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**EVALUATION OF THE VACCINE COVERAGE FOR
CHILDREN UNDER 5-YEARS-OLD IN HOUAPHAN
PROVINCE, LAO PDR**

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Directed by Professor Sunjoo Kang

Master's thesis

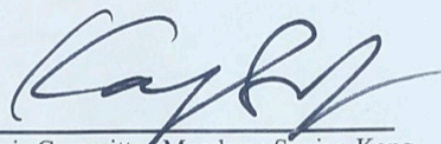
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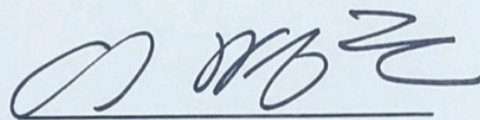
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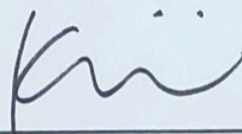
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**“EVALUATION OF THE VACCINE COVERAGE FOR CHILDREN UNDER 5-
YEARS-OLD IN HOUAPHAN PROVINCE, LAO PDR, LAO PDR” is my work”.**

PHAYTHOUN KENVONGPHACHANH

Date: December 2020

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LIST OF ABBREVIATIONS

WHO	World Health Organization
EPI	Expanded Programme on Immunization
CMR	Child Mortality Rate
MDG	Millennium Development Goals
UNFPA	United National Population Fund
UNICEF	United National International Children's Emergency Fund
UN	United National
PDR	People's Democratic Republic
MOH	Ministry of Health
LRHS	Lao Reproductive Health Survey

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Abstract

Background:

Immunization plays a vital role in the lives of children by protecting them against infectious diseases. such as Measles, Polio, Tuberculosis, Hepatitis B, Diphtheria, whooping cough, Tetanus etc. There are different programmes and facilities for newborn and child health under National Health Mission (NHM). However, despite these schemes and programmes, the immunization coverage rate in rural area of Lao PDR are quite low compared to urban.

In this Study, we present a critical review of the various factors, schemes and research currently being undergoing in child immunization.

Methods:

We analyzed second-hand data were provided by the Directorate General of Health Prevention of Ministry of Health Lao PDR in 2018 childhood immunization coverage record by different vaccine, target population background characteristic, In particular, in order to preliminarily find the factors of the immunization coverage failure in rural area, Email, Group conference through what's app Video call in-depth, semi-structured interviews were undertaken with government officials, provincial government official, healthcare workers (HCWs) , Midwife and mother.

Results:

The results of this study, the percentage of fully immunized children coverage in rural area increased slowly 1% only from 55% in 2018 to 56% in 2019. But in urban area has increased significantly 22% from 71% in 2018 to 93% in 2019 due to the EPI Department in urban area has improved its performance at health centers and ensure that vaccines are available with proper storage and maintenance of cold chain. This high coverage in urban could be due to better health service and distance from the health center

as compared to rural area, results for interview vaccine related resource supply, community participant's knowledge about vaccination, distance from health care center factors affecting the lower community demand for immunization in rural area.

Conclusion:

While impressive gains have been made in reducing infant mortality and increasing immunization coverage in Lao PDR, persistent inequalities remain in rural area. International organization (WHO) and government of Lao PDR each have important roles in supporting not only vaccine purchase, but also infrastructure efforts and supervision that can achieve and sustain national immunization goals. Immunization policy needs to be national in scope. At the same time, must be flexible enough to respond to special circumstances that occur at urban and remote area.

Keywords:

Immunization coverage; Immunization programs and policies; Lao PDR; Vaccine for Children under 5 years old; Factors of immunization coverage.

I. INTRODUCTION

1.1. Background

On May 14, 1769, Edward Jenner, a British Physician, did an experiment that would transform public health. He made two small cuts a boy's arm, James Phipps, and inserted material taken from a sore on a woman infected with cowpox, a mild disease common to dairy workers. Six weeks later, Jenner injected the boy with fluid from a smallpox lesion, and James did not contract smallpox. With this experiment, Jenner discovered that inoculation of a person with relatively harmless disease material could protect the person from a more dangerous disease. He called this process "Vaccination" originated from the Latin name of cowpox vaccinia (Murray, Robert, Rebecca, Michael, & Stacey, 2003) The National Immunization Program was launched in 1979 as the "Expanded Program on Immunization (EPI)" with introduction of six vaccines (BCG, Diphtheria, Tetanus, Pertussis, Polio and Measles).

The Immunizations have an important role on preventing the incidence and prevalence of infectious diseases in the whole world. The vaccines have been used mainly in two ways: 1) give to an individual to protect specific persons at risk, and 2) give to population to provide community immunity, which is so important to fight with infectious diseases such as Tuberculosis, Hepatitis B, Diphtheria, Pertussis, Tetanus, Poliomyelitis, Measles, Haemophilus Influenzae Type b, Pneumococcal disease that are together responsible for leading cause of almost morbidity and mortality in children under age of five (Schlipkötter & Flahault, 2010).

In addition, immunization recognized as one of the most powerful and cost-effective prevention measures against vaccine preventable diseases. global vaccine coverage for three dose of diphtheria- tetanus-pertussis (DPT3) and polio vaccine was estimated at 86%. There is great variation between regions. In Americas region, coverage

was estimated at 90%, while it is only 28% in the Western Pacific Region (Wiysonge, Uthman, Ndumbe, & Hussey, 2012).

The South-East Asia Region raised coverage from 56% in 2015 to 80% in 2016. them against infectious diseases that can cause serious illness and disability or be fatal, 130 countries had reached at least 90% coverage of DPT3 vaccine(Organization, 2015a). Many countries and areas have many successes on immunization and prevention of vaccines preventable diseases, but situation affecting effector immunization rate and challenges in rural area.

The Vietnam 170 /100000 live birth, Thailand is 124 /100000 live birth, children mortality rate in southeast Asia 46/1,000 live births, according to the Lao Social indicator survey (LSIS-II) in 2019. the maternal mortality rate in the Lao PDR is 405/100000 live births, illness and death of children in Laos because the consequences of vaccination disease low or service of the vaccine injections and drops vaccine incomplete schedule of international vaccination programs.

Access to vaccines is still suboptimal for people living in remote locations or in informal settlements in densely populated urban areas, mobile and migrant populations are also underserved. Uneven immunization coverage across countries, at subnational levels, and among some ethnic groups and marginalized population also continues to be an issue, leaving some communities unvaccinated. and limited funding for immunization programs also restricts ability to address these obstacles.(Miller & Sentz, 2006).

The reasons for failing to vaccinate or complete the vaccination schedules need to be studied in Lao PDR and to achieve optimal use of the vaccination services by all the children in Lao PDR and to achieve the national goal of ensuring that at least 90% of infants are fully vaccinated by 2020 (Ministry of Health, 2016). Houaphan Province is located in the northeastern part of Lao PDR with a 250 km long border with Son La Province of Vietnam, 128 km south of Vietnam and Nghe An Province. Houaphan Province has a total area of 16,500 Km², consisting of 10 districts, with a total population of 306,247 people.

It is a province where many ethnic groups live together, such as Lao 50.71%, Khmu 19.3%, Hmong 29.83% and foreigners 0.18%.

These people of all ethnic groups have different identities, cultures, languages. There is a fundamental unity and love among all ethnic groups. In the field of health, there is 1 provincial hospital, 9 district hospitals and 60 health centers, People of live birth, maternal mortality rate is 489 / 100,000 live births, average life expectancy is 62 years (women 63 years, men 60 years).

1.2. Purpose

To assess the immunization coverage of children under 5 years old and associated factors with vaccination service in SamTay District urban between XamNeua district rural area in the Houaphan province.

- 1) To comparison the immunization rate between rural and urban.
- 2) To identify the factors of affecting immunization rate in rural and urban areas.
- 3) To give recommendation of solution of improving the national immunization.

1.3. Research Question

The research's question related to the study objective where to identify the comparison between vaccines' coverage rate among urban and rural area. There was any different between both group?

1.4. Significance of the study

The result of this study to find out the vaccinations' rate within urban and rural area. Thus, from previous study we could find the factors affecting vaccination rate and the recommendations could be suggested to the ministry of Health to develop a policy related to vaccines' coverage rate in urban and rural area.

II. LITERATURE REVIEW

2.1. Global Status on Vaccine Coverage

Vaccination is a simple, safe, and effective way of protecting people against harmful diseases before they come into contact with them. It uses your body's natural defenses to build resistance to specific infections and makes your immune system stronger. Vaccines create immunity in an individual by introducing a weakened or killed form of the pathogen that make us ill-such as bacteria or viruses or its toxins or one of its surface proteins.

