Article

Asia Pacific Journal of Public Health
2019, Vol. 31(6) 536–547

DOI: 10.1177/1010539519867791
journals.sagepub.com/home/aph
SAGE

Strengthening Noncommunicable Disease Research Capacity and Chronic Disease Outcomes in Low- and Middle-Income Countries in South Asia: Implementation and Evaluation of the ASCEND Program

Allison Byrnes, BHSc[1], Tilahun Nigatu Haregu, PhD[2], Naanki Pasricha, MPH[3], Kavita Singh, PhD[4], Sathish Thirunavukkarasu, MBBS, PhD[2,5], Kremlin Wickkramasinghe, PhD[6], Kavumpurathu Raman Thankappan, MD, MPH[7], and Brian Oldenburg, PhD[2], on Behalf of ASCEND Trainees and Faculty

Abstract

This article describes the design, outcomes, challenges, and lessons learned from the ASian Collaboration for Excellence in Non-Communicable Disease (ASCEND) program, implemented between 2011 and 2015 in India, Sri Lanka, and Malaysia. The program involved a blended-delivery model, incorporating online and face-to-face training, mentoring, and supervision of trainees' research projects. Evaluation data were collected at baseline, 6, 12, 18, and 24 months. Intended outcomes, lessons, and challenges were summarized using a logic model. During the program period, 48 participants were trained over 2 cohorts in June 2011 and 2012. The trainees published 83 peer-reviewed articles between 2011 and 2015. Additionally, 154 presentations were given by trainees at national and international conferences. Underutilization of the online learning management system was an important challenge. Utilizing a combination of intensive face-to-face and online learning and mentoring of early career researchers in low- and middle-income countries has great potential to enhance the research capacity, performance, and outputs.

[1]Family Life Limited, Sandringham, Melbourne, Victoria, Australia
[2]University of Melbourne, Melbourne, Victoria, Australia
[3]Burnet Institute, Melbourne, Victoria, Australia
[4]Centre for Chronic Disease Control, New Delhi, India
[5]McMaster University, Hamilton, Ontario, Canada
[6]WHO European office for Prevention and Control of NCDs, Moscow, Russian Federation
[7]Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, Kerala, India

Corresponding Author:
Tilahun Haregu, Melbourne School of Population and Global Health & WHO Collaborating Centre on Implementation Research for Prevention & Control of NCDs, University of Melbourne, 333 Exhibition Street, Melbourne, Victoria 3004, Australia.
Email: haregu.t@unimelb.edu.au

Keywords
noncommunicable diseases, research capacity strengthening, low- and middle-income countries

What We Already Know?

Noncommunicable diseases (NCDs) have become a significant public health challenge in low- and middle-income countries (LMICs). Achieving the World Health Organization target of 25% reduction in premature NCD mortality by 2030 requires a significant increase in research evidence and the research capabilities in LMICs. Therefore, capacity-building initiatives that enhance human capital in research expertise and, thereby, contribute to the reduction in NCD burden in LMICs are urgently needed.

What This Article Adds?

This article summarizes that a collaborative noncommunicable disease research capacity strengthening program that combines in-country face-to-face training, online sessions, and research mentoring can be effective in improving research productivity and career progression of early career researchers in low- and middle-income countries. Besides, this approach can also contribute to generating relevant evidence that can inform policy and practice in low- and middle-income countries. However, further evidence is needed on the long-term outcomes and sustainability of such programs.

Introduction

In 2009, the global incidence of noncommunicable diseases (NCDs) surpassed that of communicable diseases to become the leading cause of premature mortality worldwide.[1] Combined, cardiovascular diseases, diabetes, cancers, and chronic respiratory diseases accounted for 70% of all deaths in 2016, the vast majority of which occurred in low- and-middle-income countries (LMICs).[2]

Prevalence of NCDs in the South Asia region is high, and it is projected that without significant intervention, global mortality rates will rise by 17% by 2025. This will create an increased burden on individual quality of life, health systems, and social and economic development. To address this challenge, multilateral agencies have set NCD prevention high on the global health and sustainable development agenda, with the World Health Organization (WHO) and United Nations targeting a 25% reduction in premature NCD-related mortality by 2030.[3]

