when it was weighed. Recording portion size, ingredient amounts, and dish weights allowed the students to assess diet as well as to collect recipes for the purpose of compiling local food composition data. In cases where the student would be separated from the participant, or recording a mass would be impractical (eg, if it required an already prepared food item to be disassembled), techniques for collecting an estimated record were discussed, including prompts used in the United States Department of Agriculture (USDA) 5-step multiple-pass system.⁴

Hands-On Training

After an explanation of how to describe foods in the diet record, the instructors brought out cooking equipment, eating utensils, and a variety of local foodstuffs including raw ingredients, packaged processed foods, and nonpackaged prepared foods. Students were asked to agree on a meal to be cooked, mentally divide the meal into food items and component ingredients, and describe them on a diet record form. After explaining how to weigh foods, a second demonstration took place in which the instructors did any cooking necessary to finish preparing the meal while the students recorded the ingredient, dish, and portion masses. After each demonstration, instructors checked the students' work and indicated areas needing improvement. Each student then took their materials home and was instructed to collect a diet record from a roommate or a family member throughout the following day. On the third day, students returned this record to the instructors to be checked and corrected.

Data Collection

After training, the students and investigators traveled to 1 of the 8 selected national regions, in which each trained student was paired with at least 1 urban and 1 rural study participant who had been previously recruited from a random sample and had provided written and informed consent to enroll in the study. Participants were aged 22 to 55 years, and half of them were female. An effort was made to match students and participants by sex, though many pairs were mixed due to the higher proportion of female students. In urban sites, students collected records from their assigned participant during the day and returned to a common students' lodging area (or their own home, if the student had family in the province) in the evening. So as not to miss any foods consumed, students were asked to arrive at their urban participant's house around the time of his or her waking and to leave upon his or her sleeping, and to obtain these approximate times beforehand from the participant. After 3 days of record collection (including 2 weekdays and 1 weekend day), the students were transported to their assigned rural participant's *ger* (traditional nomadic dwelling) where they stayed for the next 3 days. After completing rural data collection, students were transported back to the urban area, their equipment and forms were collected, and each student's record was given a final check. If an inconsistency was found, the student corrected it using their field notes and memory.

Supervision of Students

Students phoned the investigators if questions or concerns arose during data collection. Students were also visited at least once by an investigator during the 3-day collection period to review their work, correct mistakes, and answer questions. During supervision, an effort was made not to stay longer than 15 minutes per student or to enter a participant's workplace or home, so as not to disturb the participant or affect their diet. An effort was made to visit most students on the first day of each collection period, prioritizing those who experienced more difficulty during training; this way, these students could be revisited if needed before the collection period ended. Students who could not be visited on the first day due to time and

distance constraints were phoned each day until they could be visited, to address questions or concerns. In most cases, it was deemed unnecessary to revisit a student during a given 3-day collection period.

Evaluation of Approach

Students' materials in later field seasons (2013-2016) contained an optional, anonymous qualitative assessment form in which 41 students recorded questions, concerns, difficulties, suggestions, and opinions they had regarding their participation in the study. Additionally, 6 to 24 months after their participation in the study, an anonymous group of 16 students obtained a multiple-choice survey regarding the training from the investigator's mailbox, which was completed and returned to the mailbox. Throughout the 5-year study, anonymous observations of students' performance were recorded by the investigators.

Methods were approved by the Mongolian Ministry of Health Ethical Review Board (ERB) and the Harvard TH Chan School of Public Health Institutional Review Board (IRB).

Results of Evaluation

Evaluation of Training

Students generally reported positive feedback regarding the training, materials provided, and the use of their time. Most surveyed students agreed they were comfortable participating and were more interested in nutrition after the training. Some students wanted more background on the study's rationale, while others were mainly interested in the "how to" sections. Responses were also mixed regarding the need for more hands-on training, with ~50% of students suggesting that didactic training for more than 1 day would have been useful.

New students were generally enthusiastic about the idea of bringing in old students as mentors during training. We pilot tested such a scheme in 1 field season using a group of students who had performed well in previous seasons, with favorable results. These mentors were provided a brief reintroduction to the material and trained in a separate module on how to assist new students during training. In training, mentors used their experience to

answer questions during both didactic and hands-on components, in which they worked in small groups that more easily permitted students to ask questions and mentors to identify difficulties.