The vaccine induces acquired immunity so that when your body encounters the real disease-causing agent it is ready to mount a defense. There is a collective social benefit in a high vaccination coverage. For most diseases, the greater the proportion of people who are immunized, the better protected is everyone in the population as the disease transmission can be reduced or stopped. We know that vaccines save lives (Boulton, Carlson, Power, & Wagner, 2018).

The World Health Organization (WHO) suggests that vaccination prevents 2-3 million deaths each year. All rich countries have vaccination coverage rates of more than 90%. It is in low- and middle-income countries where coverage is low-in some countries below 50%. The vaccine coverage against diphtheria, pertussis (whooping cough), and tetanus is a good marker of the strength of a country's immunization programs since several administrations are required. For many essential vaccine's coverage is now much higher than 80% (Obasohan, Anosike, & Etsunyakpa, 2015).

However, the rates of vaccination are still not sufficient. In 2018, only 35% of children globally received the rotavirus vaccine, which protects children from diarrheal diseases-one of the leading causes of child mortality. Similarly, pneumococcal vaccine that protects children from pneumonia-the leading cause of child mortality-only reached 47% (Report organization 2018).

The study of Dustin G. Ginson et al revealed that in rural western Kenyan children shows that 79.9% of children were received complete vaccination, regarding the number of children who had received for each vaccine, 98.8% of them had completed for BCG vaccine, 93.0% for OPV vaccine, 94.4% for DTP vaccine and 83.0% for measles vaccine (Gibson, Dickinson, Brittain, & Robinson, 2015).

In 2013, a study conducted by A. Schoeps et al in the North-West of Burkina Faso stated that 97% of children were completely BCG vaccine, 93% for DTP3 vaccines, 93.8% for OPV3 vaccine and 78% for measles vaccine (Schoeps et al., 2013). The study of Nant Htet Htet Liynn OO in Danuphyu Township, Myanmar stated that by the age of one year, 77% of children had been fully immunized and 20% received partial immunization. And the most important fact was 2.5% of children who did not receive any vaccine at all (Nant, Mahidon, & Sāthāranasukhasāt, 2015). The study of Obasohan et al in Bida Emirate Area, Niger state, Nigeria observed that the complete immunization coverage of children between 11 to 24 months was 29.86%, were partially immunized 21.7% and had never been immunized at all and 31.9% did not possess immunization card (Obasohan et al., 2015).

2.2. History of the National Immunization

The Expanded Program on Immunization (EPI) was initiated in Lao PDR in 1980. The program was started as a pilot in two provinces and 10 districts and was gradually extended to all provinces by 1989. By 1995, all districts were served mainly through the initiative of Polio eradication. In 1993, Prime Minister R.H. Khamtay Siphandone issued a decree to accelerate the implementation of EPI leading to certification of Laos as 'polio free' in 2000 (the last polio case was detected in 1996). Following the Decree, the National Commission for Mothers and Children (NCCMC) was established and expanded to provincial and district levels to support the immunization programme. That resulted immunization coverage had increased in that measles (MCV1) immunization coverage was 78%, diphtheria tetanus toxoid and pertussis (DTP3) immunization coverage was 88%,

tuberculosis (BCG) immunization coverage was 82%, and polio (OPV3) immunization coverage was 88% in 2014 (Supply, Programme, & Organization, 2015) to identify the immunization coverage trends in Lao PDR. Characteristics of provinces or districts (population, population density, and proportion of poor villages and high-risk villages), and factors related to immunization service (including the proportions of the following: villages served by health facility levels, vaccine session types, and presence of well-functioning cold chain equipment). To determine factors associated with low coverage, provinces were coverage immunization (Phoummalaysith et al., 2018).

Since 2002, GAVI Alliance has supported Lao PDR with Immunization Services Support (ISS), injection safety support and with introduction of hepatitis B vaccine as tetravalent (DTP-HepB) vaccine. The DTP-HepB vaccine was rolled out to all districts by 2004 along with injection safety improvements (100% utilization of AD syringes and safe disposal). Monovalent Hepatitis B birth dose (HBBD) was piloted in 2004 and as of 2007, is being given in three central hospitals and two provincial hospitals. The joint UNICEF/WHO/UNFPA initiative for maternal and neonatal tetanus elimination (MNTE) has also been introduced to all provinces. Vitamin A supplementation and de-worming services were added to the routine immunization program in 2005. (Organization, 2015a).

2.3. Laos Policy on Vaccination

The government is working in partnership with UNICEF, WHO, JICA and GAVI to strengthen and provide immunization services free to every child and women in each village. Access to information on vaccine related issues is key to make immunization services successful.

The government has established several supportive policies and programmer to reduce child mortality, including the establishment of the National Commission for Mothers and Children under the leadership of the Deputy Prime Minister and Minister for Foreign Affairs. The health center level is the responsible for implementing maternal and

child health services through several specialized programs with development partners. Several possibilities to streamline and sustain the immunization program in relation to strengthening the overall health system were identified through this immunization assessment and are recommended as priority areas for action both at system and program levels.

The development of short-term and longer-term health financing strategies and reforms aimed at sustaining progress towards UHC. This policy brief aims to identify key bottlenecks for service delivery and sustainability challenges of essential health services using immunization services as well as improve coverage and increase equity of access to basic services while prioritize the policy newborn in health centers are free including vaccine for maternal and child health care services, support increasing financial of activities to districts with average service coverage health center in the area, conduct operations research to identify the most effective and efficient mix of facility based and outreach services such as mobile health service and increasing health center hospital level to 5 % in annual work plan and undertake a study to understand basic demand side service constraints(Boulton et al., 2018)

Health center: In LPDR, there is a system of routine immunization services locally coordinated by local levels as per national Immunization policy. The local health facilities Health Centers and hospitals provide routine immunization services by trained health workers and vaccinators. In the community level there is a system of follow up and monitoring for the vaccination status of target population to ensure full immunization.

Promotion: The NIP promotion and social behavioral change communication to the general population and hard to reach population very important. This is ensured through newspapers, radio, television, brochures, posters, school health program, community health campaigns, and FCHV have been mobilized to have good community enrichment and participation to increase health awareness of community people to ascertain full immunization services.

Capacity: The national immunization capacity includes from policy to the service level. In the policy level, NIP is coordinated by a unit in MoH in collaboration with DoCDC and EDPs. In provincial level it coordinated by provincial health officials thoroughly via district hospitals and by health centers in the community. There is one central cold store, 17 provincial cold stores, 350 district stores to maintain cold chain mechanism. The government has worked to improve children's health and is working with international organizations to raise funds for strategic capabilities, frameworks aimed at controlling the risk and mortality of vaccines. Management of routine immunizations, prioritize staff working at health centers and increase midwifery staff in rural areas to focus on steel vaccination services, Increase access to children with vaccines, eradication of maternal and meningitis, reduction of measles and morbidity, use of diarrheal and pneumonia vaccines, and campaign activities such as immunization in the rural area and manage vaccination programs within the context of area dependence.

2.4. EPI Targeted Diseases in Laos

EPI of ministry of health, especially developing country are free vaccines service for children are available. There are different type of vaccines provided such as Bacilli of Camette and Guérine, MRV (Measles Rubella), OPV (Oral Polio Vaccine), DTP-HepB + Hip: (Diphtheria, Tetanus, Pertussis, HepatitisB, Haemophilus, influenzae type B Vaccine), HepB: (Hepatitis B vaccine), IPV (Inactivated Poliovirus Vaccine), JE (Japanese encephalitis) in the District and health centers (Report of public health) that resulted immunization coverage had increased was of the countries. The reasons for failing to vaccinate or complete the vaccination schedules need to studied and to achieve optimal use of the vaccination services children under five year old in Lao PDR and to achieve the national goal of ensuring that at least 90% in 2022 of infants are fully vaccinated by: Tuberculosis, Diphtheria, Tetanus, Pertussis, Poliomyelitis, Measles, Hepatitis B.

Tuberculosis:

TB is a contagious disease caused by *Mycobacterium tuberculosis* or Koch Bacillus (KB). It is transmitted through respiratory droplets coughed out by a person whose sputum contains the bacteria. The first contact with the KB (primo infection) may be unnoticed; however, in one out of ten cases, a primo infection may result to a full-blown disease (pulmonary or extra pulmonary disease). Malnutrition, alcoholism, diabetes and especially Acquired Immune Deficiency Syndrome (AIDS) are current risk factors. Vaccination with BCG remains the best means of preventing children from serious forms of TB improved hygiene conditions are also important.

Diphtheria:

This disease caused by *Corynebacterium diphtheria* is an infectious one that is transmitted from one person to another by close personal contact or by inhalation. With man as the main reservoir, the incubation period is between 3 and 5 days and even more. Unvaccinated Children under 15 years are the most affected. Diphtheria has as symptoms the following: fever, running nose and sore throat. The tonsils are swollen, covered with greyish membrane, which can invade the vocal cords and the trachea; this can easily lead to suffocation. The diphtheria toxin can cause heart and kidney problems. Vaccination of children less than one year is the main preventive action.

