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Indonesia: Lessons Learned in Cold Chain and Vaccine Management

Intensification of Avian Influenza Poultry Vaccination Program, 2009-2010

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Abstract
The objective of this report is to document the background, methodology, challenges, and lessons learned from the Intensification of Avian Influenza Poultry Vaccination (InVac) program implemented by the Ministry of Agriculture (MOA), Directorate of Animal Health (DAH), with financial and technical assistance from the United Nations Food and Agriculture Organization (FAO) and the U.S. Agency for International Development (USAID) from October 2009 to May 2010. InVac was a follow on to the earlier Operations Research (OR) activity and was focused on improving cold chain and vaccine management primarily on small-scale sector-3 layer farms and intensive native chicken farms within 10 districts, and at selected Animal Health Centers (AHCs) at the sub-district level. The purpose of InVac was to promote a role for the AHCs in the implementation of vaccine strategies and programs within the poultry farm community, and to strengthen the lower levels of the supply chain based on weaknesses identified during the OR activity. It is expected that this information will assist the MOA as it plans and implements increasingly robust poultry vaccination programs in the future.

Cover photo: Upper left: Unpacking a vaccine shipment from the vaccine manufacturer. Upper right: District staff operating the incinerator. Bottom left: Stock management system exercise. Bottom right: Vaccine arrangement practice in the cold room.

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Acronyms

AHC	animal health center
AI	avian influenza
CMU	Campaign Management Unit
DAH	Directorate of Animal Health
EEFO	earliest expiry, first out
FAO	Food and Agriculture Organization
HPAI	highly pathogenic avian influenza
ILRI	International Livestock Research Institute
InVac	intensification of avian influenza poultry vaccination program
KVM	district vaccinator coordinator
LDCC	local disease control center
M&S	monitoring and supervision
MOA	Ministry of Agriculture
ND	Newcastle disease
OR	Operational Research Study on Avian Influenza Poultry Vaccination
USAID	U.S. Agency for International Development
WHO	World Health Organization

Executive Summary

In October 2008, the Indonesian Ministry of Agriculture (MOA), with funding from the World Bank and the U.S. Agency for International Development (USAID), and technical assistance from the Food and Agriculture Organization (FAO) and the International Livestock Research Institute (ILRI), began a one-year Operational Research Study on Avian Influenza Poultry Vaccination (OR) in 16 districts of West Java, Central Java, and Yogyakarta provinces. The USAID | DELIVER PROJECT also participated at the request of USAID, providing assistance for commodity procurement and vaccine cold chain management.

The OR's scientific focus was the implications of viral dynamics for determining optimal vaccination strategies. Indeed, there were significant findings that induced the Directorate General of Animal Health to issue a decree in September 2009 providing up-to-date guidance on avian influenza (AI) vaccine characteristics and vaccination strategies for Indonesia.

The OR had also provided an opportunity to introduce and monitor cold chain and vaccine management practices that were suitable for supporting large-scale poultry vaccination programs. MOA staff who observed the progress of the overall activity did not just narrowly focus on the scientific results, but also took great interest in the cold chain requirements for successful vaccination programs. As a result, the September 2009 decree also included the directive, "To maintain vaccine quality, proper cold chain management should be applied from manufacturer right down to application in the field."

Upon completion of the original OR activity, substantial stocks of vaccines remained, as did the district-level cold chain equipment in the 16 study districts. This provided an opportunity to continue with both the scientific and cold chain/vaccine management work without incurring some of the major program start-up costs. The follow-on activity, called the Intensification of Avian Influenza Poultry Vaccination (InVac) program worked in 10 of the 16 original OR districts.

In collaboration with FAO, USAID, and the USAID | DELIVER PROJECT, the Directorate of Animal Health of the MOA employed a "targeted" vaccination approach for InVac focusing on small-scale sector-3 layer farms and intensive native chicken farms. This was the opposite approach used in the OR: mass vaccination and a policy decision based on the finding of the OR. In another change from the OR activity, selected animal health centers (AHCs), that is, government owned subdistrict facilities, were incorporated into the InVac program implementation and vaccine distribution systems. The MOA took this step in part to better institutionalize the vaccination program, and in part to promote wider acceptance of the AHCs among the poultry farm community. A total of 23 AHCs in the 10 districts were included the InVac activity.

For InVac, as with the OR activity, USAID provided funding for commodity support and technical assistance through the USAID | DELIVER PROJECT. The commodity support included vaccine and cold chain equipment. It also included expendable supplies such as needles and sharps boxes. The technical assistance included supply chain system design, training for system operations, and monitoring and supervision (M&S). The project also supported refurbishing an existing walk-in cold room in Yogyakarta Provincial Agriculture Office for province vaccine storage.

After training took place, InVac used the monthly monitoring and supervision visits to both measure progress in the implementation of the new system, and to reinforce good practices. M&S

teams used a checklist to record the correct or incorrect performance of specific system routines. Visits to district-level animal health offices took place monthly, with visits to the AHCs being less frequent, approximately every other month. The measures taken on the first visits became the baseline to compare against the standard procedures that were trained. At the end of six months, the M&S team compared the standards and the results of the first with most recent visits.

Table 1. Monitoring and Evaluation Indicators

District Animal Health Offices	AHCs
• Refrigerator temperatures recorded • Use of thermometer and temperature monitoring indicators understood • Vaccines arranged correctly for top-loading ice-lined refrigerators • Batch cards in use • Bundling of expendable supplies is observed • Vaccine replenishment topping up strategy in use.	• Correctly modified domestic refrigerators in use • Refrigerator temperatures recorded • Use of thermometer and temperature monitoring indicators understood • Vaccines arranged correctly for front-loading refrigerators • Batch cards in use.

Because the cold chain system elements were not present in the wider national universe of district and AHC sites, the use of a control group was attempted; no claims of statistical significance are made. Nevertheless, analysis of M&S results indicate that general improvement in the quality of cold chain and vaccine management occurred at most sites. The following table summarizes results for all indicators and sites.

Table 2. Average Percent of Correct Application of Vaccine and Cold Chain Management Routines for All Sites

District Animal Health Offices		Subdistrict AHCs	
First Visit	**Last Visit**	**First Visit**	**Last Visit**
87%	93%	36%	77%

The improvements for the subdistrict AHCs are much greater for the AHCs than for the district animal health offices. This is because before the InVac activity, the district level had been included in the OR activity. Because of this, staff at these sites were already familiar with many of the new supply chain routines. The InVac vaccine and cold chain management practices were, however, entirely new to the AHC staff, which accounts for the greater degree of measured improvement from the start of InVac. The data also show that, while all but one district were performing well by the time of the last supervisory visit, there was much more variation across the 23 AHCs. About half of them did not rise to the 80 percent level of compliance to system routines (80 percent being the threshold of acceptable performance).

Another measured result concerns the percent of vaccines discarded due to damage incurred during or transport. During the OR activity, the measures were 1.7 percent of 359,000 doses of AI vaccine and 1 percent of 112,300 doses of Newcastle disease vaccine.

As noted previously, from a supply chain management perspective, one of the most important results of the OR activity was that it brought home to senior MOA staff the importance of good cold chain and vaccine management for animal health programs. This has been made clear by the September 2009 government national decree.

InVac provided an opportunity to capitalize on this heightened level of interest and knowledge. During the InVac planning stage, the MOA requested assistance from USAID for wider dissemination of proper cold chain information through training of national master cold chain trainers. The USAID | DELIVER PROJECT, with staff from partner organization PATH taking the lead, prepared a competency-based adult learning and participatory "Training of Trainers" program. A central cold chain master trainer team for training vaccination program implementers on supply chain management has been established and is expected to be deployed as needed to provincial and district areas as funding becomes available. This team has already been used to build provincial and district cold chain capacity in Bali to support a rabies vaccination program.

Though donor funding support for InVac ended in May 2010, the MOA expects to continue the poultry vaccination activities as part of the AI prevention program. We believe that there are important lessons learned from the InVac that stakeholders should take into account as funds become available and this work goes forward. Those lessons include the following:

- While the MOA may determine a national AI vaccination policy and provide vaccines, the long-term costs of supporting implementation will be borne by the districts. The organization and resources for maintaining a poultry vaccination program are not uniform across all districts. Time and effort will be required up front to advocate the need for program implementation and determine the best steps forward for each district, focusing on "best practices."
- InVac's relative success in cold chain management has resulted from paying attention to a range of factors. Those factors include commitment from upper-level district decision-makers; competent staff in place within implementing units; regular M&S; good quality cold chain equipment; availability of all required expendable supplies, including temperature monitors; and commitment to fund these elements. Good results will not follow from paying attention to some of these factors while ignoring others.
- To illustrate the preceding point, there is a widespread tendency to regard training as an end point of implementation and to equate that with the fact that training has taken place with good performance thereafter. Training is a "down payment" activity that must be followed by effective monitoring and supportive supervision in order to produce an appropriate return on investment.
- Even when all elements are receiving attention and M&S is in place, it still takes time to achieve and maintain good results.
- Bringing about a sense of ownership among decision-makers at national and local levels has been key to producing results at operational levels. This was accomplished in part when Campaign Management Unit (CMU) staff observed good cold chain management and decided to make it their own goal. It was also accomplished by including decision-makers in InVac's supervisory activities so that they could see firsthand both the challenges and good results of the visits.
- Achieving sustainability is a complicated undertaking. The OR activity began with no plan for cold chain sustainability. Nevertheless, the system improvements it brought along attracted the

attention of central Ministry of Health decision-makers and produced one element: a policy commitment. InVac provided an opportunity to produce another element: an operational model that enables line staff to show good results. Yet much remains to be done. For example, there needs to be an ongoing advocacy effort to consolidate ownership at local levels and squeeze out the required budgetary support.

