

Implementation of the Pandemic Influenza Preparedness (PIP) Framework in the Eastern Mediterranean Region

July 2014–August 2016



**World Health
Organization**

Regional Office for the Eastern Mediterranean

Implementation of the Pandemic Influenza Preparedness (PIP) Framework in the Eastern Mediterranean Region

July 2014–August 2016

WHO Library Cataloguing in Publication Data

World Health Organization. Regional Office for the Eastern Mediterranean
Implementation of the Pandemic Influenza Preparedness (PIP) framework in the Eastern
Mediterranean Region, July 2014 - August 2016 / World Health Organization. Regional Office for the
Eastern Mediterranean

p.

WHO-EM/CSR/155/E

1. Influenza, Human - epidemiology 2. Influenza, Human - prevention & control 3. Disease
Outbreaks - prevention & control 4. Regional Health Planning 5. Disaster Planning - organization &
administration 6. Capacity Building 7. Eastern Mediterranean Region I. Title II. Regional Office for the
Eastern Mediterranean

(NLM Classification: WC 515)

© World Health Organization 2018

Some rights reserved. This work is available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo>).

Under the terms of this licence, you may copy, redistribute and adapt the work for non-commercial purposes, provided the work is appropriately cited. In any use of this work, there should be no suggestion that WHO endorses any specific organization, products or services. The use of the WHO logo is not permitted. If you adapt the work, then you must license your work under the same or equivalent Creative Commons licence. If you create a translation of this work, you should add the following disclaimer along with the suggested citation: "This translation was not created by the World Health Organization (WHO). WHO is not responsible for the content or accuracy of this translation. The original English edition shall be the binding and authentic edition".

Any mediation relating to disputes arising under the licence shall be conducted in accordance with the mediation rules of the World Intellectual Property Organization.

Suggested citation. [Title]. Cairo: WHO Regional Office for the Eastern Mediterranean; 2017. Licence: CC BY-NC-SA 3.0 IGO.

Sales, rights and licensing. To purchase WHO publications, see <http://apps.who.int/bookorders>.

To submit requests for commercial use and queries on rights and licensing, see <http://www.who.int/about/licensing>.

Third-party materials. If you wish to reuse material from this work that is attributed to a third party, such as tables, figures or images, it is your responsibility to determine whether permission is needed for that reuse and to obtain permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

General disclaimers. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

Contents

Executive summary	5
Background	7
PIP Framework implementation in priority countries of the Eastern Mediterranean Region.....	10
Afghanistan.....	10
Djibouti	12
Egypt.....	13
Jordan	16
Lebanon	18
Morocco.....	20
Yemen	22
Eastern Mediterranean Region	25
Challenges faced	29
Conclusion and recommendations	30
Annex 1.....	32
Annex 2.....	36
Annex 3.....	38
Annex 4.....	40

Executive summary



The Pandemic Influenza Preparedness (PIP) Framework is a global effort to improve preparedness and response for the next influenza pandemic. The Partnership Contribution mechanism under the PIP Framework aims to, among other things, increase global capacities and contribute to effective preparedness for pandemic influenza. Among the beneficiary countries of the PIP Partnership Contribution Implementation Plan (2013–2016), there are seven from the Eastern Mediterranean Region of the World Health Organization (WHO): Afghanistan, Djibouti, Egypt, Jordan, Lebanon, Morocco and Yemen. These countries were selected based on geographic distribution in six influenza transmission zones, country development status, the International Health Regulations (2005) core capacities, country needs for influenza epidemiological and laboratory surveillance and H5N1 vulnerability.

