The impact of community-based, workshop activities in multiple local dialects on the vaccination coverage, sanitary living and the health status of multiethnic populations in Lao PDR

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SUMMARY

Studies on effective community-based intervention in areas inhabited by multiple ethnic groups are limited. The present study was performed to evaluate the impact of workshop activities in multiple local dialects guided by lay facilitators on vaccination coverage, sanitary living and health status in a northern district of Lao PDR. In target villages, facilitators were selected and trained to assist at village meetings to discuss health issues and develop and implement action plans. Manuals and posters with graphics were distributed. Skills were taught through demonstrations by specialists. The vaccination coverage among children and women improved significantly after 1 year. Villagers started using toilets, collecting and burning garbage, and isolating animals from human dwellings, and these activities were continued in 76, 84 and 87% of villages, respectively, 5 years after the start of the activities. The frequency of villagers falling ill was reduced in 67% of the villages. After adjustment for sociocultural characteristics and ethnicity, both the continuous sanitary living index and the reduction in the frequency of villagers falling ill were associated with the higher levels of community participation in the workshop activities. The results demonstrated that the community-based workshop activities improved vaccination coverage, sanitary living and health status. Participatory group discussions in local dialects and village activities led by lay facilitators, supervision and consultation by district trainers who were well recognized by villagers, and the distribution of pictorial educational materials can be an effective and sustainable health promotion approaches among multiethnic groups in under-resourced areas.

Key words: implementation strategies; ethic differences; community action; health behavior; Lao PDR

INTRODUCTION

Conventional community-based educational interventions and challenges

Community-based educational intervention strategies are being used worldwide for various purposes (Lewin et al., 2005). It is theorized that behavior is influenced by social norms and sustained by social networks of peers (Kumar et al., 2008). A critical challenge in applying community-based strategies is to design a program that is relevant to people’s literacy skills and lifestyles. The effectiveness of a program is significantly lowered when the contents are not...
delivered through the native language (Neuhauser et al., 2009). In areas where a mix of ethnic groups live, strategies should be adjusted to comply with the variations in their dialects. There have been, however, scant reports on an intervention study in large-scale multiethnic communities with diverse dialects.

**Multiethnic societies of Phongsaly province, Lao PDR**

Phongsaly province is a northern mountainous province in Lao PDR. There were 25 ethnic groups in the province. These ethnic groups were defined according to dialect, and each has a unique history of migration, lifestyle including traditional dress and culture (Lao Front for National Construction, 2008). The adult literacy rate of the standard Lao language in the Phongsaly province is 43%, and is the lowest among the 17 country’s provinces and Vientiane Capital (Lao Statistic Bureau, 2005).

The ethnic groups in the Phongsaly province maintain traditional lifestyles in the mountains. The percentage of households that used piped water for drinking and cooking was 7.0; and 11.8% of households were connected with public electric supply (Lao Statistic Bureau, 2005). The main economic activity of >90% of the population is agricultural production. Both men and women leave villages at sunrise and work in the agricultural fields until sunset. Women are responsible for housework in addition to their work in the fields.

**Public health issues in the Phongsaly province**

The major public health concern in district villages was the poor sanitary environment. Most villages did not have toilets, and people often excreted in bushes or the river around dwellings. The prevalence of intestinal parasite infections was highest in the Phongsaly province (Rim et al., 2003). People threw garbage around dwellings and did not collect or dispose of garbage properly; the landscape had been markedly covered with increasing amount of various kinds of garbage and animal feces, which attracted flies, and unpleasant smell hung around in the village. In majority of villages, most households bred livestock for religious ceremony and agricultural works. As in other areas in the country, people kept pigs, chickens, buffalos, etc. around dwellings, a concern because of the high risk of transmitting fecal–oral infections (Sompou et al., 2008).