There are also important issues that InVac has not addressed. What took place through InVac provides a model for the public sector segments of poultry vaccination activities. With most poultry actually raised by private sector commercial operations of various sizes, work at all levels needs to take place to define how M&S of both cold chain and vaccine management, and vaccination practices, may be extended to such critical private sector components as poultry shops and poultry farms. Proper disposal of used vaccination program waste is also an issue. While addressing these issues may wait while improvement of capacity in the public sector takes place, they are key to long-term success on a large scale.

Background

Since the first detection in Indonesia in mid-2004, highly pathogenic avian influenza (HPAI) has been a major focus of activity by national and international institutions. In 2008, the Ministry of Agriculture (MOA) and its development partners began a one-year Operational Research Activity on Avian Influenza Poultry Vaccination (OR). That activity covered16 districts of three provinces: West Java, Central Java, and Yogyakarta. The project was a collaborative effort between several institutions: the MOA, the Food and Agriculture Organization (FAO), the International Livestock Research Institute, and the U.S. Agency for International Development (USAID).

USAID made its contribution through the USAID | DELIVER PROJECT. Most visibly, USAID provided the vaccine, cold chain equipment and devices, injection devices, waste management supplies, and other supplies required to implement the activity. Initially, there was not an expectation that technical assistance would play a large role. Early on, however, it became clear that existing district cold chain equipment and personnel would be overwhelmed by the impending deluge of vaccines. They would be coming in far greater volumes than the system normally handled. Consequently, USAID directed the USAID | DELIVER PROJECT to provide technical assistance for training, and for routine cold chain and vaccine management monitoring and supervision (M&S) in the field. Indonesia-based PATH staff played a central role in this work.

The OR activity lasted one year, terminating in August 2009. The results were much appreciated by the MOA, and the Director General put forward a decree in September that outlined new expectations for future vaccination program strategies and cold chain management. At this time, there were still available significant quantities of avian influenza (AI) vaccine and technical assistance resources. The Intensification of Avian Influenza Poultry Vaccination (InVac) program used the same AI and Newcastle disease (ND) vaccines used in the OR. This included 7.835 million doses of AI and 3.547 million doses of ND vaccine and diluents remaining from the OR activity.

Accordingly, the MOA's Directorate of Animal Health (DAH) approved a follow-on activity: InVac. Within the DAH, the Campaign Management Unit (CMU) was the lead implementor. As with the OR activity, FAO and USAID (through the USAID | DELIVER PROJECT) were the main international partners.

The InVac program uses not only the same vaccines, but also the same equipment and the same district-level coordinators. InVac employs a targeted vaccination approach to focus primarily on small-scale sector-3 layer farms and intensive native chicken farms.

The OR activity had covered 16 districts for one year, and based on the resources in hand, the partners designed InVac to cover 10 of the original 16 districts for six months. From a supply chain management perspective, InVac was not just a cut down version of the OR. In an important change, the MOA also decided to incorporate selected existing animal health centers (AHCs) in certain subdistricts as part of the vaccine distribution chain. The motives for this were to:

- Promote a role for the AHCs in the implementation of vaccine strategies and programs within the poultry farm community

- Strengthen the lower levels of the supply chain, which the OR activity has revealed as the weakest links in the supply chain.

Donor funding for InVac ended in May 2010. This poultry vaccination activity, however, is expected to continue as part of the routine programs at the district livestock offices to ensure continuous protection from AI. The MOA is seeking ways to maintain an uninterrupted poultry vaccination program, as well as to improve the cold chain aspect of the existing program based on the OR and InVac experience.

In this light, the objective of this report is to provide information on the InVac supply chain–related activities. This includes the successes, the challenges, and lessons learned for the future. It is expected that this information will assist the MOA as it plans and implements increasingly robust poultry vaccination programs in the future.

InVac Program Details

The InVac program started in October 2009. The following section provides additional detail to supplement the previous overview.

Goal

To control and prevent AI infection among poultry in high-risk areas of Indonesia in follow-up to the OR.

Objectives

1. To implement AI poultry vaccination in high-risk areas in parallel with other control measures such as culling and biosecurity
2. To pilot a poultry vaccination program with good vaccination procedures prior to replication to other provinces
3. To implement effective, targeted poultry vaccination.

Sites

InVac is located in 10 districts and 109 subdistricts in West Java, Central Java, and Yogyakarta. These are 10 of the original 16 districts in which the OR was implemented, but with some additional subdistricts for each district. Implementers selected the participating districts based on their performance during OR and their desire to continue the vaccination program. Implementers also additional subdistricts. District animal health staff chose the districts to participate based on AI incidence and presence of the target population. There is a plan to expand the InVac area in 2011 to additional provinces such as Lampung and East Java.

As noted previously, InVac mobilized existing AHCs at the subdistrict level to assist in project implementation and to manage vaccine distribution to the farms. Implementers selected a total of 23 AHCs. Rapid assessments of AHC strengths and weaknesses helped to determine the sites in the AHC sample.

Some subdistricts in the overall sample did not have AHCs. In these cases, District staff worked directly with the district vaccinator coordinators (KVMs) to make alternative arrangements. In some cases, this meant storing vaccines in the KVM's home, and in some cases it meant storing them in an AHC in another nearby subdistrict.

A list of districts, subdistricts, and AHCs or other vaccine depots that are involved in InVac is provided in Appendix 1.

Poultry Targeting

While the OR targeted backyard chickens (sector-4), InVac focuses its intervention on two poultry populations:

1. Small-scale sector-3 layer farms with a population of less than 5,000 birds
2. Intensive native chicken farms in sector-4.

This choice of poultry population is based on the guidance for AI vaccine types and vaccination strategy in the September 2009 decree. An English translation of the decree is provided as Appendix 2.

Implementers used information from the profiling study (FAO 2009) carried out by FAO and CMU to estimate the numbers of poultry to be covered by InVac. This type of approach, introduced in Indonesia by the OR activity, is important for any new vaccination program. It provides the basic information on coverage targets that is the basis for estimating key supply chain–related requirements such as the quantities of vaccines and related supplies to be procured, cold and dry storage requirements, and distribution strategies.

Commodities

Previously, we have stressed that InVac extensively relied on commodities that the USAID | DELIVER PROJECT originally purchased for the OR activity. The following table, taken from an earlier report, summarizes the various product types purchased in 2008 and 2009.