Tetanus:

This disease is as a result of the actions of neurotoxin secreted by an anaerobic bacterium called *Clostridium tetanic* which develops in soiled necrotic tissues (soiled wound, umbilical cord if delivery took place under poor hygiene conditions). Spores of this bacterium can also enter someone through open wounds as a result of farm work, circumcisions and scarifications. The incubation period of the bacterium is between 3-10 days and may go up to 3 weeks. Symptoms usually appear before 14 days after contact. In a neonate, the newborn that was normal during the first few days of life becomes unable to

suck due to jaw spasms and the spasms become generalized throughout the whole body. Neonatal tetanus is fatal in 100% of the cases and prevention is by immunizing infants, pregnant woman and access to good quality antenatal and delivery services.

Pertussis:

Pertussis, also called whooping cough is a tracheobronchial infection caused by the bacteria called *Bordetella pertussis*. Transmission is by droplet spread from an infected to and uninfected person. The most vulnerable groups include infants and children living in overcrowded environment. Man is the reservoir of the disease. The incubation period can go up to 21 days and the characteristic symptom is persistent cough for 4 to 8 weeks with characteristic whooping spasms (coughing fits) that is accompanied usually by cyanosis and vomiting. Apnea and death can result from the coughing fits in infants. Malnutrition, pneumonia, and convulsions can complicate pertussis. Vaccination of children less than one year is the main preventive measure.

Poliomyelitis:

Polio is an acute viral infection caused by three types of polio viruses; type 1,2 and 3. In poor countries, the fecal-oral transmission is the route of importance though there exist the oro-pharyngeal transmission. The incubation period varies from 3 to 35 days and diagnosis is by laboratory examination of stool. Most cases are asymptomatic, and the most common symptoms are fever, Acute Flaccid Paralysis (AFP) and the most effective means of prevention is through vaccination with the OPV and then environmental and personal hygiene.

Measles:

This are acute viral infection that are transmitted by the respiratory route. The only reservoir for the disease is man and closed contact with each other is a favorable

environment for the transmission of the disease. The patient is contagious for 2 days before the rash and 4 days after the rash he is still contagious. There are primarily prevented by vaccination with the measles, Mumps and Rubella vaccine at 9 months of age.

Hepatitis B:

This is a viral disease caused by the hepatitis B virus. Transmission is through unprotected sexual intercourse with an infected person. Also contact with blood of an infected person is a serious risk factor. Mother to child transmission is possible and during childhood, scratches and wound in infected children predisposes the others to the disease. A dangerous aspect of the disease is that infected persons may remain contagious for a very long time hence exposing those around them. The incubation period can be six weeks but can go up to 6 months. Signs and symptoms include fever, jaundice, fatigue, dark urine and pale stools. Preventive measures include vaccination, practice of safe sex and health. personnel are particularly at risk since they can easily get in contact with patients' blood if universal precautions are not being practiced.

2.5. Vaccine Services Delivery in Laos

Immunization services are provided form ministry of health and EPI between WHO to hospitals central, provincial levels, district hospitals and health centers areas, outreach sites and mobile sites. Fixed sites usually cater to children living near these health facilities and provide immunization services on all working days at central and provincial hospitals, once a week at district and twice a week at health centers.

Villages located within few kilometers of health facilities are served by nurses by outreach once every three months. Nurses sometimes have to stay overnight in villages to cover all the children. However, this system has not worked in reaching all the children and health facilities failed to prioritize their areas (using population, low coverage and high drop-out rates) for targeted attention. Peripheral health workers at districts and health centers are often assigned multiple tasks by different program in a rather incoherent manner

leading to inefficient use of their time. Integration of immunization service and other mother and child health services need to be strengthened. Immunization service delivery in urban and peri-urban areas, where migrant families live remains a major concern and requires improved coordination between immunization program and urban area's authorities.(Khan et al., 2019)

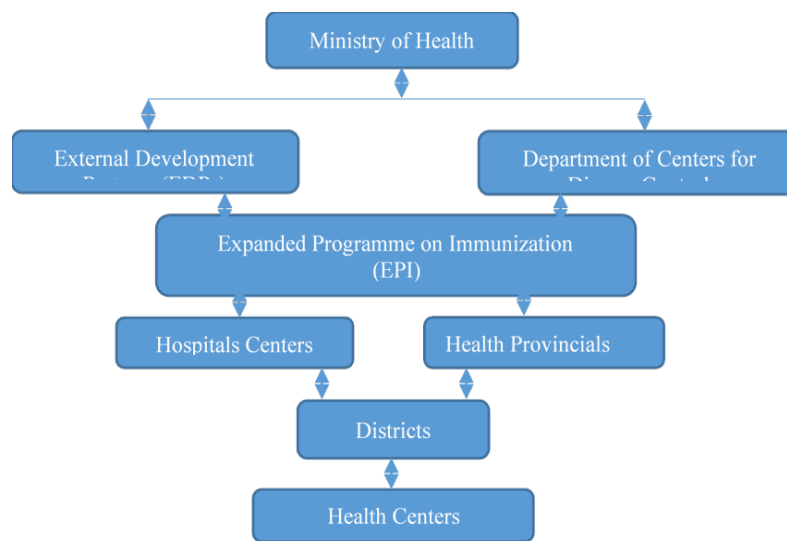


Figure 1. Immunization system services

2.6. Vaccination strategy services at health facilities

Immunization services will be made available on a regular and predictable manner at all Provincial-, District Hospitals, and Health Centers. Fixed sites are to provide services on a regular basis depend on the size of population, attendance and availability of health staff and cold chain. This can be 1-2 times/month depending on the size of the population. The MoH and NIP's policy recommendations will include immunization sites being

defined for each village, preferably at health centers in villages. This will ensure easy accessibility by all communities and help communities to know where to go for vaccination.

At the present time the number of outreach and mobile villages are greater than the number of fixed sites; therefore, there is a need to reduce the number of outreach and mobile villages and increase the number of fixed sites. This will ensure easier access for people and more efficient services by health workers(MacDonald et al., 2018)

Improving outreach visits with better microplanning: The frequency of visits by outreach teams will be optimized on as needed basis with better microplanning. Regular monitoring of data at the national and subnational levels: Institutionalize regular feedback on coverage (local area monitoring): Monthly from district to health center, quarterly from province to districts and central to provinces, meetings at national and provincial levels with feedback mechanism on Programme performance.

National-level annual meetings of all provincial EPI managers and provincial health directors' feedback on performance will be given to provinces and new strategies will be updated during these review meetings. Conduct regular Technical Working Group (TWG) and quarterly Interagency Coordinating Committees (ICC) meetings to coordinate issues related to immunization and mother and child health activities. Meetings will discuss resource mobilization and its allocation, immunization outcome dissemination, encountering obstacles and decisions made to solve problems at various levels. National Immunization Policy and Guidelines are in place and Guidelines will be developed including basic standardized micro planning tools, delivery of immunization services through fixed sites, outreach and mobile services, supervision guideline tools; and monitoring guides for routine immunization. Supportive supervision the guidelines will allow comparison over time and hence follow-up. Supportive supervision will include not just the use of checklists but will encourage on-the-job and participatory training of staff.

2.7. Factors of related of vaccine coverage

The government has been facing challenges to improve immunization coverage in Lao PDR. These challenges range from poor coordination at all levels to lack of active participation of local authorities, socio-cultural factors to the overall health system issue.

Health system-and supply-related factors.

Recording and documentation of coverage Incomplete and inaccurate documentation emerged as a key issue .With no central or district level information system where immunization records are kept and shared .Household movement ,lost immunization cards ,gaps in HC recording and the lack of a centralized reporting system where data is shared also meant that it was possible that some children received more than the recommended doses, especially during community outreach activities when VHVs tend to gather all of the village children under the age of five year old for immunization (Sychareun, Rowlands, Vilay, Durham, & Morgan, 2019).

