DROWNING PREVENTION AND LIFE SAVING PROGRAM:
IMPLEMENTATION AND EVALUATION IN THAILAND

Bachelor Degree Project in Public Health
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Abstract

Worldwide, drowning is the third leading cause of death among children. In Asia it is the first leading cause of death and a major public health threat. The objective of this paper was to develop a drowning prevention program including swimming training, CPR and lifesaving methods for children and to evaluate it. This intervention was provided and evaluated in Thailand where drowning is the first leading cause of death among children. The study used observations, quantitative and qualitative methods. In total 20 children in the age of seven to ten, from Nan Province in northern Thailand were participating.

The result of this intervention is that the children are highly capable to learn swimming, CPR and lifesaving activities within 10 days. Out of 20 participants all have successfully completed the swimming, CPR and lifesaving programs.

The conclusion of this intervention study can be sum up by both the interventions result, the questionnaires and the independent evaluators is that swimming program as this one is highly needed for saving lives. Support from the local as well as the central authority is also needed. Therefore such swimming program shows the importance of swimming knowledge and water security to prevent drowning in near future.

Abbreviations: World Health Organization (WHO), Low Income Countries (LIC), High Income Countries (HIC).

Keywords: Child, drowning, intervention, prevention, swimming program and Thailand.
1. Introduction

Worldwide, drowning is the third leading cause of death among children. In Asia, drowning is the first leading cause of accidental death among children. Definition of drowning according to WHO is the process of decreased experiencing respiratory from immersion in liquid. The outcomes of drowning are classified as morbidity and no morbidity and death. This definition is adopted by the 2002, World Congress on Drowning and should be widely used [1]. Each year more than 500 000 death occurs due to drowning [2]. Drowning in the developing countries is 10 to 20 times as high as in more developed countries [3]. In some parts of Asia the drowning numbers is like an epidemic and a major public health threat. The social cost of the families and communities who suddenly lose children are enormous. Data from drowning incidents (1404 cases), do not include water transport-related deaths, from Thailand, 1996, constituted the most common cause, accounting for 33.8% [4].

In Thailand, seven children die from drowning every day [3]. Drowning in low and middle income countries is a big problem and as much as 96% of the global burden of drowning deaths is faced in this countries. Additionally, drowning is an even bigger problem when these cases are rarely reported to the hospital for further injury / death causes statistics. Despite this major problem, there are only a few prevention drowning programs in these LIC. Prevention and swimming program in HIC is often protected and conducted by laws [1]. Major risk factors for drowning are boys, less than 14 years of age, poverty or lower level of income, low education, and residency in rural area, exposure to open water front and lack of supervision at water [4, 5, 6, 7]. Increased access to water is one risk factor for drowning and many people live around and work near water. Especially children who live near open water like ponds, ditches, pools are at risk.

Existing interventions against drowning in HIC is measurer’s like proper pool fencing, supervision of children near water, lifeguards, water safety training at a young age and the use of personal flotation devices [8]. Overall, lifesaving activities and CPR are very important for
drowning death prevention [9]. The ones who are in most risk of drowning are humans with increased access to water. Swimming program is one part of the drowning prevention work. Result from a case control study, to participate in formal swimming lessons was associated with an 88 percent reduction in the risk of drowning in the 1- to 4-year-old children [10].

SwimSafe, an organization active in three countries in South East Asia, Thailand, Vietnam and Bangladesh, works with survival swimming program for children over five years old. The SwimSafe Program is a collaborations between similar organizations and institutions, such as; The Alliance For Safe Children (TASC) and Royal Life Saving Society – Australia (RLSSA). The aim is to teach children from five years and up, the basic survival skills and water safety knowledge to help keep them safe when in or near the water that surrounds them in daily life; from ponds and lakes to rivers and the sea. SwimSafe’s methods include 20 lessons of instruction in basic water safety and lifesaving knowledge, and survival swimming. The curriculum is flexible enough to be adapted to a variety of different teaching environments, from natural water bodies to above ground portable pools and in ground swimming pools [11].

Children in age five to nine, report for more than one of three child drowning cases in Asia. Studies show that basic level of swimming skill, including survival swimming, will prevent most child drowning that occurs in children five years and older [11].