Table 3. Types and Quantities of Different Products Provided to Each District

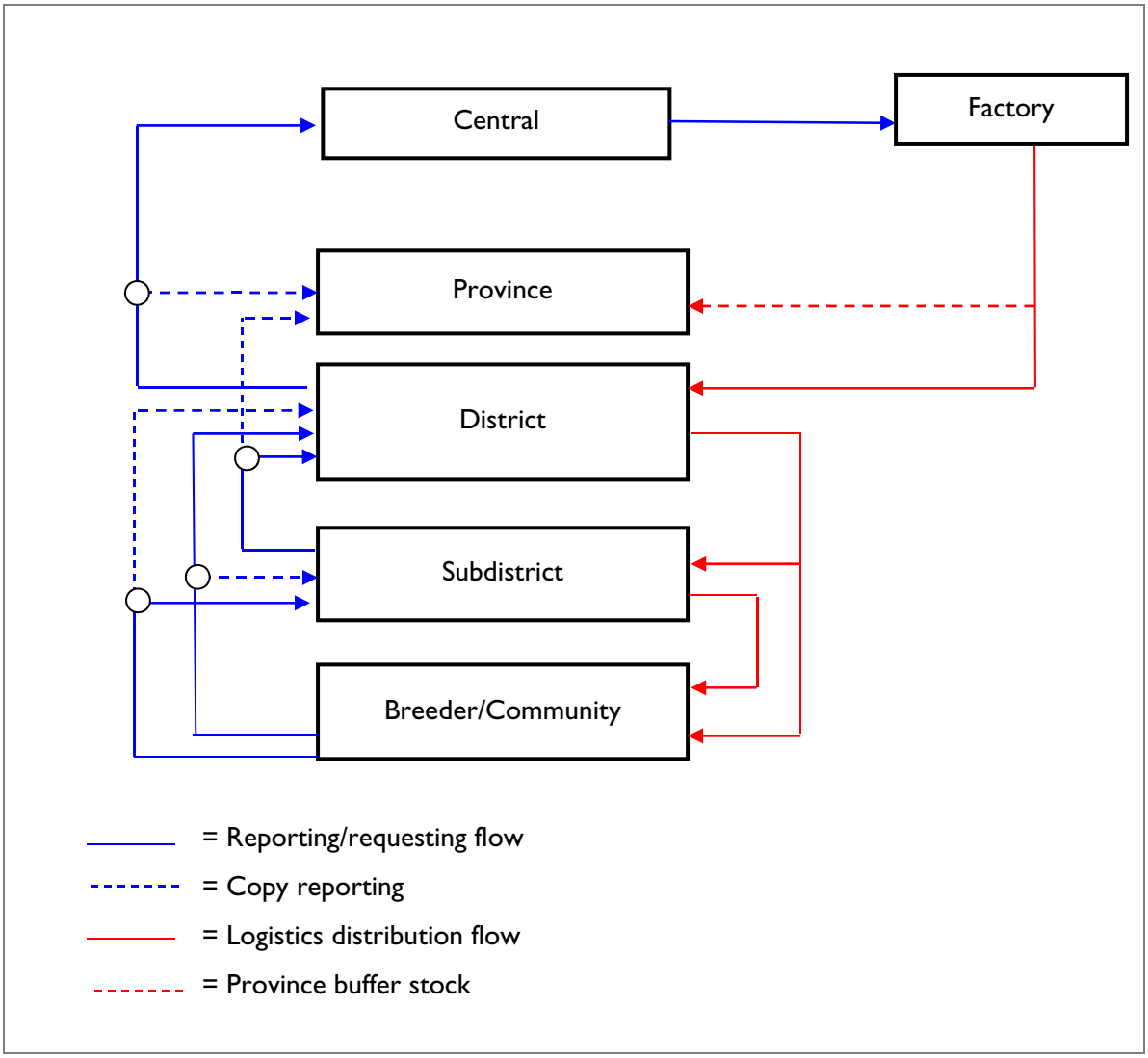
Equipment	Expendable Supplies
• 4 Refrigerators (top loading)	• Vaccines
• 75 Automatic syringes	• 1 Thermometer
• 68 Vaccine carriers	• Waste disposal bags
• 4 Coolers	• 75 Automatic syringes
• 176 Icepacks	• 15 Spare barrels for the syringes
• 60 Digital temperature monitors	• Manual disposable syringes
• 1 cutter	• 2,200 Needles
• Sharps boxes	• Personal equipment for the vaccinators
• 1 Incinerator	• Recording materials

All of this material continued to be used at the district level. However, in light of the inclusion of the AHCs in the distribution system in 2010, USAID also provided some additional supplies for use at the subdistrict level. These included domestic refrigerators, digital thermometers, and cool boxes. The distribution of these items by subdistrict is provided in Appendix 3.

Supply Chain

The structure of the InVac supply chain is given in the following organization diagram. It depicts a four-level flow of information and material.

Figure 1. Reporting/Requesting Flow and Logistics Distribution



- At the top are the commercial suppliers from whom the USAID | DELIVER PROJECT purchased the commodities.
- The USAID | DELIVER PROJECT suppliers shipped directly to the districts, which form the second level. (The province level in the broader Indonesian governmental system is bypassed.)
- Periodically, the AHCs send staff to the districts to pick up vaccines. In most cases, the vaccines are stored in modified domestic refrigerators within the AHCs.
- Finally, the AHCs issue vaccines and related supplies to individual vaccination teams.
- The vaccination teams, the final link in the chain, take their consignments of material to the work sites and put them to use.

At all levels, stock is signed in, stored, and issued according to norms developed with technical assistance from the USAID | DELIVER PROJECT. Under the OR activity, the focus was on safe

storage of vaccines, with less emphasis on information and tracking systems. The InVac activity has preserved and re-emphasized safe storage and also has introduced stock control and reordering routines that have improved the on-time movement of stock between levels. In particular, InVac has seen big improvements in processing vaccine replenishment needs, available cold storage space, and deliveries from the USAID | DELIVER PROJECT supplier to districts. More details on these measures will be given subsequently.

Program Challenges and Strategies

As a continuation of the OR study, the InVac program built on and improved on what the OR had initiated. While the basic equipment had been provided and the basic cold chain system had been set up by the OR, InVac faced challenges that OR, being an operational research study, did not have to deal with. The primary challenge has been to integrate the intensified poultry vaccination activities into the routine animal health program of each district. Other challenges arose from the variable structure of the animal health unit from district to district. Due to the decentralization reforms of 2001, different districts have varying priorities and office configurations for working in animal health.

Challenges

The key challenges that InVac had to overcome during the course of the activities are listed as follows:

1. There is a need to institutionalize InVac activities into the district routine animal health program and government animal health support and service structure.

    a. The KVMs that were mobilized and paid externally during the OR were the main contact and coordinators for AI during the course of that activity. Most of them, however, were not district animal health office employees. Their interaction with the district office staff was limited, with the result that the district animal health staff had little sense of personal ownership. From district to district, animal health staff viewed the OR poultry vaccination activity as an ad hoc event and not part of their regular program. If InVac's work is to be continued into the future, animal health staff will have to play a central role. How this will work has not yet been determined. One possibility is to continue working through the KVMs. No matter what is decided, funds from tight district budgets will be required.

    Imbedding preventative poultry vaccination within existing personnel structures of those offices responsible for animal health should therefore be made a priority. As matters stand now, most district-level decision-makers would agree that the vaccinations and related biosecurity activities are desirable. However, they have not chosen to fund them in the past, Clearly, significant advocacy will be required for InVac activities to be locally funded. This work will be complicated by the fact that since the 2001 decentralization, animal health activities are structured differently from district to district. This is reflected by variations in the names of the district animal health offices shown in Table 1.

Table 4. Titles of 10 InVac District Offices

No	District	Office Name
1	Bantul	Agriculture and Forestry Office
2	Kulon Progo	Oceanography, Fisheries, and Livestock Office
3	Gunungkidul	Livestock Office
4	Semarang	Livestock and Fisheries Office
5	Kendal	Livestock, Oceanography, and Fisheries Office
6	Klaten	Agriculture Office
7	Purbalingga	Livestock and Fisheries Office
8	Temanggung	Livestock and Fisheries Office
9	Cirebon	Agriculture, Plantation, Livestock, and Forestry Office
10	Kuningan	Agriculture, Livestock, and Fisheries Office
	Yogya Province	Agriculture Office
	Central Java Province	Livestock and Animal Health Office
	West Java Province	Livestock Office

Finally, not all districts have AHCs that are active and are equipped for reliable vaccine storage.

2. There is a lack of standard DAH/MOA policy on cold chain and vaccine management.

   a. In the absence of a standardized MOA policy on specific cold chain management, there currently is no structured program for information dissemination and capacity building on cold chain and vaccine management. Therefore, other than the KVMs who were specifically trained during OR, knowledge on proper cold chain and vaccine management is practically non-existent at the province, district, and subdistrict levels. This creates difficulty in proper implementation of vaccination programs.

      As noted, one important result of the OR was a general policy by DAH on proper cold chain management. According to this DAH policy, announced in September 2009, it is mandatory for all AI vaccine programs to use "proper cold chain management." As of now, however, this writ is on paper only and is not implemented except where InVac has operated. Even in those places, it is supported by donor-provided equipment and donor-funded operating costs.

   b. Regarding the issue of equipment, all district animal health offices do have some sort of cold storage facility but the type, appropriateness, and capacity of refrigerators vary greatly. Aside from the 16 OR districts (including the 10 InVac districts) that were provided with top-opening vaccine refrigerators, other districts mostly purchase domestic refrigerators, including inappropriate frost-free ones, or beverage coolers with transparent glass doors that are not suitable for storage of biological materials. Often, vaccine storage is shared with other supplies such as laboratory reagents, test kits, biological specimens, and even food.

This lack of proper cold chain equipment and practice can raise a question regarding the quality of the vaccine that is administered.

3. There is limited involvement of the government hierarchical structure in InVac monitoring.

   a. The provincial office and province-based local disease control center (LDCC) was not involved in implementation or monitoring of InVac. As a result, there is practically no monitoring by the province to the district and the levels below. InVac monitoring by the district toward the KVMs and AHCs is also difficult for the same reason, although routine monitoring has been proven to be essential for proper implementation and success of a program (PATH 2006, 2009).

4. There is limited access to poultry farm by the district livestock office and AHC to monitor the vaccination practice.

   a. The results of a cold chain study (USAID | DELIVER PROJECT 2009) performed during the OR showed that the subdistrict and community vaccinators at the village level were the weakest links in cold chain and vaccine management. Storage of vaccine in domestic refrigerators mixed with other household items, poor maintenance of temperature during storage, and improper transport were some of the weaknesses detected.

      There is limited access by the district livestock office and AHC to monitor the vaccination practice at the poultry farms. We believe that most of the same conditions prevail on farms. To give a sense of the complications that can come up, we provide two specific examples from the OR phase:

      - The AI and ND vaccines must not be subjected to subzero temperatures centigrade. However, workers transported vaccines with ice cubes in plastic bags, a practice that does exactly this.
      - Diluent for the ND vaccine must be kept at 2° to 8°C 24 hours prior to vaccine reconstitution, a procedure aimed to prevent thermal shock to the vaccine. Often, workers did not take this step.

   b. In both of these cases, workers made important mistakes from lack of knowledge of correct procedures. Such problems can be managed with M&S, but this will be difficult without good access to the poultry farms.