Human resources related factors

Salary and incentives

The HC staff generally demonstrated a positive attitude towards their work, stating that they felt appreciated by their community and proud of their role. However, their salary and the incentives were insufficient to cover living costs. Furthermore, salaries were not always paid on time sometimes were paid 3 months late. The HC staff also complained that they often had to use their own transport for community outreach activities. Women also said they found it hard to maintain balance when riding their motorcycle while also carrying the cold box. Inadequate staffing. Within District there are ten HCs, yet the uneven distribution of staff, with most working closer to the district center, meant only four of the ten were fully operational.(Sychareun et al., 2019)

Inadequate staffing

Inadequate staffing resulted in the HCs opening at inconsistent times, creating a barrier to access for busy mothers. Inadequate staffing during community outreach activities meant mothers often had to wait for long periods of time for their child's

immunization, with some leaving without getting their child vaccinated. Training and supervision While training was provided to the VHVs every 3 months, there was no evidence of a curriculum or schedule of the content covered.(Sychareun et al., 2019)

Furthermore, according to one of the VHVs. The last immunization training he had received was 1 year previously. One of the reasons given for infrequent training was the low number of staff at the district level and limited support from the provincial level. In the observed immunization campaign, EPI supervisors from the district and HC were allocated to each village for outreach activities. A number of staff, however, including the Head of the EPI department, felt supervision was low, partly due to lack of staffing and funding. At the time of the study, there were shortages regarding vaccine equipment, syringes, refrigerators, sharps disposal boxes, cold boxes, sterilized wipes and rubber gloves.

However, according to health staff, approximately twice a year there were stock outs of vaccines for 2 to 3 weeks. According to the health staff interviewed, sometimes, when preparing for community outreach they had insufficient vaccines and would have to try and obtain additional supplies from neighboring districts. Many of the HCWs also said that they did not get all the doses they had ordered.(Sychareun et al., 2019)

Vaccine provide recipient service utilization and community demand-related factors

Provider and Recipient

Between 2007 and 2017, immunization coverage for the first dose of measles-containing vaccine increased from 40% to 82%, according to administrative routine immunization coverage data; and the three-dose DPT vaccine increased from 50% to 85%. But recent successes in immunization coverage are fragile, and the challenge is to not only reach but maintain national SDG targets. Overall, in Lao PDR, UNICEF supports the Lao Government in ensuring that all children can access efficient, safe and sustainable immunization services. UNICEF supports the national objective of maintaining polio free status, eliminating measles and maternal and neonatal tetanus. In additions, UNICEF also supports the Ministry of Health of Laos in strengthening health system for delivery of

selected high-impact child survival and development interventions at community and facility levels, such as postnatal newborn care, early initiation and exclusive breastfeeding, immunization, provision of ORS/zinc for diarrhoea treatment, Vitamin A supplementation, and deworming of children under 5 years of age (UNICEF Laos for every child., 2017).

Immunization Coverage

There has been a steady improvement in immunization coverage since 2010 but coverage still lies below that of countries at similar income levels. According to the latest available data (WHO and UNICEF, 2017a), immunization coverage rates increased steadily for DTP3 from 74 percent in 2010 to 82 percent in 2016; and for measles from 64 percent in 2010 to 76 percent in 2016.

Lao PDR provides the standard “routine” immunizations (DTP3, BCG, TT2, OPV, HepB, HiB) and, since 2001, six additional antigens (Pentavalent, PCV, IPV, MR, JE, Seasonal Influenza campaign, and HPV demo). Furthermore, the introduction of HPV and rotavirus vaccine is currently being planned for 2018/19 by the National Immunization Program (NIP). While this will address the high disease burden, the affordability and challenges must also be considered. Additional vaccines will present a challenge due to the lengthy vaccination schedule, issues in supply-chain management, more diversified target population, potentially higher reluctance against vaccination (due to multi-injections per visit), and the higher cost of both vaccines and service delivery (World Bank-Policy Brief., 2017).

Community knowledge

Using visual vaccines and diseases cards, mothers were asked to match three vaccines (polio, measles and BCG) with the disease they prevent. Mother’s knowledge about immunization was low and generally restricted to understanding in a general way. Mothers also held deferential attitudes towards HCWs and were reluctant to ask them questions.

Knowledge sources

Most of the mothers heard about child immunization from a range of HCWs. Some were aware of community meetings in which information about immunization was disseminated but could not remember what they had been told. Furthermore, the mothers themselves did not always attend the meetings, with another family member going in their place. However, this person did not always remember the information or share the information with the rest of the family. (Sychareun et al., 2019)

Side effects and Challenges

All the mothers concerned about potential side-effects of immunization, particularly when their child or someone they knew had been negatively affected. Mothers also expressed concern the needle would harm the baby or restrict the infant's physical development. Most mothers said they wanted the HCWs to provide more explanation on the potential side-effects of vaccines and what to do if they occur, but even after knowing this, they were not sure they would be reassured. For the mothers, the best reassurance was seeing their child and others completing their immunization with no side-effects.

The latest data for Lao PDR (LSIS) show that although more children are accessing high-impact health and nutrition interventions, still less than half of all children are being reached. Evidence also suggests that only about half of all children are fully vaccinated by the age of one. Despite progress in recent years, Lao PDR still has the highest under-five child mortality rate in Southeast Asia, 46 per 1,000 live births, according to the Lao Social Indicator Survey (LSIS-II). This is due mainly to newborn complications, diarrhoea and pneumonia. Child mortality has a greater impact on children from poor and disadvantaged families. Most child deaths are preventable or treatable with high-impact, low-cost health and nutrition interventions, such as immunization, and the integrated management of newborn and childhood illnesses. The impact on child health varies greatly depending on socio-economic group, ethnicity, geographical location and the educational level of the parents.

Immunization of both mothers and children is the most cost-effective, high-impact intervention for reducing mortality and morbidity. Continuous care across life stages and

from home to the health facility, with timely referral and follow-up, is crucial for child survival and development. Evidence shows that an effective continuum of care, which includes intervention packages from pre-pregnancy to delivery, immediate postpartum care and for children up to age 5, is essential to the well-being of this and the next generation (UNICEF Laos for every child., 2017).

Preference of health service-fixed site compared to outreach

All mothers reported accessing immunization services from multiple providers. Most preferred to use the district healthcare services and ANC rather than the outreach clinic. This was partly due to a generally higher level of trust in the capacity and technical know-how of the staff at the district level. While the community outreach clinics reduced the time and cost of travelling to the district, the downside was the time lost and inconvenience of waiting for the vaccination. For some mothers, the outreach service was more convenient. Because they don't have a motor bike or car so it's a problem for them. Sometimes they don't have the money to pay for transportation, so they must borrow from someone to pay for the mini pick-up truck to the health center. If they borrow a motor bike they must pay for the gasoline and this is expensive" (Sychareun et al., 2019)

In addition, as women often cannot drive, going to the district means having someone, usually their husband, to accompany them to the district HC. This means that two people are away from work for most of the day and physical access and workloads were identified as important reasons for not using district healthcare services, including for ANC and immunization.

On the other hand, community outreach teams were reported to often arrive late and not extend their outreach beyond the village center. While some women left their child with the VHV all day, the inability of the community outreach to extend beyond the village center can act as a barrier, especially during busy time in the fields, when women and their families may spend 3–4 months staying in their rice fields, which are often far from the village center (Sychareun et al., 2019)

III. METHODS

3.1. Study design

This study described community-based study secondary analysis and stakeholder interview to access the immunization coverage of children under five years old and the factors affecting the immunization coverage from stake holder interview. Thus, as an exploratory study, this was a qualitative research design that used observation, e- mail, group conference through WhatsApp video call in-depth, semi-structured interviews were undertaken with government officials, provincial government official, healthcare workers (HCWs), midwife and mothers.

3.2. Study Site

To identify the factors affecting immunization rate in rural and urban areas form previous study site, those of health facility provide and deliver infant/child vaccines, and they also have vaccination outreach team deliver infant/child vaccines. Around 85% XamNeua district rural area population are living in the rural area and they also have vaccination outreach team deliver infant/child vaccines. Around 65% SamTay district urban area population are living in the rural area.

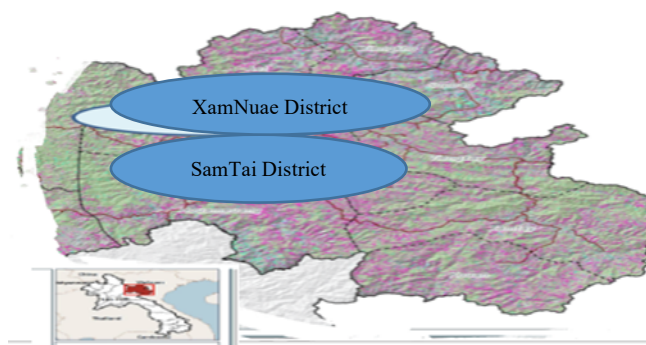


Figure 2. Geography of study location

3.3. Study population

The study population is consisted of mothers or caregivers of children under 5 years old living in XamNuae district between SamTay district, Houaphan Province, Lao PDR, there is a district health office.

3.4. Sample size

A multistage selection technique was uses by choosing from health sector with catered 38 villages 6,734 households with 56,501 totals of population, there were 1,827 of children under five years old. The district is divided into 10 sub-districts, there is a health center in each sub-district and in the XamNeua district rural area. SamTay district urban area health sector with catered 48 villages 8,102 households with 54,152 totals of population, there were 1,827 of children under five years old. The convenience method was utilized to conduct the interview.