In Thailand, one of every third child will never learn to swim. In, Thailand, the death rate among 2-year-old children is 107 per 100,000 [3].This paper builds on this frightening truth that drowning among children now compared to a global epidemic.

### 2. Aim

The objective of this paper was to implement a self-designed drowning prevention program including swimming training, CPR and lifesaving methods for children and to evaluate it. The study was performed expecting that it will assist and improve the children for better water/swimming skills and to feel safer in water when they are near ponds and lakes, rivers
and the seas. At the same time CPR and lifesaving methods should provide them primary lifesaving trainings.

3. Methods

3.1 Study participants

Twenty children (11 boys & nine girls) between the ages of seven to ten from one school district in Chiang Klang, a rural region of the upper northern part of Thailand participated in the study. Eleven boys and nine girls were selected with the criteria to have some knowledge about swimming. The selection was a random sample made by the teachers of Subkorn School in Chiang Klang, Nan province.

3.2 Study Design

A controlled field trial (CFT) was used, divided in two groups by gender. This research consists of both quantitative and qualitative data collection and is a quantitative study methodology in the form of an intervention study. All data was collected during April/May 2012. Observation studies was also used and documented. Each participant was documented every day and every step in the swimming process.

3.3 Intervention Process

The study was made in May 2012 by the authors, one of them an educated swimming teacher since 1993. The swimming program was conducted over ten-days, with one theme for every day and the lessons lasted for one hour. The program consist instruction in water safety knowledge, survival swimming and rescue skills. They were divided in two groups, boys and girls separately, using the same program. Every day the swimming lesson, started with a presentation of the days theme and leg kicks sitting by the pool edge. There was also some time for questions and wonders together with teachers and interpreter. The ten-days swimming program was self-designed by the authors approved and reviewed by to experience swimming teachers.
Day 1 Theme: Presentation

- Welcome and presentation of both us and the swimming program.
- Distribute goggles, swimwear and presentation of water tools we are having with us.
- Survey questions for parents.
- Practice leg kick on land (frog) and name game.
- End with sing / play.

Day 2 Theme: Practice the basis of swim technique

- Group gathering and presenting the theme for the day.
- Name game
- Leg kick on land (frog).
- Enter the water (like a monkey walk).
- Practice leg kick in the water with floating tools.
- Practice leg kick in water practicing with half body lying on the pool edge with legs in water.
- Dip face and whole head (with mirror and dip tools).
- End with sing / play.

Day 3 Theme: Floating

- Group gathering and presenting the theme for the day.
- Leg kick by land (frog).
- Enter the water (like a monkey walk).
- Swim breast stroke/ leg swing
- Floating practice (with turns, from back to breast (dolphin)
- End with sing / play.

Day 4 Theme: Backstroke

- Group gathering and presenting the theme for the day.
- Leg kick by land (frog).
- Enter the water (like a monkey walk).
- Practice leg kick in the water (with floating tools).
- Swim 10 meter
- Floating practice on their back, and confidence to turn around back to breast.
- Practice backstroke.
- Information of day 5 theme; Lifesaving and to bring their own “extended arm”.
- End with sing / play.

Day 5 Theme: Lifesaving

- Group gathering and presenting the theme for the day.
- Leg kick by land (frog).
- Enter the water (like a monkey walk).
• Lifesaving with lifebuoy and “extended arm”.
• Lifesaving with homemade life vest (made by half-filled water bottles, joined together with ropes in empty rice bags).
• Information of day 6 theme; Clothes swimming
• End with sing / play.

Day 6 Theme: Clothes swim (swimming with clothes on).
• Group gathering and presenting the theme for the day.
• Leg kick by land (frog).
• Enter the water (like a monkey walk) with clothes on.
• Clothes swim; try both on breast, backstroke and floating.
• Life Saving with clothes swim
• End with sing / play.

Day 7 Theme: Dive and float
• Group gathering and presenting the theme for the day.
• Leg kick by land (frog).
• Enter the water (like a monkey walk).
• Practice leg kick in the water (with floating tools).
• Diving both from surface and pool edge (with sand filled water bottles).
• Swim 5-8 meter.
• Play, dip the face and head.
• Float on backside with floating tools.
• End with sing / play.