**Community-based workshop activities in multiple local dialects targeting multiethnic societies**

The Department of Public Health of Phongsaly province and the Ministry of Health of Lao PDR, launched community-based, multiple local dialect workshop activities in the Boun-Nua district with the cooperation of local organizations in March 2005. To address the difficulty in communication in the multiethnic societies, village facilitators were selected from each village and trained to disseminate information in their dialects.

The afore-mentioned Boun-Nua district is located in the west of Phongsaly province, and includes 67 villages with a total of 3400 households and population of 18942. More than half of the villages were located 900 m above the sea level.

Each village in the Boun-Nua district was represented by one of the eight ethnic groups: Akha, Bid, Hor, Lue, Singsily, Tai, Xaek and Yaow (Lao Statistic Bureau, 2005). The Akha and Singsily dialect belongs to the Tibeto-Burman family; the Bid and Lue dialect the Mon-Khmer family; the Hor dialect the Sinitic family; the Tai and Xaeh dialect the Austro-Thai family and the Yaow dialect Tai-Kadai family.

The project’s strategic areas were determined by focus-group discussions among staff members of the Department of Public Health of Phongsaly province, the Director of the Boun-Nua District Health Office and some village authorities. The program focused on (i) improving knowledge among villagers about common diseases and preventive measures including receiving the routine vaccinations; (ii) encouraging people to use composting toilets; (iii) encouraging people to clean their living environments and (iv) encouraging people to isolate animals from human dwellings. These objectives were to be achieved by villagers’ collective activities.

**Study objectives**

The objectives of this study were to evaluate the impact of community-based workshop activity in multiple local dialects on vaccination coverage, sanitary living and health status among multiethnic populations in all the 67 villages in the Boun-Nua district of Phongsaly province, Lao PDR.
METHODS

Workshop activities
Development of educational materials
The Department of Public Health of Phongsaly province and the Ministry of Health of Lao PDR developed educational manuals and posters that provided information about common diseases and general preventive measures, as well as instructions on how to build and use toilets and animal houses, and how to clean village environments. The topics were described with illustrations and a minimal volume of text in the standard Lao language. These materials were intended for use in the training of district trainers and village facilitators, and in village meetings.

Selection and training of district trainers
The major task force was six district trainers who trained village facilitators and supervised village activities.
District trainers were selected from several district public sectors. The eligibility criteria for district trainers were that they should be officers who had experience in working with village local organizations and villagers, understood the local dialect, were familiar with the culture and the lifestyle of villagers, had flexibility in their work hours, were available for meetings at the District Health Office and activities in villages for several days and showed interest in being a trainer.

The five-day training, including 3 days of classroom sessions and 2 days of field practice, was provided to district trainers by provincial health staff members. The contents of the training included principles of primary health care; basic concepts and the skills to work within communities; how to train village facilitators; contents of manual and how-to-use instructions for village facilitators and villagers; instructions for how to use posters in villages and instructions for how to monitor and evaluate activities in villages.

Selection and training of village facilitators
District trainers approached village leaders, explained the project, and obtained their consent. District trainers requested village leaders to select four village facilitators. Village facilitators were villagers who assisted village meetings and the planning and implementation of village actions, and who were expected to act as catalysts. Village facilitators were selected among village leaders, village health volunteers and heads of women’s groups, youth groups and other sociopolitical organizations. The eligibility criteria for village facilitators were that they understood the Lao standard language and local dialect and showed interest in being a facilitator.

Village facilitators attended five-day training sessions, including 3 days of class sessions and 2 days of field practice. They learned concepts and principles of primary health care; how to use manuals and posters; how to disseminate the information to other villagers and how to work with the community to promote sanitary living conditions. The training was conducted in a participatory style, with activities such as small-group discussions, brainstorming, role playing, demonstrations and case studies. On the last day of training, village facilitators received a bag that included manuals, posters, notebooks, ballpoint pens, pencils, markers, white paper, rulers and glue. In addition, 500,000 kip (47 US dollar in 2005) per village for program management was given to the village facilitators.

