Demand-Driven Capacity Building for Public Health Nutrition Research in Lao PDR

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Abstract

Despite sustained international efforts to eradicate undernutrition, it remains the primary health threat to young children worldwide. In Lao PDR, rates of malnutrition, especially among children under five years of age, remain high. In response, the government of Laos has identified as a long-term objective the establishment of a National Institute of Nutrition (NIN). In 2019, with donor support, a large multidisciplinary team embarked on a multi-year project to support institutional strengthening in Lao PDR around public health nutrition research. We summarize the Applied Nutrition Research Capacity Building (ANRCB) project's demand-driven activities, immediate project impacts, and prospects for sustaining impacts into the future. Eight primary activities were undertaken, including back office strengthening; provision of infrastructure and equipment; mentored research; and curriculum review and development. Training and skills upgrading in areas related to public health nutrition, anthropometry, and research methods reached more 1,000 professionals. The first-ever Lao-English Nutrition Glossary was produced, as was the country's first National Nutrition Research Agenda. Project success was achieved by maintaining focus on the priorities of stakeholders and the Lao government, as articulated in the Lao National Nutrition Strategy and Action Plan (NNSAP). Project achievements can be tied to multi-year engagement, continuity of effort and contact, an emphasis on peer mentorship, and the use of an extended period of pre-planning prior to the start of activities. The project design can help to guide similar and future efforts undertaken elsewhere.

Keywords: institutional strengthening, higher education, nutrition, public health, research

Declarations

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1. Background

Despite sustained international efforts to eradicate undernutrition, it remains the primary health threat to young children [1, 2]. In 2022, 149 million children below age five worldwide were stunted (low height-for-age) and 45 million were wasted (low weight-for-height), only slightly fewer than in 2018 [1, 3]. Undernutrition is disproportionately prevalent and has the greatest disease burden in low- and middle-income countries [4]. Undernourished children are at a higher risk of death from common illnesses such as diarrhea, pneumonia and malaria [5], and face greater risk of impairments in intellectual performance, work capacity and lifetime earnings, and overall health during adolescence and adulthood - critical impediments for a country's economic growth and development. Undernourishment in childhood also perpetuates a cycle of malnutrition, as malnourished adolescents and adults face greater odds of eventually giving birth to malnourished, low-birth-weight infants when they reach reproductive age [1].

In Lao PDR, rates of malnutrition, especially among children under five years of age, remain high. The most recent data reveal that 33% of Lao children below age five are stunted, 11% are wasted and 24% are underweight, with higher percentages among some sub-groups and little overall improvement during the past five years [6, 7]. In response to ongoing concerns about these undesirably high rates of child malnutrition, the government of Laos has identified as a long-term objective the establishment of a National Institute of Nutrition (NIN). Such an institute would, ideally, provide a nationwide and interdisciplinary focus on public health nutrition, and effectively channel investments by the Lao government and the donor community into building the nation's capacity to conduct local and culturally-sensitive research,

translate research findings into action, and communicate goals and activities to a diverse set of stakeholders in the Lao community and beyond.

In 2019, with the support of the United States Agency for International Development (USAID), a large multidisciplinary team embarked on a multi-year project to help support institutional strengthening in Lao PDR around public health nutrition research, policy and programming. This paper describes the Applied Nutrition Research Capacity Building (ANRCB) project's demand-driven activities, which were undertaken to strengthen capacity to conduct and utilize nutrition research. We review several of the immediate impacts achieved by the project as well as prospects for sustaining impacts into the future. The project design can help to guide similar and future efforts undertaken elsewhere.

2. Project Strategy and Design

2.1 Identifying Capacity Building as the Primary Project Goal

As commonly used, the term *capacity building* refers to efforts targeted at strengthening and enhancing the ability of an individual, organization or community to perform effectively in a particular domain. Capacity building tends to address specialized management issues, and often involves developing the knowledge, skills, resources and infrastructure necessary to achieve specific goals and objectives [8]. For low- and middle-income countries facing significant food and nutrition security challenges, specifically-targeted capacity building combined with effective nutrition governance can be fundamental to achieving improved nutrition outcomes [9]. In Lao PDR, building this capacity has been difficult given competing demands for government resources and attention, and shifts in donor priorities, as is the case in many

115 countries. As a result, constraints on research capacity lead to a cascade of effects in which the
116 local production of contextually relevant problem-solving research becomes difficult. This, in
117 turn, undermines locally-led application of research evidence for societal benefits. This
118 fundamentally problematic dynamic, arising from a research capacity vacuum, is a major
119 challenge to improving public health.

120 The overarching goal of the ANRCB project was to improve capacity to conduct and
121 utilize nutrition research, incorporating four key components of capacity building: (i) human
122 resources development; (ii) infrastructure enhancement; (iii) knowledge and skill transfer
123 through targeted training, mentoring and "hands-on" experiential learning; and (iv) institutional
124 collaboration and strengthening. The project targeted three key Lao institutions with
125 responsibility for public health nutrition programming and training: the Ministry of Health's
126 Nutrition Center (henceforth referred to as the Center), the University of Health Sciences (UHS),
127 and the Lao Tropical and Public Health Institute (Lao TPHI). Two US-based academic institutions
128 – Purdue University and Indiana University – provided technical support, and Catholic Relief
129 Services (CRS), which has sustained a strong physical presence in Lao PDR and the South East
130 Asian region generally, served as the in-country implementing partner. Purdue University is
131 home to a highly-regarded College of Agriculture and Department of Nutrition Science. Indiana
132 University has a global reputation in public health education. Importantly, both institutions
133 have researchers who are internationally known for their global field work and training in
134 nutrition and epidemiology, agricultural economics and food policy, and public health. CRS
135 brought an established track record of working successfully with the Lao government and
136 successfully engaging in capacity building activities with multiple stakeholder groups in Laos.

The core team consisted of individuals with many years of international project experience in South East Asia, Africa, and Latin America, a feature that was central to the success of the project. Past experiences often informed not only project design, but the ability to continually and adaptively manage the project, incorporating local knowledge and needs along the way, a hallmark of effective project management [10].

The ANRCB project design was predicated on a theory of change that links improvements in nutrition indicators (e.g., stunting at the population level) to knowledge, expertise and institutional competence. Simply put, the logic behind the project design was the belief that if research can provide more accurate and higher-quality information and an improved empirical basis for understanding and action, and if a strong institution exerts ownership, collaborates with stakeholders who have a shared interest in outcomes, and operates effectively to achieve identified shared goals, this will result in a better evidence base and improved operations, which have the potential to drive better decisions, policies and programs, and in turn produce better nutrition outcomes in the long run.

2.2 Implementing a Results-Oriented Framework

To begin, the project identified a set of fundamental requirements for success: (i) a clear understanding regarding the individuals and institutions with which we would work, including their roles and responsibilities; (ii) a well-articulated problem/solution analysis; (iii) an appreciation of the needs of partners and stakeholders as articulated by them and those with whom they were interacting; (iv) a desire for sustainable change among partners; and (v) feasibility of activities within the Lao operating context and implementation period.