Day 8 Theme: CPR
• Group gathering and presenting the theme for the day.
• Leg kick by land (frog).
• CPR

Day 9 Theme: Final evaluation
• Group gathering and presenting the theme for the day.
• Leg kick by land (frog).
• Practicing for “show”

Day 10 Theme: Finale day
• Group gathering and presenting “show”.
• Group evaluation
• Diploma gives out.
• Farewell and great thank to all participations.
• Presentation of homemade Life vest (can later be made in school).
3.4 Evaluation Process
The variables age and gender were used for the strategic selection. This means that the researcher selects a number of variables in different ways are important for study purposes. Data collection for this study was made with interview and questionnaire survey. The respondent for the questionnaires, consisting nine selected questions, was the children’s parents. Stakeholders, such as local politicians, school and public health were interviewed (qualitative) about their opinion of the intervention program. Also, ten independent people working in the field of Public Health, was asked about the effectiveness of this swimming program and further suggestions.

Stakeholders were asked the following questions:
1. What is your opinion for this training program?
2. Do you encourage such training program in near future?
3. What are your suggestions for such training program?

The independent public health practitioners/researchers were asked the following questions:
   a) What is the effectiveness with such swimming training program?
   b) Do you have any further suggestions with this program, how it can be better for Thailand?

3.5 Ethics
Before starting the interviews and handing out the questionnaires, consent from the respondents was acquired (verbally or in writing) and they were also informed about the autonomy to leave the study at any time. All respondents were assured of strict confidentiality.
4. Result

Out of 20 participants all has successfully completed the swimming, CPR and lifesaving programs. Result of the observation of the swimming program day by day: The program started with a presentation of us, the swimming program, all the swimming tools and the interpreter together with the participants and their parents. The questionnaires were handed out to the parents. On day two, that was the first day that the children entered the water and practiced to dip the face and whole head under the water. Sixteen out of 20 children had no problem dipping their whole head under the water.

The focus of day three was floating both on breast and back. With floating tools and support by swimming teacher everyone fulfilled the lesson. Not everyone could float without holding on to the swimming teacher. Six children needed extra attention and more practice time.

On day four the children practiced back stroke and repeated floating with turning from day three. Also continued practiced leg kicks and swam 10 meters. Still some children needed more practice and support.

The theme for day five was lifesaving with tools like lifebuoys, extended rope and homemade life vest. Everyone succeeded and the day was very interesting for the participants.

Day six they practiced breast stroke, floating, back stroke and lifesaving with clothes on. Both boys and girls did very well.

Day seven the participants dived after sand filled bottles and practiced to dive from the pool edge. Some of the participants were very eager to learn and some were a little afraid to dive from the pool edge.

CPR was next in the program and the boys did better than the girls on pressing the dolls chest. Day nine they practiced for the final day, which was to demonstrate for parents and stakeholders. After successful training all participants received a certificate from the trainer.

4.1 Quantitative information
The questionnaires from the parents of the participants showed the number of family members where about three to seven people per family (average 4.5), income varied from 3000 to 40 000 Bath (average 17 375) per family in the area of Chiang Klang. The main reason to send their children to this swimming program was to learn to swim, second to save life and the third that other children joined the program. This program also showed that it can change children’s life and it provided safety knowledge for the participants. It also showed good resume for the society and also to encourage other children to learn how to swim and save life. 95% of the participants will earn a future as a swimming teacher, 5% answered the question maybe (Table 1).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Numbers &amp; Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family members</td>
<td>3 – 7 (Average 4.5)</td>
</tr>
<tr>
<td>Family income</td>
<td>3000 – 4000 Bath (Average 17375 )</td>
</tr>
<tr>
<td>Reason to send the child the swimming program (a multiple response question)</td>
<td>To learn swimming = 100 %; To save life = 65%; Following other children = 5%</td>
</tr>
<tr>
<td>Can this program change the child’s life?</td>
<td>100%</td>
</tr>
<tr>
<td>Does the program provide safety knowledge to participants?</td>
<td>100%</td>
</tr>
<tr>
<td>Does the program encourage swimming to other children?</td>
<td>100%</td>
</tr>
<tr>
<td>This program is good for the society</td>
<td>100%</td>
</tr>
<tr>
<td>Will the program aware child about environmental safety?</td>
<td>100%</td>
</tr>
<tr>
<td>Will the trainee become a swimming trainer in future?</td>
<td>Yes (95 %); maybe (5%)</td>
</tr>
</tbody>
</table>

**Table 1.** Parental information on family, training program and their views.

4.2 Qualitative information

The stakeholders have evaluated the whole program (presented in table2).