To achieve this target, the United Nations advocates for country-specific, whole-of-government, whole-of-society, multisectoral efforts focusing on policy development, primary and secondary prevention, health sector capacity-building, generation of research, and strengthening of disease prevention and management efforts.[4-6] The role of local organizations is critical for the effectiveness of this approach.[7]

Capacity-building initiatives that have the potential to enhance human capital in research could contribute to the reduction in NCD burden in LMICs.[8] There has been some progress in research capacity building in LMICs; however, major gaps still remain.[9] Therefore, the ASian Collaboration for Excellence in Non-Communicable Disease (ASCEND) Research Network Program was designed to contribute to this end, with a specific focus on NCDs.[10-12]

The ASCEND Research Network Program was implemented in Sri Lanka, India, and Malaysia between 2011 and 2015. Learning outcomes included improving skills and knowledge about NCD research, prevention, and management both globally and within the South Asian context. Supporting a network of participants and global faculty experienced in NCD research, policy,

and practice; supporting the enhanced generation and dissemination of evidence; and raising the profile of NCDs in these countries were also among the learning outcomes.

It was intended that through the development of a cohort of NCD research experts within the region, these outcomes would contribute to improvements in NCD prevention and management at both institutional and national levels. It was also expected that the ASCEND program would eventually be sustained "in-country," within and by the regions in which it was implemented. In light of these, the objective of this article was to describe the design, outcomes, challenges, and lessons learned from the implementation and evaluation of the ASCEND program.

Methods

Overall Program Design

The ASCEND Research Network Program was conceptualized and designed by program faculty members across 6 core collaborating research Institutions in Australia (Monash University and the University of Melbourne), India (Sree Chitra Tirunal Institute for Medical Sciences and Technology), Sri Lanka (University of Colombo), Malaysia (Monash Malaysia), and the United States (University of North Carolina), under the award of a 5-year grant from the US National Institute of Health. In the development of the ASCEND program, learnings were derived from Consortium for Advanced Research Training in Africa and other contemporary programs in LMICs.[13,14] The organization and management structure of the ASCEND Program is shown in Figure 1.

The ASCEND Program was designed as a nonaward, "blended-delivery" training program, targeting early- and mid-career researchers from Malaysia, India, and Sri Lanka. Like other research capacity strengthening programs, ASCEND was a "value add" program and was offered in addition to other degrees that many of the trainees were already enrolled in through their local institutions (Appendix 1; available online). The program utilized a global academic teaching faculty with expertise in NCDs and related areas of public health sciences, program evaluation, health policy, and health economics.

Selection of Countries and Trainees

The selection of the 3 middle-income countries—India, Sri Lanka, and Malaysia—was based on the their NCD burden and the need for NCD evidence as well as the understanding that the trainees could access appropriate research and mentoring from the local core collaborating institutions in these countries. Entry into the ASCEND program was competitive. The key prerequisites were a relevant university degree, a strong commitment to pursue a career in prevention and management of NCDs, a strong and coherent research proposal, demonstrable existing support from a within-country supervisor(s) and his/her educational/research institution, access to the Internet, and reasonable competence in English. This information was advertised by collaborating institutions and interested trainees submitted their applications. Mentors were selected by the project co-investigators and from collaborating institutions based on their expertise in NCD research and availability for mentoring the trainees.

Following selection into the program, trainees were required to participate in face-to-face teaching sessions, a follow-up online session, and in the design and implementation of a research project in their home country. After 12 months, they completed at least 2 "hurdle" assessments and were assessed on their engagement with peers (Appendix 2; available online).

ASCEND Timeline

The ASCEND program was delivered to 2 cohorts and lasted for 18 months for each cohort. Cohort 1 received training between June 2011 and December 2012, and cohort 2 from June 2012

to December 2013. Both cohorts started the program with the face-to-face training in June 2011 and June 2012, respectively. ASCEND trainees were provided with ongoing support following their formal 18-month participation in the program, including support to attend conferences, inclusion in a mentoring program, and the opportunity to actively participate in forums, webinars, and other events until the formal completion of the program in mid-2016. Data relevant to the assessment of ASCEND program were collected at baseline, 6, 12, 18, and 24 months. Evaluation of progress was undertaken through these assessments and required engagement on a Moodle site. The summary of the ASCEND training program is shown in Appendix 3.