The project was designed in three phases. Phase 1 began in September 2019 and consisted of approximately eight months of discovery and pre-planning, including a site visit by the US-based principal investigators, who conducted extensive key informant interviews with more than 100 government and international non-governmental organization (INGO) stakeholders in Laos, and an assessment (through structured interviews and surveys) of basic knowledge, skill gaps and training needs among those with whom we would work, such as government staff, university faculty, students, and recent graduates. These formative activities were designed to help the project team to learn about the current environment for conducting and utilizing nutrition research in Laos and the priorities of the government within the context of the Lao National Nutrition Strategy and Action Plan (NNSAP) [11], which serves as a guiding document for nutrition activities.

Understanding the potential receptiveness of leadership and staff of the Ministry of Health (MoH) and the Center to proposed training and capacity building activities was also considered an essential Phase 1 task. Phase 2 consisted of an additional twelve months of activities undertaken in the US and Laos to (i) design, develop, and translate research and training materials; (ii) work with stakeholder audiences to better-position the project for wide impact and visibility; and (iii) work with Center staff to increase basic institutional capacity in areas such as office operations, communication, and financial management. During Phase 2, we were also developing a Memorandum of Understanding (MOU) with the government of Laos and seeking government approval for project implementation. Phase 3, consisting of in-country

implementation activities, began once the MOU was approved and signed. These activities took place over twenty-eight months from March 2021 through September 2024.[1]

2.3 Using Data and Information to Drive Project Design

Before identifying, defining and budgeting for a set of proposed project activities, we engaged in an extensive gap assessment and co-creation process during Phase 1.[2] Criteria for identifying gaps that could be relevant for the project's focus included: (i) need for attention; (ii) government openness to receiving outside assistance; (iii) lack of redundancy or competition with other ongoing donor-led interventions; (iv) feasibility to introduce activities and achieve impact within the project life; and (v) reasonable likelihood of sustained post-project efforts. The problem narrative that was presented to the project sponsor and the government of Laos identified several interlocking components to sustain an agriculture-nutrition research environment in Laos in the long run. This was motivated by the interdisciplinary nature of public health nutrition and the significant overlap in research objectives and efforts between these two sectors. The components included identifying nutrition security as a theme important to Laos' development goals and path; building institutional infrastructure and mentorship

[1] Although originally planned as a four-year project, due to delays associated with the COVID-19 global pandemic, some Phase 2 and Phase 3 activities were delayed. With the benefit of a one-year no-cost extension from the sponsor and an extension of the MOU by the government of Laos, the project was approved to continue activities through September 2024. Although the pandemic interrupted and delayed some in-country activities, it also provided valuable opportunities for planning and communication with project partners and other stakeholders.

[2] For reasons related to the MOU, project activities were confined to Vientiane and the nearby capital region, and institutions under the purview of the Ministry of Health.

support; tailoring research capacity in an interdisciplinary way; and establishing and maintaining communication toolkits to disseminate results rapidly to stakeholders.

To develop domains for specific project activities, we used information from a range of assessments to better understand core needs and potential constraints and challenges to implementation. Among the assessment methodologies and tools used were structured conversations with stakeholders, literature reviews, key informant interviews, and online and face-to-face structured surveys. In particular, we engaged in the following:

- A scoping visit by the US team to identify potential activities. This visit included a full week of meetings with nearly 30 individuals including sponsor staff, representatives of the Lao government, university representatives and staff of various INGOs working in the nutrition space.

- An extensive literature review to understand the institutional and programmatic context of nutrition in Lao PDR. This review covered two areas. The first was the overall Lao research environment, to assess local research and scientific capacity. Materials reviewed included data (such as Lao Multi-Indicator Cluster Survey data) and Lao and external agency reports, and various unpublished INGO/donor research reports. The second included the relatively scant literature available in English covering government policy, strategy, and organization. These included key resources such as the Lao National Nutrition Strategy to 2025 and Action Plan 2016-2020 [12], an unpublished midterm Review of the Nutrition Action Plan, and unpublished documents from the 2019 National Nutrition Forum, including the National Progress Report of 2019 [13].

- Key Informant interviews conducted by CRS staff with more than 45 individuals, including both Lao and external stakeholders. During Phase 1 assessment, much of the material from these conversations was synthesized to maintain confidentiality of those who participated. This level of sensitivity was regarded as important to ensure candid responses on topics that could be construed as critical of current practices. Active nutrition community involvement in study design and implementation, and a learner-centered approach for curriculum development and research implementation has been shown to be essential for project success [14, 15, 16].

Building on findings from the scoping work listed above, structured survey instruments were developed and anonymous surveys were conducted to collect information specific to individuals' nutrition knowledge, training, and work responsibilities. Information included both quantitative and qualitative data. Surveys were developed in English and then translated into Lao.[3] Surveys were administered in Lao using both on-line and face-to-face methods, and responses were collected from a total of 49 individuals among whom 27 were faculty and students from local universities, and 22 were leadership and staff of the Center. Characteristics of survey respondents are summarized in the Appendix. As we developed training activities and materials in Phase 2 of the project, we used information obtained through the survey to help ensure materials were sensitive to the gender, backgrounds, and needs of participants.

Once all survey information had been compiled and reviewed, the project team met over a two-day period to map key informant findings to key themes; summarize answers to key questions; conduct a problem analysis with a problem/solution tree; determine which problems/solutions were already being addressed by other stakeholders and which problems/solutions would be feasible for the project to address; and, finally, to brainstorm possible points of entry and impact for the project. Organization charts were developed, vetted with partners and stakeholders, and used during Phase 1 to better understand the staffing structure at the Center as well as the relational structures among government ministries,

[3] Prior to administering the surveys, they were submitted for approval to Purdue University's Institutional Review Board (IRB) and judged, on the basis of their focus on training needs assessment, to be exempt from requirements of formal research review.

247 departments, and institutes involved in nutrition research, policy making and programming. Led
248 by these requirements, we identified five key areas for support.

249 *Area 1: Emphasizing the role of research in policy design*. At the inception of the project,
250 a relatively small number of technical professionals in Laos, university faculty included, had had
251 the opportunity to receive formal research training or develop skills necessary for publishing
252 their research in international outlets or competing for grants. As a result, efforts to conduct or
253 interpret public health and nutrition research had been severely hampered. We identified a
254 desire to better coordinate and communicate with governmental and non-governmental
255 stakeholders, and a desire on the part of university staff to better link their research to policy
256 needs. Research, findings and data, particularly anthropometric data, were identified as areas
257 where support could improve data accuracy and reliability to inform policy design.

258 *Area 2: Upgrading technical skills.* Public health and nutrition researchers are not widely
259 available in Laos, and many academics and professional staff expressed a strong desire to
260 attend formal training in technical nutrition and research topics. The number of Lao researchers
261 who have received formal training on public health or nutrition and on research is limited. This
262 restricts the availability of well-equipped researchers to train, conduct research, and mentor
263 the next generation of Lao researchers. Through the formative assessment, we identified that a
264 major impediment to pursuing research careers that the project could address was the lack of a
265 local research community.