Evaluation of Data Collection

Students had generally positive comments about their experience in data collection and their interactions with participants and instructors. Many students expressed that they were fortunate to have had the chance to participate in the study, noting that the research was "eye-opening." For example, some noted the experience would be useful in their careers in medicine or public health, as it showed them differences in diet between urban and rural areas which might be related to health. Students enjoyed the hospitality of participants in the countryside, who were "welcoming and friendly," making the students feel like "like family members." In 1 case, a student commented that being away from family and friends in the countryside was difficult; however, students appreciated and encouraged the frequent communication with supervisors via phone.

More difficulties were reported with urban participants who more often tended to seem impatient about having their foods measured before eating. Some students remarked that some of these participants actually lost interest in eating or were annoyed that their food had cooled or had been handled. Many students noted particular difficulties in restaurants. It was occasionally difficult to obtain information about ingredients from the chef or to otherwise determine what ingredients had been included in a prepared dish. In other cases, the student felt self-conscious about weighing the participant's meals in the restaurant or waiting for the meal to be finished. In winter, some students reported practical difficulties related to transportation and vehicle breakdowns in urban areas when it was very cold (sometimes reaching temperatures of -40°C).

Some students thought that recording itself was "easy," but others expressed difficulties weighing and recording the meals. In some cases, the capacity of the scales (5 kg) was too small; this was particularly problematic in the countryside, where large and heavy vessels are often used to cook dishes. Students were trained to separate such dishes out

into multiple vessels to be weighed; however, this was often impractical. Two students mentioned it would be advantageous to be equipped with their own bowls and cups to measure foods instead of using those of the participant, but they were unsure how the participants would react to this. Some female students noted that it would have been easier had they been accompanied by another student assigned to follow a second family member within the same household, as they would have felt safer and more comfortable. However, the same students agreed the presence of 2 visitors in the home could affect both participants' natural diets. Students estimated weights only when necessary but estimates occasionally appeared poor; in such cases, students revised these estimates under supervision.

Occasional errors were found in the weighed record form, including the omission of portion masses and failure to subtract plate waste. Students rarely omitted a key descriptor, although this occurred occasionally with prepared dishes. This was usually not the error of the student, since identifying all of the ingredients would have required disassembling the food, which was not allowed. Overly detailed records were attributable to the investigators' request that the students be as detailed as possible, provided that they do not disturb the participants' natural diets. Variation in the level of detail between the records of different students was not extreme and generally manifested in differences in the overall descriptiveness rather than in the enumeration of daily food consumption.

Several students suggested more research be done on participating families for the purpose of screening them for enrollment. For example, 1 student noted that a child in her participant's house was ill during the collection period, making it more difficult to interact with the participant. A few students mentioned being uncomfortable when their participants drank alcohol or when they wanted to go out, as the students occasionally felt like they were preventing the participant from doing so. Other students simply noted the inconvenience of following a participant whose work required him or her to be constantly on the move. Thus, difficulties in the recording were attributed mostly to participants' behavior. Some students suggested that providing training for the participant would be advantageous. One student

remarked that near the end of the collection period, the participant had started to help in data collection by alerting the student when they were planning to eat or bringing their food to be weighed. Some students suggested that training participants would also make them less likely to offer the student food to eat and thus affect the household food supply.

Discussion

Here we describe our experience of recruiting, training, and supervising university students in Mongolia for the purpose of collecting a prospective dietary assessment from the local population. Surrogates are sometimes used for collecting diet records from children, the elderly individuals, and low-literacy groups.⁵ In developing countries, university students may be a useful source of human capital for dietary surveys because they are familiar with local norms and foods, are less costly than dietitians or community health workers, and may be incentivized by academic internship credit. Employing students in lieu of specialized professionals may also have other tangible benefits to public nutrition in that large cohorts of young and educated individuals are being exposed to nutrition research.

