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## Teeka Tehreek: Increasing EPI Vaccinations in Khyber Pakhtunkhwa, Pakistan

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The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Director of Graduate Studies (DGS), on behalf of the program; we verify that this is the final, approved version of the student's capstone including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Narjis Fatima Hussain, Student

Dr. Angela Carman, Committee Chair

Dr. Sarah Wackerbarth, Director of Graduate Studies

**TEEKA TEHREEK: INCREASING EPI VACCINATIONS IN KHYBER  
PAKHTUNKHWA, PAKISTAN**

**CAPSTONE PROJECT PAPER**

A paper submitted in partial fulfillment of the  
requirements for the degree of  
Master of Public Health  
in the  
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By  
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**Abstract**

Globally, Pakistan ranks third among countries with the most unvaccinated and under-vaccinated children. Within the country, there are huge regional disparities, and the Khyber Pakhtunkhwa region (KPK FATA) has one of the lowest vaccination rates in the country. Low vaccination rates contribute to the high burden of childhood infectious diseases in Pakistan that cause 70% of childhood deaths. Addressing the issue requires an understanding of the barriers towards vaccinations; 30% of refusals are due to religious reasons and other misconceptions that are compounded by low literacy rates. Since religion has a critical authority in shaping the population's beliefs, attitudes, and perceptions towards vaccination, mosques will be used as one of the central components for our program. We will partner with the Council of Islamic Ideology, a religious and constitutional body in Pakistan, who have already released a religious ruling to declare vaccines a religious responsibility. Hence, partnering with them will allow us to integrate local mosques into our program for education and as a venue for vaccine camps to enhance access. On the other hand, we will collaborate with the local hospital to facilitate vaccines and to implement a client recall system to increase vaccine demand. We will train our staff and monitor fidelity through pretest posttest surveys, random observations, and monthly meetings. Formative evaluation measures will include staff recruitment and their attitudes towards vaccines so inform program feasibility. Process evaluation will measure program success such as participant characteristics, vaccines administered, and successful recalls; feedback from staff and participants will also be considered. Outcome evaluations will be conducted using an interrupted time series to measure changes in vaccine acceptability in parents and to see positive changes in attitudes, beliefs, and perceptions towards vaccines. This will provide an understanding for changing social norms towards vaccination and program sustainability. The short-term outcome for our program is to see an increase in vaccine uptake and a decrease in vaccine hesitancy, while the long-term outcome is to see a decrease in childhood infectious diseases.

## **Target Population and Need**

### **Demographics**

Pakistan, a lower-middle income country located in South-East Asia, has a growing population of 216.5 million with a crude birthrate of 28.25 per 1000 people, and a life expectancy of 67 years at birth [1]. The administrative and geographic structure of Pakistan presently comprises of four provinces: Baluchistan, Khyber Pakhtunkhwa (KPK), Punjab, and Sindh; and a federal territory – Islamabad Capital Territory. Table 1 summarizes the demographic characteristics of the population [1].

### **Health Profile of Pakistan**

Pakistan is currently facing a double burden of disease – communicable and non-communicable [2]. While non-communicable diseases are steadily rising over time in all age groups, it does not reflect the shift from infectious to chronic diseases as in many developed countries. For those countries, this shift was largely attributed to vaccines which were dubbed as one of the greatest public health achievements of the 20<sup>th</sup> century [3]. On a global scale, vaccines have greatly reduced the burden of infectious diseases, and the associated disability and death, and led to a rapid reduction of childhood mortality rates [4]. However, Pakistan’s infectious disease burden is still significant and is majorly attributed to low vaccination rates [5].

Pakistan introduced the Expanded Program on Immunization (EPI) in 1978 to cater to newborns for the first two years of life [6]. As per the program schedule, only five visits during the first year of

**Table 1.** Demographic characteristics of Pakistan

<i>Variable</i>	<i>%</i>
<b>Sex</b>	
Male	51.50
Female	48.50
<b>Age Distribution</b>	
0-14 years	36.01
15-24 years	19.30
25-54 years	34.70
55-64 years	5.55
65 years and above	4.44
<b>Population below poverty line</b>	24.30
<b>Unemployment rate</b>	7.80
<b>Literacy rate</b>	
Overall	59.71
Male	71.83
Female	46.02
<b>Population distribution</b>	
Urban	36.48
Rural	63.52
<b>Population distribution (Geographic)</b>	
Punjab	52.45
Sindh	24.78
Khyber Pakhtunkhwa	15.62
Baluchistan	6.12
Islamabad Capital Territory	1.03

birth, and one visit during the second provided immunization against nine potentially fatal diseases [7]. However, despite the program, the rates of vaccine uptake are below par. Table 2 summarizes the rates of vaccine coverage in the EPI for eligible children [8].

The 2017-18 Pakistan Demographic Health Survey concluded that overall, only 66% of children aged 12-23 months were administered all basic vaccines, and only 51% had all age-appropriate vaccines [9]. On an international level, Pakistan ranks third among countries with the most unvaccinated and under-vaccinated children [7]. In

**Table 2:** Vaccine Coverage for EPI program

<i>Disease</i>	<i>Vaccines</i>	<i>% Vaccinated*</i>
<b>Tuberculosis</b>	BCG	88
<b>Diphtheria, pertussis, and tetanus</b>	DTP1	86
	DTP3	75
<b>Hepatitis B</b>	HepB3	75
<b>H. Influenza Type B Infection</b>	Hib3	75
<b>Polio</b>	IPV1	70
	Pol3	83
<b>Measles</b>	MCV1	70
	MCV2	60
<b>Pneumococcal infections</b>	PCV1	86
	PCV2	80
	PCV3	75
<b>Diarrhea</b>	Rota1	86
	RotaC	80
<b>Tetanus</b>	TT2+	62

\*% from eligible children

2018, 40% of all children unvaccinated for DTP3 were in Pakistan; this translates to almost 1.4 million children [7]. Consequently, Pakistan remains one of the last two countries that have been unsuccessful in eradicating polio, despite global efforts. Poliomyelitis remains endemic in the country; Pakistan reported 147 new cases in 2019 and 135 new cases in 2020 [10].

Other vaccine-preventable diseases also show similar trends and add to the burden of disease. The annual incidence rate of acute respiratory infection in Pakistani children aged less than 5 years is roughly 4% and leads up to 15 million cases every year [11]. Furthermore, the incidence of diarrhea due to the Rota Virus is 24% and kills approximately 53,300 children every year in Pakistan [11]. In terms of the number of years of life lost (YLLs) due to premature death, acute respiratory infections and diarrheal diseases are the foremost causes in Pakistan [12].

For other vaccine-preventable diseases included in the EPI Program, the reported statistics are not encouraging. Pertussis incidence was found to be 3.96 per 1000 infants, while every year, approximately 23,000 children die of bacterial meningitis in Pakistan [11]. Furthermore, Pakistan is one of the 34 countries that have still not achieved the neonatal tetanus global elimination target set by the World Health Organization [11]. Additionally, more than 300 Pakistani children die every year because of measles while 70% of typhoid deaths are among children younger than 15 years [11,13]. Consequently, a significant 70% of childhood death is due to infectious diseases [13]. Children under five years make up 15% of the population of Pakistan yet make up 50% of the mortality rate in the country [14].

### **Disparities**

Within vaccine uptake, disparities exist on various levels including demographic characteristics and regional variations. Girls are slightly less likely than boys to receive all basic vaccines (63% and 68%, respectively), and 80% of children in the highest wealth quintile receive all basic vaccines as compared to only 38% of those in the poorest wealth quintile [9]. The birth order also introduces disparities; 69% of children of first-, second-, and third-order births receive all basic vaccines in contrast with 50% of children of order 6 or higher [9]. Additionally, mother's education has a positive impact on immunization coverage – only 50% of children whose mothers have no education receive all basic vaccines compared to 82% of children whose mothers have a higher level of education [9].

Regional variation also exists; 71% of children in urban areas receive all basic vaccines as compared to only 63% of their rural counterparts [9]. Regional disparities also indicate that all basic vaccination coverage is most prevalent among children of Punjab (80%), followed by children from Islamabad Capital Territory (68%), whereas coverage is lowest in Sindh (49%), KPK FATA (30%) and Baluchistan (29%) [9].

### **Vaccine Hesitancy**

The low rates of vaccinations can be understood through the concept of vaccine hesitancy in Pakistan which is a product of illiteracy, socioeconomic, cultural, and religious factors [15]. A major

obstacle to the success of immunization campaigns is parent refusal due to religious misconceptions about the purpose or effectiveness of vaccines because of illiteracy and lack of awareness [15]. About 30% of vaccine refusal in Pakistan are because of religious reasons, and with only 59% literacy rate, this becomes a major hinderance [16].

Religious factors for vaccine hesitancy play a crucial role in steering personal attitudes and beliefs, as religion has a major influence on Pakistanis [17]. Such misconceptions include the notion that vaccines can harm or sterilize children as part of a grand CIA conspiracy against Muslims, or that they contain pig-derived ingredients which are forbidden in Islam [15]. Furthermore, the required repeated administrations of some vaccines are also a hindrance; parents suspect that the repeated doses are to ensure sterilization, or that substandard vaccines were being used that can cause harm to their children [15]. There is also a strong belief in fatalism, and this breeds indifference and even disdain towards any form of medical intervention including vaccines and any disease is seen as the will of God [17].

