Exploring food security and nutrition among young women in the formally regulated garment sector of Myanmar

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Malnutrition can adversely influence women’s overall health and development and that of their children. In the Yangon region of Myanmar, young women aged 15–19 years can be excessively thin, overweight, or anemic. A significant proportion of these young women working within the formal sector are employed in the garment industry. This study used a mixed-method approach to generate robust evidence on food security and nutrition in young female garment workers. The research revealed that women have poor quality of nutrition, restricted their food intake, and ate less preferred food. The risk factors for not meeting the minimum dietary diversity were related to migration patterns, employment, food security level, and living conditions. This study offers recommendations and identifies areas for interventions that are either wanted by consulted stakeholders and/or for which there is an evidence basis for their recommendation: (1) promote food- and nutrition-specific programming, (2) increase healthy food access, and (3) improve employment conditions. These future interventions should generate comprehensive research, data, and benefits to fill in the evidence gaps identified and provide guidance on how to promote nutrition in the workplace for this vulnerable group of workers.

Keywords: nutrition; food security; Myanmar; garment; young women

Introduction

Industrial growth has been contributing to rapid urban growth and driving rural-to-urban migration. In Myanmar, the ready-made garment (RMG) industry contributes 31% of all manufacturing jobs and employs more than half of all women working in manufacturing. Since the lifting of sanctions in 2011 and 2013, international retailers are sourcing their products in Myanmar more and more. The RMG sector is a typical labor-intensive industry employing a workforce of nearly 400,000, of whom 90% are young women. Specifically, young women aged 15–19 years old, 8% of the total population, make up an important portion of the workforce in factories. Nationwide, 54.1% are employed and 37.3% do unskilled labor. By 2020, 10% of the Myanmar population is expected to rely on the garment sector for basic needs and more than one million people could be employed. This expansion could bring an additional $10 billion USD annual turnover, assuming barriers, such as the limited skills of workers, poor infrastructure, protectionist legislation, and political uncertainties, are overcome.

In Asia, women in the RMG sector typically migrate from rural areas with the explicit purpose of working and sending money back to the family. In Myanmar, previous research by the International Labour Organisation (ILO) in RMG factories found that 86% of the respondents sent remittances of 50% or more of their salary on a monthly basis. Many of these women are young and unmarried. When they do have children, the children often stay in their native village in the care of family members.

RMG workers are prone to poor health, according to a recent systematic review. Health vulnerabilities, both physical and psychological, were reported in studies in South and Southeast Asian countries. In Bangladesh, vitamin A and
calcium deficiencies were found, as well as vitamin D deficiencies from not spending enough time outdoors. In Cambodia, RMG workers had a low purchasing power of approximately $1.50 USD per day and were unable to reach appropriate dietary diversity, and 31% were underweight and anemic. Workers’ disposable income was found to be determined by the level of remittances. The increase in minimum wage in Cambodia did not translate into better nutrition because of the remittances they send. In Cambodia, as a follow up to mass fainting events, a five dollar health allowance or subsidy was initiated since 2012 to promote better health and productivity, but no evaluation of its effectiveness was carried out. Previous research in the same country showed that workers who ate in the factory were in better health and were less sick. In India, anemia was documented at a 62% prevalence in women and 75% in nonpregnant women. Women, to the detriment of their health, were reported to explore creative ways to spend less on food: pooling resources to purchase food collectively, bringing food from home, purchasing poor quality products, or skipping meals.

In Myanmar, the most common issues in the factories are unhealthy and unsafe working environments, improper food and nutrition provided to workers, and excessive working hours. In addition, women frequently encounter discrimination, sexual and verbal harassment, and lack of maternity allowances. The minimum wage for RMG work is set at 3600 MMK/day ($2.30 USD). One study suggested that women employed in garment industries face nutrition challenges: limited time to buy food; 26% were undernourished; and 72% lacked appropriate food diversity. Reported constraints include long working hours that make purchasing fresh food from market impossible and the lack of adequate places to cook. Women in the study seldom cooked and ate ready-made food, showing a preference for food that will make them feel full. Street food was also widely consumed, which increased the expenditure on food. Food avoidances during menstruation were also barriers to dietary diversification. Women in Myanmar face disadvantages in terms of pay and usually remain in nonmanagement roles. Workplaces give insufficient attention to gender-specific needs, such as the protection of pregnant and breastfeeding workers, provision of breastfeeding facilities, child care, and return-to-work policies. When factories do provide breastfeeding and childcare space, women do not always use them owing to peer pressure and nonfavorable business cultures that favor nonpregnant, single young women. Some respondents reported younger women having had abortions to fit this business culture.

Given that migration of young women toward cities is an important survival coping strategy for the rural poor populations and that the garment work environment is characterized as difficult for women, this research hypothesized that drivers of food insecurity and inadequate nutritional consumption in this vulnerable population would be dependent on employment conditions (e.g., hours worked, salary, and training received) and other factors that might be influenced by their employment (e.g., the food environments, housing conditions, and food security in the household). The general aim was to assess the status and influencing factors on food security of young women engaged in garment work from peri-urban communities in Yangon, Myanmar and to engage stakeholders in acting upon these risks. The research used an ecological approach examining how women’s work environment influenced their food security and nutrition while also using a top-down approach to identify recommendations for actions from stakeholders that have the power to initiate change. The study included: (1) assessment of the food security and livelihood situation among young women working in the formally regulated RMG sector; (2) identification of the risk factors for food insecurity and poor nutrition among these young women; and (3) identification of the medium- to long-term response options to address food insecurity of these women in collaboration with stakeholders.

Materials and methods
The survey used an ecological approach by collecting data at the individual, factory, and community level and understanding the connection between these. Using a top-down approach, results were presented and discussed at the national level with a wide range of stakeholders to translate evidence into actions.

Data collected
A convenience sample of 11 factories in peri-urban communities from the Yangon region of Myanmar
was used. These factories are source factories for international garment companies and, hence, have to obey international standards on working conditions and are consequently representative only of the best-case scenario. The factories varied in terms of their size and number of employees. The study used a cross-sectional design with an estimated required sample size of 509 young women, with an assumption based on a Food Consumption Score (FCS) of 30% (this indicator is a key food security indicator for which a benchmark in Myanmar at the national level was available and thus preferred over others), a design effect of 1.5, a confidence interval of 95%, and a nonresponse rate of 5 percent. A questionnaire was administered to 546 young women aged 18–19 years who worked in the garment industry and who lived in poor urban areas in all factories. The original aim of the survey was to capture adolescents from 15 to 19 years old. The target population had to be limited to 18–19 years during the ethical review process given that work for those under the age of 18 years is not authorized in Myanmar, that is, girls below the age of 18 are working illegally. The questionnaire included the following components: (1) household composition; (2) demography and education; (3) employment situation; (4) food expenditure; (5) FCS and food consumed away from home; (6) women’s dietary diversity; (7) food insecurity access scale; (8) food provisioning; (9) impact of work on food purchase, preparation, and consumption; and (10) living conditions. Fifty women were randomly selected in each factory on the basis of their age (18–19 years) using a list provided by the factory. In factories where there were just 50 women meeting the inclusion criteria, all were included without randomization.