In recent years, extensive use of university students for collecting long-term community follow-up data has been pioneered at the Independent University of Bangladesh (M. Omar Rahman, oral communication, October 15, 2015). To our knowledge, use of students for prospective dietary assessment of communities is not common. In developed countries, large-scale surveys of individuals' diets typically use a recall instrument or require participants to collect their own record.⁶ Each of these approaches has advantages and disadvantages in the developing country setting.^{5,7} Participant-collected diet records, while constituting a less intrusive and complex approach, may have issues with motivation in populations that are largely illiterate or unfamiliar with epidemiologic research. The 24-hour recall method, while less expensive and easier to analyze, requires repeat recalls to be separated by at least 2 weeks. This would be impractical, given the remoteness of some of our participants.

Based on the students' responses and our own observations, we suggest some degree of training

of the participants themselves to improve the interaction between participant and student and to facilitate the collection of more accurate diet records. Use of past students as mentors appeared to improve the effectiveness of training. It is likely that an extended training period, including a 2- or 3-day didactic component, would be helpful to increase the amount of information retained by the students (particularly if diet records are to be collected for more than 3 days). If training cannot be extended, we suggest making the training as interactive as possible, incorporating small groups, role-playing, and quizzes. Regardless of the length of the training, supervision of the students during data collection proved to be highly worthwhile.

Refining this approach and adapting it to other regions, where appropriate, may increase the quantity and quality of data on the diets of many industrializing populations, which are as yet poorly understood. This could confer significant advances in the understanding of nutrient- and food-disease relationships, while enabling nutrition interventions in areas where they are needed most. Research is warranted to determine how the use of students may be adapted to other dietary assessment methodologies (eg, 24-hour recall, 7-day diet record, and food frequency questionnaire) and how generalizable this approach may be for populations outside Mongolia. Consideration should also be given to the incorporation of technology-assisted methods, given that many students own smartphones and that audiovisual, telephonic, and computerized collection methods have been used in technologically advanced settings⁷ and may play a more prominent role in developing countries in the future.

Authors' Note

DG and SB conceived the study. DG, HB, HY-FC, JCS, and SB trained the students and supervised the dietary assessment. HB, HY-FC, and SB designed, implemented, and interpreted the evaluation. JCS, RL, and SB drafted the manuscript. DG, HB, HY-FC., JCS, RL, SB critically revised and approved the final manuscript.

Acknowledgment

The authors thank Rosalind Gibson for extensive technical consultation throughout the study, and Teresa Fung for helpful comments on the paper. The authors also thank the many students from the Mongolian National

University of Medical Sciences and Ach Medical Institute, who assisted this work from 2011 to 2016.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Harvard TH Chan School of Public Health Nutrition Round Table, Millennium Challenge Corporation, Sight and Life, Vitamin D Society, World Health Organization, and an anonymous foundation. SB was supported in part by the National Institutes of Health (5T32ES007069).

References

1. Institute for Health Metrics and Evaluation. GBD Compare. <http://vizhub.healthdata.org/gbd-compare>. Accessed December 1, 2015.
2. Neufeld LM, Tolentino L. Nutritional surveillance: developing countries. In: Caballero B, Allen L, Prentice A, eds. *Encyclopedia of Human Nutrition*, 3rd ed, Vol 3. UK: Elsevier; 2013:289-302.
3. Fiedler JL, Lividini K, Bermudez OI, Smitz MF. Household consumption and expenditures surveys (HCES): a primer for food and nutrition analysts in low- and middle-income countries. *Food Nutr Bull*. 2012;33(3 Suppl):S170-S184.
4. Moshfegh AJ, Raper N, Ingwersen L, et al. An improved approach to 24-hour dietary recall methodology. *Ann Nutr Metab*. 2001;45(suppl):156.
5. Thompson FE, Subar AF. Dietary assessment methodology. Coulston AM, Rock CL, Monsen ER, eds. *Nutrition in the Prevention and Treatment of Disease*. San Diego, CA: Elsevier; 2008:5-46.
6. Harris EW. Nutritional surveillance: developed countries. In: Caballero B, Allen L, Prentice A, eds. *Encyclopedia of Human Nutrition*, 3rd ed, Vol 3. UK: Elsevier; 2013:278-288.
7. Ferro-Luzzi A. Individual food intake survey methods. Paper presented at: *Measurement and Assessment of Food Deprivation and Undernutrition International Scientific Symposium*, Rome, Italy, June 26-28, 2002. <http://www.fao.org/docrep/005/Y4249E/y4249e0a.htm>. Accessed December 1, 2015.