Additionally, cultural factors that add towards hesitancy are home visits by all-male vaccinator teams when the mother is alone, or when the elder male community members have not given consent for vaccination [15]. Moreover, parents' education and the attitude of new mothers regarding vaccination are also important determinants to address the issue of vaccine hesitancy in Pakistan [6].

### **Current Services and Need**

Currently, Pakistan's EPI program provides vaccinations free of cost at government facilities with the help of NGOs like GAVI, UNICEF, and Bill and Melinda Gates Foundation; with a minimal service fee, vaccinations are also provided at private healthcare institutions. Additional cadres providing immunization services include community health workers who also provide home visits for special immunization initiatives for polio and measles vaccines [2]. Hence, even though the vaccines offered by the EPI are free, their use is limited because of the factors discussed above [6].

The proposed program, named Teeka Tehreek (Vaccine Movement), aligns with the community need for increasing the rates of immunizations to achieve a decrease in the burden of infectious



diseases by targeting newborns and their families. The community needs and resources were identified through the Government of Pakistan Demographic Health Survey and the WHO and UNICEF databases. These organizations provide extensive data on the vaccination rates and the prevalence of infectious diseases, especially in children. Other data was taken from relevant organizations like GAVI – the Vaccine Alliance, and the Bill and Melinda Gates Foundation which aim to increase vaccinations in countries like Pakistan, and work towards polio eradication by providing further resources.

With suboptimal vaccination rates for basic vaccines, as shown in Table 2, the program is needed to strengthen the already available immunization services and to provide a different and significant approach. Such approach will allow the program to address the root causes and inhibiting factors that hinder the success of the current vaccination program, as identified in the Vaccine Hesitancy section. Thus, the program will focus on addressing these barriers to have the greatest impact on reducing negative health outcomes and existing disparities concerned with vaccinations.

For program success, we plan to continually assess community needs and resources on an ongoing basis by constantly monitoring the data provided by the abovementioned organizations and through our own program evaluation. Such needs and resources include emerging community health priorities, introduction of other health programs, and newly established healthcare services in the area. This will allow us to align our program with changing community needs and to incorporate new services or priorities to make our program more acceptable and efficient. For example, if community needs in other areas of vaccinations become more urgent (influenza or COVID-19), we can expand or streamline the program in that direction, contingent on the resources present.

### **Target Population**

As seen, regional variation in vaccination rates show that KPK FATA (30%) and Baluchistan (29%) are among the lowest. Furthermore, KPK FATA has the largest average household size of 8 persons in the country and has low female literacy rates ranging from 7.8% to 50% across the region [21-22]. As discussed, in the Disparities section, these factors act as mediators and impact vaccination rates.

Apart from low vaccine rates, female literacy rates and the biggest household size, KPK FATA also faces additional barriers that justifies her selection as the target population. The FATA region in the KPK includes tribal areas of North and South Waziristan, where vaccines are vehemently opposed due to political fallacies. The leaders of these areas identify as Taliban and have put a ban on vaccine drives since the disclosure that Dr Shakeel Afridi helped the United States through a fake polio campaign to reach Al Qaeda chief Osama bin Ladin [18]. This has unwittingly put thousands of children at risk. This situation extends into many areas of Khyber and Orakzai agencies because of the deteriorating law and order, which results in aggressive actions towards community health workers and vaccine teams [18].

Hence, this grant proposal will target newborns and their families in KPK FATA to increase vaccine acceptability and uptake by building on already available services and expanding them in the appropriate cultural and regional context to remove the described barriers and religious misconceptions. The program will also focus on the problems of accessibility and awareness by extending services and introducing new components to the established healthcare delivery system.

#### **Program Reach**

As such, this program aims to introduce the intervention in three settings to understand the impact and success of the approach. Each year, an estimated 14,450 people will be reached by the grant, including the number reached in each setting and through healthcare services.

The target population will be reached in three areas of KPK FATA that share a central hospital, Jinnah International Hospital. This hospital is at a central location and serves the main urban city of Abbottabad, the town of Nawan Shehr, and the village of Aliabad [19]. Collectively, these three areas have a population of 244,462 and with a crude birth rate of 28.25 per 1000 people, 6,906 babies are born each year; they need vaccinations as per the EPI program [1]. 66% of these births (4,558 babies every year) take place in a healthcare facility [9]. Currently, Jinnah International Hospital provides vaccines for these newborns – however, the services are not used by all eligible parents because of vaccine hesitancy and the program will work to increase demand.

The rest 2,348 newborns will be served using mosque camps (details later in Program Approach), as home visits by healthcare workers are not readily accepted in KPK FATA. This will also reach 30% of the newborns that do not receive vaccines because parents cite religious reasons as a cause [16]. As such, the Jamia Masjid Mandian in Abbottabad, the Ilyasi Mosque in Nawan Shehr, and the Jame Mosque Aliabad in Aliabad will serve as the settings for educational purposes and vaccine camps through cleric sermons and monthly events, respectively. These mosques are large central mosques and serve many people; Jamia Masjid Mandian has a capacity for 5000 people, while Ilyasi Mosque (35,000 people) and Jame Mosque Aliabad (235 people) serve all people in their areas [20].

For the educational component through sermons on Fridays, the program reach has been calculated by looking at Pakistan's 96.4% Muslim population [21]. Additionally, only men go to mosques and they are the main decision makers of the family, and people start going to mosques by 15 years of age as this is when prayers become compulsory. Men comprise 51.5% of the population while 63.99% Pakistanis are above 15 years of age [1]. Furthermore, people attend mosques infrequently and only 59% of the population reported to going to the mosque at least once a week [22]. With these characteristics, this reaches as estimate of 7,543 people and since one usually visits the same mosque, the population would not change over the year – the reach will remain the same over the year and the same people will get repeated exposure. Therefore, 7,543 people would be served by this setting exclusively. However, we cannot account for the spread of information and education through interpersonal channels.

As the education component is through mosques, men will be the primary audience. Usually, men are rarely targeted through vaccination programs; targeting only women overlooks the critical influence men have over a family's decision-making power [23]. In developing countries like Pakistan, men usually control women's access to information, transportation, finances, and other health-related decisions [23]. Moreover, vaccination programs targeting men have showed positive results [23].

To reach the target population in these settings, the proposed program will rely on the Jinnah International Hospital and the mosques. The vaccination services provided by the hospital will be expanded to incorporate vaccine camps in mosques – the mosques will also impart the education component of the intervention through sermons. The program will also collaborate the Council of Islamic Ideology to facilitate the program implementation in mosques.

### **Program Approach**

#### **Evidence-based Program**

An intervention based on an evidence-based program called Vaccination Programs: Community-Based Interventions Implemented in Combination, will be implemented. This program has strong evidence and is recommended through a systemic review conducted by The Community Guide [24]. All the included 18 studies provided a common measure of change and showed a median increase in vaccination rates of 14 percentage points [25].

The program involves community-based interventions implemented in combination to increase community demand and enhance access to vaccination services. It makes use of two or more coordinated interventions to increase vaccination rates within a target population. For that purpose, it calls for partnerships between community organizations, local government, and vaccine providers to implement programs in combination. The program suggests, among other recommendations, to use recall systems and community-wide education to increase vaccine demand, and to implement expanded services through healthcare settings to enhance access [24].

For Pakistan, an adapted version of the program will be implemented in three different settings that share a common healthcare center (see Target Population). The program will focus on extending healthcare services through recall systems and vaccine camps. Another focus would be community-wide education to increase vaccine acceptance through partnerships with faith-based organizations (mosques). Furthermore, our program will follow the evidence-based program guidelines and will also combine the two components by using mosques as venues for vaccine camps.

The evidence base of the program supports our decision in deciding our program approach. A study from the evidence-base, conducted in Australia, concluded that hospital recall systems for children behind in their immunization schedules was an effective, acceptable, and relatively cheap method for completion of recommended vaccines, especially for disadvantage families [26]. As per the program recommendations, the recall system would work to increase the demand for vaccines in the community [25].

Another study from the evidence-base, conducted in California, evaluated the effectiveness of faith-based organizations (FBOs) in increasing vaccination rates in adults. The research concluded that FBO vaccination programs were effective in increasing vaccination rates and more than 90% of the participants in that study reported willingness to participate in FBO education and promotion programs [27]. Hence, the collaboration with local mosques in Pakistan would be effective in promoting vaccines and can help in reducing barriers to access and acceptance.

The inclusion of mosques as partners would be secured through a partnership with the Council of Islamic Ideology (CII) which is the most prestigious cleric council that is charged with the responsibility of issuing fatwas (ruling based on Islamic law) and giving legal advice on religious issues to the Government. It should be noted that the CII has already issued fatwas to support vaccination, but the dissemination of that information has not been very effective. Hence, mosques would be the ideal place to propagate awareness and emphasis will be made on how the CII has declared vaccinations to be a national and religious responsibility of every Pakistani [28].

Securing mosques as partners is important as they have a critical and authoritative role in the social and cultural life of Muslims [29]. They are the center of agency in a community and are responsible for guiding and instructing people in their religious as well as temporal obligations. Hence, personal attitudes and trepidations about topics, such as vaccines, are easily overruled if the mosque lays out an action plan [29]. The blind obedience and trust extended by the people allows them to follow

orders, regardless of opinion – if the mosque says to do something, that is the lawful and right thing to do [29]. Therefore, using mosques will also remove any perceived barriers related to acceptance of vaccines because of a lack of education and religious misconceptions. As reported, 30% of vaccine refusals in Pakistan are because of religious reasons and hence, mosques can provide a place for educating and raising awareness of the importance of vaccines [16].

