

# Effectiveness of community-based diabetes and hypertension prevention and management programmes in Indonesia and Viet Nam: a quasi-experimental study

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## ABSTRACT

**Introduction** Non-communicable diseases (NCDs) have surpassed infectious diseases as the leading global cause of death, with the Southeast Asian region experiencing a significant rise in NCD prevalence over the past decades. Despite the escalating burden, screening for NCDs remains at very low levels, resulting in undetected cases, premature mortality and high public healthcare costs. We investigate whether community-based NCD prevention and management programmes are an effective solution.

**Methods** In Indonesia, we compare participants in the community-based NCD screening and management programme *Pos Pembinaan Terpadu-Penyakit Tidak Menular* with matched non-participants with respect to their uptake of screening activities, health-related behaviour and knowledge and metabolic risk factors. We use statistical matching to redress a possible selection bias (n=1669). In Viet Nam, we compare members of *Intergenerational Self-Help Clubs*, which were offered similar NCD health services, with members of other community groups, where such services were not offered. We can rely on two waves of data and use a double-difference approach to redress a possible selection bias and to measure the impacts of participation (n=1710). We discuss strengths and weaknesses of the two approaches in Indonesia and Viet Nam.

**Results** In Indonesia, participants have significantly higher uptake of screening for hypertension and diabetes (+13% from a control mean of 88% (95% CI 9% to 17%); +93% from a control mean of 48% (95% CI 79% to 108%)). In both countries, participants show a higher knowledge about risk factors, symptoms and complications of NCDs (Indonesia: +0.29 SD (0.13–0.45), Viet Nam: +0.17 SD (0.03–0.30)). Yet, the improved knowledge is only partly reflected in improved health behaviour (Viet Nam: fruit consumption +0.33 SD (0.15–0.51), vegetable consumption +0.27 SD (0.04–0.50)), body mass index (BMI) (Viet Nam: BMI –0.07 SD (–0.13 to –0.00)) or metabolic risk factors (Indonesia: systolic blood pressure: –0.13 SD (–0.26 to –0.00)).

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ The major share of non-communicable disease (NCD) management and prevention interventions in low- and middle-income countries take place in primary healthcare settings.
- ⇒ Community-based programmes are thought to be a promising complement to primary healthcare interventions, yet rigorous evidence on their effectiveness is not available.

## WHAT THIS STUDY ADDS

- ⇒ This study presents a rigorous evaluation of the effectiveness of two community-based NCD prevention and management programmes in Indonesia (*Posbindu*) and Viet Nam (*Intergenerational Self-Help Clubs*).
- ⇒ We use quasi-experimental methods to investigate the effects of participation in these programmes on NCD screening uptake, improved NCD knowledge and health behaviour.
- ⇒ We rely on a large sample of study participants (Indonesia: n=1669; Viet Nam, n=1710) followed over 3 years.
- ⇒ The results suggest that community-based NCD prevention and management programmes are effective in increasing preventive health behaviour and knowledge.
- ⇒ Yet, participation in these programmes has not yet led to substantial improvements of metabolic indicators among participants.

**Conclusion** Community-based NCD programmes are well suited to increase screening and to transmit health knowledge. Due to their extensive outreach within the community, they can serve as a valuable complement to the screening services provided at the primary healthcare level. Yet, limited coverage, insufficient resources and a high staff turnover remain a problem.  
**Trial registration number** [NCT05239572](https://clinicaltrials.gov/ct2/show/study/NCT05239572).

**HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY**

- ⇒ Community-based NCD prevention and management programmes show promise in alleviating the burden of NCDs in Southeast Asia and should be integrated with primary healthcare interventions.
- ⇒ Policymakers should strive to achieve synergies between these two approaches.
- ⇒ Further evidence is necessary, especially concerning programme components that have the potential to enhance healthy lifestyles and improve metabolic risk factors.

**INTRODUCTION**

Non-communicable diseases (NCDs) account for 74% of deaths and 64% of disability-adjusted life years globally.<sup>1</sup> The increase in the NCD burden is especially sharp in lower-income and middle-income countries (LMICs), where urbanisation and economic development have led to a spike in NCD risk factors, such as obesity and high blood pressure, and a consequent rise in cardiovascular diseases and diabetes.<sup>2</sup> A rise in NCDs comes with productivity losses and an increased vulnerability to poverty.<sup>3–5</sup> At the same time, screening, diagnostic and treatment capacities are limited.<sup>6,7</sup> One particularly affected region is Southeast Asia, which saw a steep increase in the NCD burden over the last decades and faces a higher proportion of premature NCD deaths than any other region in the world.<sup>1,8–9</sup> Since NCD symptoms often become apparent only in later stages of the disease's trajectory and preventive screening is still rare in many countries, people often remain for a long time unaware of their disease. In fact, estimates suggest that in LMICs around 50% of diabetes cases and 60% of hypertension cases remain undiagnosed.<sup>10–11</sup> Undiagnosed cases lead to severe disease complications, high healthcare costs and premature mortality.