5. Vaccination program waste management is a low priority.

   a. Proper management of vaccination waste posed a challenge for InVac. While each OR district was provided with a small-scale high-temperature incinerator, a system for collection of vaccination waste, and transport for centralized incineration at the district, it was not well coordinated. As a result, most farms dispose of their vaccination waste outside of the standard system, and potentially in an inappropriate manner that could be dangerous. Only a small percentage of the farms returned their waste to the AHC/district for incineration.

Program Strategies

To address the challenges, InVac employed a number of strategies, as follows:

1. Use of standard and appropriate cold chain equipment and temperature monitoring devices.

   Proper cold chain management requires the use of proper cold chain equipment. InVac recommends use of top-opening ice-lined refrigerators for vaccine storage as a standard at the district level. This type of refrigerator is less prone to temperature fluctuations and is able to maintain the correct temperature for longer periods of time during power outages. If funding limitations dictate the provision of a domestic refrigerator, then it should be properly modified according to World Health Organization (WHO) standards and dedicated for storage of vaccine.

   For subdistrict levels (i.e., AHCs), domestic refrigerators are considered acceptable. InVac did provide domestic refrigerators to 12 AHCs to assist the vaccine distribution system. These refrigerators were properly modified following WHO recommendations and were fitted with a digital thermometer and Stop!Watch temperature indicator.

   InVac also advocates the use of a temperature monitoring devices and indicators such as digital thermometers and Stop!Watch or Freeze-tags. These devices can be considered a minimum for monitoring the cold chain condition during storage and transport such that vaccine potency can be assured prior to administration and damaged vaccine is minimized.

2. Training on the use of cold chain equipment.

   Proper cold chain management requires not just equipment but also knowledge and skill to properly use the equipment. The OR provided the KVMs with two training opportunities on cold chain and vaccine management as a way to maintain quality of the vaccination program. In InVac, the addition of the AHC required additional training, so training on cold chain and vaccine management was held for AHC staff. Furthermore, as the Yogyakarta provincial walk-in cold room was incorporated into the vaccine distribution network, additional training for cold room operators was also held to provide the operators with knowledge and skills to properly fulfill their duties (PATH 2010). Routine InVac monitoring of the cold room then served to strengthen and reinforce the knowledge learned during training of the cold room staff.

3. Establishment of a system for cold chain management, vaccine management, and logistics management.

   Proper equipment needs to be complemented by a system that allows proper utilization of the equipment. Too often, knowledge cannot be applied in the field due to lack of a system. InVac strengthened the application of several systems that were initiated in OR:

   a. Routine temperature monitoring and recording: Temperature monitoring creates a routine record of cold chain condition, enables periodic analysis of temperature data, monitors indicator status, and provides immediate feedback of any problems for action. This reduces the possibility of using damaged vaccine in the field.

      InVac reemphasized the need for a temperature monitoring chart for each refrigerator, at the district level as well as below the district level (AHCs and other vaccine depots). The temperature monitoring chart should be completed routinely, ideally twice a day, and should also record the condition of the monitoring indicator that is being used.

   b. Logistics data recording and reporting: In InVac, several recording and reporting forms were introduced for district and AHC levels. One important form is the batch card, which is a card that records receipts, stock on hand, issues, and losses for each batch of an item. The

card is batch-specific and allows the worker to directly know the quantity of current available stock, batch numbers, and expiry dates. This card allows workers to have a systematic recording of logistics and to apply the earliest expiry, first out (EEFO) principle more easily.

c. A routine delivery system for vaccine procurement based clearly on both need and storage capacity: One lesson learned from OR was that the quantity of vaccine that should be delivered on a quarterly basis by the vaccine manufacturer is not constant. It varies from time to time and from district to district depending on the consumption rate at each district. Shipping vaccines without taking into account the stock on hand risks overburdening the storage capacity at the receiving end. It leads to violation of vaccine storage standard operating procedure due to limited space.

   InVac applied a system of logistics data recording and reporting that tracked available vaccine stock, existing storage capacity, and vaccine needs for defined periods of time. This required communication between district coordinators and vaccine manufacturers prior to each vaccine shipment. Working together, the adjusted quantities to ship were based on the available stock and existing storage capacity at the district. District storage was not overwhelmed, and vaccine damage due to mismanagement of cold chain storage could be minimized.

4. Routine supportive supervision to facilitate better monitoring of field cold chain implementation.

   Supportive M&S has great value in improving compliance and management in the field. Historically, supervision has been interpreted as inspection, where the supervisor and person supervised are in a hierarchy authoritarian relationship.

   InVac, and OR before it, tried to facilitate a supportive M&S process, where a visit fosters dialogue and exchange of information for improvement of cold chain and vaccine management in the field. A protocol for monitoring visit was established containing the following elements:

   a. Routine and notified monitoring schedule: The strength of supportive M&S lies in its routine schedule that is known by all parties involved. A notification to the district is also sent out before each visit, ensuring availability of the persons to be visited.

   b. Inclusion of the government structure in the monitoring visit: The monitoring team consists of the central MOA, FAO, the USAID | DELIVER PROJECT, and PATH. In addition, the team tried to include the provincial livestock office and the LDCC to facilitate a closer involvement in InVac activities.

      At the district, even though InVac still relied on KVMs as the main contacts, each monitoring team met with district officials (district office head, chief of animal health section, or other representative) to brief them on the purpose of the visit and update them on the progress of InVac and other pertinent information. To the extent possible, this type of district meeting would be repeated at the end of monitoring visit to communicate any follow-up actions that resulted from the visit. This effectively bridged the district livestock office and KVMs, who are mostly not district staff and are based outside the district office. District officials also became more familiar with InVac activities and understood the importance of good cold chain and vaccine management. The process helped to institutionalize InVac activities into the routine district animal health program. Throughout

all encounters and meetings, the monitors kept the focus on the correct practices for storage, distribution, recordkeeping, and waste management.

c. Standardized cold chain monitoring checklist: A checklist containing all the issues that each visit needed to observe and discuss was developed for the cold chain supportive M&S visit. Each member of the monitoring team completed the checklist, which was also updated as needed. This ensured each visit to be comprehensive, helped maintain continuity from one visit to another, and ensured standard observations among cold chain monitoring teams.

d. Evaluation and feedback of monitoring findings: Following each cold chain monitoring visit, findings from the field were tabulated and analyzed. Successes and areas of needed improvement were noted along with recommendation for follow-up actions. Also, a meeting was held after each monthly monitoring visit by the CMU to review the monitoring results. The findings were formally communicated to the province and district by the central MOA as a way to facilitate district monitoring of the activity.

5. Revitalization of provincial walk-in animal health cold room in Yogya into a regional animal health cold store system.

   One recommendation from the OR is the need for a provincial-level cold room to store animal vaccine stock as buffer or on the way to the district. The limited storage capacity at the province was inadequate to store the necessary animal vaccine. Should there be a need, districts would have to request additional vaccine directly from the manufacturer. [Note: All provinces have a cold room for human vaccine but only one province in the InVac program has a currently operational provincial-level animal vaccine cold room].

   To fulfill this need, the CMU identified an existing, still operational walk-in animal health cold room facility in Yogya and requested technical assistance and funding assistance from USAID to renovate it into a regional cold store facility for Yogya and nearby districts. The USAID | DELIVER PROJECT, with USAID funding, provided assistance in refurbishing the cold room by providing an essential backup cooling unit, an electrical generator, racks, and plastic curtains, plus arranging their installation in the cold room. Official communication with the Yogya Provincial Agriculture Office was made, and their staffs were appointed as cold room operators. Training on cold chain and vaccine management was provided by PATH and the USAID | DELIVER PROJECT for the cold room operators (PATH 2010), followed by cold chain monitoring visit to assist them to set up a simple system to apply their knowledge into practice.

   Upon completion of donor support to InVac in May 2009, there were 3.150 million doses of AI vaccine and 1.277 million doses of ND vaccine remaining at the manufacturer for use by InVac in the future. These vaccines were shipped to the Yogya cold room for storage. InVac districts and other districts that need the vaccine can collect the vaccine from the cold room following a procedure established by the MOA.

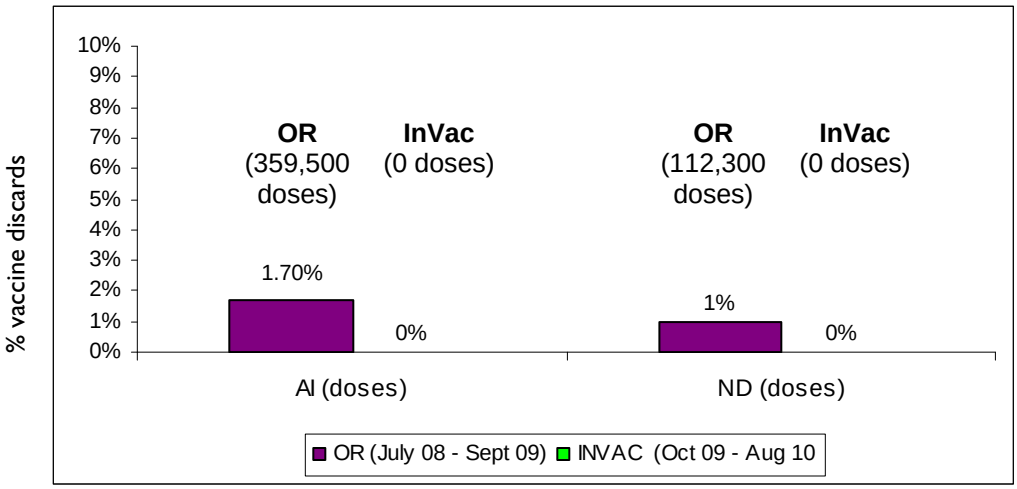
   Through this regional animal health cold store, the role of the provincial office in the district vaccination program has increased, facilitating improved involvement and monitoring by the province.