Mosques will also provide a place for vaccination camps – this can solve the cultural issues of home visits by all-male vaccinator teams when the mother is alone, or when the elder male community members have not given consent for vaccination and can bypass safety concerns. With mosques as vaccine camps, it will increase the acceptance and demand for vaccines and people can then vaccinate their children at their own ease. Thus, collaboration with religious scholars and with mosques as a setting, barriers related to accessibility and acceptance can be reduced.

Another strategy from the evidence-base that would be included in the program is the recall system. The inability to track children's vaccination history along with the parents' lack of awareness of vaccination dates worsens the issue of low immunization rates in developing countries like Pakistan [30]. Therefore, the shared hospital by the three areas will work to address this barrier by using a telephone recall system. Their database would be used to contact the parents of a newborn child every time a vaccine is due – this would increase the demand for vaccines. Based on their location and the feasibility, the parents would be given an option to either come to the hospital to get their child vaccinated, or to go to the nearest mosque offering vaccination camps.

While landline phones can be used for this purpose, mobile phone use is becoming ubiquitous in Pakistan. In a 2014 survey by Gallup Pakistan, 91.1% adults reported having one in their household, and there was negligible difference between urban and rural households [31]. Hence, the recall system will use mobile phone numbers, and in case of unavailability, landline phone contacts will be used.

The recall system would also involve the distribution of immunization cards at the time of birth or during first vaccine visit to keep track of administered vaccines, despite the setting. Hence, this proposed program will work to increase vaccine demand by increasing awareness and removing religious misconceptions (as described in Vaccine Hesitancy section) and will enhance access to services by reducing barriers related to acceptance, accessibility, and availability.

### **Program Considerations**

The program will appraise some important considerations to ensure that it is effective and acceptable to all audiences. The healthcare workers would be given proper training for their role in vaccinating children in mosques. Since healthcare workers will be recruited from Jinnah International Hospital which is based in the target community, linguistics and culture appropriateness would not be difficult to achieve. The training sessions would cover information about the vaccine schedules, distribution of vaccine cards and their purpose, storage of vaccines that require care while handling, and communication strategies.

Similarly, the ob/gyn department of the Jinnah International Hospital (the central hospital for the 3 settings) would be partnered with the project for efficient data exchange. We will hire three recall managers who will be given training in using recall systems and about vaccination cards. They will be hired from the target community to ensure linguistic and cultural appropriateness.

The three mosques, which will be used to propagate awareness, remove misconceptions, and host camps, will also have no difficulty in being linguistically and culturally appropriate. The imams/clerics of the mosques would also undergo training sessions so that they could accurately disseminate information, remove misconceptions, and administer camps for vaccinations. The latter part would be complemented by providing them contacts for the district project supervisors so that they can organize vaccine camps once a month on a Saturday – the weekend will allow nurses to take part in the project without neglecting their jobs and the parents would also not have to take time off from their work.

**Recruitment and Retention Strategies**

It is apparent that the program's success depends on the cooperation of the staff and management of Jinnah International Hospital, the three mosques (Jamia Masjid Mandian, Ilyasi Mosque, and Jame Mosque Aliabad), and families of the newborns. To maximize recruitment and participation, different strategies need to be adopted. Nurses under the employment of Jinnah International Hospital are already expected to vaccinate children presenting at the hospital – however, expanding their services to include vaccine camps in mosques might not be received well without compensation. An incentive program can be introduced for such purposes and healthcare workers taking part in these camps will be provided 15% of their annual salary for every year of the project. Furthermore, they would be provided with \$7 vouchers every month to compensate for their travel expenses while visiting mosques.

The monetary incentives and the travel coverage would encourage the healthcare workers to comply with the program. This is because they are under significant job stress because of inadequate stipends, inability to communicate effectively with families, and having to travel long distances for work without any compensation [32]. Thus, this program will offer a chance at better remuneration and will motivate them to complete the required vaccinations in their assigned areas, while the training program will allow them to learn effective communication strategies – this will provide them with job satisfaction. We will recruit 9 nurses for our project – 3 for each district of Abbottabad, Nawan Shehr, and Aliabad.

On the other hand, the Jinnah International Hospital already have a patient database; however, they do not have a recall system. Three people will be hired by the project and will take on the role of Recall Manager (RM) – one for each district. Their salary would be paid for through the grant and they will work with the hospital to handle patient data to contact parents. For this collaboration, the hospital will be given a \$1500 incentive per year to encourage participation.

Recruiting mosques would be challenging but a partnership with CII would smooth the process. CII is expected to partner with the program team because it has actively endorsed vaccinations for



Pakistanis since 2019, and this would provide them a good platform to ensure that their fatwa is followed effectively [33]. The CII is also concerned about the travel restrictions that could be placed on Pakistan because of infectious diseases, especially polio, and fears further financial ramifications for the country [33]. Hence, increasing vaccination rates aligns with the goals of the CII and would increase the likelihood of their participation.

To recruit mosques, a workshop would be held in Abbottabad, under the banner of CII. The imams would be encouraged to attend, and it would be made clear that the CII would not appreciate absenteeism. This would ensure their participation as CII is the largest and most important religious body in Pakistani government, and no one would risk their displeasure. The workshops will also have a free lunch – usually, this is enough to guarantee attendance in Pakistan. Furthermore, since the workshop will be held in Abbottabad, the clerics traveling from Aliabad and Nawan Shehr for the event would be compensated for their travel expenses.

In the workshop, they would attend sessions by CII clerics and medical personnel, who would talk about correcting religious misconceptions concerning vaccines, encouraging masses to vaccinate, and how to communicate this information through religious sermons. They would also be provided information on how to organize a vaccination camp using local contacts, and that they are expected to establish a monthly camp on a Saturday. An endorsement of the program by CII would be enough for them to comply. However, they would be told that the funding for the vaccine camps would be provided by the program – this would allow them to see that they are not being asked for anything more than using their positions to spread desired information and act as a patron for their own vaccine camps. As an added incentive, \$500 would be given annually to those mosques that host at least 11 camps.

For parents of the newborns, they are expected to be a part of the program by default. If all the other components work effectively and in synergy to remove the barriers associated with accessibility, availability, attitudes, knowledge, and awareness; their participation in the program would be

guaranteed. This is because vaccine refusal or low rates of vaccination are due to the identified barriers and once, they are addressed, most parents will engage in health protective behaviors and will vaccinate their child timely and completely, without the need for any incentive other than the health and well-being of their child.

Nevertheless, without any tangible incentives, retaining parents for vaccinations that require a series of doses at specific intervals can be challenging. However, this program establishes interpersonal relationships with health workers and with the local mosques. This helps in creating an overall acceptance of vaccines and shifts norms and attitudes towards immunization. Furthermore, the component of mosques also instills a value of religious responsibility and urges parents to comply with the teachings of the clerics [29]. Mosques can help change the attitudes of parents and can encourage them to actively seek vaccinations for their children since the CII has declared it to be the social and religious responsibility of all Pakistanis [28]. When a behavior becomes associated with religious values, it becomes the norm and non-compliance is seen as a huge faux pas.

Hence, by providing utmost facilitation to parents and by creating an environment where vaccinations are the expected behavior, both socially and religiously, the participants can be retained successfully.

#### **Planning, Piloting, and Readiness Period**

The planning period activities will involve establishing partnerships with CII, the mosques, Jinnah International Hospital, and the Health Ministry of Pakistan. It will also be spent designing training materials for nurses, RMs, and the clerics through consultation with WHO and CII to lend credibility to the information. This material will reflect on guidelines for vaccines, the need for vaccines, and the religious rulings from world renowned scholars. The material will be collected and published by the project staff.

This period will also be used to recruit the required project staff, nurses, RMs, and the clerics for the project. The CII sponsored event will take place during the planning period to make sure that the

clerics are active participants. After the end of the event, every cleric will be given an information packet that will contain the general information material and the contact information of the district supervisors to help them coordinate with nurses to organize vaccine camps, and to inform whenever there is a camp to facilitate effective data collection by the data collectors.

The planning period will also involve recruiting three Recall Managers (one for each district) that will work with the hospital. Immunization cards and logbooks will also be designed and published in the planning period and distributed among nurses and RMs. They would be given the contact information for the district supervisors to report to and for coordinating efforts and other logistical matters.

This period will also be used to collect baseline data through surveys and by accessing secondary data sources such as the vaccine registry system. This is important as this data would be central in assessing the project success and will be used for outcome evaluation through an interrupted time-series design. This will be discussed in detail in the Outcome Evaluation section.

The rest of the planning period will be spent in establishing a coordinated and effective communication system among different arms of the intervention and will focus on determining strong data collection strategies. The staff will also be explained the hierarchy and who they are supposed to report to and how the data will be collected and utilized for the project.

Before the project is launched fully, a small pilot test will be done for 3 months in one urban and one rural area in KPK FATA. This will give an insight into what parts of the program need to be revised, what components are weak and should be strengthened, and whether any part of the program needs to be adapted to work better in urban/rural settings. It can also inform on what is missing and can provide an understanding as to how effective the coordination and data collection strategies are.

### **Program Fidelity**

For program fidelity, different components will be assessed using certain measures and data will be collected to inform future decisions. These measures will be used to ensure the fidelity of training sessions, planned meetings, communication and education interactions, and vaccine camps.