The importance of reducing the global burden of NCDs has also been recognised in the Sustainable Development Goals agenda and is covered by target 3.4 (reduce by one-third premature mortality from NCDs through prevention and treatment and promote mental health and well-being).<sup>12</sup> Increased awareness, regular screening and an effective referral of diagnosed cases into treatment are key to achieving this goal. Health education that promotes healthier lifestyles, that is, reduced tobacco and alcohol consumption, better diets and increased physical activity, is an important complement.

Indonesia and Viet Nam are currently in the midst of implementing such NCD screening and education interventions in the form of community-based NCD prevention and management programmes. Generally, such 'bottom-up' approaches with the community as the main facilitator have been promoted for different domains of public health—such as community-based health insurance,<sup>13–14</sup> community-led sanitation campaigns<sup>15–16</sup> and community-based tuberculosis or maternal and child healthcare<sup>17–19</sup>—though with heterogeneous success. Yet, while community-based NCD prevention and

management programmes have a long history in many high-income countries, they have only more recently been advocated in the context of LMICs.<sup>20,21</sup> Such programmes are thought to reach out to a large number of people in the community at low cost, reduce access barriers especially in rural areas and might be able to induce behavioural change through pathways that instruments at higher levels cannot easily activate, such as community-level physical activity, mutual monitoring of health behaviour and self-education. However, tight healthcare budgets, a low prioritisation of NCDs, high turnover of staff and inadequate institutional integration jeopardise their effectiveness and long-term sustainability.<sup>22–24</sup>

A recent literature review about NCD interventions in Southeast Asia revealed that most interventions are still taking place in primary healthcare settings instead of community-based settings and treatment and acute care programmes, such as counselling for NCD patients, seem to be more common than prevention programmes and screening.<sup>25</sup> Rigorous evaluations of community-based NCD prevention and management programmes for Southeast Asia are scant although evidence on their effectiveness and facilitators, but also barriers and limitations could help to understand their potential to complement efforts at the primary healthcare level.

In this study, we evaluate whether community-based NCD prevention and management programmes are an effective solution to address the NCD burden in Southeast Asia, specifically in Indonesia and Viet Nam. The analysis is part of an international collaborative research project called *Scaling-Up NCD Interventions in Southeast Asia* (SUNI-SEA) funded under the EU's Horizon 2020 programme.

**METHODS****Study areas and participant selection**

We use quasi-experimental approaches relying on two waves of individual primary data from two community-based NCD programmes in Indonesia and Viet Nam. In both countries, these programmes are currently being upscaled, and we collected data from participants and non-participants of these programmes to assess the programmes' effectiveness. In both countries, we also conducted qualitative focus group discussions and in-depth interviews with community health volunteers and programme representatives to gain insights into facilitators and challenges of the programmes.

In Indonesia, we investigated the NCD programme *Pos Pembinaan Terpadu-Penyakit Tidak Menular* (Posbindu), which is an NCD screening, education and management programme in both urban and rural communities. To assess both programme coverage and effectiveness, the study sample is a combination of selected Posbindu participants and a random sample of households that live in the target area of the respective Posbindu. The study took place in two cities (Surakarta and Kediri) and two regencies (Jember and Batang). Within each of the

four study sites, we randomly selected five Indonesian primary healthcare centres (*Puskesmas*) and subsequently three Posbindu belonging to the respective Puskesmas for a final sample of 60 Posbindu. From each Posbindu, we randomly selected ten individuals from the participant lists. Additionally, we randomly selected ten households residing in the target area of these 60 Posbindu, and sampled two members of these households for a final sample of 1800 study participants. This sample of participants and a subsample of statistically matched observations drawn from the non-participants allows for an assessment of how participation in the programme affects relevant health outcomes.