Results and Key Lessons Learned

Reduced Vaccine Discards Due to Temperature Damage

As a result of all the interventions on cold chain and vaccine management, aided by the routine cold chain monitoring, the quantity of vaccine that was discarded due to temperature violation at the district level was reduced as described in Figure 1.

Figure 2. Vaccine Damage during OR (2008–2009) vs. InVac (2009–2010)



As can be seen in this graph, the amount of vaccine discards due to cold chain mismanagement was reduced to zero during InVac relative to the OR.

In August 2010, three months after donor support for InVac officially ended, freeze exposure did occur to AI vaccine in a refrigerator at one district livestock office due to human error. The error occurred during a transition from the KVMs to the district office staff who did not yet have proper understanding regarding cold chain and vaccine management. The same error was also discovered at the AHC. This demonstrates that transfer of knowledge is not a one-time task, and that besides training, ongoing supervision by competent staff is required.

Interestingly, the number of vaccine shipments from the manufacturer that were rejected due to "alarm" conditions in the Q-tag monitoring indicator increased during InVac relative to OR. The exact cause for this is not clear, but this illustrates the importance of using temperature monitoring indicator in all stages of the supply chain.

Improved Supply Chain Management

District Level

The reduced vaccine discard at the district level is consistent with the results of monitoring that recorded much improved cold chain and vaccine management at the district level. With the exception of a few districts, in general temperature charts are being maintained for each vaccine refrigerator at the district, a Stop!Watch monitoring indicator is used, vaccine refrigerators are placed and maintained correctly, and vaccine is arranged correctly inside the vaccine refrigerator.

In most districts, a batch card is used to record all transactions of vaccine and diluent and is continually updated. However, bundling (a system of providing vaccine, diluent, injection device, and safety box as a bundle) and EEFO principles are not consistently followed.

Figure 3. Cold Chain and Vaccine Management Performance at District Level as Measured by Adherence to InVac System Norms

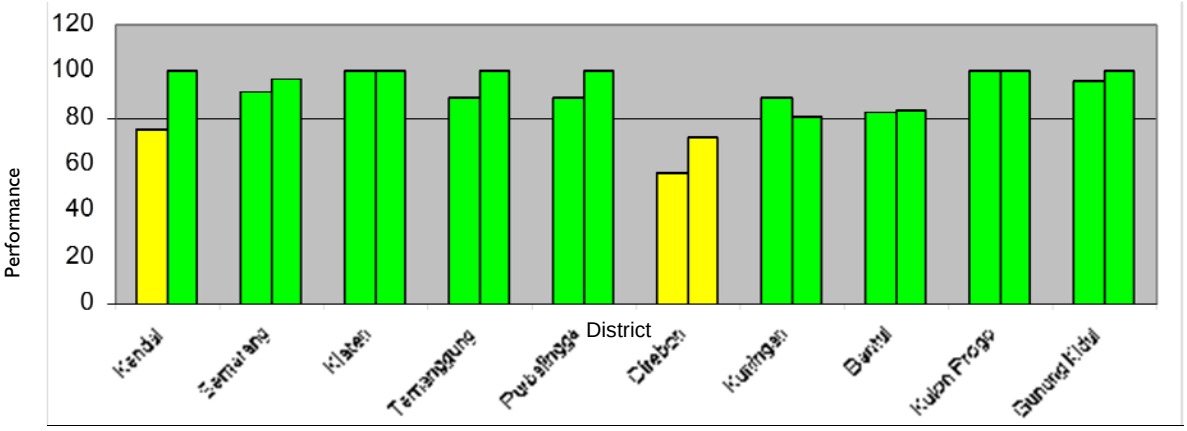


Figure 2 illustrates the cold chain and vaccine management performance of the 10 InVac district at the first InVac monitoring visit (between November 2009 and January 2010) and at the last monitoring performed in May 2010. The performance was evaluated based on adherence to the most basic cold chain vaccine management procedures: refrigerator placement and general maintenance, routine temperature monitoring through the use of thermometer and monitoring indicators, and maintenance of batch cards to record all vaccine transactions. Correct application of at least 80 percent of the criteria is indicated by a green color in the graph. Yellow indicates 50 to 79 percent, while less than 50 percent is indicated by a red color. The color codes help visualize progress in basic cold chain and vaccine management procedure, plus highlight any districts that require special attention in these areas.

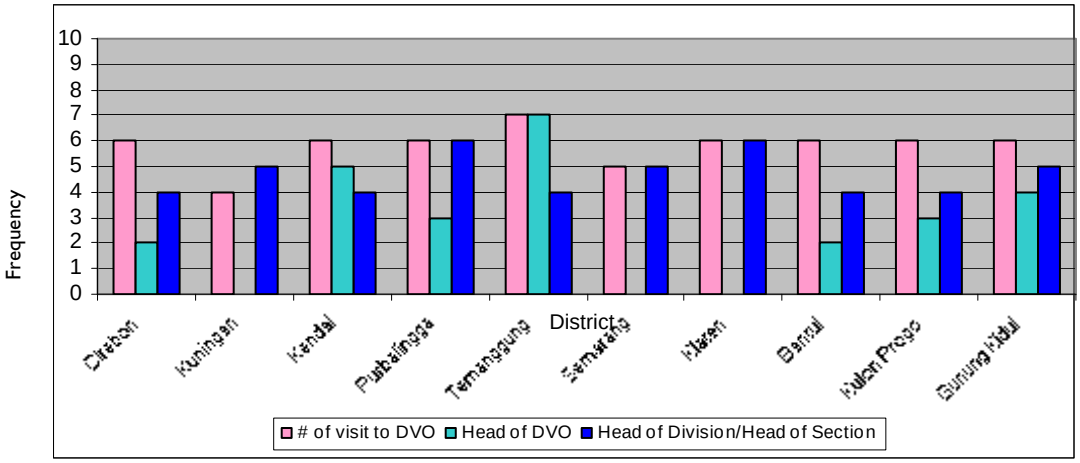
As seen in Figure 2, at start of the InVac activity, most districts were already achieving reasonably good cold chain and vaccine management standards, based on the training and monitoring work initiated during OR. At the last and fifth monitoring visit, all but one district (Cirebon) had achieved greater than 80 percent performance. The constraint faced in Cirebon district was mostly due to lack of coordination between the district animal health staff and the KVM, who is based outside the district office. Furthermore, the cold chain equipment provided during OR was placed at a location

away from the district office, causing even less involvement of the district animal health official during InVac.

In addition to these factors, Cirebon and Kuningan are the two InVac districts that are located far from their West Java provincial office. Both West Java Provincial Livestock Office and West Java LDCC are located in Bandung, approximately 120 km away from Cirebon. The distance limits significant provincial involvement in monitoring the implementation of InVac in Cirebon and Kuningan. The InVac monitoring team never visited the West Java Provincial Livestock Office and West Java LDCC during their routine monitoring visits for the exact same reason. While not the primary cause, the lack of provincial involvement in the two West Java InVac districts may contribute to the poor cold chain and vaccine management in Cirebon.

Another factor that was noted as playing a role in cold chain and vaccine management performance was the commitment from the higher-level decision-makers at the district livestock office. Following the protocol for routine monitoring visits, the monitoring team would try to meet with the district officials during every visit. As Figure 3 shows, this was able to be done at almost every visit. However, the meetings were conducted more frequently with the head of the animal health section and less frequently with the head of the district livestock office. In the case of Kendal district, the improved performance in cold chain and vaccine management (from less than 80 percent to 100 percent compliance with established criteria) was attributed in part to the increased familiarity and involvement of officials from the district livestock office and animal health section in the InVac monitoring visits.

Figure 4. Frequency of Meeting District Officials at Cold Chain Monitoring Visit, November 2009 to May 2010



Animal Health Center Level

AHCs were not involved in the OR, where most of the groundwork on improving cold chain and vaccine management was initiated. In general, at the start of InVac, the cold chain condition in the 23 AHCs that were involved in InVac was quite poor. Improvements were made through training AHC coordinator/staff on cold chain and vaccine management, followed by routine monitoring. Equipment in the form of several domestic refrigerators, vaccine carriers, and digital thermometers

was provided by USAID through the USAID | DELIVER PROJECT to complement the equipment that already exists in the AHCs.