266 *Area 3: Improving institutional infrastructure*. The Nutrition Center had been established
267 relatively recently in relation to the project, in 2012. Research infrastructure and management
268 systems in place at the Center were still evolving, which provided the project with an

opportunity to help support their desire to be a convener of research, work more efficiently across ministries, and help translate research findings into policy guidance for the government. Cross-ministerial cooperation had been a long-standing challenge. Leadership at the Center expressed an understanding of the importance of collaboration and convening relevant ministries but had not had the opportunity to receive training on this convener role or to develop their own ways to gather research and then translate findings into evidence-based policies. The Center also asked for assistance to support day-to-day management and financial systems to work more efficiently and collaboratively, and to ensure quality standards were being met. Supervisors expressed the desire to gain the skills to support staff and institutional structures as well as raise funds for future research and nutrition interventions.

Area 4: Meeting international norms. Providing support for training and tools for nutrition researchers and staff at the Center and UHS was seen as a way to help these groups to improve the quality of their work and help them to meet international norms, with the understanding that such norms are not often clearly defined. Through meetings with Center and UHS staff, project attention was focused on research ethics, professional writing, and the use of citation management software. The project also sought to identify and fill gaps in the nutrition curriculum at the university level and improve research methods in university and government settings. Because the Center and university partners both acknowledged the importance of targeted research, helping staff move away from research conducted on an ad hoc basis toward a more strategic approach was identified as important. Due to competing demands on government staff's time, the project was sensitive to concerns about overloading the Center's staff. Nevertheless, this emerged as an ongoing challenge throughout the project.

Whenever possible and appropriate, the project emphasized hands-on training to allow learners to put new skills into practice with mentorship and follow-up to track quality.

Area 5: Enhancing communication and dissemination of information to the community and policymakers. The project developed approaches to assist and support communication of nutrition research findings and topics. Coordination was encouraged between the various actors involved in nutrition across the health, education and agriculture sectors in order to help reduce information silos. The project worked to support research communication, for example through monthly webinars, quarterly newsletters, research posters, writing workshops, and participation in national and regional conferences. Engaging the private sector in nutrition solutions during research and policy decisions was also seen as a goal, in order to help drive improvements in the food environment and market-driven nutrition outcomes. The project aligned efforts with the SUN Business Network in Laos, but engaging the private sector in the project was an ongoing challenge that was not always met.

2.4 Developing a Strategy for Capacity Building

The conclusion of Phase 1 of the project resulted in our planned strategy for building capacity, which focused on undertaking activities in two main areas: (i) by providing training and capacity building for the Center to conduct research, with particular focus on helping to create a sub-unit "Center of Excellence" in anthropometrics within the Center; and (ii) by providing training and research experiences within UHS and Lao TPHI to support and foster curriculum improvements and updates, and to promote an overall research-friendly environment and evidence-based approach to addressing nutrition challenges. In addition to these two main

areas of work, a cross-cutting theme was to work continually with the Center, the MoH, allied ministries, and other nutrition stakeholders to create institutional and communication structures focusing on nutrition that could be sustained into the future.

The project design was informed by the Lao National Nutrition Strategy and Action Plan (NNSAP) [11], as well as a draft Action Plan for 2021-2025 (which, at the inception of the project, had not yet been finalized). In designing the project, the project team studied the NNSAP in detail and discussed likely points of collaboration with government and non-government stakeholders. The design was also informed by an Organizational Capacity Development Plan for the Center that had been prepared prior to the project by an outside consultant. Because many Center staff were appointees who had not had opportunities to receive formal training in nutrition or public health research, the project aimed to provide basic nutrition knowledge; skills related to nutrition assessment (especially anthropometric measurement) and field research; interpretation of research findings; and capacity to inform policy. Although the project worked most directly with the MoH, importantly this was done in a way that left open the possibility of working with other members of the Lao Nutrition Secretariat, which included representatives of the Ministry of Agriculture and Forestry (MAF), the Ministry of Planning and Investment (MPI), and the Ministry of Education and Sports (MoES). The MPI was viewed at the start as a potentially important allied ministry, as it houses the Lao Statistics Bureau (LSB), but our actual interactions with LSB proved to be limited. Key stakeholders identified at the start also included specific groups within university and INGO communities. In developing a capacity building plan, we paid particular attention to the following questions:

1. What are the key issues and problems facing the nutrition sector?
2. What critical assumptions underpin our model, and how are these (e.g., budgets, language skills) linked to contextual factors or assessment findings that would influence our design choices?
3. What proof of concept might the government of Laos require to finance future activities in order to sustain project activities?
4. What might be the exit/phase-over preferences of the government (and other key stakeholders)?

After fully considering these questions and the assessment information at hand, we then determined the range of activities the project could reasonably and feasibly tackle based on following criteria:

- Is the activity feasible based on institutional and political features in Laos?
- Can we influence the outcome?
- Are any other groups or organizations engaged in the activity?
- Are we likely to achieve results and foster improvements in the time available?

2.5 Ensuring Collaborative and Participatory Design

In March 2020, roughly four months after the start of the project, the team conducted a week-long design workshop in Vientiane. The original intent was to conduct the workshop with all project participants present in Vientiane, but due to the pandemic, the workshop was held in a hybrid format, with those from Purdue and IU participating remotely from the US and those from CRS (and occasional invited guests) participating in Laos. The aim was to (i) establish

project goals; (ii) identify and refine key activities and sub-activities; (iii) identify responsible parties; and (iv) develop an implementation plan, timeline and budget for activities. The workshop was informed by the November site visit and the extensive efforts undertaken during the ensuing period to identify and meet with as many Center stakeholders as possible. The design workshop also was informed by earlier stakeholder analysis (in terms of known funders, participants in nutrition research, and likely users of research) as well as visual mapping of the complex (and often opaque) relationships among government and non-government actors. Key individuals with in-depth experience working in Laos were brought in to discuss context and to answer clarifying questions regarding strategy. In addition, daily notes were logged and, in some cases, individuals external to the project were asked to review these daily notes and provide comments and reactions.