Participatory workshop activities in villages
Village facilitators activated and strengthened village meetings. They supported participants in identifying and prioritizing health and sanitary problems and their causes, helped to identify possible strategies, and supported villagers in planning and implementing strategies in the village. Villagers reported numbers of villagers who fell ill, and sought solutions to the spread of disease or how to take care of their symptoms. The use of local dialects was encouraged in meetings. Manuals and posters were freely used by villagers during the meetings. District trainers supported facilitators in preparing for and managing meetings.

Village facilitators encouraged the villagers to improve sanitary living by constructing toilets, collecting and disposing of garbage and isolating animals from human dwellings. During the activities, specialists from the District Health Office visited villagers and demonstrated how to construct toilets with pit latrines, how to build animal houses, how to develop garbage-management systems and how to feed animals. How to build structures of toilets and animal houses, and the related procedures were
standardized and the expectation was that similar activities would be performed. For example, villagers collected garbage in handmade, backpack-size bamboo baskets, brought them to the dumpsite inside the village and burned them. There was no additional financial support from the district, and the costs for all the above activities were to be paid by the villagers.

Supervision of workshop activities
The district trainers were scheduled to visit the village facilitators every 3 months. The trainers encouraged and assisted the village facilitators in leading their villagers, in gathering information and in solving problems. The importance of voluntary actions was shared among the trainers and they did not force facilitators and villagers to make particular actions. The frequency of trainers’ visits was influenced by the access to the villages. It was difficult to access some villages, especially in the rainy season because of the soaking of the roads.

Ethical clearance
The workshop activities and monitoring were conducted as part of the regular practices of the Department of Public Health of Phongsaly province. An informed consent was obtained from members before each group interview. Personal information was not collected, and unit of analysis was at the village level.

Data collection
Vaccination coverage
Information about estimated size of target populations and annual number of vaccinated population was obtained from the District Health Office. Vaccines tracked were those for Bacille Calmette-Guérin; the first and third dose of polio vaccine as well as diphtheria and tetanus toxoid with pertussis and hepatitis B vaccine; the measles-containing vaccine for children of 12 months of age; and the second and subsequent doses of tetanus toxoid for pregnant and non-pregnant women between 15 and 45 years of age.

Sanitary living and health status
Village level data were collected by teams of district trainers and staff of the Department of Public Health of Phongsaly province in structured interviews with groups of village leaders and village facilitators and observations in the village at the start of the workshop activities, at the end of the 1-year supervision period and 5 years after the start of the activities. The interviews were conducted in village leaders’ houses or meeting rooms.

Data included baseline characteristics, village activities during the 1-year supervision period, continuous maintenance of sanitary conditions and an impact on health 5 years after the start of the activities.

Baseline characteristics of villages included primary ethnic groups, percentage of adult women who wear ethnic dress (<30%, 30–69% and ≥70%), average number of motor vehicles per household calculated by dividing the total number of cars, motorcycles and tuktuks by the number of households in each village, whether villagers usually used markets to buy meat or vegetables, whether villagers used toilets, and whether villagers collected and burned garbage. Dresses of adult women, toilets and garbage dumpsites were confirmed by observation.

Village activities during the 1-year supervision period included the total number of village meetings (1–4, 5–9, 10–14 and ≥15), whether villagers constructed toilets and started using them, whether villagers created garbage dumpsites and started collecting and burning garbage and whether villagers constructed animal houses and started isolating animals from human dwellings. Because women stay within the village for longer time periods than men and were responsible for the household environment and taking care of families, it was also asked whether women participated in discussions on the village action plan.