To measure progress, a short evaluation was performed using the same basic criteria used for the district performance evaluation (proper refrigerator placement and general maintenance, routine temperature monitoring through the use of thermometer and monitoring indicators, and maintenance of batch cards to record all vaccine transactions). Two additional criteria were added: whether or not the domestic refrigerator used for vaccine storage is properly modified and whether it is used specifically for storage of vaccine. The same scale and color code used in the district evaluation was also applied: red indicates performance of less than 50 percent, yellow 50 to 79.9 percent, and green 80 percent and above. A green color will mean correct implementation of only the most basic procedure in vaccine storage more than 80 percent of the time and will not reflect achievement in other criteria such as detailed cold chain procedure, vaccination coverage, or waste management.

The cold chain and vaccine management performance of AHC/other vaccine depot at the first InVac monitoring (between November 2009 and January 2010) and the last monitoring (May 2010) is illustrated in Figures 4 to 6.

Figure 5. Cold Chain & Vaccine Management Performance at Animal Health Center Level in West Java Province

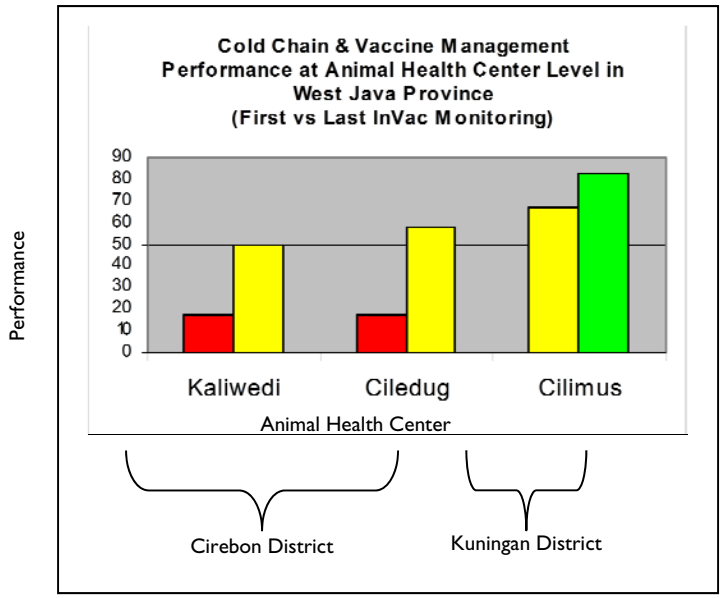


Figure 6. Cold Chain & Vaccine Management Performance at Animal Health Center Level in Yogya Province

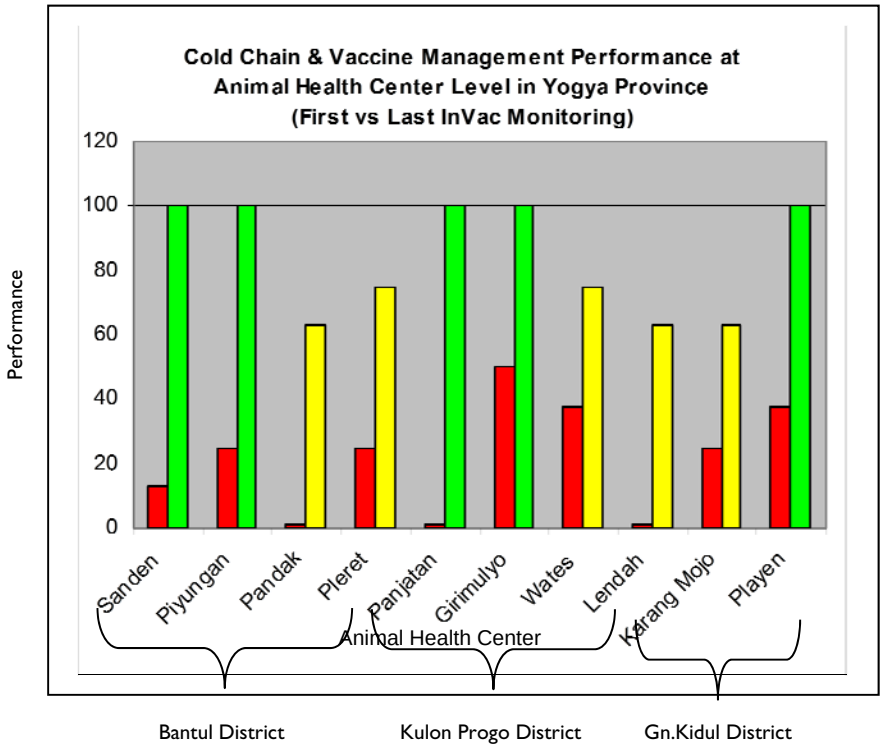
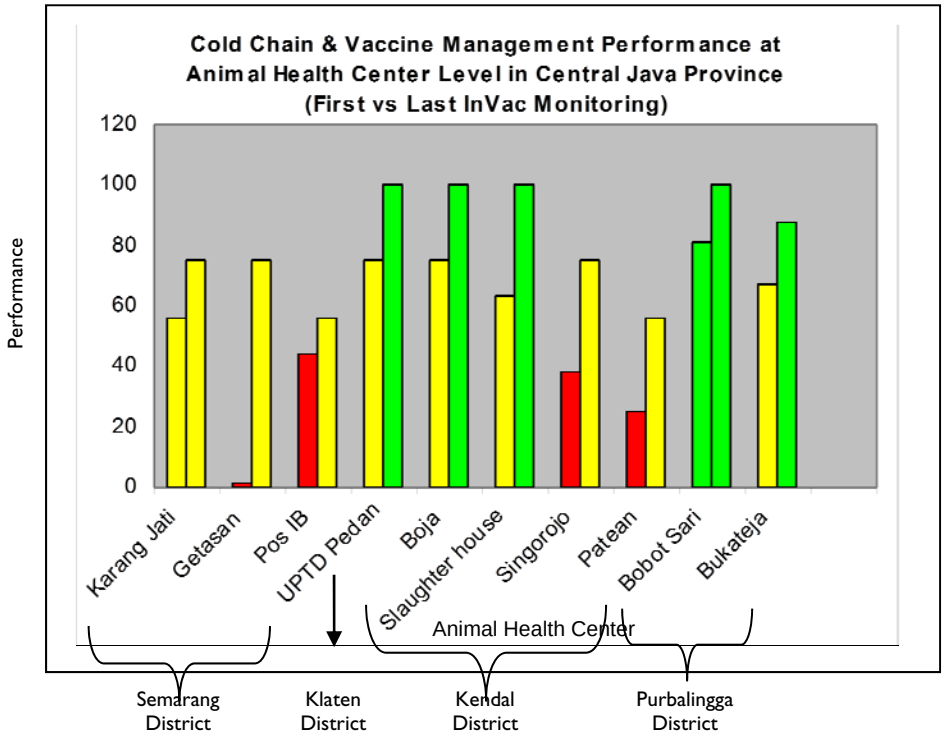


Figure 7. Cold Chain and Vaccine Management Performance at Animal Health Center Level in Central Java Province



*Note: Temanggung district, which does not involve an AHC in vaccine distribution, is not included in this graph.

Figures 4 to 6 demonstrate improvement in the cold chain and vaccine management performance of every AHC/vaccine depot that is involved in InVac activities. This was seen between the first and the last monitoring visits. The results are encouraging, though degree of improvement varies from place to place and is not yet uniform across all AHCs. Interviews with AHC staff and/or coordinators performed during monitoring noted that while knowledge on proper cold chain and vaccine management is present, compliance with norms does not necessarily follow. For example, while the need for domestic refrigerator modification is known by the AHC coordinators, the modification is often not done properly. A temperature chart is only used intermittently, as is the use of batch cards. Stop!Watch is used only in some AHCs due to its limited availability because of high cost. Bundling and EEFO principles are not followed, and there have been instances where vaccine transport to farms was done with ice cubes without an insulated container.

The level of compliance with system norms achieved with training alone suggests that ongoing M&S would achieve very good results. Other problems such as the use of frost-free refrigerators or beverage coolers with transparent glass doors cannot be addressed without additional financial support. InVac did recognize this problem and disseminated information to district decision-makers about the correct refrigerators to buy.

A closer look at the details of monitoring visit supports the need for more monitoring at the AHC level. Throughout InVac, monitoring visits to all districts were performed approximately every month, totaling five visits per district altogether. Each visit included a meeting at the district livestock office, and in most cases, a visit to an AHC. Time limitation, however, did not make it possible to visit every AHC during every visit.

Over the life of the InVac activity, the average number of visits per AHC was three. Farms are visited only about 10 percent of the time due to distance, time limitations, and limited access to sector-3 small-scale layer farms. The number of visits seems to correlate positively with the cold chain and vaccine management performance. At the district level, where five visits were made, the performance is better than that at the AHC or farm levels where there were significantly fewer cold chain monitoring visits. Future vaccination programs will need to consider routine monitoring visits to all levels.

Commitment from the Central MOA Toward Supply Chain Standards and Improvement

Monitoring experiences and data generated through OR and then InVac have created awareness within the MOA and the DAH/MOA about the negative impact of poor cold chain performance on livestock vaccination activities. Good cold chain management is now a stated MOA policy for the AI vaccination program.