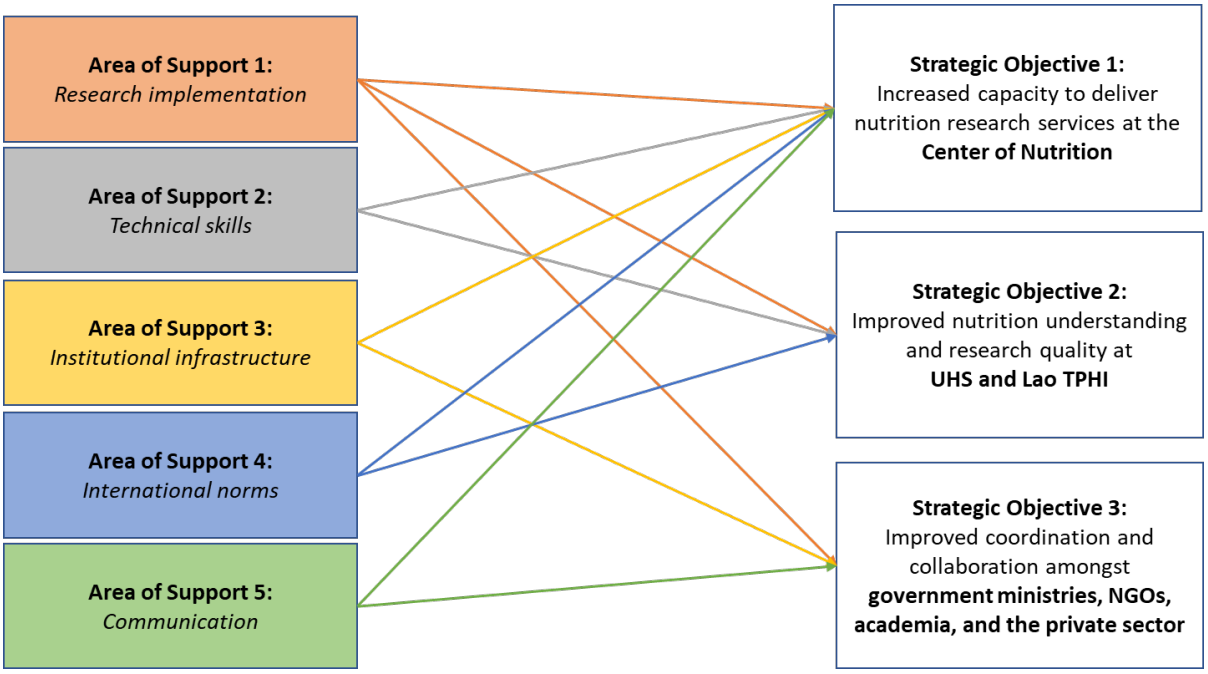
A primary conclusion reached during the design workshop was that among all possible strategic partners for the project, the MoH and the Center were the best candidates. The MoH, as the convener of the Lao Nutrition Secretariat, provided a natural and formal connection to other ministries represented in the Secretariat (i.e., MAF, MPI, and MoES). We also identified UHS and Lao TPHI as strategic higher education institution (HEI) partners. As a risk-management strategy, we deliberately identified a set of independent activities to be pursued separately with the Center and the HEIs, to guard against potential barriers or constraints that might limit progress with any particular group and thereby jeopardize overall project momentum and success. That said, the plan involved coordinating training activities to include Center, UHS and Lao TPHI staff and students. The idea was that this would not only economize on efforts but

also help address a challenge faced in many settings, namely enhancing the working relationship between government and universities, a strategic aim for the project.

2.6 Mapping Needs to Implementation

A primary outcome of the design workshop was a proposed implementation plan. During the workshop, the five key areas of support were mapped to three Strategic Objectives, i.e., the most ambitious results the project could hope to affect through changes in knowledge, behavior, and actions (see Figure 1).

Figure 1. Primary Mapping from Areas of Support to Strategic Objectives



From the Strategic Objectives, nine domains for project activities were identified. These constituted the practical steps to be undertaken by the project to generate the desired changes

393 in target knowledge, behaviors, and actions. Table 1 lists the five areas of support, along with

394 the project response and examples of specific activities undertaken by the project.

395

396 Table 1 Key areas of support

Area of Support	Response	Examples of Activities
1) Implementing research and emphasizing the value of empirical research	Joint activities involving university researchers and Ministry of Health staff	Monthly webinars, study tours, collaborative research and training, development of a National Nutrition Research Agenda
2) Upgrading technical skills	In-person and on-line short courses	Training in anthropometry, basic and advanced statistics, survey design, data handling, etc.
3) Improving institutional infrastructure	Back-office training and mentoring at the Center	Financial reporting, facilities and human resources management, scheduling systems
4) Adhering to international norms and benchmarks for research	Short-term training and peer-to-peer mentoring as part of small research grants	Research ethics, institutional review board (IRB) approval, citation management, writing workshops, participation in regional and international conferences
5) Enhancing communication and dissemination of activities and findings to the community and policymakers	Printed and online materials and collaboration with dissemination networks such as SUN business network	Dual-language nutrition glossary, dual-language quarterly newsletter, monthly webinars with simultaneous translation

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After identifying key outcome indicators associated with areas of support, the project established a comprehensive system for evaluation, monitoring, adaptation, and improvement based on results and feedback [17]. The system prioritized collection of feedback and data and listening to the voices of the partners and stakeholders. The monitoring and evaluation system allowed swift action and adaptive management to address any signs of ineffectiveness or misplaced effort.

3. Activities and Implementation

Activity 1: "Back Office" System Strengthening

As a foundational activity, CRS worked closely with the Center from the start of the project to provide training and coaching on four key elements of institutional capacity building and systems strengthening: financial management, gender and social inclusion (GESI) integration, project management, and staff onboarding. These key areas responded to an institutional needs assessment that had been conducted prior to the project. This type of institutional accompaniment is frequently neglected in projects, but is essential to support operational effectiveness and increased program quality, which in turn increases the sustainability of all other programming and provides value to all stakeholders who rely on institutional strength to support program-critical activities. Multiple stakeholder groups expressed support for this activity, as it was perceived that a stronger Center would have positive ripple effects across the many organizations collaborating with the Center in support of the government's National Nutrition Strategy (NNS). CRS was uniquely positioned to offer this support through their permanent Lao project staff. A formal hosting agreement was signed, which allowed project

staff to sit across the hall from Center staff, facilitating daily interaction to build relationships of trust and support. All technical guidance regarding finance or project management training received quality control back-up support from CRS senior programming and operations leaders and regional technical advisors. Quarterly partnership meetings with the Center were used to provide regular opportunities to assess knowledge and behavior change, celebrate success, and engage Center leadership in supporting system strengthening changes.

Activity 2: Developing Physical Space for Training

A major task at the start of the project was to identify and equip office and training spaces to enable research coordination and support local learning needs. A previous US government project had constructed a complex of buildings as a development assistance package to the government of Laos. Immediately prior to the start of our project, the Center had been relocated to one of these newly constructed buildings. The ANRCB project was allocated six empty rooms on the second floor of the building and, in 2020 and 2021, worked with the Center and an interior design company to design the space and procure the necessary furniture, equipment, and furnishings to outfit these six rooms. This work transformed the empty space into a state-of-the-art facility for group training, co-working, learning and research, and included large and small training rooms equipped for multiple uses, office space and a small library. The project worked closely to ensure the space matched the Center's vision for training and capacity building, aligning to the National Nutrition Strategy and National Plan of Action for Nutrition (NPAN). On September 16, 2021, the project and the Center held an opening ceremony co-hosted with the US Embassy. The ceremony was attended by the Lao

Minister of Health and the US Ambassador. In addition to equipping the physical space, the project worked with the Center to reinforce protocols for proper maintenance and upkeep of the facility and equipment.

Activity 3: Strengthening Capacity and Skills for Anthropometric Assessment

Anthropometry is an essential tool for assessing the nutritional status of populations and progress toward national nutrition goals, especially for at-risk populations. Given the Lao government's stated interest in addressing child malnutrition, the strong interest in anthropometry among Center leadership, and the Center's role in supporting anthropometric assessment within the country, the project team identified anthropometry as a key issue for capacity strengthening.