Evaluation of the continuous maintenance of sanitary conditions 5 years after the start of the activities included gathering data on whether villagers were using toilets, whether villagers were collecting and burning garbage; whether villagers were isolating animals from human dwellings, percentage of dwelling lots covered with rubbish (0–9, 10–49, 50–79 and ≥80%); the percentage of dwellings with free-range pigs and chickens (0–9, 10–49, 50–79 and ≥80%) and the percentage of dwellings lots covered with animal feces (0–9, 10–49, 50–79 and ≥80%).

Information on whether villagers fall ill less frequently than before workshop activities was
obtained as a measure of the impact on health from answers to the question ‘what has changed in the village since the start of the workshop activities?’

**Data analysis**

The vaccination coverage among children at the age of 12 months and pregnant and non-pregnant women between 15 and 45 years of age for both at the baseline and after the 1-year supervision period was compared by logistic regression.

The associations between baseline characteristics, selected village activities and the ethnicity of a specific village were assessed by the Fisher exact test.

The sociocultural index, activity index and continuous sanitary living index were constructed with principal components analyses. The sociocultural index was defined as the first principal component of the percentage of adult women who dress in ethnic clothing, the average number of motor vehicles per household, and whether villagers usually use markets to buy meat or vegetables. The activity index was defined as the first principal component of total number of village meetings and whether women participated in discussions on the village action plan. The continuous sanitary living index was defined as the first principal component of seven indicators of continuous sanitary living 5 years after the start of the activities.

The relationship between the activity index and the sociocultural index as well as ethnicity, between continuous sanitary living and the activity index, sociocultural index as well as ethnicity were assessed by multivariable linear regression analyses. The relationship between a reduction in the frequency of villagers falling ill and the activity index and the sociocultural index as well as ethnicity was assessed by multivariable logistic regression analyses.

**RESULTS**

**Implementation of workshop activities**

All village facilitators completed five-day trainings. In 65 out of 67 villages, the village leader was selected and became a facilitator. Manuals and posters were distributed to all villages.

Villagers started using toilets, collecting and burning garbage and isolating animals from human dwellings in all villages.

**Vaccination coverage of the district**

Table 1 shows the vaccination coverage among children at the age of 12 months and the coverage of tetanus toxoid among pregnant and non-pregnant women. The coverage was significantly increased for all vaccines and tetanus toxoid (all \( p < 0.05 \)).

**Baseline characteristics of the villages and their variations by ethnic groups**

Table 2 shows the baseline characteristics of the villages. The percentage of adult women who wear ethnic clothing was higher in the Akha villages than in the Lue and the Singsily villages (both \( p < 0.01 \)). The average number of motor vehicles per household was higher in the Lue and the Singsily villages than that in the Akha villages (both \( p < 0.01 \)). Villagers of the Lue and the Singsily villages used markets

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>% Immunized Baseline</th>
<th>% Immunized After 1 year</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
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<td>Children at age 12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>BCG</td>
<td>83.1</td>
<td>92.4</td>
<td>2.5</td>
<td>(1.7, 3.7)</td>
</tr>
<tr>
<td>Pol1 and Pol3</td>
<td>91.7</td>
<td>99.4</td>
<td>15.8</td>
<td>(4.9, 51.4)</td>
</tr>
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<td>DTP-HepB1 and DTP-HepB3</td>
<td>48.4</td>
<td>95.3</td>
<td>21.5</td>
<td>(13.9, 33.3)</td>
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<td>MCV</td>
<td>33.7</td>
<td>93.0</td>
<td>26.2</td>
<td>(17.9, 38.4)</td>
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<td>Pregnant women TT2+</td>
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<td>95.8</td>
<td>17.9</td>
<td>(11.3, 28.5)</td>
</tr>
<tr>
<td>Non-pregnant women TT2+</td>
<td>55.0</td>
<td>89.8</td>
<td>7.2</td>
<td>(6.3, 8.1)</td>
</tr>
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</table>