Face-to-Face Teaching Blocks

Two face-to-face intensive teaching blocks were delivered during the 18-month program. The first block was 3 weeks long, and the second was 1 week. Teaching blocks were held sequentially in Malaysia, India, and Sri Lanka. Travelling trainees, faculty, and staff were provided with funding support to attend each program. These teaching sessions were intended to provide participants with introductory course material in preparation for the subsequent training schedule (Appendix 3).

Online Sessions

Attendance at fortnightly sessions for the first 12 months of the program was also expected. The online platform "GoToMeeting" was used for the delivery of online sessions, which were hosted by Australian staff from Monash University, and delivered fortnightly. The online sessions generally featured a guest lecturer presenting on a curriculum topic including research methods, literature search, and critical appraisal. Interactive trainee presentation sessions were also conducted.

Research Projects

Each trainee also undertook NCD-related research project based at their home institution. Support was provided to trainees from their nominated mentor throughout the duration of their project. The ASCEND program provided some supported for the design, implementation, evaluation, and dissemination of each research project.

Engagement With Peers and Learning Materials

Completion of 2 assessments and active participation in an online Learning Management System (LMS) was also expected. The online LMS was used as a hub for learning materials, assignment submission, and other activities. Trainees were encouraged to use the LMS for discussion of session topics, ask questions, and seek feedback from each other via peer learning. A publicly available website for the program provided access to course materials and comprehensive references and resources.

Financial Support for Trainees' Research

Some modest financial support was provided to trainees to support their research, attendance at program events, and the dissemination of their research findings for at least one international conference. Financial support was also provided for trainees' attendance at ASCEND teaching blocks and associated events.

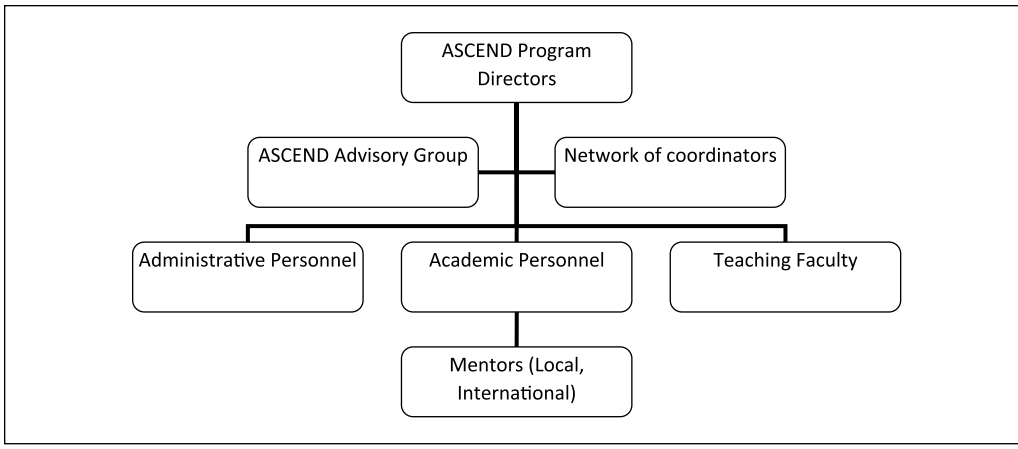

Figure 1. Overview of the organization and management of the ASCEND Program.

Mentoring

Mentors from the international faculty were paired with trainees. Mentors provided support and guidance on trainees' research projects and their career progression.

Assessment of Progress

Ongoing evaluation of trainees was conducted after each online session via a short questionnaire, with longer surveys collected during and after each teaching block. Responses were used to inform the program directors and administrators of trainee knowledge, skills, and organizational requirements. This feedback was used to adjust subsequent curricula topics and sessions. Trainees were requested to complete comprehensive progress reports at 6- and 12-month intervals throughout the program and after completion, and were periodically asked to report on their achievements, career changes, publications (including peer-reviewed journal articles, fact sheets, consumer health information, and government reports), and conference attendances. In this article, we reported the total number of peer-reviewed articles authored by the trainees and number of scientific conferences attended by the trainees between 2011 and 2015.