3.5. Data collection method

Regarding the method for data collection, this study had the following the researcher contacted the Houaphan Provincial Health Office, District Health Office and Health centers, DHS2 data by Microsoft excel. Therefore, the secondary data were provided. The detailed notes during the interviews was taken (4.7. Definition of Affecting Factors from Stakeholder analysis). This study design was chosen to explore, in depth, the reasons for supply- and demand-side failures in increasing immunization coverage in rural area. In addition, a health audit was undertaken to collect data on immunization coverage. The audit involved recording general information about the facility, the participants, vaccination type and provided important background information to the study.

Questions to stakeholders

- 1). What factors result in high or low immunization rates between urban and rural area?
- 2). What are the challenges and constraints to improving vaccination coverage in rural area ?
- 3). How to increase immunization coverage in rural area?

3.6. Statistical techniques

After data collection and data entry completed, data were analyzed using descriptive statistical method to describe type of vaccine and vaccinated children of the subjects including frequency, percentage, X-Square Tests were performed to compare the distribution among rural and urban area. This analysis using SAS 9.4.

IV. RESULTS

4.1. Sociodemographic characteristic of study site

The Houaphan Province is situated in the northeast of Lao PDR and borders Vietnam to the north, east and southeast (20.3333°N 103.833°E), one of the poorest areas of Laos. The terrain is rugged, with dense mountainous forest forming. Socio-economic problems plague the province, with an infant mortality rate and access to safe water and medical facilities far worse than the national average.

The two districts targeted were SamTay and XamNuea as typical sampling studying districts with data collected in 2018-2019 to analyze the characteristics and factors affecting immunization coverage rate in Houaphan province .SamTay is noted for its textiles with population was estimated at 54,152 and Xam Neua is in a valley with population was estimated at 56,501 .The number of men and women in SamTay is roughly equal. Men hold a slightly lead with 28,647 men for 27,845 women (in 2018). More precisely, out of 1,000 people, 507 are men (50.70%) and 493 are women (49.30%). SamTay is one of the most urbanized districts with 81,02 households where are covered by the largest Buddhism religion with over 40,614 followers, or over 75% of its total population. There are 6,734 households that who are mostly Lao, Vietnamese, and Hmong, with some Tai Dam, Tai Daeng, and Tai Lu. Most of them living in rural and remote areas, lack of transportation and far away from the public service center ,relatively little is known about families living in these mountainous areas of XamNuea with their particular strong traditional belief associated with ethnic group compared to those living in SamTay .GDP per capita is measured international dollars 2,448USD in SamTay versus 1,213USD in XamNuea.

Table 2. General characteristic of XamNaue district and SamTai district in Houaphanh Province in 2018-2019.

Characteristics		SamTayDistrict Urban	XamNuea District
		N (%)	
Sex	Population	(N=54,152)	(N=56,501)
	Male	27,100 (50.10)	28,647 (50.70)
	Female	27,052 (49.90)	27,854 (49.30)
Ethnicity	Lao group	35,189 (65.00)	31,640 (56.00)
	Ethnicity group	18,953 (35.00)	19,210 (44.00)
Religion	Religion (Buddhism)	40,614 (75.00)	24,860 (66.00)
	Religion (Ethnicity)	13,538 (25.00)	14,860 (34.00)
GDP	Person	2,448USD	1,213USD
No. of	Household	8,102	6,734

4.2. Immunization Coverage Goal and Action Comparison in Houaphan Province.

Vaccination is administered free of charge to all children in Lao People's Democratic Republic (Lao PDR) and the national goal is to achieve at least 95% coverage with all vaccines included in the national immunization program by 2025.

Data for the whole province made up of 10 districts from 2018-2019 show that approximately 12% Immunization Coverage rate has been increased with a large variability between different regions. Even though the vaccination coverage rate has shown great improvements and substantial changes in Samtay district in 2018 and 2019 from 71% to 93%.

The other 9 Administrative divisions vaccination coverage rate has increased still quite slow especially in Xam Neus district in 2018 and 2019 from 55% to 56% only and far away far from the national goal 95% (Table 3).

Table 3. Immunization Coverage Goal and Action Comparison in Houaphan Province 2018-2019.

Name of District	Year 2018			Year 2019		
	Goal	Action	%	Goal	Action	%
Xam Neua	1,827	1,012	55.00	1,870	1,271	56.00
Xiengkho	825	533	65.00	664	452	68.00
Viengthong	391	236	60.00	315	198	63.00
Viengxay	1,025	593	58.00	825	602	73.00
Houameuang	1,049	598	57.00	844	639	76.00
Samtay	1,183	840	71.00	1,103	993	93.00
Sop Bao	819	497	61.00	659	505	77.00
Et	866	453	52.00	697	566	81.00
Kuy	789	576	73.00	635	520	82.00
Sone	511	305	60.00	411	357	87.00
Total:	9,286	5,643	61.00	7,474	5,651	73.00

4.3. Public Health Service and Immunization Coverage for children under 5 years old in SamTay district between SamTay district in 2018.

Results shown in ttable 4 and 5 Immunization service for children under 5 years old between SamTay district urban district and XamNuae district in 2018. At the community level, there are 9 heath centers covered by 39 technical staff and 12 midwives in Samtay (Table 4) and 10 health centers covered by 43 technical staff and 12 midwives in XamNeua (Table 5). However, these services are facing challenges of funding, human resources, and logistics. The total demanded. amount of the participants to be served by Mobile team stay and mobile team(go-back) are high 415/196 in XamNeua compared with in SamTay 196/157 respectively. To identified the main barriers to Childhood vaccination coverage is the distance to healthcare facilities, and source of information were significantly factors associated with the children's vaccination status. Therefore, EPI

coverage in XamNeua remains inadequate, mainly due to socio-economically disadvantaged, lack of transportation resources and inaccessibility of remote populations.

Table 4. Public Health Service and Immunization Coverage for children under 5 years old in SamTay district in 2018.

Health centers	Participants	Technical staff	Midwife	Villages	Station	Mobile team stay	Mobile team(go-back)
Meung	151	7	2	7	91	34	29
HouaSing	139	6	2	8	85	31	18
NaMard	132	4	1	6	46	19	19
PanSam	130	4	2	7	45	21	17
XiegBan	141	3	1	4	75	23	21
MeungPua	132	4	1	3	49	16	16
PhoSai	124	5	1	4	40	13	12
XiengKam	109	3	1	4	31	15	11
NongKam	125	3	1	5	25	24	14
Total	1,183	39	12	48	487	196	157

Table 5. Public Health Service and Immunization Coverage for children under 5 years old in Xam Neua district in 2018

Health centers	Participant	Technical staff	Midwife	Villages	Station	Mobile team stay	Mobile team(go-back)
Ket maung	205	5	2	5	52	79	31
Van	191	4	1	4	48	46	25
Hang hone	180	4	1	4	31	51	21
Taun	188	4	1	5	41	36	21
Natamong	180	3	1	4	29	51	21
Nong kang	185	4	2	2	22	24	19
Huaw ma	165	4	1	3	39	36	13
Sa hery	198	4	1	3	51	37	15
Sang kan	159	6	1	4	53	29	19
Huam jai	176	5	1	4	35	26	11
Total	1,827	43	12	38	401	415	196

4.4. Type of Immunization coverage rate between SamTay District and XamNeua district 2018

Childhood immunization is a proven intervention that can protect against several communicable diseases and morbidity and mortality. Expanding coverage of the childhood immunization program has been a priority for the Government of the Lao People's Democratic Republic. Poliomyelitis was eliminated and immunisation against measles and neonatal tetanus has also increased. New vaccines for the prevention of viral hepatitis, bacterial meningitis and pneumonia have also been added to the national immunisation schedule. Immunisation coverage is currently at urban 71% of children under five years being fully immunised; however, this is substantially below the government's target of 90% and, with wealthier groups and urban families having higher levels of coverage.

Furthermore, while overall coverage has increased, changes in the equity gap have plateaued. In rural areas 55%, two of the main reasons for low immunisation coverage are low uptake of facility-based birthing and high dropout rates. The Ministry of Health, the World Health Organization (WHO) agrees with the International Immunization Standards for Children 5 years of age should be fully vaccinated as follows: Country. Each year the number of vaccines increases by the status of the World Health Organization (WHO).