Fidelity for the training session will be insured through the pretest posttest surveys which would allow the project team to understand that the training was delivered as expected; high scores on the posttest surveys would provide the measure to conclude this. The training will be conducted by a WHO consultant. On the other hand, the workshop with CII and the clerics would be monitored for fidelity through observations. While the CII and the WHO consultant would be provided the resources and materials to educate clerics about vaccines and other topics, the manner of disseminating that information would differ. Hence, this workshop will be observed with a checklist to ensure that all components of the core planned materials were discussed and delivered.

The intervention also calls for planned monthly meetings of the district supervisors with the district nurses and RM. This is an important component as it facilitates vital communication between different arms of the program. Monthly meetings must happen for the success of the program, and its fidelity will be ensured by asking the supervisors to submit minutes of the meeting every month. This will keep the project team informed about the regularity of the meetings, and if certain supervisors do not comply, it would be easy to reach out and provide potential solutions to the problem. This method will also be used to ensure the fidelity of mosque camps – supervisors will be asked to submit data and details about mosque vaccine camps every month along with the minutes. Since mosques are required to organize one vaccine camp every month, a less than expected number of camps would alert the project team, and necessary action can then be taken to restore the fidelity of the program.

For the communication and education components delivered by the clerics, random observations will be used in all three mosques during their Friday sermons, when they are expected to preach about vaccines. Similarly, RMs and nurses would be observed during their interpersonal communication with parents, in-person and on the phone for recall, with consent. Such observations on a random basis can be done every 3 months to ensure the fidelity of the program, and to understand any challenges or potential issues in the implementation so that they can be addressed effectively.

**Program Inclusivity**

The program will be inclusive and non-stigmatizing towards all individuals and there will be no discriminatory policies, including in recruitment and hiring of program staff and service providers. While one component of the program will be held in mosques, it should be noted that a person belonging to any religion can enter mosques and be a part of the vaccine camp. As such, the mosque will only act as a venue for vaccines. Similarly, the program only incorporates Islamic content for religious misconceptions; the misunderstandings are due to Islamic beliefs and they are targeted for the educational component, but the service is for everyone. Furthermore, female nurses would ensure that parents are comfortable utilizing the services at mosques for their daughters if they do not appreciate services from a male vaccinator. Additionally, the training session and the service providers in different districts would use the local language to communicate and interact, so that interpersonal relationships and successful training could be conducted. These elements would ensure participation from people who would have otherwise refused – this would guarantee that the program is inclusive and does not differentiate between people based on their religion, regional association, or gender.

**Potential Risks or Challenges**

Like every program, this program can also run into some potential risk or challenges. While clerics are important figureheads for education and shifting norms, a potential challenge may arise if a child reacts adversely to a vaccine. This may cause mistrust as the relationship between vaccines and religious concepts is fragile. While the CII would play a huge role in bridging that mistrust, an incident like this can be challenging. To address this, the seminar and training materials will include information about potential adverse reactions to vaccines, potential allergens, and a layman's explanation to make them understand that it might happen but is not life-threatening and can be managed. Communication materials will also focus on how the long-term benefits outweigh the short-term adverse effects. This will prepare the clerics to deal with an incident like this and will also create a trusting relationship; otherwise, it might have been interpreted as hiding potentially harmful information.

Another potential challenge that may occur is the confirmation of the accuracy of logbooks kept by nurses and RMs. The incentives might make them report false data with fake, completed records. This can be a serious risk to the evaluation of the program, and can endanger children who are unvaccinated, yet shown as vaccinated in the records. To address this challenge, a random record check would be done by the district supervisor once a completed logbook is received. They would contact 1-2 parents randomly per page and inquire about the vaccinations and services received. This can ensure that the data is reported accurately and will discourage nurses and RMs to make up false data.

### **Performance Measures and Evaluation**

The program implementation will be evaluated through the assessment of certain performance measures. These measures will inform if the program is serving the population that it should be catering to, whether it is being implemented as planned, is effective, and if any revisions or improvements need to be made.

### **Process and Implementation Evaluation**

#### ***Planning, Piloting, and Readiness Period***

The activities of this phase have been described in the Program Approach section and will need to be evaluated to inform decisions. The effectiveness of recruitment strategies will be analyzed by the successful recruitment of nurses and recall managers. It will also look if all the clerics from the three mosques took part in the CII sponsored events. These numbers will give a good overview of the success of recruitment and will inform about the feasibility of the program. Process evaluation at this stage will also give an insight into the reasons of participant refusal. This would help in revising recruitment strategies to be more effective and would allow us to understand if our incentives were lacking.

Another important factor that would be evaluated in the planning phase are the behaviors and attitudes towards vaccination of the nurses, RMs, and the clerics. This is critical as an outcome of this project is to bring about a change in attitudes regarding vaccine uptake. If the deliverers of the program do not have attitudes and behaviors that align with the program outcome, then they would not be

effective agents of change when confronted by hesitant parents. Therefore, at the time of recruitment, the project staff would be asked to fill the Vaccine Acceptability Survey (VAS) and their data would be analyzed. The VAS measures five facets of vaccine acceptance including perceived safety, perceived effectiveness and necessity, acceptance and vaccine schedule, benefits of vaccines, and perceived legitimacy of authorities to require vaccines [34]. This instrument demonstrates high reliability and construct validity, with a Cronbach's  $\alpha$  of 0.97 [34]. Meanwhile, those who do not match with the program objectives will be asked to take part in additional training sessions, subject to their approval.

The other part of the planning phase focuses on training the nurses and RMs in communication strategies and vaccine administration. This stage will be evaluated through pretest posttest surveys. Since the training session will be compulsory, attendance for the session would not provide a better understanding regarding success. The pretest posttest surveys will provide information about the attention and interest in the session. A poor score would inform the need to revise the training session to be more interesting and interactive, and to make the content comprehensible. The training session will be important in maintaining the fidelity and coordination of the program – hence, a careful evaluation would ensure that participants are aware and competent to be part of the program.

### ***Program Implementation***

Once the program starts, the numbers served by gender and ethnicity in each setting would provide an accurate measure of program performance. These numbers will be collected during vaccine camps, mosque sermons, and vaccine appointments at Jinnah International Hospital, and will be reported in the monthly meetings. In vaccine camps, the gender and ethnicity of parents and children will be recorded by the nurses before administering vaccines. This data will be saved in their logbooks. Similarly, the RMs would record this data in their logbooks when parents benefit from the recall system and bring their child for vaccination. Meanwhile, in mosques, this data would be collected during the Friday sermon to see the exposure to the educational component of the program. Here, the numbers will be collected by administering quick surveys through iPads at the mosque door. The data collectors

on the project team would be responsible for this – the survey will ask about previous attendance to Friday sermons to control for repeated exposures.

Additionally, the monthly meetings of the vaccine staff (nurses, RMs, and district supervisors) would provide data about the success of the program. These meetings will provide information about the participation rates in mosque camps, the number of total and answered telephone calls made by RMs, the number of vaccines administered by nurses, the number of completed immunization schedules, the number of referrals made by RMs to mosque camps, the number of immunization cards distributed, and the number of completed immunization cards. All this data would be recorded in the logbooks that would be provided to nurses and RMs, at the start of the program. The logbooks will also record information about parent refusals and the reasons behind it. This would inform the need for addressing other barriers for program success.

These monthly meetings and data would also give an insight into what parts of the program are working and what parts need revision. The data would also inform whether the program is being implemented as thought, the coordination among different settings, and if the population is being reached effectively. These meetings would also be critical in providing communication between the staff for coordinated efforts. The data from the monthly meetings reports would be published on a semi-annual basis to comply with the grant; after every meeting, applicable laws, policies, and procedures would be reviewed to confirm ability to collect required data for the next month.

Furthermore, every 6 months, feedback would be taken from nurses and RMs regarding the program through focused group interviews. These interviews would ask them to identify the challenges and success of the project, and if any changes could be done to facilitate and better implement the program. For participants' feedback, every 6 months on a Friday, focused group interviews would be held with the worshippers after the sermon. These interviews would provide an insight into the success



of the educational component and would help in identifying key challenges and lessons to improve the delivery of this program section.

### **Outcome Evaluation**

The outcome goals for the proposed program can be divided into short-term, medium-term, and long-term outcomes. The short-term outcomes are reduction of religious misconceptions, and increased knowledge and awareness of parents regarding vaccines and immunization schedules. The medium-term goals are to see a decrease in vaccine and an increased uptake of EPI vaccines. The long-term outcome goal is the reduction of vaccine-preventable diseases in children.

These outcome goals would be evaluated using an interrupted time series study design. In the planning phase, baseline data would be collected by Data Officers through surveys and would assess the perceptions, attitudes, knowledge, and behavior regarding vaccines. Surveys would also collect data on demographics and current vaccine services utilized, if any. The WHO cluster EPI survey sampling strategy would be used which recommends 20 clusters x 7 households coverage methodology [35]. Data would also be collected from secondary sources, namely the registry system of doses administered. This can be obtained from the Health Ministry and other organizations like GAVI which are working in Pakistan.

The survey that will be used to collect data from parents at different timepoints for analysis is called the Parental Vaccine Attitudes Scale (PVAS). PVAS is based on two subscales: the first one comprises of 10 items to measure vaccine perceptions and concerns (Cronbach alpha score of 0.95); the second one has 4 items related to vaccine preventable disease salience and community benefit (Cronbach alpha score of 0.97) [36]. Principal component analysis with eigenvalue of more than 0.3 was used for the loading of different within the subscales [36]. This scale will be used as it was developed by a Pakistani university and accounts for the unique considerations of the population.