Intended Results

The ASCEND training program aimed to increase research skills and capabilities of trainees, strengthen institutional research capacity, establish collaborative networks, and raise the priority of NCDs in the region. Details of the intended program results are presented in Figure 2. The overall approach was to establish a global, collaborative model, which placed emphasis on institutional leadership and participation in each region.

Wider Engagement

In addition to the formal program delivery, a large public forum was held at the end of the program. This forum was attended by representatives from several stakeholder organizations, including the WHO and Global Alliance for Chronic Disease. The forum resulted in key

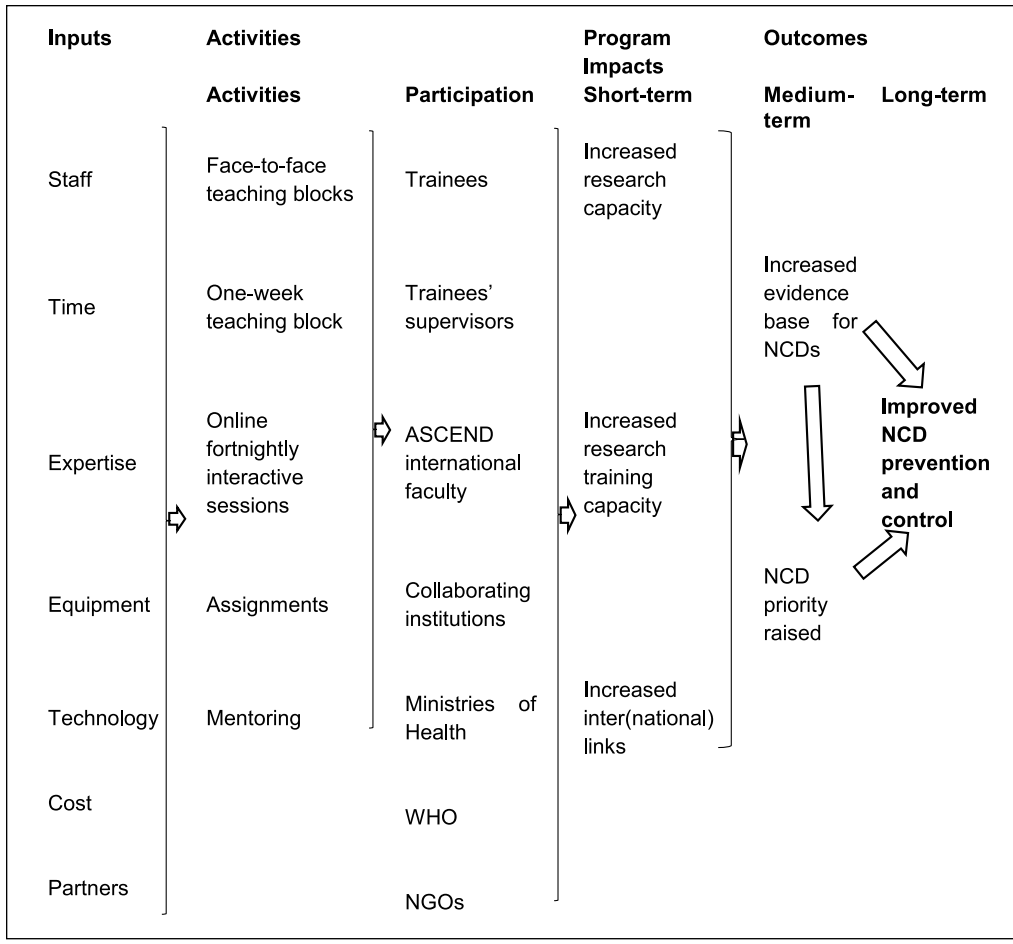

Figure 2. ASCEND program's logic model, monitoring and evaluation framework.

recommendations for enhancing the implementation of evidence for the prevention and control of NCDs in the region.[8]

Data Sources for Evaluation

Evaluation and metrics were derived from the ASCEND Program Monitoring and Evaluation framework, with most emphasis being on the training outcomes for the trainees. We used a mixed-methods design with quantitative data and quotes/testimonials from interviewees. The main sources of data were interviews with implementers and trainees and reviews of progressively documented program data and information. Trainees also provided information and updates through questionnaires, online survey forms, and presentations.