In any country, a strong research infrastructure must be established and maintained to identify local factors associated with stunting and to develop the capacity to formulate strategies to reduce, prevent, or address them. The Center's role was identified as offering an opportunity to strengthen the country's anthropometry infrastructure. It became clear through conversations in Phase 1 that the role of the Center in anthropometric assessment training for data collection and oversight in Laos and its tie to the MoH combined to create the building blocks and incentives to sustain such infrastructure in Laos. A focus on anthropometry was therefore motivated by the importance of accurate anthropometric measurement to provide a reliable evidence base for the country and the recognition that the Center was the institution responsible for training and renting equipment for anthropometric assessments across Laos. It was therefore seen as desirable to help strengthen capacity among Center staff to understand

the role of anthropometry; recognize the value and use of anthropometric indicators; have access to and the skills to use accurate and field-appropriate instruments; and develop the ability to impart knowledge to others. Although the training modalities and standards being employed at the Center were not fully known at the start of the project, our conversations during Phase 1 with a wide range and large number of stakeholders, including Center staff, suggested room and desire for improvement. We also recognized that once data collection modalities had been strengthened, capacity building in data entry and analysis would be essential for staff to analyze and interpret Lao indicators relative to those collected globally. Together with Center leadership, a training program in anthropometrics was developed to support the long-term vision of creating a Center of Excellence in Anthropometrics.

Activity 4: Curricula Review at the Lao University of Health Sciences (UHS)

Anticipating that many project training activities would be undertaken at UHS, early in the first year of the project we contacted university leaders to identify interests and needs, and to provide a comprehensive review of programs and existing curricula. Prior to the project, UHS enjoyed a strong track record of training students in a Masters of Public Health (MPH) program. This program, which emphasized public health education and management, and basic epidemiology and biostatistics, relied on faculty members from three different units: the Faculty of Public Health, the Faculty of Medicine, and the Research Institute of Health and Medicine. During early project scoping, it became clear that the MPH program placed little emphasis on nutrition science. Although students arrived at their program without basic principles of nutrition and nutrition science, many expressed interest in child malnutrition and

other issues surrounding early life. Developing in students a more holistic understanding of nutrition across the life course, including adolescence, adulthood, and into old age, was seen as beneficial by university leadership. Over the course of the following year, course program descriptions and syllabi (some available in English and some translated from Lao) were reviewed for both content and teaching methods. This resulted in a review report containing suggested additions, changes, and examples of program designs at other institutions. It also guided the development of project training modules which were later used to augment existing course materials to fill gaps in teaching materials.

Activity 5: Short-term Training

Short-term training was a centerpiece of the project, and over the course of the project Purdue and Indiana University experts worked with Lao partners to develop a total of twelve, multi-part video lessons, consisting of more than 40 hours of content. These modules, and their target audiences, are listed in Table 2. Some modules were specifically targeted at staff at the Center and some were targeted at UHS and Lao TPHI staff. Nearly all included pre- and post-training assessments and teaching guides in both English and Lao. In addition to developing and delivering training at the Center specific to anthropometry, other short-term training modules targeted at the Center were developed to on-board staff and strengthen understanding of basic nutrition concepts.

507 Table 2 Training modules and target audiences

Topic	Target audience
Basic nutrition concepts and terms	Nutrition Center staff; others
Nutrition assessment methods	Nutrition Center staff; UHS and Lao TPHI faculty and graduate students; others
Research concepts	UHS and Lao TPHI faculty and graduate students; others
Anthropometry - children	Nutrition Center staff; others
Anthropometry - adults	Nutrition Center staff; others
Anthropometry - advanced topics	Nutrition Center staff; others
Food Environments	Nutrition Center staff; UHS and Lao TPHI faculty and graduate students; others
Food safety	Nutrition Center staff; others
Behavior change	Nutrition Center staff; UHS and Lao TPHI faculty and graduate students; others
Research design and planning	UHS and Lao TPHI faculty and graduate students; others
Statistical analysis	UHS and Lao TPHI faculty and graduate students; others
Academic writing	UHS and Lao TPHI faculty and graduate students

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509

510 Training materials were tailored to address general nutrition knowledge as well as,
511 when appropriate, issues especially relevant to the needs of women and at-risk groups. Training
512 topics directly targeted at university instructors and students included modules on research
513 design, research methods, research coordination and priority setting. Modules focused on
514 practical activities and strategies for converting knowledge to action. The project worked with

UHS and Lao TPHI faculty to support uptake and classroom use of modules in degree programs, and to identify training needs and gaps. For example, to identify gaps in current scientific knowledge and strengthen basic understanding of food safety concepts, the Purdue team completed a background review on food safety issues in Laos to inform the development of a training module. Although originally envisioned as stand-alone trainings for somewhat separate audiences, over the course of the project many training activities combined audiences, and training sessions were frequently conducted with participants from the Center, UHS and Lao TPHI, enhancing interaction and networking among these groups.

Over the course of the project, more than 60 group training sessions were conducted with more than 1,000 participants. Certificates of completion were issued to those who completed trainings. Many in the target audience participated in single trainings, while others participated in nearly all. In total, the project reached more than 400 unique individuals, including professional staff, university faculty, and students. A general working principle when developing training modules was to begin by assessing institutional demand as a driver, emphasizing the importance of examples, especially Lao examples, and promoting the use of group-based exercises and activities to capitalize on local learning styles and modalities. Wherever possible and appropriate, modules were developed in collaboration with Lao partners, first in English and then translated into Lao. Where translation was deemed problematic, terms were back-translated from Lao to English to ensure proper meaning. For some modules, e.g., those focused on statistical techniques or professional writing, only English language modules were developed. Group discussions and activities also facilitated learning among participants with varying proficiency in English. Content was disseminated through local

partners and a project YouTube channel. Modules were used and disseminated in a number of ways, including synchronous in-person and on-line sessions, as well as asynchronous self-guided sessions.

In addition to topic-based training, the project incorporated team-based research activities. During Phases 2, a “Small Research Grant” (SRG) program was introduced. The goal was to provide a guided, funded, and mentored research experience. Expressions of interest were solicited among staff at the Center, UHS and Lao TPHI. The multi-year program followed a logical sequence of steps, including: (i) development and refinement of a research concept; (ii) presentation and refinement of a research proposal; (iii) development and approval of a research budget; (iv) design of data collection and survey instruments; (v) training on responsible conduct of research (RCR) and preparation and submission of IRB materials; (vi) data collection, curation and processing; (vii) methods refinement and selection; (viii) data analysis; (ix) oral presentation of preliminary results to a research audience; (x) preparation and presentation of research posters at national and regional conferences; and for a subset, (xi) preparation and submission of a journal article. Each team consisted of 4-6 researchers from the Center, UHS or Lao TPHI, and each team was paired at the start of the process with mentors from Purdue, Indiana or Cornell universities. Teams worked with their mentors by email and through virtual meetings, and also benefited from multiple reciprocal visits to each other’s institutions, including 4-6 week stays in the U.S. by SRG leaders during the final writing stage. Laptops and statistical software were provided to each team. Sequencing of the SRG steps was tied to relevant training modules, for example on assessment methods, research study design, statistical analysis, and academic writing. Whenever possible, these hands-on, closely

monitored and mentored research collaborations targeted junior faculty and young researchers in Laos, thereby helping to enhance capacity within the respective Lao institutions to provide and sustain mentoring and scientific good practices into the future.