The subscales were validated by measuring the association between the scales and the immunization status of the respondents' children. All items were rated on a 5-point Likert scale and high scores represented negative attitudes and perceptions of the parents towards childhood vaccinations.

High scores on both subscales were seen in parents of unimmunized children – such parents were 5 times and 10 times more likely to score high [36]. Thus, these subscales can assess parental attitudes towards vaccine preventable diseases and can predict vaccine acceptance among parents in Pakistan.

As mentioned, data will be collected during the planning phase before the program implementation, and once every year the project is implemented. These data points would provide with enough information to analyze the changes in desired outcomes. Annual analysis would also provide insight on whether the program is working or not – however, the data from first year of implementation would not be taken as a measure of success or failure as programs might take more than a year to be effective. Analysis of data will provide an insight into parental attitudes and perceptions regarding childhood vaccinations and the sustainability of the program. It is expected that a successful program would see lower scores on the subscales as the project progresses, signifying a positive change in the attitudes and behavior of the target population. As such, an increase in EPI vaccine uptake; a favorable change in the perceptions, attitudes, knowledge, and behavior of parents; and a decrease in vaccine refusal based on religious and cultural factors would be expected from a successful program. Furthermore, the secondary source of the registry system of administered doses would also show an increase proportional to the population needs.

To demonstrate that the outcomes are a result of the program and not due to general decline, parents will be asked about their utilization of vaccine services in the community. It is expected that over years, there would be an increase in the consumption of the services provided by the grant through Jinnah International Hospital and mosque camps. Such use of services can also be corroborated through the data collection from nurses, RMs, and mosque camps. Hence, the use of these services provided by the project would be established as the major cause of the success of outcome goals. It can be shown then that the outcomes are attributed to the program, and not because of a general decline in the health outcome overall.

### **Capacity and Experience of the Applicant Organization**

The Health Department Khyber Pakhtunkhwa (HDKPK) has the necessary experience to implement evidence-based programs on a large scale in the proposed target population, with the collaboration of several partner organizations. In 2014 HDKPK implemented the Insulin for Life Programme in partnership with Hayatabad Medical Hospitals Association in Peshawar, KPK [37]. This program caters more than 15,000 diabetes patients every year and reduces their load of complications through education and provision of insulin at subsidized costs [38]. In 2016, HDKPK also introduced the Strengthening of Rehabilitation Services for Physically Disabled, in collaboration with the Association for Rehabilitation of Physically Disabled, to increase opportunities for and enhance the status of all persons with disabilities for their total integration into the society in KPK [39]. In addition to this, we are also working with providers of vaccine supplies such as UNICEF and WHO [37].

Apart from these large-scale programs, HDKPK also implements community-based projects to promote and protect health [37]. For that purpose, we conduct Community-Based Participatory Research to identify needs of the target population and encourage decisionmakers from the community to join our team to better inform our conclusions. Hence, our work shows our leadership in preventing negative health outcomes, promoting positive development, and our clear understanding of the needs and resources in KPK. Our successful work with the community has enabled us to gain the trust and approval of the public and has increased our influence and credibility.

Our partnership with different international organizations like WHO to increase the uptake of vaccines is proof that, at an organizational level, we are committed to this issue. Furthermore, this project aligns with our mission to protect the health of the citizens of KPK through regulation, monitoring, and provision of health services [40]. Hence, while the current EPI program is working to address immunization services, we believe that this proposed program will provide a different approach to increase the rates and will focus on other significant factors that contribute to vaccine hesitancy.

As such, our organization has the necessary staff, including an experienced project manager, financial officer, vaccine procurement officer, data manager, biostatistician, communication expert, and support staff [41]. This organizational structure allows us to effectively manage our human resources, and to establish and maintain strategic relationships with our partner organizations. Furthermore, our capacity to manage financial resources is shown by an annual budget handling of around 152 million dollars, as allotted by the provincial government [42]. We also conduct annual performance system checks and publish annual reports to account for the budget and our progress as a public health department. Furthermore, we have a low turnover and can hire staff relatively quickly and have processes in place to address staffing needs.

We understand that community needs change over time and that programs should adjust accordingly. In addition to essential evaluation data, we also conduct needs assessments at regular intervals to update our understanding of community needs and priorities; this data is used to make decisions and quality improvements. For example, in our Insulin for Life Program, we noticed that some eligible Type 2 diabetes patients refused insulin and were more comfortable with oral medications. We then collected data on refusals and found out that there were misconceptions about insulin. This helped us improve our program by adding an education component to dispel such myths and allowed us to initiate dialogue with reluctant patients to secure their participation.

As an organization, we are committed in establishing strong relationships with our partner organizations and encourage a transparency policy for efficient data exchange. Our liaison and communication departments are a vital force in maintaining these links; they serve as effective channels and allow us to monitor our partner activities, while also informing them of our status through monthly reports. Apart from catering to our partners, HDKPK also has strong policies that prohibit discrimination in the provision of services based on age, race, disability, sex, color, national origin, religion, sexual

orientation, and gender identity [40]. We are an inclusive organization and strive to provide equal opportunities for all.

### **Partnerships and collaborations**

The successful implementation of this project will need certain partners and stakeholders with well-defined roles and responsibilities. In Table 3, we have identified the necessary groups from federal, provincial, and local levels to ensure inclusive representation, and have acquired letters of support from all entities. The project director will serve as the central point of contact for all communications. Transparency in data and information exchange will be encouraged and expected to develop strong relationships with partners based on mutual trust and respect. Furthermore, meetings with the partners will be held on a semi-annual basis, where the progress reports for the project will be shared.

### **Community Advisory Group**

A Community Advisory Group (CAG) will also be established to specifically address vaccine hesitancy and acceptability in the target population. The members of the group will be selected based on their expertise and their ability to contribute to the successful implementation of the project. Additionally, they will also provide insight on how to improve and address any aspects of it for effective operation. Bi-annual meetings will be held by the project director to discuss barriers to implementation, vaccine camp feasibilities, educational content, recruitment and retention of parents and vaccine staff, and other challenges. These meetings will also serve to report on project progress and to establish a communication channel with abovementioned partners and stakeholders. The Primary Investigator will reach out to recruit the members for CAG and as such, most of the individuals in Table 4 have already been contacted and have shown eagerness to be a part of CAG.

**Table 3: Stakeholders and community partnerships**

<i>Entity</i>	<i>Level</i>	<i>Description</i>	<i>Role</i>
<b>Ministry of National Health Services Regulations and Coordination</b>	Federal	A government organization committed towards helping Pakistanis maintain and improve health.	Coordinates all preventive programs in the country, national and international.
<b>EPI Pakistan</b>	Federal	The EPI cell under NHSR&C coordinates, monitors, and supervises provincial vaccination programs.	Procurement and supply of vaccines, syringes, safety boxes, and other logistics needed to vaccinate target population.
<b>Council of Islamic Ideology</b>	Federal	A constitutional body that advises the legislature whether a certain law is repugnant to Islam.	Provides religious counseling to clerics; has already issued a fatwa for vaccine acceptance and will facilitate effective dissemination.
<b>Directorate General Health Services</b>	Provincial	A provincial organization with the mission to protect and improve the health and environment for all people in Khyber Pakhtunkhwa.	Provides regulation, monitoring and provision of health services within the available resources.
<b>Jinnah International Hospital</b>	Local	An international-standard hospital that serves the main city of Abbottabad and the surrounding localities.	Provides healthcare and immunization services to the residents; will provide staff for vaccine camps in mosques and implement recall system through recall managers.
<b>Jamia Masjid Mandian, Abbottabad</b> <b>Ilyasi Mosque, Nawan Shehr</b> <b>Jame Mosque Aliabad, Aliabad</b>	Local	Large, central mosques that serve their respective areas with compulsory Friday sermons and congregational prayers.	Will provide the venue for vaccine camps; the sermons will incorporate educational content to increase vaccine acceptability and address misconceptions.
<b>Khyber News</b>	Local	News and current affairs Pashto satellite television channel in Pakistan.	Provides local news and informative programs to KPK population.
<b>GAVI Alliance</b>	International/ Non- Governmental Organizations	A global health partnership committed to increasing access to immunization in poor countries.	Provides surveillance and monitoring and have open access data on vaccinations; helps in vaccine procurement and logistics; maintains vaccine registries.
<b>UNICEF</b>		UNICEF works to provide vaccinations to every child.	
<b>WHO</b>		WHO works with health authorities in strengthening services, addressing issues and supporting research.	