Establishment of a Central Cold Chain Master Trainer Team for Training Vaccination Program Implementers on Supply Chain Management

As part of the MOA commitment to improve the cold chain and vaccine management in their vaccination program, at their request and with funding from USAID, the USAID | DELIVER PROJECT provided technical assistance to the CMU in establishing a central team of master cold

chain trainers who are competent in cold chain management knowledge and skills. The central cold chain master trainers are expected to train provincial trainers, who in turn will train district vaccination staff in a tiered fashion. This approach is expected to disseminate the knowledge and skills on proper cold chain and vaccine management quickly in priority areas throughout Indonesia.

Key Lessons Learned

InVac overcame a number of constraints; through the InVac strategy outlined previously, substantial progress in cold chain and vaccine management at the district and, to a certain degree, at the subdistrict levels was made. From the process, we have generated a number of lessons learned, as follows:

- While the MOA may determine a national AI vaccination policy and provide vaccines, the long-term costs of supporting implementation will need to be borne by the districts. The organization and resources for maintaining a poultry vaccination program are not uniform across all districts. Time and resources will be required up front to advocate the need for program implementation and determine the best steps forward for each district.
- InVac's relative success in cold chain management has resulted from paying attention to a range of factors. Those factors include commitment from upper level district decision-makers; competent staff in place within implementing units; regular M&S; good quality cold chain equipment; availability of all required expendable supplies, including temperature monitors; and commitment to fund these elements. Good results will not follow from paying attention to some of these factors while ignoring others.
- To illustrate the preceding point, there is a widespread tendency to regard training as an end point of implementation and to equate the fact that training has taken place with good performance thereafter. Training is a down payment activity that must be followed by M&S in order to produce a return on investment.
- Even when all elements are receiving attention and M&S is in place, it still takes time to achieve and maintain good results.
- Bringing about a sense of ownership among decision-makers at national and local levels has been key to producing results at operational levels. This was accomplished in part when CMU staff observed good cold chain management and decided to make it their own goal. It was also accomplished by including decision-makers in InVac's supervisory activities so that they could see firsthand both the challenges and good results of the visits.
- Achieving sustainability is a complicated undertaking. The OR activity began with no plan for cold chain sustainability. Nevertheless, the system improvements it brought along attracted the attention of central Ministry of Health decision-makers and produced policy commitment. InVac provided an opportunity to produce another element, an operational model that enables line staff to show good results. Yet much remains to be done. For example, there needs to be an ongoing advocacy effort to consolidate ownership at local levels and obtain the required budgetary support.

Remaining Issues

Upon completion of donor support to InVac, there are still a number of issues that need to be resolved before InVac can be of the proper quality and becomes sustained:

1. Funding: operational, supplies

   The MOA now realizes the importance of proper cold chain management for their vaccination programs and have made significant improvements in cold chain and vaccine management policies and priorities. Expansion of InVac activities into more subdistricts within the InVac districts, and into other provinces is in the planning stages. Additional funding will be needed to provide the other regions with proper top-opening refrigerators, temperature monitoring indicators, and other essential cold chain equipment. In the absence of adequate funds, the standard equipment and devices cannot be maintained, and replicating the key cold chain system that was applied in InVac to other areas may not be possible.

2. Monitoring of vaccination practice at farms

   Most farms are independent and do not depend on the district livestock offices for provision of vaccines or any other logistics. It is therefore a challenge for the district to monitor the vaccination practice at the farms. Yet, farms, primarily small-scale farms, are perhaps the ones that need cold chain and vaccine management improvement the most. A different approach may need to be sought to link the district livestock offices with farms.

3. Poultry shops

   As mentioned previously, most farms do not depend on the government for provision of vaccines. They buy vaccines from poultry shops that are present practically at every corner, in every neighborhood. Vaccine supply through poultry shops may in fact be a higher proportion than the supply through the public sector. As poultry shops represent the private sector that is under the coordination of a different Ministry, the MOA has no authority to regulate the poultry shops. However, information on their cold chain condition and what is needed to improve their practice should be considered to achieve proper protection through vaccination.

4. Waste management

   Management of vaccination waste remains an issue that requires attention. In the absence of a standard policy for waste management, attention should be paid to developing a system that is applicable for each district.

Conclusion

InVac has been able to continue the cold chain and vaccine management improvement effort that OR started through cold chain training and routine monitoring and supportive supervision activity. Significant improvement in cold chain and vaccine management practices at the district level, and to a certain degree at the AHC level, was observed and is considered a valuable contribution to the overall animal vaccination program. We hope the documentation of the InVac process and results will be a useful set of lessons learned to guide the implementation of any future vaccination program, as well as to address any remaining issues.

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Appendix 1

List of Participating Districts/Subdistricts/Animal Health Centers in the Intensification of Avian Influenza Vaccination Program

District	Participating Subdistrict		Participating AHC/ Artificial Insemination Post*/ KVM's House**
Central Java			
Semarang (total existing: 19 subdistricts)	Bergas	Bawen	Karang Jati
	Ambarawa	Pringapus	
	Sumowono	Bandungan	
	Bringin	Tuntang	Bringin*
	Tengaran		Tegal Waton
	Getasan		Getasan
	Kaliwungu		
Kendal (total existing: 20 subdistricts)	Boja	Kendal Kota	Boja
	Limbangan	Patebon	
	Kaliwungu		
	Singorojo		Singorojo**
	Patean	Platungan	Patean**
	Sukorejo	Pageruyung	
	Brangsong	Gemuh	Brangsong**
	Ringinarum	Pegandon	
Klaten (total existing: 26 subdistricts)	Trucuk	Cawas	Trucuk
	Karangdowo	Ceper	
	Pedan		
	Bayat	Ngawen	Covered by district
	Kalikotes	Karanganom	
	Jatianom	Wedi	
	Jogonalan	Juwiring	
Purbalingga (total existing: 18	Bobotsari		Bobotsari
	Kutasari	Pengadegan	Covered by district

District	Participating Subdistrict		Participating AHC/ Artificial Insemination Post*/ KVM's House**
subdistricts)	Kalimanah		
Temanggung (total existing: 20 subdistricts)	Pringsurat	Kranggan	Covered by district
	Temanggung	Tembarak	
	Kandangan	Bulu	
	Kaloran	Kedu	
D.I. Yogyakarta			
Bantul (total existing: 17 subdistricts)	Piyungan		Piyungan
	Sanden		Sanden
	Pandak		Pandak
	Pleret		Pleret
	Dlingo		Dlingo
	Pajangan		Pajangan
Gunung Kidul (total existing: 18 subdistricts)	Playen	Paliyan	Playen
	Patuk		Patuk
	Karangmojo	Semin	Karangmojo
	Ponjong	Ngawen	
	Wonosari	Gedangsari	Covered by district
	Nglipar	Semanu	
Kulon Progo (total existing: 12 subdistricts)	Wates	Pengasih	Wates
	Girimulyo	Nanggulan	Girimulyo
	Panjatan	Galur	Panjatan
	Lendah	Sentolo	Lendah
West Java			
Kuningan (total existing: 32	Cilimus	Pancalang	Cilimus
	Mandirancan	Garawangi	
	Jalaksana	Kramat Mulya	

District	Participating Subdistrict		Participating AHC/ Artificial Insemination Post*/ KVM's House**
subdistricts)	Pasawahan	Ciganda Mekar	
	Lebak Wangi	Kalimanggis	Covered by district
	Luragung	Cidahu	
	Sindang Agung	Ciawi Gebang	
	Japara		
Cirebon (total existing: 37 subdistricts)	Ciledug	Sedong	Ciledug
	Lemahabang	Astana Japura	
	Susukan Lebak	Karang Sembung	
	Sumber	Kaliwedi	Tengah Tani (district store)
	Plumbon	Gempol	
	Palimanan	Beber	
	Suranenggala	Dukuh Puntang	
	Weru	Kedaung	Kaliwedi
	Talun		

Appendix 2

Decree from Directorate General for Veterinary Ministry of Agriculture on Policy for Avian Influenza Vaccine and Vaccination Strategy

September 30th, 2009

No.: 300099/PD.620/F/9/2009

Regarding: Policy on Vaccine and Avian Influenza (AI) Vaccination Strategy

Based on findings from studies about the dynamics of AI virus as the basis for vaccination strategy implementation, the AI virus was found to have undergone genetic change (antigenic drift), requiring a new master seed for AI vaccine and proper vaccination strategy that matched the virus dynamics.