Activity 6: Lao-English Nutrition Glossary

The team identified a lack of consistency when translating nutrition terms from English to Lao. Many terms, especially technical terms, could only be translated with difficulty, and resources such as Google's translate feature were often unreliable in rendering correct translations. In response, the team worked with the Center and university researchers to identify key terms, develop the most accurate and appropriate translations, and generate a glossary to ensure proper and consistent translation across stakeholders of nutrition and nutrition research in Lao. This activity was used as a practicum to support the Center in putting into practice project management skills, and the MoH fully embraced the project, eventually producing 4,000 copies of the glossary for distribution in schools, clinics and health facilities throughout the country.

Activity 7: Enhanced Communication

An important aim of the project was to increase multi-sectoral cooperation and awareness of nutrition research in Lao. To support this, a communication strategy was developed that centered around two innovations: a quarterly newsletter highlighting nutrition research being conducted in-country and a locally-led seminar/webinar series. Both channels were designed to highlight past and ongoing research. The newsletter included links to key resources, advice, and opportunities, as well as meeting announcements. It was produced in both Lao and English and

distributed via email, WhatsApp, and various social media channels to key stakeholders in government, INGOs, civil society organizations, and academia. Social media proved more effective for uptake than email. The webinar series, which included real-time translation, was initially launched with research presentations from project staff, but eventually evolved to include non-project researchers. Both activities were conducted with Center staff in leadership positions in order to build capacity in multi-sectoral communication and convening.

Activity 8: National Nutrition Research Agenda

An over-reliance on donor-led research can reduce the incentives for evidence-based policy-making over time, creating unpredictable research cycles and fragmentations in the health system [18]. In 2016, Lao TPHI produced a summary of nutrition and health research topics and in 2018 developed a National Health Research Agenda with 11 priority topics. However, at the start of the project, Laos did not have a research agenda for nutrition. To address the need for such a document, the project engaged with researchers at Lao TPHI to identify gaps and needs for nutrition research in the country and to attempt a prioritization of these needs. From the start, the goal was to ensure local ownership and control of identifying and prioritizing nutrition research gaps in Laos. The priority-setting exercise included national-level policymakers (e.g., from the MoH), the National Nutrition Committee (representing multiple sectors), the Mother and Child Health Center (MCHC), and local members of the NGO and INGO communities. During Phase 1, interviews were conducted with 30 policymakers from a range of sectors, including nutrition and health researchers and practitioners. The aim of Phase 1 was to explore perceived research needs using key informant interviews. Simultaneous to this, a literature review was

conducted to collect published findings of relevance to the nutrition situation in the country. These interviews and subsequent feedback and listening sessions resulted in eight primary themes and 68 sub-themes. These were then incorporated into a survey instrument administered to 160 stakeholders, including district and provincial health officers, provincial hospital staff, and members of the Ministry of Health's National Nutrition Committee. Participants were asked to rank topics in terms of importance, and the resulting ranking was used to develop a prioritized list of 60 research questions. These were further vetted with senior stakeholder and published in early 2024 as the *National Nutrition Research Agenda 2023-2026* (NNRA). The NNRA serves as the first locally-developed guiding document for nutrition research in Lao PDR.

4. Implications and Impacts

4.1 Addressing the Need for Local Ownership of Project and Programs

Despite being classified as a low-middle-income country, Laos still grapples with a weak health system, both in terms of physical infrastructure and with regard to human capital [17]. Going forward, understanding the national context of needs, and developing local ownership of challenges and their solutions, will be critical for setting priorities (for example, as seen in the development of the NNRA), which can then be targeted for improvement across various dimensions of work. Three specific aspects of local ownership stand out.

First, empowering individuals and embracing a diversity of experiences is key. To sustain impacts from capacity building efforts, researchers need to be equipped to work in teams to lead research independently and collaborate effectively. This requires strong research teams

and partnerships with institutions that share not only similar goals, but also similar philosophies and a willingness to embrace local empowerment. For this project, our target training audience represented multiple disciplines, which required our team to sometimes rethink our approach to nutrition research and adjust trainings accordingly, especially to cover areas of knowledge not previously encountered. For example, many professionals in our target audience had been trained in medicine, not nutrition or research. In the context of this project, however, diversity of experience and training often served to deepen conversations and create shared understanding among those with different perspectives. Fostering community among researchers through training across institutions, creating opportunities for networking, and supporting engagement in national, regional and international scientific conferences help individuals to benefit from diverse perspectives and experiences.

Second, given the very large number of Lao ethnicities and languages, wherever possible, tools and materials used should be adapted to and validated to local contexts and languages. This ensures not only relevance and effectiveness in training activities and efforts to address nutrition challenges, but also ensures knowledge translation through effective communication and dissemination of research findings among stakeholders, including policymakers, researchers, and communities. It is essential to ensure that research findings are translated into actionable policies and interventions to achieve sustainable improvement so as to improve local systems. For example, Laos still lacks country-specific dietary guidelines, food-based recommendation guidelines, laboratories for nutrient analysis, and national food composition tables. As long as the country relies on resources borrowed or adapted from neighboring countries, it will be difficult to ensure that the country's nutrition challenges are

being fully embraced and "owned." Local ownership is especially important in higher education, where curriculum improvements and teaching enhancements require absolute sensitivity to local norms and practices. Interventions using evidence from research must be responsive to local needs, as the use of appropriate tools, materials and methods can improve knowledge and enhance the skills of professional staff [19]. Closing the loop on local adaptation and validation requires a monitoring and evaluation system that supports adaptive management so that feedback from end-users can be used to adjust programs and practices.

Third, independent governance and funding of research teams can help provide a greater sense of ownership and encourage young researchers to build research careers in-country. Where possible, governments should allocate specific budgets for research and implementation, and do so with transparency and using methods that reward effectiveness and accountability. Ideally, activities should be supported in ways that encourage collaboration among a range of stakeholders, including researchers, implementation teams, and policymakers. Such efforts speed translation of research findings into actionable policies.

4.2 Challenges to Local Ownership

Multiple challenges to fostering local ownership exist, especially in the realm of addressing nutrition and food security challenges, not least because addressing malnutrition comprehensively requires navigating the co-existence of different forms of malnutrition, including undernutrition and overnutrition. Stakeholder groups may have sometimes opposing or conflicting goals or perspectives. In a country like Laos, with considerable ethnic diversity, linguistic and geographic barriers pose challenges to reaching vulnerable populations, especially

669 in remote areas. Infrastructure limitations, such as poor road conditions and lack of basic
670 amenities, further exacerbate these challenges. Limited English proficiency can hamper access
671 to information and undermine collaboration, which means effective communication strategies
672 are needed to bridge the gap between researchers, policymakers, and communities.

673 Often, dependency on foreign funding undermines local budget allocations for health
674 and nutrition research. This can exacerbate weaknesses in monitoring and evaluation within
675 the health system. In addition, where various entities, including NGOs, universities, and
676 government sectors such as health and agriculture, operate independently and in an
677 uncoordinated fashion, efforts can overlap, sharing of findings can be difficult, and assigning
678 ownership as well as monitoring and evaluation can be difficult.