BCG, bacille Calmette-Guérin; Pol1 (Pol3), first (third) dose of polio vaccine; DTP-HepB1 (DTP-HepB3), first (third) dose of diphtheria and tetanus toxoid with pertussis and hepatitis B vaccine; MCV, measles-containing vaccine; TT2+, second and subsequent doses of tetanus toxoid.
### Table 2: Baseline characteristics by ethnicity of village

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Village name</th>
<th>Number of households</th>
<th>Percentage of adult women who wear ethnic clothing</th>
<th>Average number of motor vehicles per household</th>
<th>Villagers usually use markets to obtain meat or vegetables</th>
<th>Villagers used toilets before workshop activities</th>
<th>Villagers collected and burned garbage before workshop activities</th>
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*Continued*
to obtain meat or vegetables more frequently than villagers of the Akha village (both $p < 0.05$). Before workshop activities, villagers in 16% of villages used toilets and villagers in 24% of villages collected and burned garbage. Animals were not isolated in all villages.

The sociocultural index

The sociocultural index was positively correlated with the average number of motor vehicles per household, and whether villagers usually use markets to obtain meat or vegetables, and negatively correlated with the percentage of adult women who wear ethnic clothing (all $p < 0.01$), and accounted for 64% of the total variances.

The activity index and their variations by ethnic groups

Table 3 shows the total number of village meetings and whether women participated in discussions on village action plan during the 1-year supervision period, and continuous sanitary living, and the impact on health 5 years after the start of the activities. The total number of village meetings was significantly higher in the Lue and the Singsily villages than that in the Akha villages ($p < 0.01$).

The activity index

The activity index was positively correlated with the total number of village meetings and whether women participated in discussions on the village action plan (both $p < 0.01$), and accounted for 70% of the total variances.

Changes in sanitary living

Five years after the start of the activities, villagers continued to use toilets in 76% of villages, to collect and burn garbage in 84% of villages and to isolate animals in 87% of villages.

Dwelling lots covered with rubbish were observed less frequently in villages where villagers continued to collect and burn garbage than in other villages ($p < 0.001$). Free-range pigs and chickens, and animal feces, were observed less frequently in villages where the villagers continued to isolate animals than in other villages (all $p < 0.05$).

The continuous sanitary living index

The continuous sanitary living index was positively correlated with whether villagers were using toilets, whether villagers were collecting
<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Village name</th>
<th>Selected activities during the 1-year supervision period</th>
<th>Continuous sanitary living 5 years after the start of the activities</th>
<th>Impact on health 5 years after the start of the activities</th>
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<tr>
<td></td>
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<td>Total number of village meetings (times)</td>
<td>Women participated in discussions on village action plan</td>
<td>Villagers using toilets</td>
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and burning garbage and whether villagers were isolating animals from human dwellings and negatively correlated with the percentage of dwelling lots covered with rubbish, the percentage of dwellings with free-range pigs and chickens and the percentage of dwelling lots covered with animal feces (all \( p < 0.01 \)), and accounted for 57% of the total variances.

**Changes in the health status of villagers**

A decrease in the frequency of villagers falling ill since the start of the activities was reported in 67% of villages.

**Relationship between the activity index, sanitary living and changes in the health status**

Table 4 shows the relationship between the activity index, the continuous sanitary living index and whether villagers fall ill less frequently than before workshop activities. A higher value in the activity index was associated with the higher value in the sociocultural index, but not with ethnicity. A higher value in the continuous sanitary living index was associated with a higher value in the sociocultural index, but not with ethnicity. Reductions in the frequency of villagers falling ill were associated with a higher value in the sociocultural index, but not with ethnicity. After inclusion of the activity index in the model, there was no direct influence of the sociocultural index and ethnicity on the continuous sanitary living index and whether villagers fall ill less frequently than before workshop activities. A higher value in the continuous sanitary living index was associated with a higher value in the activity index after adjustment for the sociocultural index and ethnicity. A reduction in the frequency of villagers falling ill was associated with a higher value in the activity index after adjustment for the sociocultural index and ethnicity.