Data Analysis

The qualitative data were analyzed using narrative synthesis. Quantitative data were summarized using both numerical and graphic summaries. By using the logic model as an organizing framework, we presented the lessons learnt in key result areas of the program.

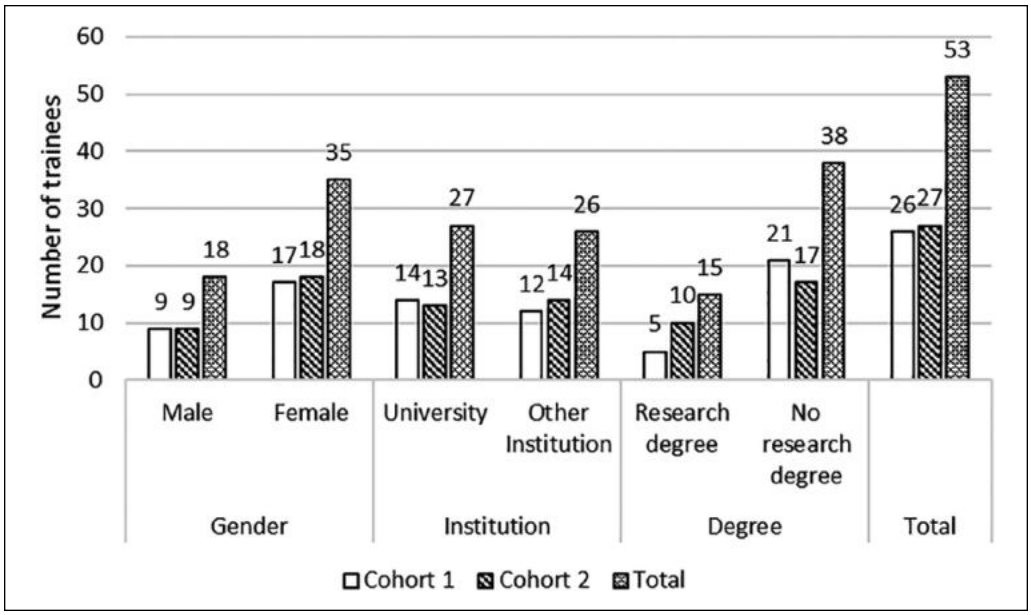

Figure 3. Background characteristics of ASCEND trainees.

Ethical Considerations

Ethics approval for the ASCEND program was obtained from the Monash University Human Research Ethics Committee (Approval Number: CF10/1408–2010000755), and trainees obtained consent for their individual research projects from their home institutions.

Results

Characteristics of the Study Participants

Of 65 applications received for the first cohort, 26 (40%) were selected. For the second cohort, 50 applications were received and 27 (52%) were selected. There was a total of 53 ASCEND trainees from across 2 cohorts. Two thirds of the trainees were female, half were undergoing university training, and 75% did not have a higher research degree at their program commencement. Detailed characteristics of the trainees are summarized in Figure 3.

Program Fidelity

On average, the face-to-face training blocks had an 80% attendance rate, while the online sessions were attended by an average of 15 (60%) participants per session. The qualitative findings suggested that attendance at the online sessions was influenced by trainees' individual learning requirements, as well as their availability to attend due to work-related or other commitments. The training provided trainees with an international experience while they continue working in their own institution (see quotes from ASCEND trainee 1—Appendix 4).

Attendance at online sessions varied, with both cohorts' attendance strong at commencement, yet declining somewhat over time. The lowest attendance at an individual session (of both cohorts) was 7 participants, and the highest was 22 participants.

More than 70% of trainees rated each of the face-to-face training blocks as high/very high in terms of relevance and quality, while 80% of trainees rated the online sessions as high/very high

in terms of relevance and quality. More than 90% of assignments were also submitted on time by trainees. However, the LMS and mentoring program were not as widely utilized as anticipated, mainly due to work commitments and unspecified personal circumstances.