679 Finally, "brain drain" is a significant challenge. It takes two forms. The familiar one arises
680 when trained and highly-skilled individuals leave the country. But an equally pernicious version
681 arises when trained individuals leave their positions, e.g., in government or higher education,
682 for local jobs in unrelated but more remunerative settings. Both types of brain drain undermine
683 capacity building efforts. Effective strategies are needed to retain local talent and provide
684 opportunities for professional growth.

685

686 ## 4.3 Potential Strategies to Achieve Local Ownership

687 As with most externally-funded and externally-led projects, achieving local ownership has been
688 a central goal as well as an ongoing challenge. Local ownership of project activities and outputs
689 can occur through the use of multiple approaches, some of which have gained more traction
690 than others. Important aspects that allowed us to promote some degree of local ownership

include first and foremost having government entities as primary partners and signing our MOU with the Ministry of Health, which ensured high-level attention, regular feedback, and project accountability to government priorities. Among the strategies employed to engage stakeholder audiences and involve them in project design and implementation include the use of various modes and methods of interaction, including online and in-person trainings and learning labs; in-person and hybrid seminars, webinars, and workshops; direct collaboration with universities to build capacity effectively and prioritize university needs surrounding curriculum development and training needs; and working with Lao partners to draw lessons from research and projects undertaken in different countries but similar contexts to inform content, strategies and approaches. Helping to support scientific research conducted in Laos has meant that classroom examples can be more relevant and engaging for students, reflect local contexts, and meet the needs of the community of end-users, which should help ensure a sense of ownership over project resources.

Incentivizing professional growth was a central aim of the project, and was achieved by providing paired, long-term mentorship and goal setting for staff through initiatives such as financial support for research, overseas study tours and short-term residencies as visiting scholars, English language training and training certification. The project organized an in-person "watch party" for the 2023 Agriculture, Nutrition, and Health (ANH) Academy, the first of its kind for Laos. The project also co-sponsored a major Lao public health conference in November 2023, at which a panel discussion and poster session were used to highlight the work of the project and Lao project partners. Major involvement in and sponsorship of the 14th Greater Mekong Subregion Public Health Conference in June 2024 also provided an opportunity to

showcase project output and promote regional research networking with academics and practitioners from more than 20 academic institutions from Cambodia, China, Laos, Myanmar, Thailand, Vietnam, the United States and Australia.

Such immersive approaches not only encourage personal development but also enhance overall capacity within the research workforce and public health community. Whether such efforts have helped to stem brain drain (especially out of the government/university sectors) is perhaps unknowable. What is clear is that the project has strengthened scientific partnerships, enhanced knowledge, skills and confidence among young researchers, and helped position them and their institutions to be more effective partners in future collaborations. The project also achieved considerable success in building connections between Lao institutions, including the Nutrition Center, the University of Health Sciences, and the Lao Tropical and Public Health Institute. Interaction among these groups was part of the project design, and the opportunity to study together, engage in research together, and travel together resulted in new professional connections and relationships that are mutually reinforcing. Fostering collaboration among multiple stakeholders (multi-sectoral and interdisciplinary) and creating efficient working systems or research ecosystems should facilitate the updating, sharing of frameworks, results, strategies, and lessons learned among stakeholders, ensuring that various areas of work are distinct but shared, and mutually beneficial.

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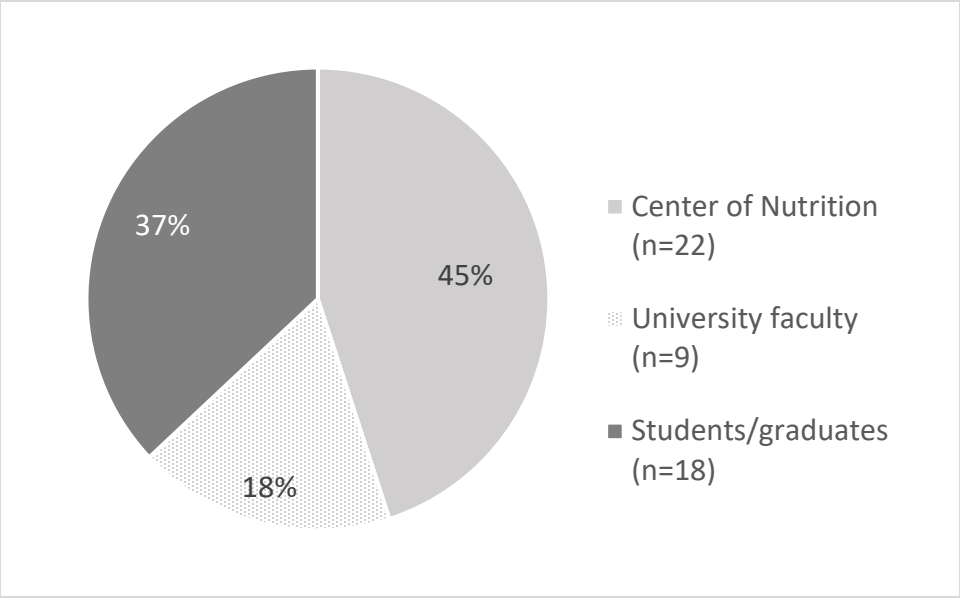
Appendix. Characteristics of survey respondents

Figures A1-A4 display characteristics of respondents to the formal surveys conducted among staff at the Nutrition Center, Lao TPHI and UHS in 2019 and 2020, and with recent graduates of a Netherlands-based training program. These provide context for activities and help to better understand the audience for project training activities. Of 49 participants, 45% were members of the Center staff, 37% were students or recent graduates of the universities included, and 18% were university faculty (Figure A1).

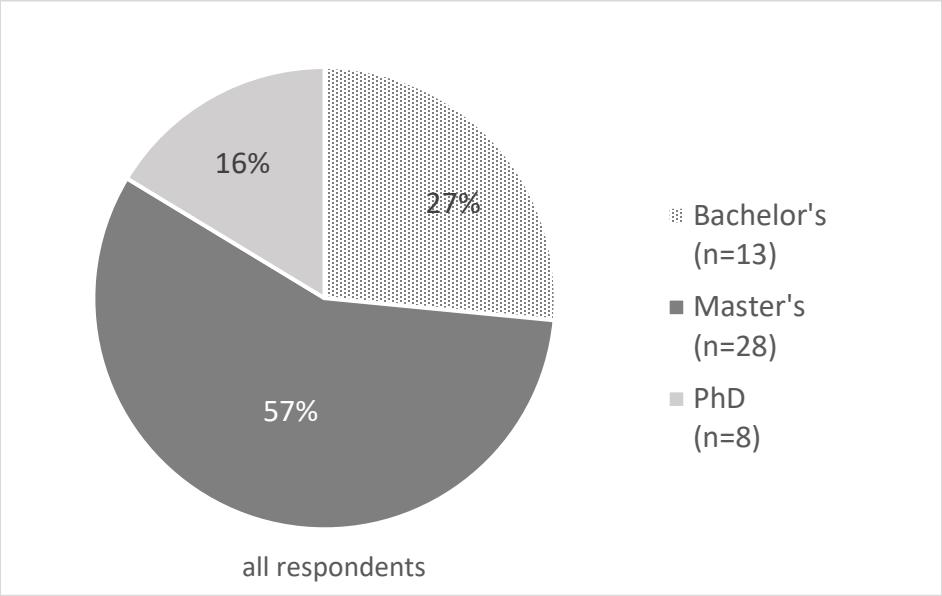
Figure A1. Institutional Affiliation of Survey Respondents