<table>
<thead>
<tr>
<th>Occupation in Chiang Klang</th>
<th>What is your opinion of such swimming program?</th>
<th>Do you encourage such program in the future?</th>
<th>Your suggestions?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Health Headmaster</td>
<td>Very good, because no one can swim and it is very important to save lives. Many children drown in Nan province with three death cases this year (in three months) in</td>
<td>Yes, the children need to learn how to save lives. The problem is the government; “we have no pool, no teacher and no money”. There are</td>
<td>Swim with a grown up and tell the children how to swim in the nature. Inform when and where to swim, especially during the summer when the government is digging</td>
</tr>
<tr>
<td>Source</td>
<td>Issue</td>
<td>Response</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
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<td></td>
</tr>
<tr>
<td>Chiang Klang.</td>
<td>three private pools in Chiang Klang, but expensive with a charge of 40-100 baht per person. The people with low income do not afford to learn how to swim.</td>
<td>in the flood because of the flooding, to minimize the damage. Speak of safety. “Me myself, go and visit every village during this times. Talking to the leaders to inform the children about the danger and safety. If there would be a pool to the children, are there any local people who can learn them to swim?” “I will try to work for that to happen, access to a pool”</td>
<td></td>
</tr>
<tr>
<td>Subkorn school Headmaster</td>
<td>“We have first aid in girls-and boy scout, and we can bring this knowledge to scouting”. It is a good and useful program, many people do not know how to swim. Drowning is common and to know how to swim is useful. “Many people here in Chiang Klang have drowned because of that”. In Nan, 2 women in their thirties, drowned this year, when they was to catch fish in the river. The government is digging during the flooding season. Our children need skills in lifesaving, so that they can teach to save both their selves and others.</td>
<td>Yes</td>
<td>“To motivate more students to learn how to swim. I think we need a bigger pool and to increase the swimming programs length. I have spoken to many people and parents about your swimming project, and many more parents want to send their children to your program. I am working for a high school here in Chiang Klang and I will do my best to encourage the government to build a swimming pool, but I do not know if we have the budget for it”</td>
</tr>
<tr>
<td>Sheriff Wanna</td>
<td>Very good</td>
<td>Yes. The district does not have a</td>
<td>To continue teach other to swim so they can</td>
</tr>
</tbody>
</table>
Local government

“This program is very good, because we are worried about their children’s safety. There is no swimming teacher and they wish if they can do a curriculum”.

Yes

Important to teach the adults and to mix gender in the swimming class.

Hospital Headmaster

It is a very good program. Really like the aim, to save life.

Yes

In the future, teach other children in the whole Thailand, not only in Chiang Klang. Suggestion to teach the English teachers from abroad and other adults in Thailand, therefore more can be able to learn how to swim and also more frequently training, not only 10 days.

Table 2. Evaluation result from stakeholders.

4.2 Independent evaluation

1 What is the effectiveness with such swimming training program?

Pediatrician: “Short term – very effective”… “Adult also learned indirectly. Schools and community around there learned too”… “Many new concepts have been introduced, e.g. diving”… “Long term – needs follow up, of course”…

Injury prevention specialist: “I think your program course is very effective and a good model for Thai children to learn. Not only they learned how to swim but also how to save their life from drowning and can do CPR because you know that drowning is the leading cause of Thai children death and in others country as well”
**Public health researcher:** “The main effectiveness is that it can save lives and make people feel friends with the water. Other good thing is that the program can be applied to many different age groups and all over the world”

**Nurse:** “The program gave opportunities to countryside children of Nan to learn how to swim.

- Children competency to do the thing you taught
- To make the community partnership known about the important to teach the children for swim and can help the people who drowning”…

**Physician:** “It’s really appreciating their parents including staffs you were working with”…

**Nutritionist:** “10-day swimming program is great program for people who want to learn how to swim actively and is suitable for children to learn faster than adults. They can learn to swim and enjoy themselves when they are in the pool”
So 10 days is considered adequate for children to learn how to swim”.