Increased Research Capacity: Training Outputs

Training was ultimately provided to more individuals than originally anticipated. This was achieved by admitting more trainees per cohort, maximizing the use of resources, particularly face-to-face workshops. As running face-to-face workshops was costly to the program, cost-effectiveness was maximized by increasing the number of trainees.

Increased Evidence on NCDs: Research Outputs

At the end of the program, most trainees had published at least one peer-reviewed journal article from their ASCEND-related research project, and each trainee had presented at least one conference presentation. Trainees from the first cohort published 60 peer-reviewed articles during 2011 to 2015, and cohort 2 trainees published 23 peer-reviewed articles during 2012 to 2015. Other research outputs included publication of fact sheets, consumer health information booklets, and government reports. A special ASCEND issue of the *Asia Pacific Journal of Public Health* was published and this contained 13 peer-reviewed papers from ASCEND trainees.[8]

A total of 154 research presentations were given by trainees at national and international conferences during 2011 to 2015. Trainees presented at major conferences in Europe, North America, and/or Australia. Many of these presentations were financially supported by the program as travel allowances.

Involvement in Research and Career Development

ASCEND trainees contributed to training programs within their institutions. They participated as members of boards, committees, and working groups within their countries, and were awarded external scholarships and travel awards. Many trainees participated in national level public health projects during or following the program and were involved in conducting research training in their own institution.

More than 50% of ASCEND trainees commenced higher research degrees during or following their participation in the ASCEND program. These included PhD, Masters, or MD programs, either in their home country or at one of the collaborating ASCEND institutions. Most of the research degrees were undertaken in institutions in Malaysia, India, or Sri Lanka, with mentoring and supervisory support provided by the international ASCEND faculty (see quotes from ASCEND trainees 2 and 3—Appendix 4).

Strengthening of Partnerships and Collaboration

Investment from collaborating organizations and groups was beneficial in helping trainees develop cross-regional and international collaborations. It also helped trainees feel part of a collegiate group working for the same purpose and gain valuable career direction and mentorship.

Each of the ASCEND face-to-face training blocks and associated forums and other events involved significant engagement and knowledge exchange and networking activities among trainees, ASCEND faculty, local health ministries, nongovernmental organizations, the WHO, and other organizations (see quotes from ASCEND trainees 4 and 5—Appendix 4).

Discussion

The ASCEND program provided training to 50 young researchers from universities and research institutions within participating countries and established a growing network of regional collaborators from government, non-government, and other organizations in South Asia.

Along with the expansion of formal degree programs for public health in LMICs in recent years,[15] the unique quality of a program like ASCEND is its ability to link trainees and their faculty in LMICs with institutions and faculty from high-income countries, Furthermore, there was the development of strong South-North-South collaborations[16] and related research.[17,18] ASCEND, by delivering a blended learning program that incorporates a supportive global faculty, e-learning, remote and face-to-face training, and formal mentorships, has supported trainees to continue working and living in their own countries, rather than having to relocate to a high-income country to undergo training and mentorship.

Through the program, trainees have also had the opportunity to exchange their research findings with senior policymakers and practitioners, and to network and interact with leading researchers from their own countries and from around the world. Such a program would not be possible without significant financial, infrastructure, and in-kind resources, which presents a challenge in viability and sustainability for many countries, particularly those with scarce resources.

ASCEND has been a unique program in its focus on training and capacity building to support NCD prevention and control in LMICs. Despite the growing NCD challenges confronting LMICs, there is still a lack programs that focus on the needs of LMICs.[19] To date, most of the research capacity strengthening programs in LMICs have primarily focused on communicable diseases, maternal and child health, and/or on enhancing broader population health research and knowledge.[9,20] Furthermore, a program such as ASCEND, where most of the training and support was provided within host countries, can help ameliorate the problem of "brain drain," by allowing trainees to stay in their home country while undertaking the program. At the same time, this can open doors to an international network of education and mentorship.

Through the implementation of the ASCEND program, the faculty has demonstrated an effective and efficient delivery of NCD research capacity strengthening. Other collaborations, such as Asia-Pacific Academic Consortium for Public Health,[21] can make use of the lessons learned from the ASCEND program by designing and implementing similar programs.