Another questionnaire was administered to the factory’s human resource managers (in total 11 managers were interviewed) to identify key issues related to the 11 factories and their food environment situations, consumption habits, and opportunities for positive change using convenience sampling (since access to the factories is a limiting factor). Pictures of the canteen, food options, and WASH conditions were taken to add to the questionnaire’s description.

For all factories, a walking food map of an area around each of them (using a 1-km radius) was created to assess the types of food available, as well as their costs. A 1-km-radius area was selected because it was a reasonable walking distance and encompassed a wide range of food retail outlets. Prices may vary by quantity; so the price data were collected on the basis of standard packet/serving sizes, as well as for the largest and smallest sizes available. A food walk questionnaire was used to capture the data for five food stalls within the said 1-km radius per factory (in total 55 food stalls were interviewed). The food stalls were selected on the basis of their proximity to the factory. Pictures were taken to add to the questionnaire’s description.

The study participants were allowed to complete the interviews during business hours. Interviews were conducted during the working day in agreement with factory management. Consent was obtained from each respondent before their respective interviews were conducted. The interviews themselves were conducted face-to-face in a secure area within the factory. Female enumerators administered the questionnaire.

The questionnaires were pretested and minor adjustments were made after the pretesting. The enumerators were trained on the content of the questionnaires and on food security, nutrition, and WASH by the lead researcher and the National Nutrition Center, Ministry of Health and Sports, Myanmar. They were selected from a pool of enumerators with experience in quantitative and qualitative data collection in factories. The lead researcher and the National Nutrition Center monitored and completed quality checks. Prior approval by garment factories to use their employees’ lists as a sampling frame and to conduct the interviews in the factories were obtained.

**Translating findings into actionable recommendations**

Consultative workshops were held in Yangon, Myanmar in early 2019 that included participating factories, donors, and international and national actors in the RMG sector, urban nutrition, health, and food security. On the basis of the key findings of the research, a set of recommendations were discussed in the first workshop with factories and other actors in small groups and presented in plenary settings. The second workshop, chaired by the National Nutrition Center, built on these and further discussed actions that can be led by government and other actors.
Setting. The settings for this study were two industrialized areas of Yangon, Hlaing Thar Yar and Shwe Pyi Thar. Hlaing Thayar Township, which has a population of nearly 700,000, about half of whom are squatting illegally, has attracted migration historically because of the development of fast-expanding industrial zones (garment and light industries). The population growth rate between 1998 and 2011 in Hlaing Thayar was 7% annually compared with 3% in other peri-urban areas in the same period. After Cyclone Nargis in 2008, some of the affected population from the Delta region migrated to Hlaing Thayar. Shwe Pyi Thar, north of Yangon, has four industrial estates with large numbers of migrants seeking employment opportunities. According to the 2014 Census, the population in Shwe Pyi Thar was 343,526, including significantly more girls or women (164,264 males versus 179,262 females).

Data analysis. Data on garment workers were entered for advanced cleaning and analysis using the SPSS statistical software. The data were also encrypted in the absence of personally identifying information and with strict rules for data access implemented. Chi-square tests were used to ascertain differences between study groups (e.g., women meeting diet diversity versus women not meeting diet diversity and the number of hours they work). The main indicators included the FCS, the Food Consumption Score-Nutrition (FCS-N) (protein, heme iron, and vitamin A), Minimum Women’s Diet Diversity (MDD-W), the Household Food Insecurity Access Scale (HFIAS), and the Household Food Insecurity Access Prevalence. These indicators are based on the United Nations World Food Program core indicators and are part of internationally recognized guidelines for nutrition and food security that have been used and tested in Myanmar (Table S1, online only).

To identify the risk factors for food insecurity and poor nutrition among young women, univariate and multivariate logistic regression models were used to examine the relationship between socioeconomic characteristics, work- and food-related factors, and the risk of not meeting MDD-W. Simple and multiple analyses of covariance using linear regression were used to examine the relationship of risk factors with MDD-W. A value of $P < 0.05$ was considered statistically significant, although odds ratios were also examined to consider the effect size. Two models are used: model 1 explored the association of MDD-W and factory-related variables (e.g., employment hours and salary) adjusting for women’s age and education; model 2 explored the same association adjusting for the previous factors and women’s health and living conditions.

The food stalls and the factory’s human resource managers data were analyzed separately in SPSS and using frequencies and means. The stakeholder data from meeting notes were analyzed using thematic analysis to identify key areas of recommendations.

Ethical considerations. This study was reviewed and approved by the Ethics Review Committee, Department of Medical Research, Ministry of Health and Sports, Myanmar on October 30th, 2018. Informed consent was obtained from all participants, and permission for the study was sought from the relevant authorities before the study was conducted. The team behind the study respected the fundamental principles regarding research on human subjects. A small stipend was provided to the study’s participants to cover the cost of the time their participation took (commensurate with local salaries for the amount of work time).

Results

Key findings are presented at individual, household, and factory level since understanding women's nutritional situation in a holistic manner using an ecological approach is important. We hypothesized that their working and living environment might affect their access to food and their ability to cook and eat.

Women’s profile and situation

Most of the young women (62.6%) lived in a hostel or a rented apartment with at least three other persons with whom they shared meals with (Table S2, online only). They were predominantly single (90.5%) and 66.3% of them were 19 years of age, 47% of them having completed high school. Most lived within proximity to the factory (less than half an hour away and driving distance). They mainly used the bus shuttle or ferry provided by the factory or walked to work. The majority of young women (98.4%) migrated to Yangon within the past 3 years in search of better job opportunities and income, with 37.7% of the migration taking place recently (less than 1 year). Their places of origin were
mainly Ayeyarwaddy (48.3%), Bago (15.9%), Magway (11.4%), and Rakhine State (11.2%) in Myanmar. There was a peak of relocation around April (17.6%), May (20.7%), and June (10.5%), which corresponds to the lean season in Myanmar.

The women were recently employed; 59% were employed for less than 6 months and worked for at least 49 h a week (61.4%). These workers were paid monthly with cash, and their average daily wage equivalent was 8497 MMK or $5.70 USD per day (minimum: 3600 MMK; maximum: 13,348 MMK, SD: 2154 MMK). A minority received skills training (15.9%). They were provided by factories with housing (21%), food and/or drinks (17%), transport (99%), and clothing (16%). Within the past 7 days, 11% of the participants were absent from work, with sickness being the primary cause (51%). Sixty six percent of them attended private clinics to seek health care. Working women experienced various levels of headache (always or often: 13%), thirst (always or often: 7.7%), and hunger (always or often: 14.8%). They demonstrated clinical signs and symptoms of anemia: weakness or exhaustion (always or often: 8.1%), dizziness (always or often: 7.5%), and cold hands and feet (always or often: 5.2%). Given that most workers come from poorer households, it was anticipated that women who recently migrated were in poorer health. Results showed no significant difference between women who migrated less than 1 year versus those longer term migrants when exploring women’s hunger, thirst, and anemia signs at work.