**School Nurse:** ”When the program finished all parents and students are satisfied. And our local government try to do like you do because everyone awareness about the danger of downing”.

**Psychiatric Nurse:** “I think that is a perfect project in Thailand and Chiang Klang.

- It a first time in Chiang Klang and made the people in here interesting for program, and a good project for prevention before drowning, but have short time for training.
- And I like this program having safety program, injury prevention and CPR course too.
- The cooperation from school, family, children attention and stakeholder”.

2 **Do you have any further suggestions with this program, how it can be better for Thailand?**

**Pediatrician:** “Did you show the children places where they can drown…e.g. river, canal, and lakes”…

**Injury prevention specialist:** “your success program can be translated into Thai for our study or can train people such as teacher, volunteered. to be a trainer like you”.

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**Public health researcher:** “To be able to proceed with this work one has to have support from the government, so maybe more promotion for the program and spreading information to different stakeholders could be a solution. Also it needs to have more people working with the project, maybe two in the water and one or two on land watching everything and taking notes and pictures. Maybe also invest in two good interpreters so that all the information needed can be translated effectively and in time”.

**Nurse:** “You may continue your programs in other place in Nan or in Thailand”.

**Physician:** “In Thailand the children at risk for drowning are usually from the low-income family. Furthermore for this group of people, they are not aware of the risky situation for drowning. For example, they might leave the child alone in the risky area or allow their children to go for swimming without supervision.

I mean if it's possible the focus group should be the low-income family in any part of Thailand, even in Bangkok”

“Most people in Thailand have some misconceptions on CPR for drowning children; they usually put the children on their shoulder and run to push to water out of the stomach.
(More than half of the attendances in the conference room during 2-4 of May would do this kind of rescue if they met someone drowned.)”

Emphasize the correct procedure of CPR, not to put the children on their shoulder and run or other procedure”.

“I'm quite not sure if the parents attend any part of the program or not, If the parents could join in some parts of the program such as CPR class it would be a lot of benefit.”

“Making the parents, teachers and the community become partners for the program, in case they might know how to arrange the things to set up the program in the following years”.

**Nutritionist:** “The program teaches children to swim. Thailand is a country with hot climate. Children are often too cool to swim in river during the summer. And often drowned due to lack of means to help themselves properly when they drowned. Therefore, it is a great program for children. It Thailand has a swimming instructor for children all learned”.

**Swedish stakeholder:** “Thailand is no longer a developing country. An NGO style project in Asia is better done elsewhere in the region (Burma, Laos). When it comes to the
implementation a more narrow focus on capacity building and training the trainers seems motivated”.

*School Nurse:* “They are thing that about swimming program will succeed, should be cooperation from everybody such as family, school, government officer, community and local organization, specific community or village”.

“Give drowning information data for community. And take the project into local organization policy and district policy”.

5. Discussion

Major findings of this intervention are that the children are highly capable to learn swimming, CPR and lifesaving activities within 10 days. The parents were very pleased and highly supportive to the program and researchers. They demanded such programs more frequently with bigger capacity in the near future. The stakeholders focused on the lack of both swimming facilities and trainers. Therefore such training program using existing facilities is very important for the LIC. The independent evaluators recommended that this program is very effective for saving life’s and therefore needs more support from the local as well as the central authority. In a nutshell, this training program has been evaluated as a very effective and useful drowning prevention program.

5.1 Method discussion

The program was succeeded in the swimming pool under controlled situation. To make it into reality, a few more days is needed in the future to bring the participants in natural environment like ponds and rivers. Training for the local trainers is very important for such program to be universal successful.

In order to do the research, a wider comparing between rural and urban needs to be done, this requires more time and more money. The intervention study divided the participants by gender and it would have been interesting to evaluate any differences between boys and girls. Due to the weather circumstances in Asia, especially when it rains heavy, it would be useful
with an indoor swimming pool; this also depends on the budget for the program. Swim Safe is using mobile swimming pools and their program last for 20 days [11]. Comparing to their methods that’s what’s making this swimming program more effective and less cost. The interviews with stakeholders and independent researchers were a very useful and relevant study for this project. The five stakeholders to participate in the interviews could have been more in number to increase the credibility and collect more information, about the circumstances and the right needs for the people in- and outside Chiang Klang.