The implementation of PIP in the Region has been under way since July 2014. Until March 2016, there had been three funding cycles. During 2014–2016, the countries have shown progress in putting in place both the hard and soft infrastructure and in building systems that address the local needs and could be sustained over time for influenza surveillance and pandemic preparedness. Some of the countries (e.g. Afghanistan and Yemen) were able to build or rebuild their infrastructure despite years of war and conflict. Similarly, countries dealing with huge numbers of refugees and their health needs (e.g. Jordan) were able to prioritize influenza, a disease perceived to be a low public health priority. Furthermore, pandemic preparedness has steadily gained attention at the national level. Countries have also developed partnerships to make effective and optimal use of resources, for example harmonizing funding from other donors and technical agencies such as the Centers for Disease Control and Prevention, Atlanta.

At the regional level, the WHO Regional Office for the Eastern Mediterranean has contributed to PIP implementation by: advancing the public health research agenda on influenza in the Region, holding joint review missions for priority countries and consultative meetings with experts to review surveillance strategies and tools, conducting capacity building workshops on surveillance, analysing surveillance data to generate evidence for public health policy and practice, and developing data-sharing portals such as the Eastern Mediterranean Flu Network. The WHO Regional Office commissioned several reviews on influenza and its preparedness, published a theme issue of the *Eastern Mediterranean Health Journal* on influenza, and supported national participation in international research conferences addressing the challenge of influenza and its preparedness. Furthermore successful partnerships have been forged with academic institutions, technical organizations, other donors and multilateral platforms for influenza surveillance, research and preparedness.

In view of its economic and geopolitical context, the Region faces several health challenges. Many factors, including the number of conflicts and humanitarian emergencies in the Region, particularly in the PIP priority countries, compound these challenges. Among the main challenges are: lack of political commitment to influenza and pandemic preparedness, inadequacy of health infrastructure, lack of focus on implementation and monitoring and the cross-cutting area of capacity. The countries can do better in their efforts to improve and strengthen

health systems including the essential elements for influenza preparedness. They need to address the implementation issues by continuous monitoring and programme improvement, and enhance capacities at various levels.

The threat of the emergence of a novel influenza virus and it giving rise to the next pandemic remains very real, thus investment in influenza surveillance and pandemic preparedness is an urgent need. The need is particularly great in Eastern Mediterranean Region countries faced with complex emergencies, settings where public health priorities are usually different. Challenges notwithstanding, the PIP Framework and PIP Partnership Contribution Implementation Plan provide an opportunity to strengthen cross-cutting elements of the health system and fulfil the needs of the Region in the coming times.

Background



Addressing the infectious diseases that have epidemic and pandemic potential is a global public health priority and is a focus of the work of the World Health Organization (WHO). Numerous resolutions of the World Health Assembly have addressed building national and global capacities to detect, prepare for and respond to epidemic and pandemic diseases. In the aftermath of the 2009 influenza pandemic, preparing for future pandemics remains a high priority for WHO and its Member States.

The Pandemic Influenza Preparedness (PIP) Framework is an important step towards improving the preparedness of member countries. Spurred in 2007 by the likelihood of an imminent influenza pandemic and adopted in 2011, the PIP Framework has three components: virus sharing, benefit sharing and governance.

The stipulated benefit-sharing system includes an annual contribution (the “Partnership Contribution”) to WHO by influenza vaccine, diagnostic and pharmaceutical manufacturers that use the WHO Global Influenza Surveillance and Response System (GISRS). An aim of the benefit-sharing system is to increase global capacities to prepare for pandemic influenza. The Framework specifies that PIP Partnership Contribution (PIP PC) resources are to be used to improve pandemic preparedness and response through various steps, such as conducting disease burden studies, and strengthening laboratory and surveillance capacity and access to and effective deployment of pandemic vaccines and antiviral medicines.

In 2012, the Director-General’s PIP Advisory Group made several recommendations about the allocation of PIP PC resources and their use. More specifically, they proposed to allocate 70% of the PIP PC to pandemic preparedness and 30% to a reserve for pandemic response activities. The Advisory Group further recommended that the majority (70%) of preparedness resources be used to support surveillance and laboratory capacity-building and that 10% each be allocated for disease burden studies, strengthening regulatory capacity to improve access to and effective deployment of pandemic vaccines and antiviral medicines, and strengthening risk communications. The recommendations were accepted by the Director-General and endorsed by the 131st Executive Board that approved this division of funds to the year 2016.