Forty seven percent of young women met the minimum diet diversity for women (MDD-W; a proxy indicator of diet quality); they consumed five or more food groups (out of 10 food groups) on the day before the interview date. The main food groups consumed were rice, bread, meat, poultry, fish, and vegetables (including dark green vegetables). The women who met their minimum dietary diversity were consuming significantly more of all the food groups (excluding rice, bread, and potatoes). They also consumed more foods that were less nutrient dense (i.e., sugar and sugary drinks) (Table 1).

There were significantly more women who fainted at work and did not meet the minimum dietary diversity (11% versus 1%, chi-square value = 7.4, P = 0.007).

Ten percent of the women did not have breakfast before going to work. Ninety seven percent of them were able to consume lunch and dinner. Fifty nine percent of them took a light snack. The main reasons for not having breakfast were a lack of time and not feeling hungry. The main reason for not having lunch and dinner was a lack of hunger. The main reasons for not having snacks were a lack of hunger and a lack of money (Table S3, online only).

Breakfast and dinner were mainly prepared and consumed at home, whereas lunch was prepared at home and consumed at the factories at which the women who partook in the study worked. At home, breakfast and dinner preparation entailed the use of a rice cooker and cooking rice where the women live for the majority. Snacks were predominantly purchased when they were sold within proximity to the factories where the women worked (Fig. S1, online only). In the sample, 1.8% of women relied entirely on home-cooked food and 1% entirely on food purchased from restaurants. There were significantly more women who brought lunch from home who did not meet the minimum dietary diversity compared with women meeting diet diversity (55.7% versus 44.3% at P = 0.029). There was no significant difference for MDD-W between women who relied only on street food and women who relied on food cooked at home. For women relying only on home food, there were more women who did not meet MDD-W compared with women relying on other sources of food (52.4% versus 47.6%), but the difference was not statistically significant.

Lunch and dinner ordinarily cost more than 700 MMK or $0.50 USD per meal, whereas snacks ordinarily cost more than breakfast (525 versus 406 MMK). The costs varied significantly for each meal, with large standard deviations. Most women cooked where they slept. The remainder had no kitchen, did not cook at all, had a separated kitchen, or used a shared kitchen. Less than half of the women did not report their work having any impact on food purchases, preparation, and consumption. The main changes reported when women were asked the impact of their work on their life were having more money to buy prepared meals and having less time to visit the market and to cook what they purchased from the market.

**Food security situation in the households**

For this study, the term *household* describes a group of persons who regularly share meals and live under the same roof. Members of these women's
Table 1. Percent of women consuming foods from various food groups yesterday, when above or below the threshold of five food groups (n = 546)

| Food groups                                      | MDD-W <5 food groups |          |          |          | MDD-W ≥5 food groups |          |          |          |          |          |          |          |
|--------------------------------------------------|-----------------------|----------|----------|----------|-----------------------|----------|----------|----------|----------|----------|----------|----------|----------|
|                                                  | %                     | 95% CI – lower limit | 95% CI – upper limit | P value | %                     | 95% CI – lower limit | 95% CI – upper limit |          |          |          |          |          |          |          |
| Rice, bread, potatoes, sweet potatoes, tuber, and maize | 52.6                  | 48.4     | 56.8     |          | 47.1                  | 42.9     | 51.3     |          |          |          |          |          | NS       |
| Beans, pulse, lentils, chickpeas, and tofu       | 9.9                   | 7.4      | 12.4     |          | 22.2                  | 18.7     | 25.7     |          |          |          |          |          | <0.001   |
| Nuts and seeds                                   | 2.2                   | 0.9      | 3.4      |          | 9.5                   | 7.0      | 12.0     |          |          |          |          |          | <0.001   |
| Dairy, milk, and yogurt                          | 1.3                   | 0.3      | 2.3      |          | 5.9                   | 3.9      | 7.9      |          |          |          |          |          | <0.001   |
| Meat, poultry, fish, and shrimp (organ meats)    | 36.6                  | 32.5     | 40.6     |          | 41.4                  | 37.3     | 45.5     |          |          |          |          |          | <0.001   |
| Eggs                                             | 10.3                  | 7.7      | 12.8     |          | 23.1                  | 19.6     | 26.6     |          |          |          |          |          | <0.001   |
| Dark green leafy vegetables                      | 24.5                  | 20.9     | 28.1     |          | 37.5                  | 33.4     | 41.6     |          |          |          |          |          | <0.001   |
| Other vitamin A–rich fruits and vegetables       | 11.0                  | 8.4      | 13.6     |          | 26.4                  | 22.7     | 30.1     |          |          |          |          |          | <0.001   |
| Other vegetables                                 | 27.3                  | 23.6     | 31.0     |          | 39.6                  | 35.5     | 43.7     |          |          |          |          |          | <0.001   |
| Other fruits                                     | 5.5                   | 3.6      | 7.4      |          | 20.3                  | 16.9     | 23.7     |          |          |          |          |          | <0.001   |
| Sugary food consumption (sweets)                 | 6.4                   | 4.3      | 8.5      |          | 15.0                  | 12.0     | 18.0     |          |          |          |          |          | <0.001   |
| Sugary drinks (carbonated soft drink, sweetened tea, and sweetened coffee) | 14.1                  | 11.1     | 17.0     |          | 16.5                  | 13.4     | 19.6     |          |          |          |          |          | 0.034    |

Households can include other workers in the garment industry. They may live in a hostel or dormitory provided by the factories at which they work, with their relatives, or with people who reside within their village.

 Households with inadequate food consumption (poor and borderline) were 8.4% of the study’s respondents, with 0.9% of them having a poor diet (see Table S1 for definitions, online only). None of the households consumed less than three food groups. The households with an adequate diet consumed more meats, fish, organs, eggs, vegetables, and fruits (Fig. S2, online only).

 The FCS-N presents the household’s food consumption of vitamin A, protein, and heme iron. The daily consumption of foods rich in heme iron was reported at 15%. Less than half of the households did not consume foods rich in protein every day (Fig. 1).

 The HFIAS score is a measure of the degree of food insecurity (with regard to access) in the household within a 30-day period. The HFIAS scores for the women showed that 50% were food secure, 27% were mildly food insecure, 14% were moderately food insecure, and 8% were severely food insecure (Fig. 2). With regard to access, the households experienced issues related to restricted food variety, food preference, and adequate food quantity more frequently.