**Table 4:** Community Advisory Group

<i>Name</i>	<i>Organization/Role</i>	<i>Responsibilities</i>
Dr. Sonia Sameen	EPI Pakistan; KPK District Supervisor	Vaccine procurement and other logistics; monitoring and surveillance.
Dr. Pir Fazal Abbas	Council of Islamic Ideology, Member	Point of contact with CII and will assist in creating educational material and hosting seminar with clerics.
Mr. Mudabbir Khan	District Council Abbottabad; Assistant Director	Will coordinate matters relating to secretarial functions of village and neighborhood councils in the district.
Mr. Hussain Baig	Ilyasi Mosque, Nawan Shehr; Cleric	Will provide input regarding feasibility and practicability of vaccine camps and insight into sermon content for educational purposes.
Mr. Ahsan Ahmed Khan	Jamia Masjid Mandian, Abbottabad; Cleric	
Mr. Muhammad Khan	Jame Mosque Aliabad, Aliabad; Cleric	
Mrs. Saadia Farasat	Jinnah International Hospital; Chief Nursing Officer	Represent vaccine nurses and recall managers and give insight into the challenges, and improvements for camps.
Mrs. Mariam Shinwari	Jinnah International Hospital; Nursing staff	Can provide important information about recruitment and retention of staff, and staff satisfaction with project.
Ms. Ruda Haque	Khyber News; Coordinator	Can provide target population reactions about the program and the acceptability.
Mrs. Keysa Kazmi	Community member; champion	Can provide insight into why parents refuse vaccines and can help shape the program components.

### **Project Management**

The project management plan is essential for successful management and implementation of the program. The Logic Model and the Gantt Chart in the Appendix provide a detailed view of the project activities expected to take place before and during the 3-year grant period. During the pilot period, we will critically assess our program approach to analyze program feasibility and to identify potential challenges and barriers; changes will be made to improve program components. Once, the program starts, monthly vaccine staff meetings with district project supervisors, fidelity checks, bi-monthly meetings of the project director with key staff members, and bi-annual feedback from the staff and the target audience using focused interviews will highlight areas of improvement for the program.

This will allow us to make minor changes and incorporate feedback from lessons learned – while the monthly meetings will provide us information about barriers and challenges, the bi-monthly and bi-annual feedback will give direction to our constant efforts to improve the program. The initial data from Year 1 will also inform us of the effectiveness of our communication system, and if there is a need to hire more staff. By the end of Year 1, we expect to have sorted out the minor kinks in our project management and to stabilize the project for smooth operations through Years 2 and 3.

The table below describes the project management staff and their responsibilities. Our team will have the necessary expertise and experience to successfully implement all project activities and accomplish set objectives. All staff will be selected on the basis of their experience in implementing evidence-based programs, their ability to work in a diverse team and with various partners and stakeholders, and their expertise for the applied position. Additionally, the project team will be offered highly competitive salaries and will have the opportunity to participate in professional development trainings to ensure minimum turnover and a well-trained staff.

### Team Responsibilities

**Table 5:** Roles and responsibilities

<i>Role</i>	<i>Responsibilities</i>
<b>Primary Investigator</b>	<ol style="list-style-type: none"> <li>1) Secure approval from NHR&amp;C</li> <li>2) Have final authority for all decisions</li> <li>3) Review progress reports to ensure that goals are being met, as per sponsor guidelines</li> <li>4) Oversee hiring process for key project staff</li> <li>5) Establish partnerships with key partners and stakeholders</li> <li>6) Establish collaboration with CAG</li> </ol>
<b>Project Director</b>	<ol style="list-style-type: none"> <li>1) Develop, monitor, and make any necessary changes to program components for successful implementation, including budget, research design, evaluation, data collection, recruitment strategies, and other administrative activities.</li> <li>2) Identify and hire other project staff</li> <li>3) Supervise all project staff</li> <li>4) Ensure that all staff has received relevant training</li> <li>5) Assess professional development needs and provide annual professional development opportunities for staff, as necessary</li> <li>6) Disseminate information to partners, stakeholders, and CAG through bi-annual meetings</li> </ol>



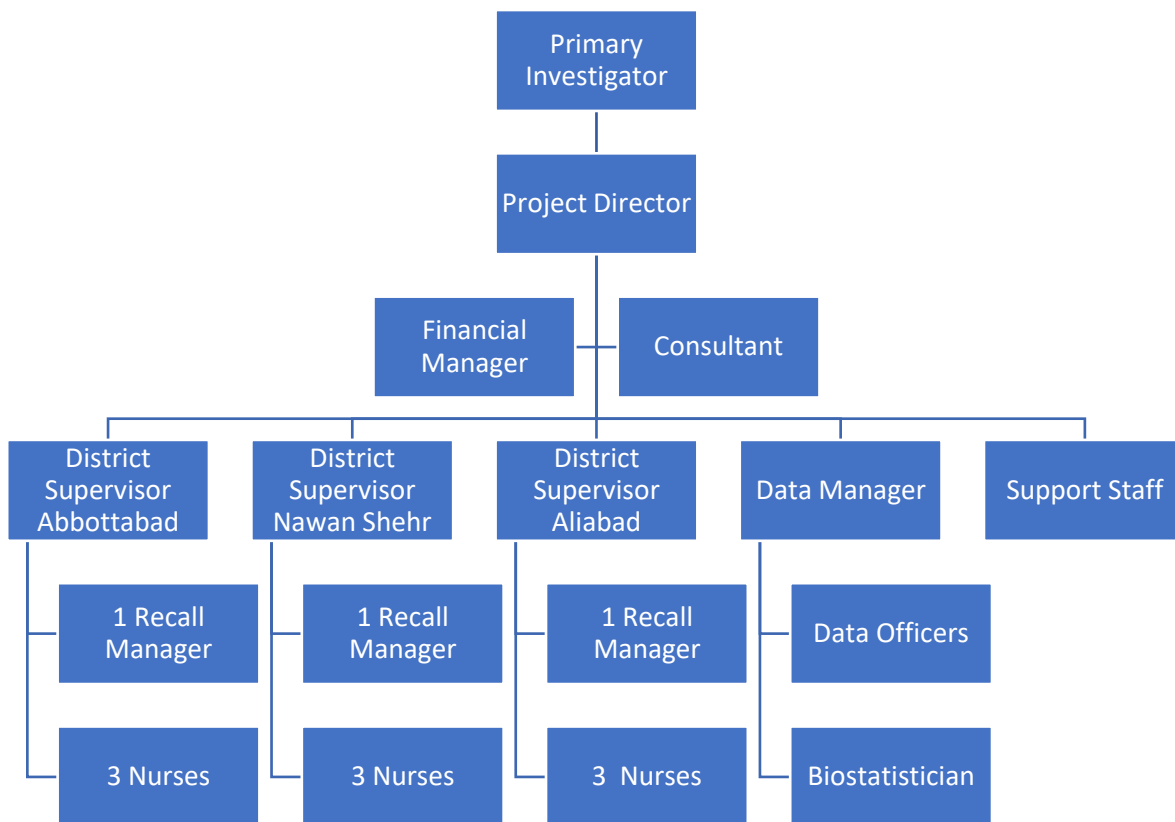
	<ul style="list-style-type: none"> <li>7) Assess staff and participant feedback on bi-annual basis</li> <li>8) Responsible for all day-to-day management of the program</li> <li>9) Oversee implementation and evaluation of program</li> <li>10) Monthly meetings with key staff members</li> </ul>
<b>Financial Manager</b>	<ul style="list-style-type: none"> <li>1) Responsibly manage budget and accounting system</li> <li>2) Timely payment of wages, reimbursements, and incentives</li> <li>3) Publishing monthly reports of expenditures</li> <li>4) Oversee supplies transactions by support staff</li> </ul>
<b>Consultant</b>	<ul style="list-style-type: none"> <li>1) WHO consultant to provide training sessions and materials</li> </ul>
<b>District Supervisor</b>	<ul style="list-style-type: none"> <li>1) Hold monthly meetings with district vaccine staff and clerics</li> <li>2) Collect completed logbooks and distribute new ones</li> <li>3) Provide immunization cards, when needed</li> <li>4) Point of contact for vaccine staff and clerics</li> <li>5) Publish monthly reports of progress</li> <li>6) Perform data checks on completed logbooks</li> </ul>
<b>Recall Manager</b>	<ul style="list-style-type: none"> <li>1) Collect information on new births and record parent information</li> <li>2) Distribute immunization cards to new parents</li> <li>3) Communicate with parents to explain vaccine schedule and need</li> <li>4) Call parents to remind them when a vaccine is due</li> <li>5) Coordinate with nurses to set vaccine appointments</li> <li>6) Use logbooks to record information on individual vaccine progress, vaccine refusal, and participant</li> <li>7) Attend monthly meetings with district supervisors</li> <li>8) Participate in bi-annual feedback through focused group interviews</li> </ul>
<b>Nurse</b>	<ul style="list-style-type: none"> <li>1) Provide vaccinations to children</li> <li>2) Distribute and complete immunization cards</li> <li>3) Attend mosque vaccine camps at least once a month</li> <li>4) Use logbooks to record parent and child data</li> <li>5) Communicate with parents to explain vaccine schedule and need</li> <li>6) Use logbooks to record information on individual vaccine progress, vaccine refusal, and participant</li> <li>7) Attend monthly meetings with district supervisors</li> <li>8) Participate in bi-annual feedback through focused group interviews</li> </ul>
<b>Data Manager</b>	<ul style="list-style-type: none"> <li>1) Oversee data collection and analysis</li> <li>2) Store and organize data and ensure data security</li> <li>3) Publish data reports on a bi-annual basis to comply with grant</li> </ul>
<b>Data Officer</b>	<ul style="list-style-type: none"> <li>1) Collect baseline data, and yearly data after implementation</li> <li>2) Collect data to evaluate effectiveness of training sessions</li> <li>3) Collect data using VAS to assess vaccination attitudes in recruits</li> <li>4) Collect data from District Supervisors on monthly basis</li> <li>5) Conduct focused interviews with vaccine staff and participants (6 months)</li> <li>6) Data collection on Fridays in mosques for participant data</li> <li>7) Fidelity checks using random observations in mosques, and for interpersonal communication by nurses and RMs with parents (3 months)</li> <li>8) Data entry in system</li> </ul>

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<b>Biostatistician</b>	<ol style="list-style-type: none"> <li>1) Develop study design</li> <li>2) Conduct sample size and power calculations</li> <li>3) Perform data analysis</li> <li>4) Provide data interpretation, as needed</li> </ol>
<b>Support Staff</b>	<ol style="list-style-type: none"> <li>1) Designing and publication of logbooks, immunization cards, and information packets</li> <li>2) Coordinating and organizing training sessions and CII seminars</li> <li>3) Providing support for administrative activities by acting as communication channels between different departments</li> <li>4) Purchasing of supplies</li> </ol>

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The organization chart below for project management highlights the hierarchy for better understanding.