Since then, under the multipronged PIP PC Implementation Plan 2013–2016, PIP activities are being carried out in 43 priority countries across the world including seven from the Eastern Mediterranean Region.

Overall, the PIP PC Implementation Plan 2013–2016 outlines the following five outcomes that should be achieved.

1. **Laboratory and surveillance:** The capacity to detect and monitor influenza epidemics is strengthened in developing countries that have weak or no capacity.
2. **Burden of disease:** National policy makers will have the influenza disease burden data needed for informed decision-making and prioritization of health resources.
3. **Regulatory capacity building:** Countries with weak or no regulatory capacity will be able to regulate influenza products, including vaccines, antivirals and

diagnostics, and to accelerate registration of these commodities in case of an influenza pandemic.

4. Risk communications: Global capacities are strengthened with a special focus on pandemic influenza communications.
5. Planning for deployment: Plans for deployment of pandemic supplies, including vaccines, antivirals and diagnostics, will be developed and regularly updated.

All of these outcomes require certain capacities at the country and regional level and the PIP Framework provides guidance on the activities and their outputs that should be carried out to reach the desired capacity. Since outcome 1 relates to preparedness, which is the focus of PIP PC implementation for the period 2013–2016, an outline of the three PIP outputs and their respective activities is given below. Details of the outputs and activities for key deliverables are given in Annex 1.

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

Key Deliverable 1: Develop national capacity to detect and investigate new influenza virus sub-types

The activities include assessing gaps and building capacities for laboratory and epidemiological surveillance, and promoting partnership-building to address the human–animal interface of influenza.

Key Deliverable 2: Strengthen information and virus sharing at national level

The activities include building national information management systems for surveillance data, including both hardware and software, and virus sharing.

Output 2: National capacities to monitor trends in circulating influenza viruses are strengthened.

Key Deliverable 1: Strengthen influenza laboratory surveillance and the link with epidemiological surveillance

The activities include examining the gaps and providing relevant laboratory training as well as advocating to the government for local investment in order to make preparedness sustainable.

Key Deliverable 2: Strengthen influenza disease surveillance (SARI and/or ILI surveillance)

The activities include assessing the existing surveillance capacity and establishing or expanding severe acute respiratory infection (SARI) and influenza-like illness (ILI) surveillance systems.

Key Deliverable 3: Enhance national data-sharing capacity to ensure monitoring and assessment of influenza events of international concern

The activities include establishing data management to improve external data-sharing systems.

Output 3: Global collaboration, through the sharing of information and viruses, is strengthened and the quality of the system is improved [polymerase chain reaction (PCR) detection quality assurance].

Key Deliverable 1: Share representative viruses in a timely manner

The regional activities include packaging, shipping and other logistics training.

Key Deliverable 2: Enhance networking to maximize use of limited resources

The activities include supporting the WHO GISRS network through coordinating laboratory capacity, updating reporting tools and standards and strengthening regional networks by improvement of data sharing between countries with similar transmission patterns.

Key Deliverable 3: Maintain high quality influenza virus detection capacity

Regional level activities include training staff of the National Influenza Centre (NIC), and organizing academic exchange programmes/study tours on good laboratory practices and intercountry workshops on the WHO External Quality Assessment Programme.

This document reports the PIP activities in the Region and the seven member countries that are recipients of grants under the 2013–2016 PIP PC Implementation Plan.

PIP Framework implementation in priority countries of the Eastern Mediterranean Region

This section provides country information for the period 2014, when PIP activities started in the Region, to 2016. It outlines the activities carried out for key deliverables against outputs 1 and 2, the number of cases identified and the PIP PC funds used for PIP implementation. Regional information, i.e. the activities implemented by the WHO Regional Office for the Eastern Mediterranean for key deliverables against output 3 is also included. During the 2015–2016 period, WHO has carried out review missions to five of the seven PIP priority countries (Afghanistan, Egypt, Jordan, Lebanon and Morocco) to assess progress in PIP implementation.