 Eighteen percent of the participants reported that their households within the past 12 months lacked sufficient food to meet their dietary needs. The months with the highest rate of inadequate food access were June 2018, August 2018, and September 2018. The rates of inadequacy have increased overall since October 2017. From October to April (the cool to dry season in Myanmar), the rate of household inadequate food access follows the same trend as the higher rate of relocation to urban areas. This is not the case from the end of the dry season and start of the monsoon. These are important seasonal shifts in Myanmar, suggesting linkages between migration patterns and hunger seasons in rural areas.
Situation in and near the factories
Two factories provided food options for the workers. One of the options was a canteen with subsidized prices; the other was a free, fixed-menu lunch. All factories provided space, tables, and stools for their workers to eat. All other factories allowed street vendors to sell food and drinks on or near their premises at lunch time. The food environment (as reported by the factories’ managers, or the human resource departments of the respective factories) was adequate; in all factories, the tables and floors were cleaned between lunch, and there were no offensive smells. Seven factories had adequate space for the consumption of food and drink; only one factory’s eating space was overcrowded (i.e., too small). In more than half the factories studied, the participants reported that the factories provided workers with a clean, safe, and generally pleasant eating space. These findings were checked against the pictures and observations undertaken by enumerators. Importantly, these were done during the dry season and a cool month; as most of the canteens were outside (and most were sheltered), it is likely that the quality of the eating arrangement might be influenced by the heat in the extreme hot months and the intense rain during the monsoon period. The young women who participated in this study shared their views regarding food provisions in the factories at which they worked. These food provisions typically include the canteen, free lunches, and food from street vendors who arrive on the premises at lunch time within the factory. They mostly agreed that a large selection of fruits, vegetables, and healthy food were available, and that these were of high quality. Most of them were neutral with respect to the serving size and the effect the food provisions had on their budget. For most of them, however, they agreed that food provisions had a positive effect on their work attendance and health. Nevertheless, 13% of them disagreed in relation to the availability of healthy food; 23% disagreed on the quality; 19% disagreed on the quantity; 13% disagreed on the positive impact on their budget; and 21% disagreed on the notion that food provisions had a positive effect on their health. There was no association between their views on the food environments that participants reported and their nutritional situation as assessed with MDD-W.

The food walks (Fig. S3, online only) show that availability of food near the factories was adequate, except for one factory. Food outlets were located within proximity of the road or just outside the factory gates. At lunch time, outlets were allowed to enter the premises of the factories. Most of the outlets were open all day, all week, and all year. Most of the food served by these outlets was prepared on site; for 71% of them, the same food options were sold daily. The food options varied for 29% of the outlets according to the season. With reference to hygiene, 16% used protective clothing or gloves. Twenty-nine percent operated in or within proximity to potential sources of contamination.

The food options available near the factories were diverse (Fig. S4, online only) and very cheap. Teas,
coffees, and sweets were the three most common options, but nutritious foods were also available. Units of food sold on average cost 249 MMK or $0.16 USD per standard serving size, 219 MMK or $0.14 USD for the smallest serving size, and 475 MMK or $0.31 USD for the largest serving size. Some of the most popular and traditional items include pickled tea leaves salad for 500 MMK (326 g), papaya salad for 300 MMK (81.50 g), or mohinga (a morning soup made of fish) for 400 MMK (245 g). The weight on average varied between 148 and 234 g, according to the serving size.

The young women who participated in the study mostly agreed that the food provisions near the factories at which they worked were affordable and that healthy options were available. Their views regarding the food’s quality were mixed, however.

**Risk factors for poor nutrition**

Risk factors for poor nutrition were analyzed using a categorical minimum diet diversity measure for women (categorized as to whether these women reached the minimum dietary diversity levels) as the dependent variable. In univariate analyses, risk factors that were associated with not meeting diet diversity for women included: not always living there; working less than 40 h; receiving skills training; not receiving a uniform; being absent in the last 7 days; not having a snack yesterday; being food insecure; not having enough food in the last 12 months; living closer to the factory; renting a house; having a land deed as a document to prove tenancy, compared with tenancy agreement or receipt for payment; not having a kitchen; having toilets in their own yard; and having a pit latrine compared with a flush latrine (Table 2). Mean daily income was lower among women not meeting diet diversity than women meeting diet diversity (but the difference was not significant) (2122 versus 2194 MMK/day, respectively).

In a multivariate logistic regression model (model 1), not meeting diet diversity was significantly associated with insufficient access to food, consuming snacks the day before, and food insecurity in the households. In model 2, adjusting for environment characteristics, not meeting diet diversity was still associated with the food insecurity variables as well as sanitation variables (Table 3). In the final model (model 3), which adjusted for the previous factors and employment, not meeting diet diversity was still associated with food consumption and access to food security at the household level, sanitation, and some employment variables (e.g., received clothing from the factory and months of migration). Potential explanations for these associations are provided in Table 3.

The univariate and multivariate logistic regression models demonstrate that the quality of diet among women is associated with conditions in the household, in the environment, and at work. In the final model, salary and number of hours worked were not significant factors after accounting for factors at the household and environmental level, through which work-related factors might work to influence dietary diversity. Additionally, looking further at the food situation in the factories, women...
Table 2. Employment-related and living condition characteristics of women by diet diversity status at significance level

|                                           | Not meeting MDD-W (%) | Meeting MDD-W (%) | P value |
|------------------------------------------|-----------------------|-------------------|---------|
| **Duration of stay**                     |                       |                   |         |
| Always lived here                        | 18.3                  | 17.9              | 0.018   |
| Did not always live here                 | 81.7                  | 82.1              |         |
| **Number of hours worked per week**      |                       |                   |         |
| Less than 40 h                           | 29.4                  | 28.0              | 0.025   |
| 40–48 h                                  | 10.0                  | 9.3               |         |
| 49 h and more                            | 60.2                  | 62.6              |         |
| Other                                    | 0.3                   |                   |         |
| **Received skills training**             |                       |                   |         |
| Received uniform from the factory        | 17.3                  | 14.4              | 0.040   |
| **Absent in the last 7 days**            |                       |                   |         |
| Ate snack yesterday                      | 28.0                  | 31.1              | 0.002   |
| HFIAS (insecure)                         | 49.8                  | 40.1              | 0.022   |
| **Food security**                        |                       |                   |         |
| Severely insecure                        | 1.4                   |                   | 0.001   |
| Mildly insecure                          | 8.0                   | 1.9               |         |
| Food secure                              | 90.7                  | 98.1              |         |
| **Distance between place of living and factory (driving time)** | | | |
| Less than half an hour away              | 45.6                  | 39.2              | 0.048   |
| From half an hour away                   | 13.5                  | 15.6              |         |
| From 1 to 2 h                            | 0.3                   | 1.2               |         |
| **House**                                |                       |                   |         |
| Rent                                     | 86.5                  | 82.5              | 0.043   |
| Owns the house                           | 9.0                   | 12.8              |         |
| Use without pay                          | 3.8                   | 3.5               |         |
| Temporarily squatting                    | 0.7                   | 1.2               |         |
| **Document to prove occupancy**          |                       |                   |         |
| Land deed                                | 24.6                  | 16.0              | 0.029   |
| Tenancy agreement                        | 6.6                   | 8.9               |         |
| Receipt for payment                      | 6.9                   | 14.8              |         |
| None or other                            | 61.9                  | 60.4              |         |
| **Kitchen facilities**                   |                       |                   |         |
| Do not cook                              | 4.2                   | 5.8               | 0.014   |
| No kitchen                               | 36.0                  | 34.2              |         |
| Community kitchen                        | 1.7                   | 1.9               |         |
| Cook in same place as sleeping           | 52.6                  | 47.5              |         |
| Separate kitchen                         | 5.5                   | 10.5              |         |