The most frequent level of formal degree training among respondents (Figure A2) was a Master's Degree (57%), followed by a Bachelor's Degree (27%) and a PhD (16%). PhDs were

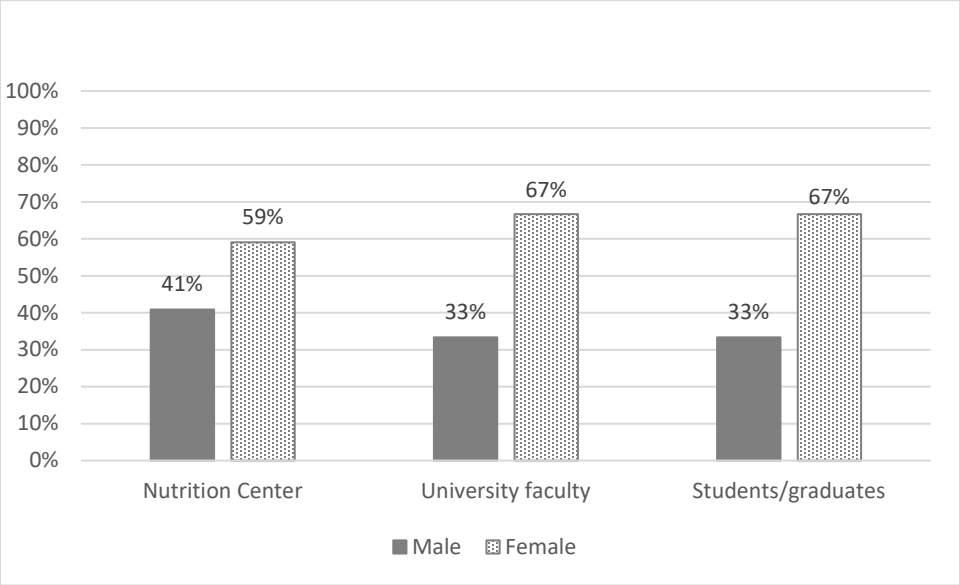
often found among university faculty, a large proportion of whom received their degree training in Laos.

Figure A2. Highest Degree Earned by Survey Respondents



Roughly two-thirds of respondents were female, with a slightly larger proportion of males at the Center (Figure A3).

819 Figure A3. Proportion of Survey Respondents Based on Affiliation and Gender



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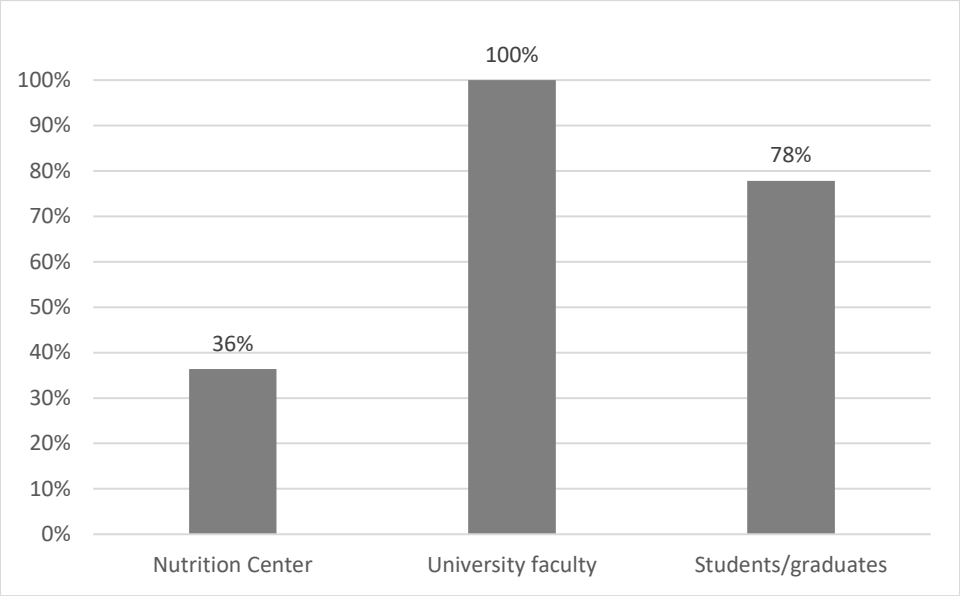
822 All university faculty reported some prior training in research (Figure A4), but only one-third of
823 Center staff reported such training. Turning to exposure to nutrition topics, the proportions
824 were reversed: while three-quarters of Center staff reported having taken at least one course in
825 nutrition, only one-third of public health university faculty reported formal training in
826 nutrition—in some cases many years ago and therefore perhaps not providing current
827 knowledge and methods (Figure A5).

828

829 Figure A4. Previous Research Training of Survey Respondents



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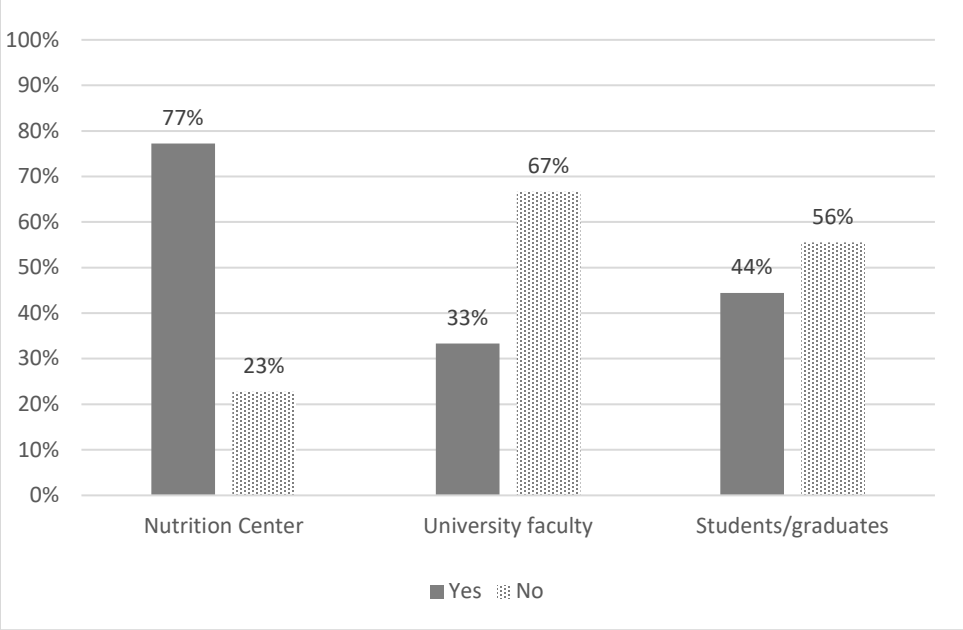
832 Figure A5. Previous Formal Courses in Nutrition of Survey Respondents



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