In Viet Nam, we focused on *Intergenerational Self-Help Clubs* (ISHCs), which are community-based solidarity groups established at the village level, and with the major share of their members being elderly, women or other vulnerable groups.<sup>26 27</sup> ISHCs aim to promote active and healthy ageing and focus on aspects such as social participation, mutual economic support, health and community care. The SUNI-SEA project implemented additional NCD health components in these groups. The study took place in the two provinces Hai Phong and Ninh Binh. In both provinces, we selected all districts in which (1) the district health centres provided NCD treatment and preventive services and (2) ISHCs already existed, resulting in nine districts. Of these nine districts, one per province was allocated to the control group, the remaining seven formed the intervention group. From the 7 intervention districts, we selected 59 villages with ISHCs (34 in Hai Phong and 25 in Ninh Binh) and sampled 1 ISHC per village (=59 ISHCs). From each ISHC, we randomly selected 20 members to be interviewed (=1178 individuals; all other members also received the intervention, but were not included in the study sample). From the two control districts, we randomly selected 25 villages per district without ISHCs but with other community-based groups (CBGs), for example, farmer groups, women unions or elderly associations. From all groups per village, we constructed a list of all members and then randomly sampled 20 members (stratified to reflect to the age and gender composition of ISHCs), resulting in a sample of 1004 control participants. Comparing ISHC members, which received the NCD prevention components, with other CBGs members, which did not, allows for an assessment of how this NCD component affects the outcomes of interest, as long as we control for already existing differences between the two groups before implementation. More details on the sampling strategies and inclusion criteria for both countries are provided in online supplemental appendix A, pp. 1–3.

All data were collected by trained enumerators during face-to-face interviews with the same individuals in 2021/2022 and in 2023. The clinical trial number of the SUNI-SEA project is NCT05239572.

## Involvement of patients and the general public

The research presented in this article is part of a broader collaborative research project (SUNI-SEA). This project followed a participatory research design, that is, from the start of the proposal preparation researchers, doctors, health staff, patients, policymakers and staff from the national and local health authorities contributed jointly to the research design through workshops held in the target countries, online fora, focus group discussions and in-depth interviews. These same formats have also been used and are still being used to disseminate the research findings. The findings are intended to improve the work and health environment of doctors, health staff and patients and ultimately reduce the incidence of NCDs. The subjects underlying the analysis in this article were made aware of the fact that the survey data are used for research and policy advice, but patients were not aware whether they were in intervention areas or control areas as this could have affected their behaviour and hence bias the results. For details, see our study protocol and ethical approval.

## Programmes and intervention description

### Indonesia

Posbindu invites on a regular (preferably monthly) basis all community members above the age of 15 years to gather at a central place in the community (ie, village or urban district), to identify NCD risk factors, undergo blood pressure and blood sugar screening, to measure the body mass index (BMI) and to get education and advice by so-called *cadres* (community health volunteers) on health-related behaviour. Posbindu operates under the responsibility of Puskesmas, to which they refer patients who need follow-up exams and, if needed, treatment and from which nurses are sent to participate in Posbindu to provide professional medical support, for example for blood sugar measurements. The programme started in 2011 and has been rolled out in the country since 2015. It aims to shift NCD prevention from the primary healthcare level to the community level and thereby empower communities in their NCD risk management. The services of the programme are free of charge and are financed primarily through Puskesmas funds and are occasionally topped up by additional community funds. Yet, participation rates are still relatively low, especially among younger people and men.<sup>28</sup>

### Viet Nam

ISHCs are inclusive community-based solidarity groups, which meet on a monthly basis. The ISHC model was launched as a pilot project in 2006 by Help Age Viet Nam in partnership with the Viet Nam Association of the Elderly and the Viet Nam Women's Union to introduce a community-based approach to achieve active ageing and inclusive development. Since then, the ISHC model has been upscaled throughout the country and by 2021, more than 3000 ISHCs were registered. ISHC members pay a small yearly membership fee between US\$1 and US\$4.

In the course of the SUNI-SEA project, NCD prevention health components were provided to already existing ISHCs with an established member base. These activities included regular health communication and education, physical exercise, bi-annual health check-ups and screening for risk factors of hypertension and diabetes. Additionally, the project provided NCD training for community health volunteers, ISHC management board training workshops, provision of equipment for periodical NCD screening and education material for members. The project also assisted in developing a software application to record screening activities. Further, the linkages between ISHCs and commune health stations and district health centres were strengthened through improved referrals. These additional components to prevent and control NCDs were rolled out in our study region after the first data collection in 2021.

Hence, these two programmes, while following the same target of NCD prevention, have some important structural differences. While the programme in Indonesia can be considered a stand-alone programme, service provision programme and outreach programme of the health sector, ISHCs are all-encompassing community groups, focusing on multiple aspects of community solidarity and empowerment, of which NCD prevention activities are only one component. Yet, both programmes focus equally on health education and screening activities to identify individuals at risk for NCDs and to improve referral to the primary healthcare system. In terms of the implementation period of the two programmes, Posbindu can be considered a long-standing health programme. In contrast, the NCD prevention components in Viet Nam are newly introduced into the ISHC activities, yet the ISHCs themselves exist for more than a decade.