Continued

reached minimum dietary diversity irrespective of whether the factories at which they worked provided food. For the factories that provided food, they had access to a larger variety of foods during lunch time, assuming that the food stall vendors were allowed to enter the factories’ premises to sell daily. The large effect size for sanitation shows the importance of addressing household and community level factors to bring changes in nutrition at the individual level. Being able to afford a place to live with a flush toilet is significantly related to being able to also achieve minimum dietary diversity.

Discussion

Results of the stakeholder engagements

On the basis of the key findings of the research, a set of recommendations was discussed, including actionable recommendations at the factory level and more complex recommendations that would need to be supported by policies and regulations on urban food systems.

At the factory level:

1. Provide space for the women to cook in the housing facilities provided by the factories and facilitate access to fresh food. Women lack the time and ability to cook where they live. Simple solutions, such as providing community kitchens equipped to store and cook food in hostels, were recommended by factories. The impact of work is that women have less time to go to the market or cook. One suggestion from the workshops was to bring the markets to the workers by organizing small markets once a week at the factories.
### Table 3. Multivariate logistic regression models of work-related factors as a risk factor for not meeting diet diversity

| Variable | Model 1 – Food security | Model 2 – Environment | Model 3 – Employment | Explanation (only for the variables at significance level) |
|----------|-------------------------|------------------------|----------------------|----------------------------------------------------------|
|          | OR of meeting diet diversity | 95% CI lower | 95% CI upper | OR of meeting diet diversity | 95% CI lower | 95% CI upper | OR of meeting diet diversity | 95% CI lower | 95% CI upper | P value |          |
| Having insufficient access to food security score (HFIAS Score) (higher score means higher food insecurity access) | 0.613 | 0.399 | 0.940 | 0.025 | 0.544 | 0.337 | 0.880 | 0.013 | 0.538 | 0.327 | 0.884 | 0.014 | Food insecurity in the household impacts the dietary diversity of women. |
| Ate snack yesterday | 0.531 | 0.343 | 0.822 | 0.005 | 0.619 | 0.387 | 0.989 | 0.045 | 0.635 | 0.393 | 1.026 | 0.064 | Women not consuming enough food during meals need snack to maintain their energy level or eat snacks to replace meals. |
| Facing food insecurity in the household |          |          |          |          |          |          |          |          |          |          |          |          |
| Food secure (ref) | 1.000 | 1.000 | 1.000 |          |          |          |          |          |          |          |          |          |
| Severely insecure | 0.000 | 0.058 | 0.725 | 1.000 | 0.000 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 1.000 | Food insecurity in the household affects the dietary diversity of women. |
| Mildly insecure | 0.205 | 0.058 | 0.725 | 0.014 | 0.221 | 0.059 | 0.826 | 0.025 | 0.194 | 0.051 | 0.736 | 0.016 |          |          |          |
| Number of rooms |          |          |          |          |          |          |          |          |          |          |          |          |
| Having improved sanitation | 0.875 | 0.758 | 1.010 | 0.069 | 0.881 | 0.759 | 1.022 | 0.093 |          |          |          |          | Women with unimproved sanitation are living in unhealthy environments, and this might affect their ability to access food. |

Continued
| Variable | Model 1 – Food security | Model 2 – Environment | Model 3 – Employment | Explanation (only for the variables at significance level) |
|----------|-------------------------|------------------------|----------------------|----------------------------------------------------------|
|          | OR of meeting           |                        |                      |                                                          |
|          | diet diversity          | 95% CI                 | 95% CI               | P value                                                 |
| Toilet location (ref: elsewhere) | 1.000 1.000 |                       |                      |                                                          |
| Having toilet on premises | 1.678 0.614 4.591 0.313 1.312 0.433 3.975 0.631 |                       |                      | Women with unimproved sanitation are living in unhealthy environments, and this might affect their ability to access food. |
| Having toilet not on premises | 0.699 0.298 1.639 0.410 0.603 0.230 1.583 0.304 |                       |                      |                                                          |
| Cooking location (ref: separate kitchen) | 1.000 1.000 |                       |                      |                                                          |
| Do not cook | 0.781 0.207 2.946 0.715 0.933 0.237 3.665 0.920 |                       |                      |                                                          |
| No kitchen | 0.743 0.283 1.954 0.547 0.801 0.295 2.176 0.663 |                       |                      |                                                          |
| Community kitchen | 0.801 0.164 3.921 0.784 0.986 0.191 5.089 0.987 |                       |                      |                                                          |
| Cook in same place as sleeping | 0.810 0.319 2.054 0.657 0.886 0.338 2.326 0.806 |                       |                      |                                                          |
| Living with family (ref: hostel) | 1.347 0.760 2.390 0.308 1.377 0.767 2.473 0.284 |                       |                      |                                                          |
| Salary per day | 1.000 |                       |                      |                                                          |
| Number of hours: less than 40 h | | | | 0.292 |
| Number of hours: 40–48 h | | | | 0.587 0.298 1.157 0.124 |
| Number of hours: 49 h and more | | | | 0.783 0.354 1.730 0.545 |
| Received clothing | 2.456 1.031 5.853 0.043 | | | Women who receive clothing for work can save money and spend more on food. |
Table 3. Continued

| Variable                      | Model 1 – Food security | Model 2 – Environment | Model 3 – Employment | Explanation (only for the variables at significance level) |
|-------------------------------|-------------------------|------------------------|-----------------------|----------------------------------------------------------|
|                               | OR of meeting diet diversity | 95% CI lower | 95% CI upper | OR of meeting diet diversity | 95% CI lower | 95% CI upper | OR of meeting diet diversity | 95% CI lower | 95% CI upper | P value |                                                                 |
| Received training             |                          |                        |                      | 1.475 | 0.683 | 3.185 | 0.323 |                                                                 | Skilled women are better paid and might spend more money on non-nutritious food. |
| Month of migration (Jan–Dec)  |                          | 0.914 | 0.839 | 0.996 | 0.041 |                                                                 | Patterns of migration and hunger experienced in rural areas are linked. |
| Constant                      |                          | 1.536 | 0.011 | 0.473 | 0.307 | 0.410 | 0.412 |                                                                 |                                                                 |

Note: Bold face numbers indicate that the significance level has been reached; OR, odds ratio.