There are usually two methods of vaccination: drops vaccines and inject vaccine currently used in Lao PDR. Houaphan province is also that has used all kinds of vaccines that have been prescribed. Table 6 and Table 7 show Summary of each type of vaccine for children under 5 years of age in XamNeua district and SamTay district and also divided into service details into 3 steps service vaccine: station, go-back, stay, as well as individually the children who received the vaccine and summarized as a percentage of each step of the service. Shows a total population of 1,827 children under 5 years old, but the vaccination rate is only 1,012 of 55%. SamTay of district there was a total of 1,183 children. The number of vaccinated children was 840 of (71), a higher vaccine rate compared with XamNeua district. (Table 6)

Table 6. Type of Immunization coverage rate in SamTay District 2018

Vaccination	Station		Go and Back		Stay		Total
	#	%	#	%	#	%	#
BCG	57	47.31	11	9.13	15	12.45	83
HepB	34	19.72	11	6.38	13	7.54	58
OPV1	23	10.58	6	2.76	17	7.82	46
OPV2	39	22.23	4	2.28	14	7.98	57
OPV3	44	36.96	22	18.48	18	15.12	84
Penta1	34	21.08	10	6.20	18	11.16	62
Penta2	42	24.78	9	5.31	8	4.72	59
Penta3	27	12.69	13	6.11	7	3.29	47
PCV1	37	22.20	10	6.00	13	7.80	60
PCV2	32	16.32	9	4.59	10	5.10	51
PCV3	19	9.69	13	6.63	19	9.69	51
MCV1	38	25.84	11	7.48	19	12.92	68
JE	40	32.80	22	18.04	20	16.40	82
Vit A (6-11m)	21	6.72	6	1.92	5	1.60	32
	487		157		196		840
Total coverage: 71%							

#= Number

Full name of the vaccine. Bacilli of Camette and Guérine, MRV (Measles Rubella), OPV (Oral Polio Vaccine), DTP-HepB + Hip:(Diphtheria, Tetanus, Pertussis, HepatitisB, Haemophilus, influenzae type B Vaccine), HepB: (Hepatitis B vaccine), IPV (Inactivated Poliovirus Vaccine, JE (Japanese encephalitis).

Table 7. Type of Immunization coverage rate in XamNeua District 2018

Vaccination	Station		Go and Back		Stay		Total
	#	%	#	%	#	%	#
BCG	35	34.30	13	12.74	50	49.00	98
HepB	41	34.85	11	9.35	33	28.05	85
OPV1	25	17.00	6	4.08	37	25.16	68
OPV2	31	22.32	12	8.64	29	20.88	72
OPV3	56	73.92	25	33.00	51	67.32	132
Penta1	27	19.98	10	7.40	37	27.38	74
Penta2	21	11.97	16	9.12	20	11.40	57
Penta3	14	6.58	13	6.11	20	9.40	47
PCV1	25	13.00	10	5.20	17	8.84	52
PCV2	29	18.27	16	10.08	18	11.34	63
PCV3	19	13.30	19	13.30	32	22.40	70
MCV1	27	20.52	11	8.36	38	28.88	76
JE	30	25.80	28	24.08	28	24.08	86
VitA(6-11©)	21	6.72	6	1.92	5	1.60	32
	401		196		415		1,012
Total coverage: 55%							

#= Number

Full name of the vaccine. Bacilli of Camette and Guérine, MRV (Measles Rubella), OPV (Oral Polio Vaccine), DTP-HepB + Hip: (Diphtheria, Tetanus, Pertussis, Hepatitis B, Haemophilus, influenzae type B Vaccine), HepB: (Hepatitis B vaccine) IPV (Inactivated Poliovirus Vaccine, JE (Japanese encephalitis) in the District and health centers (Report of public health).

4.5. Average value vaccine coverage of children under 5 years old between Urban and rural area

This study has some limitations that need to be acknowledged. The study was conducted in two districts and is not representative of the country. Nevertheless, the study was not intended to be representative but was rather undertaken to qualitatively better understand persistent low immunisation coverage in Lao People’s Democratic Republic. Rural community demand for vaccinations remains low. Few IEC materials to educate parents on the importance of immunization were seen. Funding delays push outreach sessions into the rainy season when fieldwork is a priority and many parents are unwilling to wait for outreach teams to arrive, reducing the efficiency of outreach services. Resources to disseminate available IEC materials and strategies have been inadequate.

Approximately 60% of children are vaccinated through outreach activities in rural area. Inadequate funding remains a major problem for outreach, however, is insecure and often delayed. Over 90% of vaccine and Programme operational costs are funded by donors. Differences in donor funding cycles, planning and reporting requirements, and delayed financial disbursements make coordination of outreach services difficult. Ensuring nationwide coverage of outreach services is a continual challenge for EPI. The team found several instances where delays in disbursement of outreach funds had substantial negative effects on vaccination coverage. (Table 8)

Table 8. Average value vaccine coverage of children under 5 years old between Urban and rural area.

	Vaccinated	Non-Vaccinated	Total	<i>P</i>
	N (%)			
Urban	840 (71.00)	343 (29.00)	1,183 (100)	<.0001
Rural	1,012 (55.40)	815 (44.60)	1,827 (100)	

There is a significant difference between vaccination rates in the urban and the rural setting as the p-value is <0.05, using the Chi-Square test.

4.6. Average value vaccine service steps: station, go-back, stay of number children under 5 years old between SamTay district Urban and XamNeua district rural area

The High reliance on donor's rural place has funding gaps were identified for outreach, traditional EPI vaccines, training, supervision, monitoring and evaluation, IEC, and vaccine transport and cold chain. Coordination to ensure nationwide coverage is a difficult and time-consuming process due to unanticipated delays in project approvals, differences in donor funding cycles and reporting requirements, and difficulties tracking fund disbursements. Funding is unpredictable and delays are common. Delays in funding for outreach had clear negative impacts on vaccination coverage as high demand of mobile team in rural area showed Go-back 196 and stay 415 total 611(60%). While there has been increased donor interest in supporting integrated Maternal Neonatal Child Health (MNCH) outreach services in the past two years, most donors are only supporting four rounds of outreach per year. This low frequency of contacts will make it difficult to reach the 95% vaccination coverage goal and impossible to substantially improve timeliness of vaccination. (Table 9)

Table 9. Average value vaccine service steps: station, go-back, stay of number children under 5 years old between SamTay district Urban and XamNeua district rural area.

	Rural (N=1,012)	Urban(N=840)	<i>P</i>
	N (%)		
Station	401 (39.60)	487 (57.90)	<.0001
Go-back	196 (19.30)	157 (18.60)	
Stay	415 (41.00)	196 (23.30)	

There is a significant difference between vaccination rates in the urban and the rural setting as the p-value is <0.05, using the Chi-Square test.

4.7. Factors affecting immunization coverage according to stakeholders

The interview with stakeholder identified health system- and supply-related factors, and service utilization and community demand factors that influence immunization coverage as well as barriers to increasing immunization coverage.

The group conference video call stakeholder interview study carried out that there is a need to describe demographic (age, sex, level of education, religion) and socio-economic (monthly income, marital status, employment income) characteristics factors influence low vaccine acceptability in terms of expected benefits, lack of political will by political leaders to mobilize and support immunization services, social mobilization of various elements of society for a common developmental goal, insufficient community participation due to lack of awareness, distance from the health facility, place of delivery, migration of families, mothers knowledge and attitudes towards immunization, weather conditions and low literacy levels of the parents and analyze their association with inadequacies in immunization coverage relate. Such information would highlight groups that require targeted intervention to improve coverage.

Question interviews stakeholder

- 1). What factors result in high or low immunization rates between urban and rural area?
- 2). What are the challenges and constraints to improving vaccination coverage in rural area ?
- 3). How to increase immunization coverage in rural area?

Vaccine service provider

Interview with Miss Phanomvan who has 7 years working experience as technical staff of department of planning and cooperation addressed that the major contributing factors to poor coverage in rural area are social mobilization and insufficient community participation. Social mobilization entails a continuum of activities within a broad strategic framework. It calls for a journey among partners and results in the successful transformation of development goals into societal action. The societal mobilization strategy calls for partnership with all stakeholders: politicians, government, non-governmental organizations, community groups and families. It is argued that effective

social mobilization activities would have a significant impact on the attitudes of people towards embracing the positive values of immunization.

Interviews with Dr Manychan who has 21 years working experience as Vice of director in management vaccine of Expand Programme on Immunization and Dr Sysomephone who has 17years working experience as Director at management of Office of Health Houaphan Provincial study revealed that incomplete and inaccurate documentation emerged as a key issue. None of the Health Centers, village heads or village health volunteers could provide quantitative data on the level of coverage at the village level, making it impossible to estimate coverage. While each village Health Center should record immunizations in a separate book, with the same book used to record community outreach immunizations, records were incomplete. Furthermore, according to some Health Center Workers, the book was not always taken during community activities. While on the day of the immunization campaign some mothers brought immunization cards along with them, they were frequently reported as lost or misplaced. According to Health Center Workers, another reason why some mothers may not have had immunization cards is because sometimes the Health Center has insufficient cards for the population and that this could last several months. there is no centralized data storage system. As one Health Center Worker explained people move from one district to another and it's hard to record the immunizations a child has had. There is poor communication between provinces, districts and health center." Poor data management at the village also means the Health Center immunization coverage data submitted weekly to the district level, where it is compiled and sent to the provincial level and then forwarded to the National EPI centre, is likely to be incomplete.