**DISCUSSION**

**Summary of findings**

The results showed the effectiveness of this peer-led community-based intervention in multiple local dialects on the vaccination coverage, sanitary living and health status among multiethnic populations. The vaccination coverage among children and women in the district improved. Villagers started using toilets, collecting and burning garbage and isolating animals from human dwellings in all villages from the beginning of the workshop activities. A higher value in the continuous sanitary living index was associated with a higher value in the activity index after adjustment for the sociocultural index and ethnicity. A reduction in the frequency of villagers falling ill was associated with a higher value in the activity index after adjustment for the sociocultural index and ethnicity.

**Impact of community-based, workshop activities in multiple local dialects**

The program was accepted in all villages. All village facilitators completed training, and introduced manuals and posters to villages. At least one village meeting was held in every village since the start of the workshop activities. These activities were not enforced by the trainers and promoted voluntarily without external incentives. During the interviewing, we met a woman who said that she realized that living in a cleaner environment made her feel better, and villagers are motivated to promote the activities as a model village in the district. Transmission of knowledge and new experiences had substantially changed the attitudes of villagers toward health-oriented lifestyles and environments.

With political commitment, we think the workshop activities could be scaled up rapidly among multiethnic populations in other areas.

The program promoted sanitary living of villagers. Toilets were used and garbage was collected and burned in more villages after the start of the workshop activities than before. Villagers started isolating animals from human dwellings. These effects continued to be observed in more than half of villages 5 years after the workshop activities, without further incentives or periodic visits by district trainers. Most of these outcomes required changes in the village’s collective activities, which is one of the unique features of this intervention compared with previous interventions that focused on changes in individual behaviors (Lewin et al., 2005).

The enhanced sanitary living of the villagers suggests that workshop activities should improve the sanitary environment, although data about environment observations were recorded after the start of the activities. This idea was supported by
the district trainers, who realized that the rapid improvement in sanitary environment conditions began after the start of the workshop activities.

The improvement was also seen in the health status of villagers. The installation and use of a latrine has been shown to reduce the incidence of diarrhea through preventing fecal materials from entering the domestic environment among people who had not used latrines before (Barreto et al., 2007; Cairncross et al., 2010). The reduction in the contact with domestic animals is also known to reduce the transmission of infectious diseases from animals to humans (Grados et al., 1988; Crump et al., 2002). The reduction in illness agrees with the concurrent substantial increase in the coverage of routine vaccinations for children and anti-tetanus toxoids for adult women observed in the district. This increase in the vaccination coverage was not observed in neighbor districts at the same periods.

The increase in the vaccination coverage is concurrent with the increase in uptake of measles and DPT vaccinations of children, through an intervention in which trained teams led focus group meetings where they discussed current vaccination coverage, benefits of childhood vaccination and local action plans, reported in Pakistan (Andersson et al., 2009). This study has expanded these evidences to all routine vaccines for children as well as tetanus toxoid for women and to multiethnic populations.

The dose–response relationship between activities and outcomes of the workshop activities, continuous maintenance of sanitary conditions and the reduction in the frequency of villagers falling ill, indicates that as a village held more meetings, and if women participated in discussions on the village action plan, the sanitary living showed more improvement and villagers became healthier. The dose–response relationship modifies the causal relationship between activities and outcomes, and validates the promotion of the villagers’ participation to the workshop activities through appropriate support from district trainers to strengthen their effectiveness. These relationships were independent of the sociocultural index and ethnicity, and applicable to any ethnic groups in the district.