2. Create a positive environment in the factories for women and their future children. Recommended efforts discussed included encouraging flexibility of working hours, a supportive environment for pregnant and breastfeeding women, and supporting migrant workers with distance parenting.

3. Conduct more research on provision of free or subsidized foods in the factories. Only two factories provided food provisions (one free lunch and one subsidized lunch). The other factories let street food vendors onto their premises. With a limitation in sample size, the findings did not show significant difference in terms of the proportion of women meeting dietary diversity whether the factory provided food or not. Factories’ management recommended that sound costing evidence was needed to decide upon investment for canteens.

4. Conduct more research on the cost-effectiveness of implementing anemia prevention and treatment programs (iron supplement, multiple micronutrients, or food fortification). Some working women were in poor health and likely to be anemic. Currently, in Myanmar, iron supplementation is only provided to pregnant women and adolescent schoolgirls. For factories and the National Nutrition Center to support a supplementation program in the workplace, more research on costing and cost-effectiveness in reducing anemia in the workplace was recommended to inform budgetary decisions.

At the national, regional, and city level:

5. Support the improvement of quality and hygiene of food sold by street food vendors near the factories. The study reported consumption of street foods mainly at lunch and snack time, with sugary drinks and sweet snacks widely sold. Issues around hygiene were also noted. Factories recommended that actions to improve the quality and hygiene of foods from street food vendors be undertaken.
6. Support a food cash allowance for young women. Low purchasing power by workers was discussed in the workshops. As in Myanmar, the Ministry of Social Welfare, Relief, and Resettlement started a maternal and child cash transfer (MCCT) program (a cash allowance for pregnant mothers and mothers of children up to the age of 2) in 2017 in certain areas.\textsuperscript{20} The use of an MCCT approach for improving nutrition was recommended as an opportunity to include vulnerable young women in the program. Currently, there is no plan to extend the program to other target groups and Yangon city.

At the community level:

7. Support community-based nutrition interventions. Discussions highlighted the importance to act at the community level too and that changes only at the factory level would not be sufficient. Recommended interventions included the use of existing community-based platforms to promote positive behavioral changes for nutrition practices.

At individual level:

8. Educate young women on financial literacy. Given the importance of remittances in Myanmar and the potential of decreasing their purchasing power, one recommendation was to provide financial literacy to the women for them to make informed choices with their own money.

\textbf{Limitations and strengths}

This research includes several limitations and strengths. The first limitation is related to the control the factories had over the survey. The team relied on the factory to provide a list of workers for interview, and the interview was done on factory premises and on factory time, which could have influenced the results. On the positive side, the fact that the survey was conducted in the factories ensured maximum participation by women, which might not have been the case in the community. Also, the survey teams were able to observe and take pictures of the canteen, toilets, water treatment equipment, and working space. This information was important to evaluate the women’s and factory managers’ responses on workspace conditions. Additionally, the recommendations during stakeholder meetings were discussed with factory managers but were unfortunately not checked with the young women themselves. This has strongly been recommended as a first step in the development of future interventions. The second limitation is due to the change in the age range of participants for ethical reasons, given that 15–17 year old adolescents might be at higher nutritional risk. The third limitation is related to the creation of household-level variables (e.g., FCS), recognizing that food sharing varies greatly among nonfamily members in the household. Finally, this survey was not able to capture the longitudinal changes in nutritional status of women. Change in malnutrition levels after a certain period of work would have been key information in comparing the nutritional value of home food versus food they eat at work.

\textbf{Discussion and implications for programs and policies}

The research showed that women have poor quality of nutrition, with higher risk depending on migration patterns, employment, and the food security situation and living conditions in the household. These findings based on data collected in source factories for international garment companies are representative of the best-case scenario. We have shown that this sample shares the same socio-economic demographics (recent migrants, place of origins, being single, and level of education), as previously reported in similar samples.\textsuperscript{2,17,21} Women suffer from various health issues and also restrict their food intake, eat fewer preferred foods, and eat less in quantity in their households. These findings confirmed those from previous studies that RMG workers in Asia are likely to be in poor health and nutrition.\textsuperscript{8–12,17} As the majority of the women are young and recent migrants, these women are likely to arrive in urban areas with poor knowledge and ability to fend for themselves in an unknown environment. They face constraints that are related to their employment: the availability of low-quality food around the factory and the absence of provision of diverse foods in the factory. But there are also direct consequences of their employment on their way of living: no kitchens, long working hours, and the restrictions they apply to themselves.
in the households. Additionally, as seen from the previous research, their financial responsibility toward providing financial security to their family is an additional burden. The risk factors identified showed that women do not face the same risks when meeting food diversity. The time of migration linked to survival strategies and lean seasons in their place of origins can affect their nutrition. Their housing conditions, which are reflective of poor facilities (limited space, access to sanitation, and security of tenure), influence their ability to cook and maintain good nutrition. Food security at home is clearly linked to their nutrition level, demonstrating that efforts should not only be targeted to the situation in factories but also in the households. These associations do not prove causality, however. Further research should be conducted to gain a full understanding with respect to the causality pathways.

The recommendations discussed during stakeholders’ consultations identify areas for interventions at the individual, factory, community, city, regional, and national level. Some of these proposed interventions are similar to what has been explored in the region and elsewhere, while some are new. In this section, we focus on the three recommendations that are wanted by stakeholders and which are evidence based (3, 4, and 5 in summary Table 4) and not on the ones that are wanted and for which there is no evidence or no specific evidence in the workplace (1, 2, 6, 7, and 8 in summary Table 4). The first group of recommendations on food- and nutrition-specific programming and healthy food access that are backed up by evidence are validated interventions that should be initiated, while for the second group further research and analysis is still needed. We also added recommendations that were not discussed during the workshop but that should be considered on the basis of current evidence on promoting employment conditions and food- and nutrition-specific programming in the workplace (9–12 in summary Table 4). The summary table highlights the evidence gaps related to nutrition in the workplace and the need for more comprehensive evidence on what interventions work to improve nutrition and guidance on how to implement these.

**Recommendations that are wanted by stakeholders and are evidence based.** These recommendations, including the provision of free or subsidized foods in the factories, anemia prevention and treatment programs, improvement of the quality of street foods, and food cash allowances, are clear intervention points.