Interview with Dr.Panom who has 16years working experience as Director of Technical staff at Planning of Expanded Programme on Immunization study found that at District Hospital before the last immunization campaign, the staff were not prepared, they were all rushing around at the last minute. Government staff is lazy, they are not strict, and they depend on the district head of immunization and this person doesn't have a schedule

or checklist either to tell them what to do leading up to the campaign, so they don't plan. While training was provided to the village health volunteers every 3 months, there was no evidence of a curriculum or schedule of the content covered. Furthermore, according to one of the village health volunteers, the last immunization training he had received was 1 year previously. One of the reasons given for infrequent training was the low number of staff at the district level and limited support from the provincial level. However, most of the healthcare workers expressed a desire to further develop their skills to give outreach injections when they come to rural village.

Interview with Mrs. Chanla who has 11 years' experience as technical staff of midwife of Health Center explained that their salary and the incentives were insufficient to cover living costs, Furthermore, salaries were not always paid on time, in the previous year, salaries were paid 3 months late. The Health Center staff also complained that they often had to use their own transport for community outreach activities. they found it hard to maintain balance when riding their motorcycle while also carrying the cold box.

Interview with Mr Kamchan who has 2 years' experience as technical staff of volunteer vaccine service sectors of XamTay district said that as Village Health volunteer who do not receive a salary, the allowance of 50,000 kip per day (USD 6) provided for training in the district Health Center 2 days every 3 months, was insufficient to cover travel, accommodation and the opportunity costs of not working in their rice-fields for 2 days. The lack of compensation for accommodation meant that, rather than working all day on immunization campaigns, staff sometimes left early to travel home each evening. He explained that I don't stay the night there. I go to District Hospital then back to my village in the evening after dark because the money is not enough to pay for a room to stay. It's a 50 min walk. He also suggested that more vaccinators is needed. Because we only have one vaccinator at health center and if he is sick. children can't get the vaccine sometimes. We need more staff so when mother goes to get the injection, she can get it for her child.

Vaccine service recipient

Interview with Mr chan who has 3 years working experience as Head of village mentioned that all the mother reported being concerned about potential side-effects of immunization, particularly when their child or someone they knew had been negatively affected. Some mothers take their baby away when the doctors come to the village. They don't want their child to get the vaccine because the parents are afraid the injection will make the baby sick. Mothers also expressed concern the needle would harm the baby or restrict the infant's physical development. Most mothers said they wanted the Health Center Workers to provide more explanation on the potential side-effects of vaccines and what to do if they occur, but even after knowing this, they were not sure they would be reassured. For the mothers, the best reassurance was seeing their child and others completing their immunization with no side-effects.

Interview with mother said We need the village doctor (healthcare worker) to work regularly because sometimes it's open and other times its closed and we don't know. Sometimes they work in the morning and take the afternoon off." Inadequate staffing during community outreach activities meant mothers often had to wait for long periods of time for their child's immunization.

Mother reported accessing immunization services from multiple providers. Most preferred to use the district healthcare services rather than the outreach clinic. This was partly due to a generally higher level of trust in the capacity and technical know-how of the staff at the district level. While the community outreach clinics reduced the time and cost of travelling to the district, the downside was the time lost and inconvenience of waiting for the vaccination. For some mothers, the outreach service was more convenient. Mother explained: I don't have a motor bike or car so it's a problem for me. Sometimes I don't have the money to pay for transportation, so I must borrow from someone to pay for the mini pick-up truck to the health center. If I borrow a motor bike I must pay for the gasoline and this is expensive"

The Factors Affecting Immunization Coverage from Stakeholder

List of interviewees	Position	Working of experience	Obstacle factors and Recipient of Recommendation
Miss.Phanomvan	Technical staff of Department of Planning and Cooperation	7 Years	Cooperate with Development partners to strengthen immunization programs, provide planning activities and policy.
Dr.Manychan	Vice of director Management Vaccine of Expanded Programme on Immunization	21 Years	Provide immunization delivery management service system to rural area, equipment, budget funding, equity of access to vaccination information.
Dr.Panom	Director of Technical Staff of Planning of Expanded Programme on Immunization	16 Years	Provide health care related education to improve the capacity of health workers .Give incentive for the technical staff and midwife who are working at health centers in the rural areas, especially mobile team .Schedule more vaccine campaign focus on short time vaccination education to make children's parents fully understand the importance of vaccine and get knowledge of vaccine to increase children vaccinated attitude .
Dr.Sysomephone	Director Management of Office of Health Houaphan Provincial	17 Years	Lack of finance and technology to support health system to record, target, share immunization information. Low health care documentation system like yellow card used from local rural area can't record and share vaccination coverage rate information correctly with provincial
Mr. Kamchan	Technical Staff of Volunteer Vaccine service sectors of XamTay District	2 Years	Lack of technical staff who take responsibility to analyze immunization coverage data. The budget for supporting vaccine service-related activities from the government is not enough, because the government and local authorizes are poor and cannot support and give incentive to technical staff. Many health workers start as volunteers, they do not earn salary for a long time. The population here in these rural areas, lack of the vaccination knowledgement and do not understand how important the vaccine is. They believe their religion culture very strong and cannot easy to change their mind and behavior.

Mrs. Chanla	Tectnical Saff of Midwife of Health Center	11 Years	<p>Health centers does not enough vaccine related resource, low equipment, Parents don't believe the vaccine service is safety after their children vaccinated. It is very difficult to cooperate and give information because many people there can't understand Lao language, they believe their religion culture and they are not interested in join vaccination actives program because they are farmer and they are busy with their working in the rice fields and spend 3-4 months .The people there always move their house according to the season because they have different work at different season to do to find food to maintain their life .</p>
Mr. Chan	Head of Village	3 Years	<p>Many people they are ethnic group live in the remote mountain area and they are very poor, they don't want to follow the policy from government. The parents misunderstand vaccine, they think vaccine make their child sick. on the other hand, it is very difficult to change the parent's thinking because they believe their cultural lifestyle.</p>
Mrs. Malina	Village woman	-	<p>Health centers is far away from my home. I don't have transportation tool to reach the health center. We don't have money to pay for the transportation even vaccine is free. Find food for Children and maintain family life is important. Without vaccine we can live but without food, we cannot. Our children need food more than vaccine. some of the child vaccinated, but they got sick and some child vaccinated the same vaccine more than 2times because vaccine does not work.</p>

V. DISCUSSION

The implication of this study is to identified evaluation of the vaccine coverage for children under 5-years-old in Lao PDR, especially in Houaphan Province. Also, identified several health system factors affecting that lower community demand for immunisation. These included the use of multiple providers, inconsistent record keeping and an inadequate health information system. At the individual and household level, there was a lack of understanding of the role of immunisation and the role of the different services provided urban and rural area. To assess the immunization coverage of children under 5 years old and associated factors with vaccination service(Kochhar et al., 2017).

The results in our study, the percentage of fully immunized children coverage in rural area increased slowly 1% only from 55% in 2018 to 56% in 2019. But in urban area has increased significantly 22% from 71% in 2018 to 93% in 2019 due to the EPI Department in urban area has improved its performance at health centers and ensure that vaccines are available with proper storage and maintenance of cold chain. This high coverage in urban could be due to better health service and distance from the health center as compared to rural area, The major finding in this study was the distance to healthcare facilities as Socio-geography characteristics factor in rural area regarding vaccination. A major determinant is the difficulty for mobile vaccination units to reach the target populations. Xam Neua District is part of the mountainous regions where many villages are not accessible by road during the rainy season. Thus, a recent supervision of EPI in Lao PDR recommended increasing the number of rounds to at least six per year in order to increase the vaccination coverage (Nanthavong et al., 2015).

A nationwide study in Oudomxay province on the causes of non-vaccination have both demonstrated a significant relationship with distance from the nearest health care center. Our study confirms the importance of the remoteness of villages from the health center as a key factor for non-vaccination. In addition, as more than 90% of parents are farmers, their children often accompany them in the fields, hence their absence during

immunization campaigns. The main cause for non-immunization or incomplete immunization of children was their difficulty to access to the healthcare centers.(Nanthavong et al., 2015). A international different studies in Nigeria and the NDHS have documented higher immunisation coverages in the urban areas compared with the rural areas(Rhoda et al., 2020).however the two studies found that assessed location as a predictor of immunisation gave conflicting findings. The study by Adedokun et al. which made use of a national data found that location was a predictor of immunisation status (Baek, 2014; Rhoda et al., 2020) .while that of Olugbenga-Bello et al in North Central Nigeria did not find a relationship between location and immunisation status. In view of this contrasting findings there is need for further research into the influence of location on immunisation status of children.