### Relationships between sociocultural characteristics and level of villagers’ participation

The results revealed the characteristics of villages that were related to level of villagers’ participation, as measured by the activity index. The level of villagers’ participation was higher when the value of the sociocultural index was higher. The sociocultural index in this study can be interpreted to reflect contacts with other villagers. In the study areas, people use motor vehicles to visit markets to sell agricultural and craft products and to buy food and other household goods and to bring other villagers to health facilities, schools and other facilities, in addition to using the vehicles on their farms. Purchasing food from markets is used as an indicator of market exchange (Henrich et al., 2010). In the market, people are exposed to frequent and anonymous interaction with other villagers and market norms. People who have more contact with neighbors become more open and susceptible to new information and ideas, and more likely to accept new behaviors, including recommendations by local government staff. The Lao PDR expanded the

<table>
<thead>
<tr>
<th>Activity index</th>
<th>Continuous sanitary living index</th>
<th>Villagers fall ill less frequently than before workshop activities</th>
</tr>
</thead>
<tbody>
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<td>Sociocultural index</td>
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<td>$\beta = 0.43, p &lt; 0.01$</td>
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<td>Villages without preexisting toilets and garbage collection (n = 48)</td>
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<td>Activity index</td>
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<td>Ethnicity*</td>
<td>$p = 0.19$</td>
<td>$p = 0.10$</td>
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</table>

*Ethnicity was grouped into three categories: (i) the Akha; (ii) the Singsily and (iii) the Bid, the Hor, the Lue, the Tai, the Xaek and the Yaow.
magnitude of its economic activities. It is expected that the economic activities and interaction among villagers in the Boun-Nua district will improve in the future.

Ingenuity of the workshop activities in multiethnic groups

It is difficult to improve the health literacy and change the behavior of ethnic minority groups (Schillinger et al., 2002). Diversity of ethnicity has been one of the barriers to healthier sanitary environments and improving health literacy. To address the issues of multiethnic populations and the difficulties in communication in the standard Lao language, the program was developed with three distinct features. First, villagers selected facilitators among villagers who understand the standard language and are familiar with district organizations. These facilitators were expected to share information and ideas provided during the training with villagers in a credible and appealing way (Stephenson et al., 2004). It was based on the idea that peer-led intervention is more effective at changing behavior than non-peer-led interventions (Milburn, 1995). Second, district trainers were selected with the criteria including familiarity with various dialects and experience in working with village organizations. They respected local cultures and traditions. These trainers were well recognized by village facilitators and other villagers; a critical condition to be accepted by villagers. Third, manuals and posters were designed with predominant graphics to be more comprehensible for illiterate villagers. Therefore, villagers could make evidence-based decisions based on the current village situation by themselves and without outside enforcement.

This program applied participatory strategies to train village facilitators, which have been shown to be effective for the training of village representatives with diverse organizational backgrounds in a randomized controlled trial in rural Vietnam (Hien et al., 2008). This also seems to be effective for leaders of different ethnicities.

Validity and reliability

Information about continuous sanitary living and reductions in the frequency of villagers falling ill was collected from interviews. However, information bias was less likely to explain these findings. We interviewed persons who actively participated in the workshop activities and who held responsible positions in the village. The interviewers are those who were familiar with the villagers through frequent contacts. There were consistent associations between reported sanitary living behaviors and observed sanitary environment. Illness was asked rather than specific diseases, because detailed examinations were usually not available. Health status measured by a lay person has high predictive validity for later morbidity and mortality (Idler et al., 2000). Information about whether sick people decreased in the village was obtained with open-ended questions asking about any improvements after the workshop activities, which encouraged subjects to report more distinctive events, compared with asking them closed questions.
CONCLUSIONS

In conclusion, the community-based workshop activities improved the vaccination coverage, promoted sanitary living, including the utilization of toilets, the collection and disposal of garbage and isolating animals from human dwellings, and thus reduced the frequency of villagers falling ill. Participatory group discussions in local dialects and village activities led by lay facilitators, supervision and consultation by district trainers who were well recognized by villagers, and the distribution of pictorial educational materials can be an effective and sustainable health promotion approaches among multiethnic groups that use their local dialects in under-resourced areas.

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