In consideration of the recommendations from Expert Commission on Animal Health (Komisi Ahli Kesehatan Hewan), Animal Drugs Commission (Komisi Obat Hewan), and experts' opinion from AI Disease Control Unit (UPP-AI) and OFFLU (OIE-FAO collaboration) regarding the policy on vaccine and AI vaccination strategy, please be informed of the following:

1. Avian Influenza (AI) Vaccine
   a. To produce a good vaccine with high quality, efficacy, and safety, as well as optimal potency, new master seed will be required with the following criteria:
      1) H5N1 Subtype
      2) High immunogenicity
      3) Antigenicity with a broad geographic coverage
      4) Stable genetic and antigenic properties
      5) High degree of protection in challenge tests against several virus isolates with differing genetic and antigenic characters.
   b. Candidates of the new master seed for AI vaccine manufacture in Indonesia are:
      1) A/Chicken/West Java/PWT-WIJ/2006
      2) A/Chicken/Pekalongan/BBVW-208/2007
      3) A/Chicken/Garut/BBVW-233/2007
      4) A/Chicken/West Java (Nagrak)/30/2007

Besides these four vaccine master seed candidates, other candidate can be added as long as it meets the specified criteria.

   a. As of 2009, Indonesia is still using AI vaccine with temporary registration number (Nomor Registrasi Sementara) or temporary registration list (DPS) from MoA, consisting of import vaccine (H5N2 and H5N9) and up to 20 brands of locally produced vaccine, which used genetically reversed Legok 2003 (H5N1 HPAI) master seed and H5N2 LPAI. In light of this situation, a challenge test will be conducted with challenge isolates recommended by Expert Commission on Animal Health (Komisi Ahli Kesehatan Hewan), which are: isolate of A/Chicken/West Java-Subang/29/2007 or isolate of A/Chicken/West-Java/SMI-PAT/2006. AI vaccine that failed challenge test will be handled according to existing regulations.

b. While awaiting production of vaccine with the new master seed, AI vaccination program in endemic and high risk areas should use vaccine produced with local H5N1 isolates registered to Indonesia's Ministry of Agriculture.

2. AI Vaccination Strategy

a. Will be conducted only in endemic and high risk areas, with a targeted vaccination strategy that covers more that 80% of the at-risk population.

b. Sector 1, 2, and large scale sector 3 will conduct their own vaccination program with supervision from the Government.

c. Whereas vaccination for intensive free-range chicken farms (birds are kept in a fenced enclosure) and small scale layer chicken farms (population below 5,000 birds) will be conducted by the central, provincial, or district/city government.

d. Use of inactivated vaccine requires booster vaccination and should be repeated every 3 months, or according to manufacturer's recommendations.

e. To maintain vaccine quality, proper cold chain management should be applied from the manufacturer right down to application in the field.

f. Seromonitoring should be carried out to determine the success of vaccination program;

g. Vaccination strategy should be followed by other control strategies, such as biosecurity improvement, limited depopulation, surveillance, monitoring of poultry traffic, and raising public awareness;

h. Vaccination will not be given to Sector 4 (where birds are allowed to roam), and instead, other control strategies as described in point g above will be used. Sector 4 farms should be directed to use intensive poultry farming.

i. Vaccination is not performed in AI free and risk free areas.

Thank you for your attention.
Director General,

Dr. Ir. Tjeppy D. Soedjana, Msc

Appendix 3

List of Supplies Provided During the Intensification of Avian Influenza Poultry Vaccination Program

No	Province	District	AHC	Digital Thermometer	Marina Cooler	Refrigerator
1	Yogyakarta	Bantul	Piyungan	1	1	1
			Pajangan	1	1	
			Dlingo	1	1	
			Pleret	1	1	
			Pandak	1	1	
			Sanden	1	1	1
				6	**6**	**2**
		Kulon Progo	Girimulyo	1	1	1
			Panjatan	1	1	1
			Lendah	1	1	
			Pengasih	1	1	
			Wates	1	1	
				5	**5**	**2**
		Gunung Kidul	Patuk	1	1	
			Semin	1	1	
			Karangmojo	1	1	1
			Playen	1	1	1
			Wonosari	1	1	
			Semanu	1	1	
				6	**6**	**2**
2	Central Java	Klaten	Trucuk	1	1	1
				1	**1**	**1**
		Temanggung	Kedu	1	1	
				1	**1**	**0**
		Kendal	Weleri	1	1	
			Boja	1	1	1
				2	**2**	**1**
		Semarang	Bringin	1	1	
			Getasan	1	1	
			Tengaran	1	1	
			Karang Jati	1	1	1
				4	**4**	**1**
		Purbalingga	Bobotsari	1	1	1
			Bukateja	1	1	
				2	**2**	**1**
3	West Java	Kuningan	Ciawigebang	1	1	
			Cilimus	1	1	1
				2	**2**	**1**

No	Province	District	AHC	Digital Thermometer	Marina Cooler	Refrigerator
		Cirebon	Timur	1	1	1
			Tengah	1	1	
			Barat	1	1	
				3	**3**	**1**
			TOTAL	**32**	**32**	**12**

Appendix 4

Photos of Intensification of Avian Influenza Poultry Vaccination Program Activities

Monitoring Activity at the District Level November 2009 to May 2010

Top-opening refrigerators at the district.

During period of low vaccine stock, only two out of four refrigerators are in use. Empty refrigerators should be wiped dry and stored with the lid open to prevent condensation.

AI vaccine arrangement in a top-opening refrigerator.

ND vaccine arrangement in a top-opening refrigerator.

Unpacking a vaccine shipment from the vaccine manufacturer.

Checking the condition of the temperature monitoring device (Q-tag).

District staff loading the vaccines into a refrigerator.

Incinerator at the district.

District staff operating the incinerator.

Room temperature storage of vaccination logistics at the District.

Monitoring Activity in Puskeswan/AHC
November 2009 to May 2010

Monitoring team.

AHC staff.

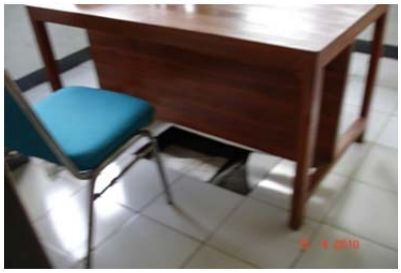
Sector-3 small-scale layer farm.

Animal Health Center

Freeze-tag part in Stop!Watch shows freeze exposure at one AHC.

Use of Stop!Watch helps better monitoring of vaccine condition.

Inadequate modification of refrigerator and incorrect arrangement of AI vaccine in the refrigerator.



Poor condition of one AHC (i.e., sagging floor tiles in all AHC rooms) made it inappropriate for vaccine storage.

Cold Chain Situation at AHCs <u>Before</u> InVac

Frost-free refrigerator.

Storage of vaccine mixed with other items.

Inadequate or no modification of domestic refrigerator to make it suitable for vaccine storage.

Use of a digital thermometer in a domestic refrigerator.

Proper modification of a domestic refrigerator.

Proper vaccine arrangement in a domestic refrigerator.

Use of temperature monitoring indicator to ensure vaccine condition in the refrigerator.

Use of digital thermometer in a refrigerator.

USAID | DELIVER PROJECT job aid on a domestic refrigerator at one AHC.

Cold Room Renovation, February 2010

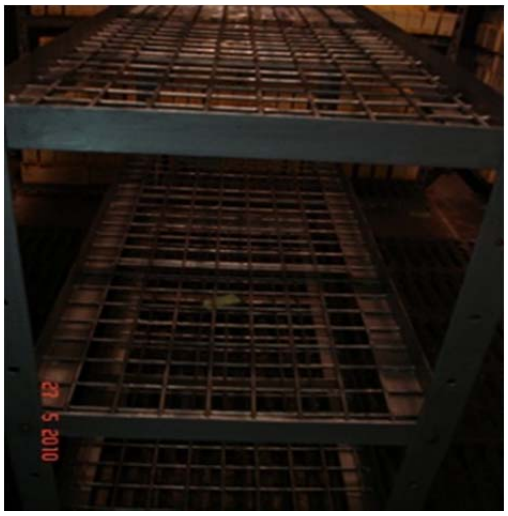
New evaporator below Searle's.

Plastic curtain door.

New condensor unit.

New (left) and old control panel.

Automatic light switch.



New additional rack.

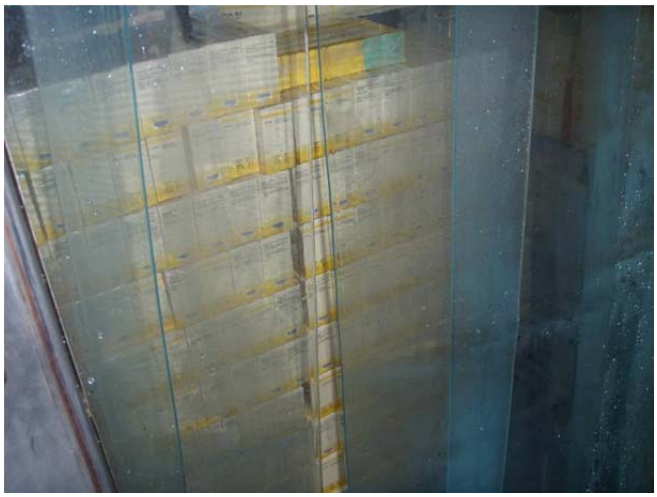
Extra digital thermometer.

Existing dial thermometer for the Yogya cold room.

ND vaccine on a rack in the cold room.

AI vaccine on a rack in the cold room.

Cold Room Situation in August 2010



Cold Room Management Training
March 10–11, 2010

Vaccine arrangement practice in the cold room.

Exercise on completion of batch card.

Stock management system exercise.

A display of some cold chain equipment and devices.

Training participants and facilitators.

For more information, please visit deliver.jsi.com.

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