The study with stakeholder interview explored that the supply and demand factors promote and constrain immunization coverage in Houaphan Province in the Lao People's Democratic Republic. Several supply-side factors were identified, some of which are not unique to immunization but are also relevant to other primary healthcare interventions and have been reported elsewhere. These include, for example, vaccination related fund and policy, inadequate human resources, weak information systems, stock-outs and the capacity of district-level management for health center. Other factors included the community not always being informed of outreach dates or outreach sessions conflicting with other priorities such as livelihood and households' obligations. Given supply-side factors affect demand, general health system strengthening is likely to be an effective strategy for achieving results. Services must respond to individual and community needs in planning outreach, including the timing of outreach activities. At the same time, the healthcare workforce needs to be given the autonomy and ability to adapt services to community needs. (Desai, Cravioto, Sur, & Kanungo, 2014).

Lack of on time funding to support mobile team on transportation and parent's education regarding vaccination, Moreover, doubt in the mind of mothers about the

nonavailability of vaccine or absence of vaccinator at the place of immunization was also an important factor in the failure of immunization(Organization, 2015b).One the other hand, Lack of money is also often claimed by responders as a reason for non-vaccination. Although vaccination is done for free, the cost of travel and the loss of a day's work represent a financial handicap for these poor people. These data corroborate the results of two recent studies regarding reasons for non-vaccination in Lao PDR(Organization, 2015b).

The study found the socio-demographic predictors of immunisation status to be maternal education, maternal religion and the family's wealth quintile. An educated mother living in urban with job or higher income compare to a mother living in farm in rural area is expected to gather health information from health workers or mass media and this helps her to make better decisions and improve health seeking behaviors. A study conducted in rural Nigeria found that mother's knowledge of immunization was significantly correlated with full immunization, Other studies also found that maternal education was a determinant of immunization. While our study did find a strong association between paternal literacy and immunisation status. This is of concern, as increased knowledge among families and communities has been found to be effective in increasing immunization demand. A systematic review and data-analysis, for example, found that, in low- and middle-income countries, education was likely to be more effective than incentives in increasing uptake of vaccinations, although both were effective. (Kochhar et al., 2017).

We have also found that the reason behind the partially and nonimmunized children was the nonavailability of the vaccines at the EPI centers. There are major limitations to our study that may affect the interpretation of the results and the generalization of the findings. Immunisation rates have consistently varied widely across geopolitical zones of the country, so our results may not be generalizable to other zones. It is however noteworthy that in addition, the number of vaccination cards seen and hence the immunisation history that could be verified was limited therefore the immunisation coverage could actually be much lower than that gotten by this study. (Desai et al., 2014).

5.1. Recommendation

The world has changed dramatically since the outbreak of COVID-19. The pandemic disrupted routine immunization services and other essential health services. Low immunization coverage in many developing countries, including Lao PDR, has been exacerbated, posing a huge challenge to ensure that every child is vaccinated in every corner especially in rural area. When a child is deprived of immunization, their lives and communities are at risk. Working with partners to strengthen immunization programmes to identify and prioritize children to vaccinate every child in every community, no matter how remote or challenging ensure no one is left behind.

Therefore, to achieve the goals, we have to work with various partners beyond the health sector. For example, Ministry of Information, Culture and Tourism, Lao National Front for Development, Lao Women's Union, Lao Youth Union, Ministry of education and development partners working in the area of women and child health. Strengthening partnerships with non-health sectors will act as a catalyst in increasing immunization coverage. To enable these sectors to work together regularly, it is necessary to form a 'Communication Taskforce' to support not just immunization but also other areas of mother and child health. Taskforce should meet quarterly to ensure regular communication and coordination across sectors at all levels. It is also expected that the Taskforce will implement joint activities under the joint plan(Organization, 2015b).

VI. CONCLUSION

Based on the latest World Health Organization (WHO) and United Nation Children's Fund (UNICEF) global estimates (for 2016), global vaccine coverage for three dose of diphtheria- tetanus-pertussis (DPT3) and polio vaccine was estimated at 86%. There is great variation between regions. In Americas region, coverage was estimated at 90%, while it is only 28% in the Western Pacific Region. The South-East Asia Region raised coverage from 56% in 2015 to 80% in 2016. Global vaccine coverage was at 85%. Around 60% of these children live in 10 countries: Angola, Brazil, The Democratic Republic of the Congo, Ethiopia, Indonesia, Iraq, Nigeria, Pakistan and South Africa. 86% of infants worldwide (116.5 million infants) received DPT3 vaccine, protecting them against infectious diseases that can cause serious illness and disability or be fatal, 130 countries had reached at least 90% coverage of DPT3 vaccine.

Those mentioned reasons are multi-factorial; and only single intervention cannot deal with all the identified obstacles to timely childhood vaccination and some of those difficulties can be solved by immunization program managers through established interventions as follows: health workers training to reduce missed opportunities, improve communication of health worker on delivering health education to communities, and the enhancement of outreach services to remove barriers of vaccination.

However, other factors such as parental education, cultural mores, and the role of gender and religious beliefs are complex, country or region specific, and difficult to interpret. Thus, location specific enquiry is required to address factors related to the failure to vaccinate or complete vaccination schedules.

While impressive gains have been made in reducing infant mortality and increasing immunization coverage, persistent inequalities remain. International organization (WHO) and government of Lao PDR each have important roles in supporting

not only vaccine purchase, but also infrastructure efforts and supervision that can achieve and sustain national immunization goals. Immunization policy needs to be national in scope. At the same time, must be flexible enough to respond to special circumstances that occur at urban and remote area.

The second-hand data study confirmed that vaccination coverage of urban and rural areas differed significantly in their reported vaccination coverage and their receipt of each vaccine. In urban areas, accessibility to immunization centers is high compared to rural areas where amidst the few centers immunization is schedule based. These groups in rural area should be targeted for outreach visits to complete immunization for children.

The stakeholder's interview study revealed that factor affected immunization coverage in rural area is social mobilization, as defined by UNICE, is a broad scale movement to engage people's participation in achieving a specific development goal through self-reliant efforts. Social mobilization of various elements of society for a common developmental goal can overcome long odds and reach goals hitherto thought unattainable in a limited timeframe. It involves all relevant segments of society: opinion leaders, communities, individuals, religious leaders, decision and policy makers, professional groups, bureaucrats and technocrats, commerce and industry. It is a planned and decentralized process which seeks to facilitate change for development through a range of players engaged in interrelated and complementary efforts. It takes into account the felt needs of the people, embraces the critical principle 3 of community involvement and seeks to empower individuals and groups for action.

Further research is also needed to better understand the pathways to improving immunization and how to build on strengths of all level's participation of local authorities. Private health care plans and providers have the capacity to do more in implementing immunization surveillance and preventive programs within their health practices, but such efforts require additional assistance such as comprehensive high-quality primary care

services training and oversight, incentives especially for outreach mobile team Who work in remote rural area. Such as recent attempts to address supervision of Health care workers in delivering vaccine, on time salary payment and in advance payment of extra outreach transportation and vaccine campaign to make Health care works' positive attitude towards helping their community in rural area. (Verma, Khanna, & Dhankar, 2016)

Also, qualitative and quantitative work is needed to better understand the interplay between the different supply and demand-side factors and the relative importance of each. focus on both supply and demand side factors, including providing education to women and their families encouraging them to be active agents of their own and their children's preventative health-seeking behavior.

Low immunization coverage was associated with lack of mother's awareness about repeat visits to achieve complete immunization rather than overall vaccine awareness. This led to failure by mothers to make repeat visits to complete immunization. Furthermore, anti-vaccine rumors such as pathogenicity of a vaccine and propaganda of vaccines weakening their children which were encountered in the community, affected immunization coverage attained. Most illiterate mothers as well as their husbands have negative attitudes towards vaccination and believe that vaccines have got side effects on the health of their children. Negative perceptions about vaccination and anti-vaccine rumors in some communities affect the level of immunization coverage. Miss-information about the side effects of vaccine during illness and false contraindications also affect the level of immunization coverage.

This study was carried out multi-ethnic with varying socio-cultural and education background, local language play a special role to affect the immunization coverage in rural area. The use of immunization services however requires acceptability from the target community. This means that for immunization services to be used there must be a clear understanding of the benefits of vaccination among community members, a readiness for providing vaccination by the health services, and interventions to overcome access barriers

to immunization services. Comparison between urban with high immunization coverage rate and rural is also warranted to help to identify successful pathways to improving coverage.

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