Afghanistan

Afghanistan carried out a number of capacity-building activities to strengthen its laboratory and epidemiological surveillance system during 2014–2016. In 2014, the country established a SARI/ILI surveillance system through PIP support – laboratory specimens were collected without epidemiological information before this period. For this purpose, surveillance focal points at all the sentinel sites were trained on SARI/ILI surveillance, including sample collection, storage and transportation. Combining the two components of surveillance considerably improved the effectiveness of the surveillance and influenza preparedness programme.

The PIP PC Implementation Plan 2013–2016 identifies 12 capacity indicators to monitor the progress associated with two PIP outputs. The first output, national capacity to detect respiratory disease outbreaks caused by novel viruses, is covered by four indicators: the presence of an algorithm; real-time polymerase chain reduction testing; sequencing; and national warnings systems or event-based surveillance. The second PIP output is strengthened national capacity to monitor trends in circulating influenza viruses. The indicators to monitor progress in this output are: SARI national surveillance; ILI national surveillance; regular influenza surveillance reports/bulletins; integration of laboratory and epidemiological data; rapid response team training; human–animal interface coordination; country implementation plan; and evidence of sustainability.

Revitalization of the National Influenza Centre in Kabul, Afghanistan

The National Influenza Centre in Afghanistan was established in the Central Public Health Laboratory in 2007 with support from WHO, US Naval Medical and Research Unit-3 (NAMRU-3) and the Ministry of Public Health Afghanistan. In 2009 it had the capacity for virus isolation and polymerase chain reaction (PCR) identification. During 2007–2011, real time PCR, and virus isolation and identification were performed and original specimens and isolates were referred to NAMRU-3 in Cairo. However, this stopped functioning in 2012. In 2015, through PIP support, this facility was revitalized and a cell culture and virus isolation laboratory was restarted. The number of tested specimens has significantly increased (1368 in 2015 and 2074 up to 31 August 2016) compared to the earlier period (195 in 2011 and 150 in 2012). The proportion of influenza-positive specimens also increased during the same period. A total of 20 influenza-positive virus isolates were shared with the Centers for Disease Control and Prevention, Atlanta in 2016.

During 2015, after almost three years of not functioning, the country restarted the national laboratory for cell culture and virus isolation. A landmark achievement for the laboratory was the revival of the PCR testing system and its approval by the External Quality Assessment Programme. This approval has greatly benefited the NIC and the PIP Programme. After its revitalization, Afghanistan shared the virus isolates for the first time with the WHO Collaborating Centre at the Centers for Disease Control and Prevention, Atlanta.

Instituting SARI/ILI surveillance, integrating laboratory and epidemiological data, training rapid response teams and progressing towards sustainability of the preparedness system are among the indicators for which capacities have been successfully established, while partial or no capacity has been established for the remaining indicators, as identified by a WHO review mission in May 2016.

In terms of financial spending, the country consistently utilized the PIP PC amounts during 2014–2016; 2015 was the busiest year both for activities and spending.

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

Key activities for laboratory surveillance during 2014–2016 included training on: identification of new subtypes of influenza, standard operating procedures and laboratory algorithms and virus isolation. A total of 120 surveillance staff/rapid response team members and 24 laboratory staff were trained; the training also included biosafety, biorisk management and biosecurity.

In terms of epidemiological surveillance, initial assessments were done to inform the training and epidemiological strategies. A national conference on respiratory infections was also held in this regard. Afghanistan established nine sentinel sites in Balkh, Bamyan, Herat, Kabul, Kandahar, Kapisa, Kunduz, Nangarhar and Paktya provinces. Moreover, the country organized training on the human–animal interface of influenza for veterinarians, a one-day training on the Eastern Mediterranean Flu Network (EMFLU) for influenza focal points and quarterly zoonosis meetings to address the human–animal interface of influenza.