**Figure 1.** Project management organization chart for Teeka Tehreek

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**Budget and Budget Justification****Personnel**

<i>Position</i>	<i>Annual Salary</i>	<i>%FTE</i>	<i>Salary</i>	<i>Fringe</i>	<i>Salary Requested</i>	<i>Total</i>
Primary Investigator	\$15,000	15%	\$2,250	\$675	\$2,925	\$15,157
	\$15,450	30%	\$4,635	\$1,391	\$6,026	
	\$15,914	30%	\$4,774	\$1,432	\$6,206	
Project Director	\$11,500	75%	\$8,625	\$2,588	\$11,213	\$37,036
	\$11,845	75%	\$8,884	\$2,665	\$11,549	
	\$12,200	90%	\$10,980	\$3,294	\$14,274	
Financial Manager	\$8,000	50%	\$4,000	\$1,200	\$5,200	\$16,073
	\$8,240	50%	\$4,120	\$1,236	\$5,356	
	\$8,487	50%	\$4,244	\$1,273	\$5,517	
District Supervisor (x3)	\$5,640	50%	\$2,820	\$846	\$10,998	\$43,192
	\$5,809	70%	\$4,066	\$1,220	\$15,859	
	\$5,983	70%	\$4,188	\$1,257	\$16,335	
Recall Manager (x3)	\$3,800	100%	\$3,800	\$1,140	\$14,820	\$45,808
	\$3,914	100%	\$3,914	\$1,174	\$15,265	
	\$4,031	100%	\$4,031	\$1,209	\$15,723	
Nurse (x9)	\$4,920	15%	\$738	\$221	\$8,635	\$26,689
	\$5,068	15%	\$760	\$228	\$8,894	
	\$5,220	15%	\$783	\$235	\$9,160	
Data Manager	\$7,800	50%	\$3,900	\$1,170	\$5,070	\$17,822
	\$8,034	50%	\$4,017	\$1,205	\$5,222	
	\$8,275	70%	\$5,793	\$1,738	\$7,530	
Biostatistician	\$6,000	40%	\$2,400	\$720	\$3,120	\$12,307
	\$6,180	40%	\$2,472	\$742	\$3,214	
	\$6,365	70%	\$4,456	\$1,337	\$5,973	
Data Officer (x6)	\$3,000	80%	\$2,400	\$720	\$18,720	\$53,041
	\$3,090	60%	\$1,854	\$556	\$14,461	
	\$3,183	80%	\$2,546	\$764	\$19,860	
Support Staff (x3)	\$2,400	80%	\$1,920	\$576	\$7,488	\$21,188
	\$2,472	70%	\$1,730	\$519	\$6,749	
	\$2,546	70%	\$1,782	\$535	\$6,951	
Consultant for 2 sessions (Year 1)						\$600
<b>Total for Year 1</b>						<b>\$88,788</b>
<b>Total for Year 2</b>						<b>\$92,593</b>
<b>Total for Year 3</b>						<b>\$107,349</b>

The bulk of the budget will be spent on the salaries of the project management staff and personnel. These costs were calculated based on the current market salaries and their time contribution. An annual increase of 3% has been included in the calculations. Furthermore, fringe benefits were calculated as 30% of the payable amount, as per the regulations in Pakistan.

***Dr. Ali Imran, MBBS, MPH; Primary Investigator (15%/30%/30%)***

Dr. Imran is the director of the Health Department Khyber Pakhtunkhwa (HDKPK) and will contribute 15% FTE during Year 1 and then 30% for the rest of the project. Dr. Imran has served as the director of HDKPK for 19 years and has successfully implemented many evidence-based programs in the community. He has strong network connections and his excellent rapport with the Ministry of National Health Services Regulations and Coordination will help in getting approval from the government for this project. He will be responsible for reviewing progress reports to ensure that goals are being met and will be the key figure in establishing partnerships with key stakeholder and CAG. He will also be the final authority on decisions and will oversee the hiring process for key project staff.

***Dr. Safdar Saeed, DrPH; Project Director (75%/75%/90%)***

Dr. Saeed will contribute 75% FTE for the first two years, and 90% in the last year. He has been a part of HDKPK for the past 10 years and have coordinated many projects implemented by the health department. He will be responsible for developing, monitoring, and making any necessary changes to program components for successful implementation. He will overlook budget, research design, evaluation, data collection, recruitment strategies, and other administrative activities. He will be responsible for hiring and supervising all other project staff and ensure their training. He will be the focal point of contact to disseminate information to partners, stakeholders, and CAG through bi-annual meetings. He will also assess staff and participant feedback bi-annually and identify areas of program improvement. He will also meet with key staff members monthly and address rising issues, supervise

day-to-day management, and oversee implementation and evaluation of the program. Dr. Saeed will also travel to Washington D.C. once every year of the grant period to attend Project Director's Meeting.

***Mr. Tanveer Ashraf, MBA; Financial Manager (50%/50%/50%)***

Mr. Ashraf has 10-year work experience with HDKPK and will work 50% FTE for the duration of the project. He will be responsible for managing the budget and accounting system, and for the timely payment of wages, reimbursements, and incentives. He will also oversee supplies transactions by support staff and will publish monthly expenditure reports to share with the project director during meetings.

***Mr. Tahir Khan, MSc.; Data Manager (50%/50%/70%)***

Mr. Khan will work 50% FTE for the first two years and 70% for the last. He has 7 years of work experience with the HDKPK. He will oversee data collection and analysis by coordinating efforts, store and organize data while ensuring data privacy, and will publish data reports on bi-annual basis to comply with the grant.

***Ms. Saliha Safdar, MPH; Biostatistician (40%/40%/70%)***

Ms. Safdar will work 40% FTE for the first two years and 70% for the last. She has 5 years of work experience with the HDKPK in the capacity of a biostatistician. She will be responsible for developing the study design, conducting sample size and power calculations, performing data analysis, and providing data interpretation, as needed.

***Data Officers, BS (80%/60%/80%)***

Six data officers will be hired and will be expected to contribute 80% FTE in Year 1, 60% in Year 2, and 80% in Year 3. Two officers will be assigned to one of the three districts – Abbottabad, Nawan Shehr, and Aliabad. They will be responsible for data collection, including baseline data and yearly data after implementation. They will also collect evaluation data on training sessions and will be responsible



for performing fidelity checks every 3 months. Additionally, they will conduct focused interviews with staff and participants every 6 months to collect feedback. They will also do data entry, as required.

***District Supervisors, BS (50%/70%/70%)***

Three district supervisors with relevant work experience and qualifications will be hired and expected to contribute 50% of FTE in Year 1 and 70% for the other two. Each will be responsible for one of the three districts – Abbottabad, Nawan Shehr, and Aliabad. They will hold monthly meetings with the district vaccine staff and clerics and oversee implementation by acting as a point of contact. They will distribute logbooks and immunization cards, when needed, and will collect completed logbooks. They will be responsible for performing data checks on completed logbooks to assure data validity, and to pass it on to the Data Officers. They will also publish monthly reports of progress.

***Recall Managers, BS (100%)***

Three recall managers will be hired and give 100% FTE for all three years and will be assigned to one of the three districts. They will be responsible for collecting information on new births and record parent information, distributing immunization cards, communicating with parents to explain vaccine schedule and need, calling parents for vaccine reminders, coordinating with nurses to set vaccine appointments, and using logbooks to record information. They will attend monthly meetings with district supervisors and will participate in bi-annual feedback through focused group interviews.

***Nurses, BSN/RN (15%/15%/15%)***

Nine nurses from the Jinnah International Hospital will be selected and will contribute 15% FTE. Three nurses will be assigned to each district. They will be responsible for attending monthly mosque vaccine camps and will provide vaccinations to children. They will also distribute and complete immunization cards and will use logbooks to record data. Additionally, they will communicate with parents to explain vaccine benefits and schedule, attend monthly meetings with district supervisor, and participate in bi-annual feedback through focused group interviews.

**Support Staff, Intermediate (80%/70%/70%)**

Three support staff will be hired to provide 80% FTE in Year 1 and 70% in Year 2 and 3. They will be responsible for designing and publication of logbooks, immunization cards, and information packets. They will also coordinate and organize training sessions and CII seminar, and will be expected to provide support for administrative activities. Their major task will be purchasing and maintaining supplies.

**Consultant, WHO (2 training sessions)**

A WHO consultant will be asked to provide 2 training sessions – one for the nurses and RMs and the other for the clerics. They will be asked to provide the training materials, and WHO guidelines regarding vaccination.