In this study, we focus on outcomes and hence success of both programmes. The process outputs and fidelity to the intervention components have similarly been analysed and evaluated within the course of the SUNI-SEA project and are documented in complementary reports and studies.<sup>26 28–30</sup> They showed that occasional contextual barriers could lead to a heterogeneous degree of implementation of the activities and procedures and that optimal implementation was considerably dependent on available resources as well as the support from the primary healthcare system. Hence, our results below must be interpreted as the average outcomes, hiding potential implementation heterogeneities. Yet, we discuss some of the underlying contextual barriers below.

## Outcomes

The NCD programmes under study were expected to affect the participants in different ways, starting with NCD knowledge, resulting in healthier behaviour, increased screening uptake and ultimately improved health. Thus, we investigate multiple outcomes. We assess whether the two programmes impacted (1) knowledge about diabetes and hypertension, (2) the probability of having been screened for high blood pressure and high

blood sugar, (3) health behaviour, specifically fruit and vegetable consumption, smoking and physical activity and (4) metabolic risk factors, specifically blood pressure and BMI.

Knowledge about diabetes and hypertension was assessed in the form of a general NCD knowledge index (10 questions; index ranging from 1 to 10), and in the form of asking about risk factors, symptoms and consequences of hypertension and diabetes separately. Having been screened for high blood pressure and high blood sugar was measured as binary variable based on the respondents' self-reporting. Fruit and vegetable consumption was measured as the number of days per week a respondent consumed fruits and vegetables and the average amount of fruits and vegetables consumed per day (self-reported). Physical activity was measured as binary variable indicating if the participant had at least on average 30 min of physical activity per day and as a continuous variable measuring the minutes of physical activity per week (self-reported). For Indonesia, physical activity included only vigorous physical activities, whereas for Viet Nam also moderate physical activities were included. Smoking was measured as binary variable based on the respondents' self-report. Blood pressure was measured three times with an electronic monitor (before, during and after the interview) and the average of the three measurements was taken. To calculate the BMI, participants' height and weight was measured after the interview.

## Statistical analysis

To assess the effects of participation in Posbindu activities in Indonesia, we compare participants with non-participants using propensity score matching, that is, we model empirically participation conditional on observable characteristics collected at baseline and then predict the conditional probability of participating for each individual in the sample.<sup>31</sup> We employ nearest neighbour matching with one neighbour and with replacement. The impact assessment then compares the outcomes of participants and non-participants with the same probability of participation. Observations for which no statistical matches can be found are excluded from the sample, that is, we focus on the area of common support. Impacts can be interpreted as nearly causal if Posbindu participation is largely explained by observable characteristics.

To assess the effects of participation in the ISHCs in Viet Nam, we compare ISHC members who received the NCD prevention health components with members of other CBGs who did not receive these components using a difference-in-difference approach.<sup>32</sup> This is possible since, unlike in the Indonesian case, at baseline none of the members had received the NCD prevention health components as these were implemented only after the baseline data collection by the SUNI-SEA project team. Difference-in-difference compares changes in outcomes over time between individuals that received the health component between baseline and endline (ie, were

selected into treatment) and individuals that did not receive it over the entire period (ie, were not selected). Any difference in the changes in outcomes over time can then be causally attributed to participation in the health intervention. The only source of bias are unobserved time-varying factors that are different in ISHCs and CBGs. Observed time-varying factors can be introduced as controls and time-constant factors, including those driving the 'selection' of villages into 'treatment', are accounted for with individual fixed effect. We include age, household size and the household's economic status as time-varying controls. Hence, in the case of Viet Nam, the identifying assumption is softer than in the case of Indonesia as only unobserved time-varying factors can bias the results. Yet, both identification strategies identify treatment effects on the treated, that is, the estimated coefficients can be interpreted in the same way. Further details of the two empirical strategies are presented in online supplemental appendix B, pp. 4–9.

## RESULTS

### Participants' characteristics

The sample for Indonesia consisted of 776 individuals that had participated in Posbindu, and of 776 matched individuals which had never participated in Posbindu, but were statistically similar in terms of observable characteristics. The sample for Viet Nam consisted of a balanced panel of 1710 individuals that were interviewed at baseline and endline and of which 897 were members of ISHCs and 813 were members of other CBGs. Descriptive summary statistics of the socio-demographics and the outcome variables of interest of both country samples are presented in tables 1 and 2.

Both programmes were primarily able to reach out to women, with the share of female participants reaching 82% in Posbindu and 76% in ISHCs. In terms of the age structure, participants in Viet Nam were generally older than in Indonesia. In Viet Nam, given the focus of ISHCs on elderly, 96% of participants were above the age of 50 years, whereas in Indonesia, 44% of participants were above the age of 50 years.