5.2 Result discussion

For the local kids that participated in the swimming program, it was effective and so for other kids around them. The kids were very eager to show others what they have learned and that makes it a very positive spin-off effect. Since all the children fulfilled the swimming program and learned basic swimming knowledge, CPR, lifesaving, how to act around the water and how to make their own life-vests, their own lives will be a little bit safer and so will the lives around them to. Once you have learnt how to swim you will never forget, even if you need to practice to become more comfortable in the water and be even safer in the environment.

For the grown-ups around the kids this program also was a great experience and a good lesson in how to give the children knowledge that will save lives. In HIC, the children often take swimming lessons from early age and continue in school. Most of the parents have swimming knowledge and can practice with the children. In LIC the reality is not the same, therefore the importance of involving the parents. Ten days may seem like short time, but this study shows it is possible and it is a good start and enough time to teach the kids the basics. Hopefully grown-ups in school-managements, politicians and parents will follow up on this very good initiative and ask for or even demand this kind of education to be mandatory for all the children in Thailand. If they do, it will save many lives all over Thailand.

Like waves in the water, the knowledge of how to swim could be spreading to kids all over Thailand and in the long run liberate the Thailand people to enjoy their beautiful beaches and country to a higher level than before. And knowing how to swim will give the people a safer environment to live in.
5.3 Limitations and further recommendations for future research

This study has both time and budget limitations and could with advantage have been made over a longer period and with more participants. To see an effect and to measure, with less drowning cases and to comparing the genders, a cohort study is recommended. Still, worldwide, children under five years old have the highest rates of mortality, and therefore teachers and parents need to be involved for the swimming program, for drowning prevention [2, 3]. Where needed, “warning signs”, life vests (to use when practicing lifesaving) provisions are warranted. Collection of bottles should be emphasized to fill up with sand and to use as diving tool. In HIC, drowning interventions as proper pool fencing, water safety training and child supervision in water surroundings, is used [8]. Therefore, such methods need to be supported and high priority. In the current study, mainly fathers answered the questions. But in reality mothers take care of the children more than the fathers. So actually, mother’s responses are warranted.

The suggestion is that in addition to having the courses with the children and involving teachers, parents, local politicians like this swimming program, is to educate local people to be able to hold this swim education on their own. With a lot of aid and acknowledgment from the local schools, communities and people with power of different kind, the program could be implemented into the Thailand school system as part of the mandatory education. If the “right” kind of people support the program this could come true in the future.

Start by running the program with both children and local schoolteachers; educate local people that can continue to teach other children both in the same area and in other schools or villages how to be safe around water and how to swim. The educated local people can follow up on the kids that already been thru the program and keep practicing with them. Drowning prevention awareness for the parents is another important aspect. In low/middle incomes countries there are a big problem with the child supervision. In general, children under 5 years old have the highest drowning mortality numbers the world all over and therefore drowning prevention awareness should be a low cost training program in aspect to save lives.

The main goal with the program is to spread the knowledge how to swim and how to be safe around water, by adding the education of local grown-ups to keep practicing with the kids and teach new kids how to swim the aim is set for a better and safer Thailand. Safe Community program is an effective and successful program for reducing injuries including drowning.
among children and promoting safeties around the world, especially in the low and middle income countries [12]. Therefore Thailand should embrace Safe Community program to implement drowning and injury prevention especially among children in cost effective philosophy. As children, males and individuals with increased access to water is a high risk of drowning, therefore the swimming program should first be held at such areas.

Further recommendation to prevent drowning, is to inform the local people about where and when the digging is about to happen. Together with teachers the children can make warning signs and put up at such areas. Likely WHO:s recommendation for drowning prevention, techniques methods are suggested, as develop and implement safe water systems. Also the aspect that children often is left alone without supervision, needs to be consider as an important future implement drowning intervention [2].

5.4 Conclusion
The intervention was a very successful swimming program and also supported by stake holders. It needs in drowning-prone areas in Thailand and also in other low income countries. The conclusion of this intervention study can be sum up by both the interventions result, the questionnaires and the independent evaluators is that swimming program as this one is highly needed for saving lives. Support from the local as well as the central authority is also needed. Therefore such swimming program shows the importance of swimming knowledge and water security to prevent drowning in near future.
6. Acknowledgement

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6. References