Output 2: National capacities to monitor trends in circulating influenza viruses are strengthened.

Key activities to strengthen laboratory surveillance and link it to epidemiological analysis included training on improving the quality of epidemiological data from the nine sentinel sites. Activities for strengthening SARI/ILI surveillance included training on SARI/ILI surveillance for the staff from the sentinel sites. Training was also provided on data management to enhance national data-sharing capacity to ensure monitoring and assessment of influenza events of international concern.

More specimens were laboratory-tested in late 2015 and early 2016 than before (Fig. 1). The greatest proportion were positive for influenza type A (lineage not subtyped) followed by influenza A(H3) and A(H1N1)pdm 09.

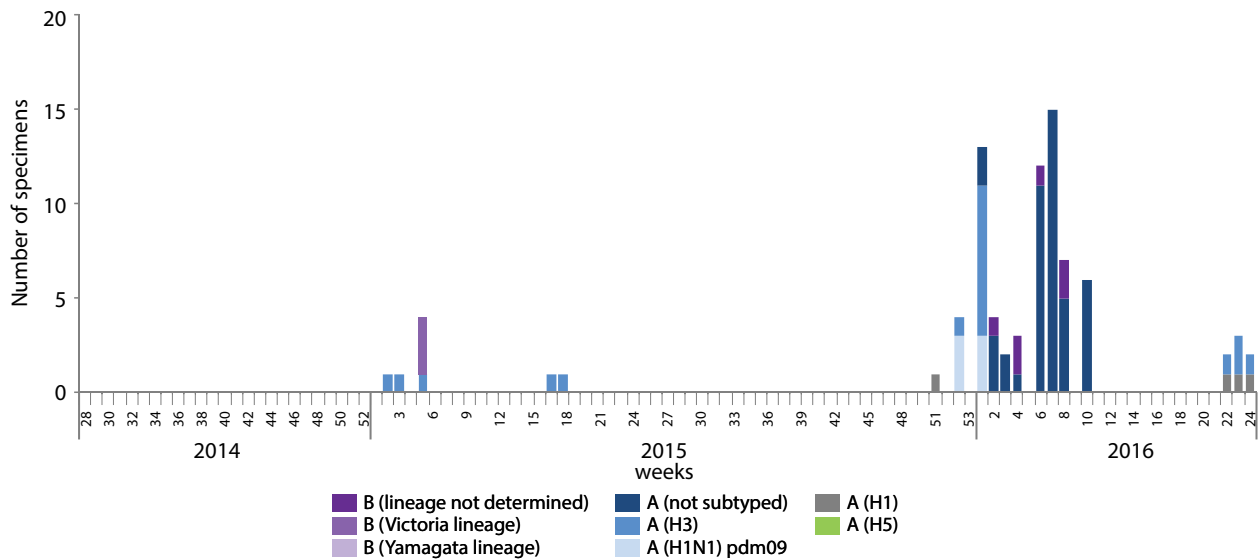


Fig. 1 Number of tested specimens positive for influenza by subtype, Afghanistan, 2014–2016 (Source: Global Influenza Surveillance and Response System)

Djibouti

Capacity-building activities were started in 2014 to strengthen the laboratory and epidemiological surveillance systems in Djibouti.

The country received support from the WHO Regional Office as well as from some countries of the Region, particularly Morocco, to improve their surveillance and response system. Notable was the twinning support under which visiting experts from Morocco helped assess the situation and suggest a plan of activities to strengthen influenza surveillance followed by training to implement these plans. In addition, Djibouti sent its samples for PCR testing and analysis to the NIC in Morocco.

The country used USD 75 000 of PIP PC funds in 2014 for capacity-building activities. No expenditure was reported out of PIP PC funds in the subsequent years.