With respect to the outcome variables at baseline, the two country settings can be considered as being quite similar. In both samples, the general NCD knowledge index was high (mean of 8.3 and 8.5; min: 0, max: 10), whereas the knowledge about specific risk factors, symptoms and complications (mean between 0.6 and 1.8; min: 0, max: 5) was comparably low. In both countries, individuals had more often been screened for high blood pressure than for high blood sugar levels. Yet, BMI levels and smoking rates were somewhat higher in Indonesia than in Viet Nam. The large difference in minutes of physical activity per day stemmed from the fact that in Indonesia only vigorous activity was measured, whereas in Viet Nam also moderate activity was measured.

### Effects of participation in NCD programmes

The results of the statistical analysis are presented in figure 1 for Indonesia and in figure 2 for Viet Nam. For the analysis, we standardised all continuous variables by the respective control group mean and standard deviation (for Viet Nam this refers to the control group at baseline and for Indonesia to the matched control group at endline), such that the control group mean and SD were 0 and 1, respectively, and the effects were interpreted as changes in SD of the respective variable of the control group. Although, the focus is on within country effects, this standardisation allows also for a comparison of the effect sizes across both country settings and across outcomes. The four binary outcomes (having been screened for diabetes, having been screened for hypertension, currently smoking and having at least 30 minutes of physical activity per day) are presented as percentage change relative to the control group mean (divided by 100). We also present absolute effect sizes in Table C1 in online supplemental appendix C, p. 10.

For both countries, we detected a large and significant increase in knowledge. The combined NCD knowledge index increased by 0.29 SD (95% CI 0.13 to 0.45) in Indonesia and by 0.17 SD (95% CI 0.03 to 0.30) in Viet Nam. Also, the more specific knowledge about diabetes and hypertension risk factors, symptoms and consequences was significantly larger for participants than for non-participants; between 0.41 SD (0.24–0.57) and 0.65 SD (0.49–0.81) in Indonesia and between 0.19 SD (0.03–0.35) and 0.38 SD (0.22–0.54) in Viet Nam. In absolute terms, this corresponds to an increase of 0.3 to 0.5 more correctly answered questions. Participants in Indonesia were also significantly more likely to have ever been screened for diabetes (+93% (79%–108%); control mean: 48%) and hypertension (+13% (9%–17%); control mean: 88%) than non-participants. For Viet Nam, we also found an increase in blood sugar screening (+5% (–2% to 12%), control mean: 69%), yet the coefficient was not statistically significant. Further, no difference in blood pressure screening could be detected.

We found only mixed results for behavioural and metabolic outcomes. In the case of Indonesia, we detected a marginally significant reduction in the probability of being a smoker (–29% (–61% to 3%), control mean: 11.6%) and a significant reduction in blood pressure levels (systolic blood pressure: –0.13 SD (–0.26 to –0.00)). Yet, no differences in fruit or vegetable consumption, in the probability of conducting at least 30 minutes of physical activity per day or the BMI could be detected. In the case of Viet Nam, we found that participants consumed a larger quantity of fruit and vegetables per day (+0.33 SD (0.15–0.51); +0.27 SD (0.04–0.50)) and had a lower BMI (–0.07 SD (–0.13 to –0.00)). Yet, we did not observe any differences in smoking or physical activity behaviour and contrarily detected an increase in blood pressure levels (+0.16 SD (0.02–0.30)).

**Table 1** Sociodemographic characteristics at baseline

	Indonesia		Viet Nam	
	(1)	(2)	(3)	(4)
	Posbindu participants	Non-participants	ISHC members	CBG members
	n=776	n=776	n=897	n=813
<b>Sociodemographics</b>				
Age	47.82 (11.28)	48.15 (12.46)	65.31 (8.15)	66.63 (8.23)
<b>Gender</b>				
Female	633 (82%)	636 (82%)	680 (76%)	629 (77%)
Male	143 (18%)	140 (18%)	217 (24%)	184 (23%)
<b>Education</b>				
Less than high school	285 (37%)	278 (36%)	578 (64%)	635 (78%)
High school	407 (52%)	411 (53%)	196 (22%)	134 (16%)
More than high school	84 (11%)	87 (11%)	123 (14%)	44 (5%)
<b>Working status</b>				
Currently working (agriculture)	56 (7%)	47 (6%)	371 (41%)	348 (43%)
Currently working (non-agriculture)	309 (40%)	322 (41%)	101 (11%)	68 (8%)
Not working (retired/old/sick)	108 (14%)	112 (14%)	367 (41%)	347 (43%)
Homemaker	254 (33%)	237 (31%)	53 (6%)	42 (5%)
Other	49 (6%)	58 (7%)	5 (1%)	8 (1%)
<b>Marital status</b>				
Single	21 (3%)	21 (3%)	14/896 (2%)	21 (3%)
Married	632 (81%)	637 (82%)	669/896 (75%)	592 (73%)
Separated/divorced/widowed	123 (16%)	118 (15%)	213/896 (24%)	200 (25%)
Asset index	4.45 (1.34)	4.45 (1.25)	3.75 (1.08)	3.50 (1.15)
<b>Household monthly income</b>				
US\$0 to US\$<70	197 (25%)	187 (24%)	96/740 (13%)	153/638 (24%)
US\$70 to US\$<140	262 (34%)	238 (31%)	103/740 (14%)	102/638 (16%)
US\$140 to US\$<351	270 (35%)	307 (40%)	206/740 (28%)	190/638 (30%)
US\$>351	31 (4%)	27 (3%)	335/740 (45%)	193/638 (30%)
Refused	16 (2%)	17 (2%)		
<b>NCD diagnosis</b>				
Diagnosed with hypertension	202 (26%)	205 (26%)	293 (33%)	301 (37%)
Diagnosed with diabetes/high blood sugar	55 (7%)	57 (7%)	79 (9%)	87 (11%)