**Supplies**

<i>Item</i>	<i>Unit Cost</i>	<i>Number needed</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
<b>Vaccine Administration and Recall System</b>					
Needles	\$0.05	32,500	\$1,625	\$1,625	\$1,625
Gloves	\$0.09	65,000	\$5,850	\$5,850	\$5,850
Band-Aids	\$0.05	32,500	\$1,625	\$1,625	\$1,625
Alcohol swabs	\$0.02	32,500	\$650	\$650	\$650
Cotton balls	\$0.01	32,500	\$325	\$325	\$325
Hand sanitizer	\$2	36	\$72	\$72	\$72
Immunization cards	\$0.05	6910	\$345	\$345	\$345
Logbooks	\$1	144	\$144	\$144	\$144
Vaccine travel box	\$60	9	\$540	-	-
Sharps disposal	\$13	9	\$117	-	-
Travel vouchers	\$7	108	\$756	\$756	\$756
Phones	\$160	3	\$480	-	-
Call plan	\$20	36	\$720	\$720	\$720
<b>Training and CII seminar</b>					
Travel reimbursement	\$7	2	\$14	-	-
Food	\$13	25	\$325	-	-
Printed materials	\$0.05	25	\$1.25	\$1.25	\$1.25
<b>Data Collection and incentives</b>					
iPads	\$400	6	\$2,400	-	-
Focus group incentive	\$10	72	\$720	\$720	\$720
Mosque	\$500	3	\$1,500	\$1,500	\$1,500
Hospital	\$1,500	1	\$1,500	\$1,500	\$1,500
<b>Total</b>			<b>\$19,610</b>	<b>\$15,834</b>	<b>\$15,834</b>

We will need 32,500 needles every year to fulfill the vaccination needs in the mosque camps – vaccination supplies needs are not calculated for children served in the hospital as they will come under hospital management and their services. As per the calculations, an estimated 2500 children will be served every year by the mosque camps. Each child needs 13 vaccines, so  $2500 \times 13 = 32,500$  needles every year. The same number (32,500) is needed for band-aids, cotton balls, and alcohol swabs. Similarly, a double of that number will provide us with a need of 65,000 gloves every year for mosque camps. We will need hand sanitizers as well – since there are 12 camps in a year at three locations, we will need  $12 \times 3 = 36$  sanitizers every year. For immunization cards, as per the birth rate, 6910 children will be born every year in the target population; we will need as many immunization cards. For logbooks, all 9 nurses and 3 recall managers will be given one for every month, so  $12 \times 12 = 144$  logbooks every year will be required. As a one-time purchase, vaccine travel boxes will be needed for all 9 nurses, as well as their own Sharps container for safe disposal. They will be responsible for these supplies and will maintain them for the 3-year grant period. Nurses will also be provided travel reimbursement vouchers for \$7 for every camp, so  $9 \text{ nurses} \times 12 \text{ camps} = 108$  reimbursement vouchers every year.

For recall managers, all 3 of them will be provided phones as a one-time purchase to last them for 3 years. They will also be provided with a call plan every month and with 3 recall managers,  $3 \times 12 = 36$  call plans will be needed every year. Furthermore, 6 iPads will also be purchased in the first year for Data Officers to assist them in data collection.

For trainings and seminar, \$7 travel reimbursement vouchers will be provided for the two clerics from Nawan Shehr and Aliabad that will come to Abbottabad. Food will also be provided for 25 people: 3 clerics, 3 recall managers, 9 nurses, one training consultant, one CII member, and 8 members of the project staff (4 for seminar, 4 for training session). Furthermore, printed training and information materials will also be provided for all 3 years, in case of updated information. For focus groups with worshippers every 6 months, \$10 incentives will be provided. As such, a focus group of 12 people from

all 3 settings will be selected, so  $12 \times 3 = 36$  people – each year it will be done twice, so  $36 \times 2 = 72$  \$10 incentive vouchers every year for focus group participants. It should be noted that for training sessions and focus group interviews, no costs will be rendered for place as these will take place within the HDKPK conference room, the mosque or at Jinnah International Hospital auditorium. Finally, all 3 mosques will be given \$500 every year as an incentive bonus for participating in the program and for hosting 12 vaccine camps. If the camps are less than 11, they will not be given any incentives. The hospital will also be given \$1500 per year for their participation.

### Travel

<i>Category</i>	<i>Unit cost</i>	<i>Number needed</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
<b>International travel</b>					
Airfare	\$1,000	1	\$1,000	\$1,000	\$1,000
Lodging	\$400	1	\$400	\$400	\$400
Per diem	\$76	3	\$228	\$228	\$228
<b>Local travel</b>					
Mileage	\$130	3	-	\$390	\$390
Overnight	\$30	3	-	\$90	\$90
Per diem	\$15	3	-	\$45	\$45
<b>Total</b>			<b>\$1,628</b>	<b>\$2,153</b>	<b>\$2,153</b>

The project director will need to travel to Washington D.C. every year for the annual Project Director's Meeting. This will be in compliance with the grant and will provide an opportunity to present preliminary findings of our program implementation and success. We will also send 3 staff members to an annual regional meeting in Islamabad in Years 2 and 3 for further professional development and increased dissemination of our results.

### Total for each year

<i>Year</i>	<i>Personnel</i>	<i>Supplies</i>	<i>Travel</i>	<i>Total</i>
Year 1	\$88,788	\$19,610	\$1,628	<b>\$110,026</b>
Year 2	\$92,593	\$15,834	\$2,153	<b>\$110,580</b>
Year 3	\$107,349	\$15,834	\$2,153	<b>\$125,336</b>

### Teeka Tehreek: Increasing EPI Vaccinations in KPK, Pakistan Logic Model

Inputs	Activities	Outputs	Outcomes -- Impact		
			Short	Medium	Long
<ol style="list-style-type: none"> <li>1. Funding</li> <li>2. Nurses</li> <li>3. Religious clerics</li> <li>4. Council of Islamic Ideology</li> <li>5. Mosques: Jamia Masjid Mandian, Ilyasi Masjid, Jame Mosque Aliabad</li> <li>6. Recall Managers (RMs)</li> <li>7. Data collectors</li> <li>8. Project Manager</li> <li>9. Project Staff</li> <li>10. Contact information material for nurses</li> <li>11. Health Ministry cooperation</li> <li>12. Equipment to carry vaccines</li> <li>13. Logbooks for nurses and RMs</li> <li>14. Information material for CII and clerics</li> <li>15. Immunization cards</li> <li>16. Information material for RMs and nurses</li> <li>17. Training session for nurses and RMs</li> <li>18. EPI Vaccines and related material</li> <li>19. District supervisors</li> <li>20. Data from secondary sources</li> <li>21. Community Advisory Group</li> </ol>	<ol style="list-style-type: none"> <li>1. Training session for nurses and RMs to improve communication skills and knowledge</li> <li>2. CII seminar for clerics to disseminate information about religious misconceptions and educate them on vaccines</li> <li>3. Clerics using sermons to propagate CII's message</li> <li>4. Mosque camps by nurses</li> <li>5. Contact info of district supervisors distributed to clerics coordinate efforts</li> <li>6. Clerics hosting one vaccine camp/month</li> <li>7. RMs recalling parents for vaccine appts</li> <li>8. RMs coordinating with mosque camps and nurses to facilitate parents</li> <li>9. Distribution of immunization cards at every facility, if first vaccine</li> <li>11. Checking existing Immunization cards for coordination</li> <li>12. Nurse and RM logbooks to keep records</li> <li>13. Data collection and analysis</li> <li>14. Monthly meetings among vaccine staff for logistics and performance reviews</li> <li>15. Data collection for Friday sermons</li> <li>16. Bi-annual feedback from staff and participants</li> </ol>	<ol style="list-style-type: none"> <li>1. Number of participants in training session</li> <li>2. Number of participants in CII event</li> <li>3. Number of mosque camp visits by nurses</li> <li>4. Number of completed immunizations by nurses</li> <li>5. Number of vaccines by nurses</li> <li>6. Number of camps organized by mosques</li> <li>7. Number of participants in mosque camps</li> <li>8. Numbers served by gender and ethnicity at each setting</li> <li>9. Number of Immunization cards distributed per setting</li> <li>10. Number of completed Immunization cards</li> <li>11. Number of referrals made by RMs to camps</li> <li>12. Number of calls made by RMs</li> <li>13. Number of focused groups and participants</li> <li>14. Number of logbooks completed and collected</li> </ol>	<p>Removal of religious misconceptions</p> <p>Increased knowledge of parents regarding vaccines</p> <p>Increased awareness of parents regarding vaccine schedules</p> <p>Increased facilitation for vaccine uptake</p>	<p>Decrease in vaccine refusals on basis of religious reasons</p> <p>Decrease in vaccine hesitancy</p> <p>Increase in EPI vaccine uptake</p> <p>Positive change in attitudes and behavior towards vaccines</p>	<p>Decrease in vaccine-preventable infectious diseases in children</p>

#### Assumptions

Nurses, RMs, and clerics are available and eager to participate in the program. Recruitment strategies are effective. The Jinnah International Hospital data for registered births is integrated. UNICEF and Govt. are providing free vaccines, as per current situation.

#### External Factors

Other vaccine programs by GAVI, UNICEF, etc. – immunization cards for coordination

### Program Gantt Chart

## Teeka Tehreek (Vaccine Movement) in KPK, Pakistan

Health Department KPK

Project Start: Jan-21