Like other similar programs,[22] ASCEND has resulted in increased number of publications by the trainees. However, sustaining the outputs was a challenge.[23] Although some of the network members continued to collaborate in NCD research, there has been no takeover of the network. Research funding is the key challenge. A self-funded model was trialed and found to be unsuccessful. This has proven that the "train them, they will conduct research" philosophy may not always be applicable in the context of LMICs. Financial support, along with continuous mentoring, is critical for research capacity strengthening programs. Another challenge for many of the trainees was that ASCEND did not fund the actual research projects.

It appears that sustainability of a program ASCEND was largely based on financial viability and external funding. A sense of ownership by local institutions involved in the program would be critical for sustainability of this research capacity strengthening program. However, without continual funding and further strengthening of capacity of these institutions, this is potentially challenging. At individual level, the benefits of the research capacity strengthening program can maintained, adapted, and developed. But sustainability of research capacity at organizational level requires system and organizational level interventions in addition to training, mentoring, and networking of researchers.

A limitation of this program was the challenge of undertaking a rigorous evaluation, that is, measuring contribution or attribution to institutional or regional impact. This was a challenge due to several reasons. Among these are the barriers of resourcing and complexity of such a program

lending itself to evaluation design. Although the results of the program demonstrate a significant improvement in research knowledge, skills and outputs from baseline, assessment of long-term outcomes such as the impact of publication productivity, and research dissemination was not undertaken. Therefore, caution needs to be applied in determining the impact of such outputs. Before joining the ASCEND program, trainees have basic education on general research methods and most of them had lack of exposure to the actual research practice. The NCD research output from the selected countries was also very low. Although no control group was used as part of this program, the added value of ASCEND program in terms of improving NCD research output at individual and country level was substantial.

Conclusion

The ASCEND program has demonstrated an effective collaborative and contemporary approach for strengthening NCD research capacity among early career researchers in the Asia Pacific region using contemporary information and communications technology for program delivery. The program model enabled the enhancement of capacity and performance of the trainees as well as networking and knowledge exchange to emerge between the participants. The online component allowed flexibility with work, family, and other study commitments for the trainees. The face-to-face component proved to be crucial for solidifying the ASCEND community and network. If successfully replicated, the program's model could make a significant contribution to the generation and translation of significant evidence relevant to the prevention and control of NCDs in LMICs.

Recommendations

The ASCEND model was implemented successfully and as planned, and therefore would be suitable for adaption and/or adoption for future research capacity building in other LMICs. Conducting NCD research capacity strengthening programs "in-country" (rather than in a high-income country) has several distinct advantages. Future programs should focus on core curricula, including online and face-to-face teaching using contemporary technology and enhance the way mentoring is incorporated into the program. Building strong, sustainable partnerships between researchers, policymakers, and program implementers is also very important. Evaluation of long-term outcomes of such programs is recommended to determine their long-term scalability and sustainability in similar settings, worldwide.

Authors' Note

Allison Byrnes and Tilahun Haregu were formerly with Monash University, Australia.

Acknowledgments

We extend our thanks to the World Health Organization Collaborating Centre for NCD Implementation Research at the University of Melbourne for supporting this study. We also thank Kate Chalmers and Ameera Katar for their critical review of the draft manuscript.

Declaration of Conflicting Interests

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

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This program was undertaken as part of the Asian Collaboration for Excellence in Non-Communicable Disease (ASCEND), which was funded by the Fogarty International Centre of the National Institutes of Health under Award Number: D43TW008332. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

ORCID iD


Tilahun Nigatu Haregu https://orcid.org/0000-0002-8797-0469

Supplemental Material

Supplemental material for this article is available online.