Mean (SD in parentheses) for continuous variables and n (% in parentheses) for categorical/binary variables for both countries at baseline. Income and education categories are aligned between countries.

\*The following exchange rates are applied: Indonesia, 2021 exchange rate of 14 242 IDR to US\$1; Viet Nam, 2021 exchange rate of 22 770 VND to US\$1. Converted into purchasing power parties, US\$1 in IDR in 2021 corresponds to US\$2.91 in 2017. Likewise, US\$1 in VND in 2021 corresponds to US\$2.97 in 2017 expressed in purchasing power parities. Put differently, 14 242 IDR (22 770 VND) in 2021 could buy a bundle of goods and services worth US\$2.91 in 2017 (US\$2.97).

CBG, community-based group; ISHC, Intergenerational Self-Help Club; NCD, non-communicable disease.

## DISCUSSION

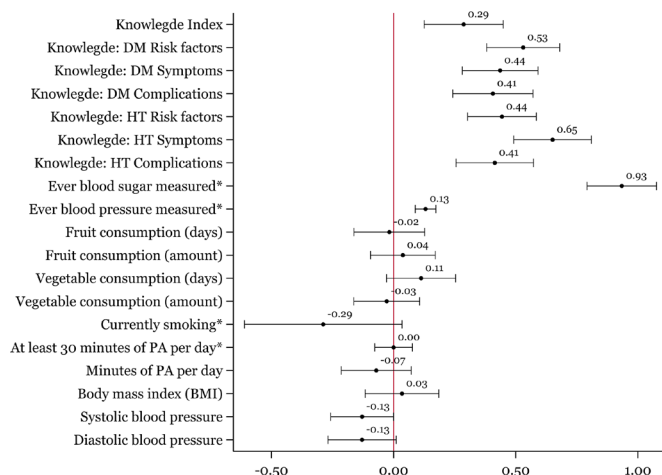
Our findings suggest that community-based NCD programmes in Indonesia and Viet Nam are effective in transmitting NCD-related knowledge and awareness towards their participants. Also, Posbindu ensures that individuals are screened for high blood pressure and blood sugar levels on a regular basis and thereby makes an

important contribution towards the prevention and monitoring of NCDs. In Viet Nam, the non-significant differences in screening rates can at least partly be explained by the fact that screening rates were already at very high levels at baseline (which resulted from increased blood pressure screening rates during COVID-19 vaccination campaigns). Specifically, at baseline 98% of non-ISHC

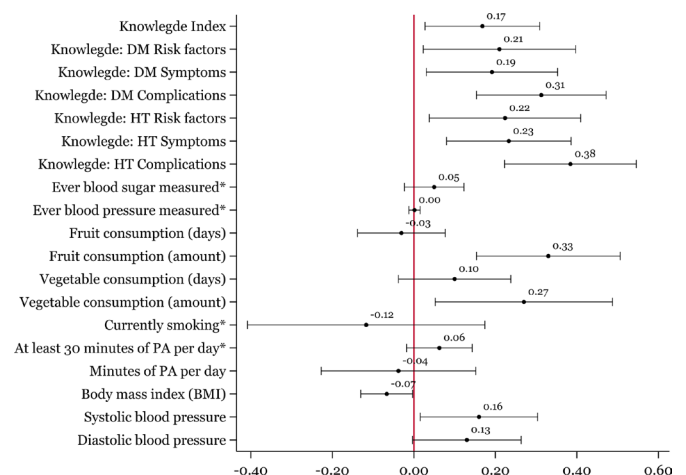
**Table 2** Outcome variables at baseline