On *provision of foods in the factories*, randomized controlled trial findings in Cambodia showed that although a free lunch resulted in more frequent consumption of dark green vegetables, vitamin A–rich fruits and other fruits, and oil and fat during lunch, it did not improve the dietary diversity sufficiently over a 24-h period. Recommendations were made to more closely adapt lunch to the nutritional situation of women and to monitor women skipping meals. In a previous research in Cambodia, a canteen offering low-price lunches ($1.00 USD) demonstrated potential to improve the food security of RMG workers. The study assessed the nutritive value of a low-price lunch model and showed that the lunches satisfied energy and macronutrient recommendations but did not have enough iron. If meals are provided, attention to the quality and diversity of food is important to make health and productivity improvements.

Cost-effectiveness analysis, as highlighted in a study on the perceptions of garment factory owners on nutrition and the feasibility for pursuing canteen services in Cambodia, is needed to demonstrate that canteens are sound investments for factories. In the effectiveness study of workplace nutrition programs in RMG factories, nutritious lunch enhanced with fortified rice, along with weekly iron and folic acid (IFA) supplementation, had the most significant impact on anemia levels compared with regular lunch and behavioral change communication (BCC). These findings could inform national legislation obliging factory owners to operate canteens or provide nutritious meals in other ways and support national guidelines on meal provision in garment factories.

Previous work on *supplementation interventions* in the workplace has demonstrated the effectiveness of a weekly dose of IFA, with or without vitamin C, on anemia reduction and increased productivity, but not of increasing consumption of iddli, a popular cereal-based fermented food, or of gooseberry juice in India. The use of fortified staples, for example, fortified rice, which is already produced and available in Myanmar, or snacks rich in vitamins, could be tested in such a setting to provide data for cost–benefit analysis. This would be
Table 4. Summary table of the recommended interventions grouped in two categories: interventions wanted by stakeholders, and other evidence-based interventions

| Interventions wanted by stakeholders | Evidence-based or best practices that show positive impact on nutrition and food security for garment workers | Final recommendations |
|-------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------|
| 1. Provide space for the women to cook in the housing facilities provided by the factories and facilitate access to fresh food. | — No evidence found. | — Evidence gap exists, and more research is needed to evaluate the proposed intervention. |
| 2. Create a positive environment for women and their children. | — Evidence shows that breastfeeding space and support in the workplace increases breastfeeding exclusivity rate and duration.\(^{38}\) | — Evidence gap exists, and more research is needed to evaluate the proposed intervention. |
| | — Additional benefits for the working mother, such as reduced absenteeism, improved productivity, and reduced turnover and healthcare costs.\(^{39}\) | |
| | — Key drivers of business action and challenges businesses face to implement family-friendly policies.\(^{40}\) | |
| | — Research is needed to identify the barriers of good nutrition for working mothers and their children.\(^2\) | |
| 3. Conduct more research on the provision of free or subsidized foods in the factories. | — Free or subsidized lunch can improve food security.\(^{27–31}\) | — Cost-effectiveness analysis is needed. |
| | — Attention to quality and diversity of foods is important.\(^{27–31}\) | |
| | — Interventions should be done in the community as well.\(^{27–31}\) | |
| | — Changes in canteen options are best accepted when these are made with nutrition education.\(^{32}\) | |
| | — Anemia can be reduced in factory when nutritious lunch with fortified rice is provided, including weekly IFA supplementation.\(^{33}\) | |
| 4. Conduct more research on the cost-effectiveness of implementing anemia prevention and treatment programmes (iron supplement, multiple micronutrients, or food fortification). | — Daily iron supplementation is recommended as a public health intervention in menstruating women and adolescent girls living in settings where anemia is highly prevalent (\(\geq 40\%\) anemia prevalence) for the prevention of anemia and iron deficiency.\(^{34}\) | — More data needed on the cost structure at the scale of a factory-based anemia prevention program. |
| | — Effectiveness of a weekly dose of IFA along with vitamin C in the workplace on anemia reduction and increased productivity but no evidence of fortified food.\(^{35}\) | |
| | — Anemia can be reduced in factory when weekly IFA supplementation and nutritious lunch with fortified rice is provided.\(^{33}\) | |
### Table 4. Continued

| Interventions                                                                 | Evidence-based or best practices that show positive impact on nutrition and food security for garment workers | Final recommendations                                                                                                                                 |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 5. Support the improvement of quality and hygiene of food sold by street food vendors near the factories. | — Evidence that street foods contribute significantly to the daily intake of poor slum dwellers. 36–39  
— Programs are currently implemented that aim to improve the quality and hygiene of street foods near factories funded by LIFT in Myanmar.  
— No evidence that these programs have an impact on women’s nutrition and food security status. | — More understanding of the nutritional value of food consumed, the hygiene of the food served, consumer behaviors, and the sociocultural aspects around street food is needed in Myanmar.  
— Data of evaluations and impact assessment from pilot project of interventions that improve quality and food safety planned in Myanmar should be reviewed and discussed to determine whether these should be scaled up. |
| 6. Support a food cash allowance for young women.                           | — Cash allowance provided in Cambodia following mass fainting events but no evaluation of its effectiveness found.  
— Maternal cash transfer program during pregnancy and child 2 years of age is implemented in Myanmar but no program exists for young women. 40 | — The use of a maternal child cash transfer approach for improving nutrition is an opportunity to include other vulnerable populations, such as the young women employed in the garment sector.  
— Evidence gap exists, and more research is needed to evaluate the proposed intervention. |
| 7. Support community-based nutrition interventions.                         | — Community-based platforms are known to be cost-effective interventions in tackling malnutrition. 41  
— No evidence found specific to factory workers.                           | — Evidence gap exists, and more research is needed to evaluate the proposed intervention. |
| 8. Educate young women on financial literacy.                              | — No evidence found specific to factory workers.                                                            | — Evidence gap exists, and more research is needed to evaluate the proposed intervention. |
| Other interventions                                                         |                                                                                                               |                                                                                                                                                |
| 9. Pay workers whose wages are calculated on a piecework basis not less than twice a month instead of currently once a month. | — Recommended by ILO. 42                                                                                     | — More evidence is needed to explore pay frequency and nutrition and food security. |
| 10. Ensure that food safety in canteens makes transition to healthy food more acceptable. | — Key enablers to eat healthy food include trust in canteen food. 43                                         | — Ensure food safety in canteens in factories                                                                                                    |
key information for factory management, as recommended in Cambodia. Weekly IFA supplementation and nutrition promotion in factories has also shown constraints compared with other platforms like schools, such as difficulty in getting access to the factories owing to busy work schedules, and these would need to be further understood. Currently, in Myanmar, the National Nutrition Centre, part of the Ministry of Health and Sports, is implementing multiple micronutrient supplementation for pregnant women, vitamin B1 supplementation for pregnant and lactating women, and vitamin A supplementation for postnatal women and iron-folate supplementation for adolescent school girls. Current nutrition programs reach women who are working in garment factories only if they are pregnant and/or lactating and seeking antenatal care from public health facilities. Future nutrition programs in the factories should generate data on the cost structure at the scale of a factory-based anemia prevention program. This knowledge is highly needed to assist policy makers in prioritizing nutrition interventions within national budget constraints.