References

1. World Health Organization. *Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks*. Geneva, Switzerland: World Health Organization; 2009.
2. World Health Organization. NCD mortality and morbidity. http://www.who.int/gho/ncd/mortality_morbidity/en/. Accessed July 26, 2019.
3. Siegel KR, Patel SA, Ali MK. Non-communicable diseases in South Asia: contemporary perspectives. *Br Med Bull*. 2014;111:31-44.
4. Global Burden of Disease Study 2013 Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2015;386:743-800.
5. Weber MB, Ranjani H, Staimez LR, et al. The stepwise approach to diabetes prevention: results from the D-CLIP randomized controlled trial. *Diabetes Care*. 2016;39:1760-1767.
6. GBD 2013 DALYs and HALE Collaborators; Murray CJ, Barber RM, et al. Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990-2013: quantifying the epidemiological transition. *Lancet*. 2015;386:2145-2191.
7. Beran D, Byass P, Gbakima A, et al. Research capacity building-obligations for global health partners. *Lancet Glob Health*. 2017;5:e567-e568.
8. Oldenburg B, Wickramasinghe K, Byrnes A. Building noncommunicable disease research capacity in the South Asian region: the ASCEND program. *Asia Pac J Public Health*. 2016;28(1 suppl):6S-9S.
9. Franzen SRP, Chandler C, Lang T. Health research capacity development in low and middle income countries: reality or rhetoric? A systematic meta-narrative review of the qualitative literature. *BMJ Open*. 2017;7:e012332.
10. Sivaramakrishnan K, Parker RG. The United Nations high level meeting on the -prevention and control of noncommunicable diseases: a missed opportunity? *Am J Public Health*. 2012;102:2010-2012.
11. Schmidt H, Barnhill A. Equity and noncommunicable disease reduction under the sustainable development goals. *PLoS Med*. 2015;12:e1001872.
12. McKee M, Haines A, Ebrahim S, et al. Towards a comprehensive global approach to prevention and control of NCDs. *Global Health*. 2014;10:74.
13. Ezeh AC, Izugbara CO, Kabiru CW, et al. Building capacity for public and population health research in Africa: the consortium for advanced research training in Africa (CARTA) model. *Glob Health Action*. 2010;3.
14. Fonn S, Egesah O, Cole D, et al. Building the capacity to solve complex health challenges in sub-Saharan Africa: CARTA's multidisciplinary PhD training. *Can J Public Health*. 2016;107:e381-e386.

15. Rabbani F, Shipton L, White F, et al. Schools of public health in low and middle-income countries: an imperative investment for improving the health of populations? *BMC Public Health*. 2016;16:941.
16. Cash-Gibson L, Guerra G, Salgado-de-Snyder VN. SDH-NET: a South-North-South collaboration to build sustainable research capacities on social determinants of health in low- and middle-income countries. *Health Res Policy Syst*. 2015;13:45.
17. Mathews E, Thomas E, Absetz P, et al. Cultural adaptation of a peer-led lifestyle intervention program for diabetes prevention in India: the Kerala Diabetes Prevention Program (K-DPP). *BMC Public Health*. 2018;17:974.
18. Thankappan KR, Sathish T, Tapp RJ, et al. A peer-support lifestyle intervention for preventing type 2 diabetes in India: a cluster-randomized controlled trial of the Kerala Diabetes Prevention Program. *PLoS Med*. 2018;15:e1002575.
19. Kilic B, Phillimore P, Islek D, et al. Research capacity and training needs for non-communicable diseases in the public health arena in Turkey. *BMC Health Serv Res*. 2014;14:373.
20. Kaser M, Maure C, Halpaap BM, et al. Research capacity strengthening in low and middle income countries—an evaluation of the WHO/TDR Career Development Fellowship Programme. *PLoS Negl Trop Dis*. 2016;10:e0004631.
21. Liveris M. The role of APACPH (Asia-Pacific Academic Consortium for Public Health) in addressing public health issues in the Asia-Pacific region. *Asia Pac J Public Health*. 2000;12(suppl):S13-S15.
22. Fatima R, Yaqoob A, Qadeer E, et al. Building sustainable operational research capacity in Pakistan: starting with tuberculosis and expanding to other public health problems. *Glob Health Action*. 2019;12:1555215.
23. Franzen SRP, Chandler C, Siribaddana S, Atashili J, Angus B, Lang T. Strategies for developing sustainable health research capacity in low and middle-income countries: a prospective, qualitative study investigating the barriers and enablers to locally led clinical trial conduct in Ethiopia, Cameroon and Sri Lanka. *BMJ Open*. 2017;7:e017246.