	Indonesia		Viet Nam	
	(1)	(2)	(3)	(4)
	Posbindu participants	Non-participants	ISHC members	CBG members
	n=776	n=776	n=897	n=813
NCD knowledge index	8.32 (1.57)	7.95 (1.69)	8.56 (2.52)	7.68 (3.07)
Knowledge: DM risk factors	1.68 (0.88)	1.50 (0.80)	0.66 (0.82)	0.76 (1.17)
Knowledge: DM symptoms	1.81 (1.35)	1.52 (1.29)	1.64 (1.34)	1.45 (1.75)
Knowledge: DM complications	1.20 (0.98)	1.03 (0.91)	1.24 (1.17)	1.17 (1.75)
Knowledge: HT risk factors	1.87 (1.00)	1.69 (0.90)	1.12 (1.33)	1.21 (1.99)
Knowledge: HT symptoms	1.70 (0.87)	1.61 (0.85)	1.49 (1.12)	1.54 (1.87)
Knowledge: HT complications	1.27 (0.78)	1.08 (0.76)	1.08 (0.74)	1.06 (1.13)
Ever blood sugar measured	562 (73%)	371 (48%)	694 (77%)	562 (69%)
Ever blood pressure measured	760 (98%)	739 (95%)	885 (99%)	794 (98%)
Fruit consumption (days/week)	4.28 (2.49)	3.91 (2.53)	5.63 (2.16)	5.21 (2.33)
Fruit consumption (amount/day)	1.66 (0.98)	1.57 (0.96)	2.08 (2.62)	2.03 (2.21)
Vegetable consumption (days/week)	6.36 (1.50)	6.10 (1.64)	6.87 (0.82)	6.86 (0.79)
Vegetable consumption (amount/day)	1.88 (0.91)	1.84 (0.88)	2.46 (1.16)	2.53 (1.98)
Currently smoking	70 (9%)	93 (12%)	68 (8%)	49 (6%)
At least 30 min of PA/day	184 (24%)	130 (17%)	755 (84%)	671 (83%)
Minutes of PA/day	17.89 (26.30)	13.84 (30.17)	139.45 (150.14)	140.43 (151.06)
BMI	25.70 (4.71)	25.16 (5.17)	22.51 (2.63)	22.16 (2.68)
Systolic blood pressure	133.67 (21.41)	134.24 (22.75)	131.01 (18.11)	140.40 (20.76)
Diastolic blood pressure	87.65 (12.52)	87.27 (13.27)	80.00 (10.69)	81.90 (11.24)

Mean (SD in parentheses) for continuous variables and n (% in parentheses) for categorical/binary variables for both countries at baseline. BMI, body mass index; CBG, community-based group; DM, diabetes mellitus; HT, hypertension; ISHC, Intergenerational Self-Help Club; NCD, non-communicable disease; PA, physical activity.



**Figure 1** Results for Indonesia. Notes: Effect sizes are standardized and interpreted as changes in SD. Effect sizes for binary variables (indicated with \*) are interpreted as percentage changes divided by 100. For absolute effect sizes, see online supplemental table C1. DM, diabetes mellitus; HT, hypertension; PA, physical activity.



**Figure 2** Results for Viet Nam. Notes: Effect sizes are standardized and interpreted as changes in SD. Effect sizes for binary variables (indicated with \*) are interpreted as percentage changes divided by 100. For absolute effect sizes, see online supplemental table C1. DM, diabetes mellitus; HT, hypertension; PA, physical activity.

members and 99% of ISHC members reported to have been screened for hypertension (see [table 1](#)), leaving not much room for further improvement.

Yet, the improvements in knowledge seem only partially translating into healthier lifestyles and improvements in metabolic risk factors. This is not unexpected, given that behavioural change such as healthier diets and more physical activity typically require the postponement of short-term pleasure in favour of longer-term health benefits. The literature offers a variety of theories that could explain this result. Stage models such as the trans-theoretical model<sup>33 34</sup> claim that behavioural change is a long process, where contemplation (thinking about behavioural change) and preparation (planning of behavioural change) must precede the adoption of new behaviour and these stages together can take several months, a year or even longer. Many of our study participants, in particular in Viet Nam, have exposure times much less than that. Both social cognitive theory<sup>35</sup> and the health belief model<sup>36 37</sup> emphasise the importance of self-efficacy, that is, an individual's belief in his or her capacity to adopt a new behaviour including control over one's own motivation and social environment.<sup>38</sup> Health belief models also evoke the underestimation of the severity of one's own risk and benefits of behavioural change as potential barriers to behavioural change. All these factors might be very relevant in our case. Yet, social ecological models,<sup>39</sup> which see the individual's environment as the main barrier for behavioural change, might be less relevant in our context as the community-based interventions do exactly address this constraint by embedding prevention and disease control within people's community. Newer theories also consider factors rooted in neurobiology and highlight the importance of motivation and rewards.<sup>40</sup> Testing the relevance of these theories against each other is clearly beyond the scope of this article but should be addressed in future research.