Regarding improving the quality and hygiene of street food, there is a growing recognition of the urgent need to find solutions globally and in Myanmar. Street foods make a significant contribution to energy and protein intakes of people, from 13% to 50% of the energy required for adults, with a significant contribution to the daily intake of protein for adults, up to 50% of the recommended dietary allowance (RDA). However, street foods also contribute to the development of obesity and noncommunicable diseases (caused by the high-level contribution of fat, trans fat, salt, and sugar) and, as such, to the triple burden of malnutrition. Limited work so far has been conducted in Myanmar to assess how much street food contributes to the RDA and potentially to the burden of malnutrition. Understanding the nutritional value of food consumed, the hygiene of the food served, consumer behaviors, and the sociocultural aspects around street food would be key to exploring the potential for nutritious street food options and tackling the burden of overweight and undernutrition in urban settings. Street foods are also frequently associated with food-borne illnesses on account of the potentially unsanitary conditions in which food may be stored and prepared. In Myanmar, the burden of unsafe food (not only street food) is estimated at $500–700 million USD of annual productivity loss. To ensure food safety, previous experiences globally concluded that a complete package should be deployed: regulations, standards, and guidelines; development of IEC material (training manuals

### Table 4. Continued

| Interventions                                      | Evidence-based or best practices that show positive impact on nutrition and food security for garment workers | Final recommendations |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------|
| 11. Provide nutrition education.                   | — Nutrition education can improve knowledge and has limited impact in changing attitudes.                   | — Recommend understanding better women’s knowledge and how they make choices. |
|                                                    | — Nutrition education intervention should be done in parallel with increasing access and affordability of healthy foods at work. | — Multi-level interventions should be explored in the factory and community. |
|                                                    | — Checks and nutrition screening can contribute to prevent noncommunicable diseases (e.g., diabetes and heart diseases) and weight reduction when done with counseling. | — Recommend exploring further type of checks that could be implemented (e.g., anemia or malnutrition screening) with adapted counseling. |
| 12. Provide nutrition and health checks at the workplace. |                                                                                                             |                       |

*The Livelihoods and Food Security Fund (LIFT) is a multidonor fund set up in 2009. LIFT aims to strengthen the resilience and sustainable livelihoods of poor households by helping people to reach their full economic potential. This is achieved through increasing incomes, improving the nutrition of women and children, and decreasing vulnerabilities to shocks, stresses, and adverse trends. Note: Portions highlighted in light blue are the recommendations by stakeholders that are evidence based.*
for regulators and vendors); capacity-building programs of food safety for vendors, regulators, and consumers; food and water testing facilities for biological and chemical contaminants; and inspection and monitoring. Street foods are an important link in the urban food delivery system, and regulation of their nutritional content and safety in addition to training and certification process for street vendors is needed. Consumer awareness promotion can be an effective intervention in promoting urban population health, and specifically the health of the urban poor. Several interventions in Myanmar are currently under way aiming to improve nutritious food access near the factories. Evidence from these interventions will be important to review to evaluate the impact of these interventions on nutrition and food security for potential scale up and advocacy for regulations.

Other recommendations and best practices of nutrition interventions in the workplace that are evidence based. A recommendation of the ILO in the Protection of Wages Recommendation, 1949 (No. 85) is to pay wages to workers whose wages are calculated on a piecework or output basis not less often than twice a month at intervals not exceeding 16 days. Paying output-waged workers twice a month rather than monthly can smooth purchasing power over a month period and prevent workers in countries like Myanmar from taking on loans with high interest rates until the next pay day. In the participating factories, women were paid on a monthly basis. Paying on a more frequent basis could potentially affect food security levels in the household and hence the nutrition of women, although more evidence would be needed to confirm this association.

Ensuring food safety in workplace canteens can contribute to consumption of the nutritious foods served. Barriers and enablers are important to understand how to improve worksite canteen nutrition. A study in China showed that food safety and trust in the quality of the food provided was crucial for employees to influence individual choices toward nutritious foods. Employees preferred to eat nutritious foods from the canteen over outside foods because they knew the food was safe. The study showed that offering nutritious and safe food is a balancing act, from an organizational point of view, between limiting factors (e.g., budget and food safety regulations) and the desired outcomes (e.g., food variety and quality).

Nutrition promotion can increase knowledge but not necessarily change habits. In an effectiveness study of workplace nutrition programs on anemia status in RMG workers, there was an increase by 6% of anemia among women in the BCC promotion alone intervention (the study compared twice-weekly IFA supplementation and enhanced BCC versus BCC alone). In the workplace, nutrition promotion intervention along with cues near the purchasing point (e.g., information sheet by the canteen or vending machine) can improve the social acceptability of healthy diets and support the intention to change behaviors. In a systematic review, worksite interventions promoting healthier food and/or physical activity habits among employees showed acceptable effectiveness when the interventions were done in the community as well. Interventions done in parallel to increased access and affordability of foods at work led to significant changes.

Nutrition checks in the workplace can include nutritional status measurement and classification using body mass index to assess if the worker is underweight, normal weight, overweight, or obese. Interventions so far have predominantly been done in the United States or Europe, with a systematic review showing that weight monitoring was effective when implemented over 6–12 months. These checks work best when done with nutrition counseling and have the most impact when counseling is more frequent.

Conclusions
This study provided detailed and robust data related to the nutrition and food security of young women working within the garment industry in Myanmar. The findings, presented at the individual, household, and factory levels, showed that these women frequently encounter poor quality of nutrition and food security access issues. This study offers recommendations and identifies areas for interventions on food- and nutrition-specific programming and healthy food access that are wanted by stakeholders and are evidence based. The other best practices found included interventions improving employment conditions and food- and nutrition-specific programming. Dedicated funding and investment from the factories would need to be
allocated to improve the nutrition and health of the working women in Myanmar, a key segment of their population. Future interventions need to be well researched to fill in the evidence gaps identified and provide guidance on how to promote nutrition in the workplace.

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Author contributions

S.G., P.L.G., and L.M.H. were involved in the conception, design, and collection of data. S.G. led the analysis and S.G., P.L.G., and L.M.H. interpreted the data and prepared the manuscript. All the authors critically reviewed the paper and approved the final version submitted for publication.

Supporting information

Additional supporting information may be found in the online version of this article.

Table S1. List and description of nutrition and food security indicators used.

Table S2. Demographics and location of the participants.

Table S3. Reasons for not consuming food per meal type in the last 24 hours.

Figure S1. Sources of food per meal type.

Figure S2. Mean consumption over the last 7 days per food group classified per food consumption score (FCS).

Figure S3. Example of a food walk near a factory.

Figure S4. Food items sold near the factory (percent).

Competing interests

The authors declare no competing interests.

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