Our findings add to the results of a recent study analysing NCD community-based programmes in the USA, Brazil, India and South Africa.<sup>24</sup> This study found that the programmes were successful in improving metabolic indicators in the USA and Brazil, where the focus was on improving access to care and medication adherence. In contrast, it found no improvements in participants' metabolic indicators in the context of India and South Africa, where the focus lied on screening activities. While the programmes analysed in our study do not only focus on screening, but also on NCD education and improved referrals, this seems still to be insufficient to translate into improvements in metabolic indicators. Hence, stronger linkages to the primary healthcare sector and improved access to care might be required in the context of Viet Nam and Indonesia. A further barrier in Indonesia and Viet Nam was the low participation of the male population. Men in Indonesia indicated that the timing of the screening was not convenient for their work and those men who participated frequently considered the meetings as female-oriented activities. In Viet Nam the large

participation of women was a deliberate effort to enhance the health and empowerment of women through ISHCs.

Some lessons can also be learnt from the comparison between both countries. A major difference between both lies in the institutional setting. Posbindu forms a stand-alone community programme which implies that the necessary infrastructure, such as the actual place of activity, as well as financial and human resources, need to be built up and organised before Posbindu can start its activities. This proved sometimes difficult in the given setting, due to limited financial resources or a shortage in health volunteers. Volunteers are quite frequently involved in other community programmes (eg, *Posyandu*, a maternal and child health community programme), and hence can allocate no or only limited time towards Posbindu. Moreover, in some communities, current policies require that community health volunteers rotate after a given time period, limiting the possibilities for health volunteers to establish long-term relationship with participants and to build up location-specific expertise. In Viet Nam, in contrast, the NCD health component was added to already existing and well-established institutional structures. This implied that the organisational set-up posed little difficulties and volunteers were already providing their services. A further advantage was that ISHCs were already regularly visited by a large share of community-members and the health volunteers were known and trusted. Further, the interconnection of ISHCs with local stakeholders, such as the commune people healthcare committee, facilitated the mobilisation of support and collaboration from commune health stations. In Indonesia, conversely, the programme suffered from low take-up rates. In some communities, low trust in the community health volunteers further led to a bypassing of the Posbindu services and seeking care directly in the primary healthcare system. Hence, in terms of the institutional set-up, an embedding in already existing community group structures seems more promising than a stand-alone programme.

Yet, we detected larger knowledge increases in Indonesia relative to Viet Nam and the programme in Indonesia was also more successful in increasing diabetes and hypertension screening rates. This suggests that a targeted, single-focus NCD programme might be in a better position to transmit NCD-specific knowledge as well as ensure regular screening than an integrated approach as in Viet Nam. In Viet Nam, the NCD component was only one of many other activities within ISHCs. A potential synergy emerges from integrating the two approaches: leveraging pre-existing community-group structures while implementing sessions centred on NCDs within these community gatherings. This strategy holds promise for addressing the needs of both countries effectively. Moreover, insights from our process evaluation suggested that local contextual barriers, such as staff shortages, limited technical capacities and skills for using software applications and limited information exchange between the community programmes and the



primary healthcare providers should be addressed as they can undermine intervention fidelity and hence the full potential of such interventions to unfold.

Overall, our results suggest that community-based NCD prevention and management programmes can be an important complement to NCD interventions at the primary healthcare level. They are comparably cheap, given that they rely partly on voluntary work and they seem to be well suited to increase NCD knowledge, screening rates and improve at least somewhat behavioural risk factors. Hence, conditional on adequate funding and synergies with the primary healthcare system, community-based NCD programmes that can be embedded in existing community structures, but maintain a clear focus on NCD education and screening, could be promoted to address the increasing NCD burden in Southeast Asia.

### Strengths and limitations

A strength of our study is that we relied on a large number of participants in two country settings over multiple years, allowing us to provide insights into different approaches and institutional settings of community-based health programmes. Moreover, using insights from the qualitative interviews and focus group discussions allowed us to disentangle reasons that might have contributed to the limited impacts on quantitatively measurable outcomes.

Yet, the comparison across the two countries has some limitations. First, both programmes differ in the time that has elapsed since their roll-out. While the programme in Indonesia can be considered a long-standing programme being scaled up since 2015, in Viet Nam the NCD health component was added to the ISHCs only in 2021. We therefore might expect that especially in Viet Nam, the community-based programme may require more time to unfold its full potential. Hence, our results might reflect only short-term effects. Second, the cross-country-comparison must account for the fact that in Viet Nam somewhat older people are targeted and reached than in Indonesia. While Posbindu targets all community members above the age of 15 years, ISHCs are specifically designed for elderly of the communities. This was also reflected in the mean age of the participants in our samples (Indonesia: 47, Viet Nam: 65), which could partially explain the knowledge differences between the country settings.

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