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

Key activities for laboratory surveillance included training for various levels of laboratory staff on influenza/respiratory virus detection using real time PCR,

Twinning support from Morocco in Djibouti

Under PIP funding, Djibouti received twinning support from Morocco. In the early phase in August 2014, visiting experts in epidemiology and influenza virology from Morocco helped assess the surveillance situation and suggest a plan of activities to strengthen influenza surveillance. In 2015, a delegation of laboratory and epidemiology staff from Djibouti visited Morocco for hands-on practice in laboratory and surveillance systems. In the absence of its own polymerase chain reaction testing mechanism during the initial stages, Djibouti sent influenza clinical samples to the National Influenza Centre (NIC) in Morocco for testing, the results of which were sent to Djibouti for analysis. The NIC Morocco also facilitated sharing the Djibouti samples with the WHO Collaborating Centre for reference and research in the United Kingdom for further testing

PCR machine safety, virus sequencing and haemagglutination inhibition (HI) neutralization assay.

To improve epidemiological surveillance, SARI/ILI surveillance capacity was assessed in the country and a consultative workshop was held to review the situation. Based on this, training on epidemiological and laboratory surveillance for influenza and respiratory diseases was carried out for Ministry of Health surveillance officers at the national level.

Output 2: National capacities to monitor trends in circulating influenza viruses are strengthened.

Key activities for strengthening influenza disease surveillance (SARI and/or ILI surveillance) included the addition of three sentinel sites in 2014 and four in 2015 as part of the surveillance system.

Training was provided to the relevant staff on analysis and interpretation of SARI/ILI sentinel surveillance data. To enhance national data-sharing capacity to ensure monitoring and assessment of influenza events, staff of the Institut National de Santé Publique de Djibouti were trained on data management.

Egypt

The influenza surveillance system was introduced in Egypt in 1999 through the establishment of ILI sentinel sites. The Ministry of Health and Population and other government institutions have a strong commitment to continuous investment to support the influenza surveillance system so as to provide good quality data to estimate the trends, impact and severity of influenza-associated illnesses in the country.

The current influenza surveillance system has a wide network of sentinel sites at public hospitals and regional laboratories covering nine governorates in Upper and Lower Egypt: Alexandria, Aswan, Cairo, Damietta, Gharbia, Giza, Menia, Menoufia and Sharkia.

There is strong collaboration between the central Ministry of Health and Population, directorates of health, district health authorities, sentinel sites and

Surveillance mechanisms in Egypt

Influenza-like illness (ILI), severe acute respiratory infection (SARI) and acute respiratory infection surveillance are under the Influenza and Acute Respiratory Diseases Unit (IARDU) which reports to the Department of Epidemiology and Surveillance and the Central Directorate for Preventive Affairs. Several surveillance systems function in Egypt under the Ministry of Health and Population, which complement each other.

1. National notifiable disease surveillance system. This is the routine surveillance that provides an electronic platform for reporting and monitoring over 26 notifiable diseases, including seasonal influenza.
2. ILI and SARI sentinel surveillance system. This operates at selected public hospitals in nine governorates.
3. Hospital-based acute respiratory infection syndromic surveillance. This has been in operation since 2009 and covers 429 public and private hospitals. It provides an electronic platform for reporting and monitoring seasonal influenza, avian influenza and Middle Eastern respiratory syndrome – novel coronavirus).
4. Event-based surveillance system. This has been in operation since 2015 with the purpose of capturing, through formal and informal channels, information about events that are a potential risk to public health.
5. Avian influenza surveillance system. This was established in 2006 and obliges all health care facilities across the country to notify suspected influenza A(H5N1) cases.

key stakeholders (WHO, US Naval Medical Research Unit-3 and the Centers for Disease Control and Prevention, Atlanta). In recent years, the Ministry has upgraded the central and regional public health laboratories to support the influenza surveillance system, and the national influenza surveillance platform has contributed to the detection of novel influenza A among suspected human cases of H9N2 and Middle Eastern respiratory syndrome – novel coronavirus infection.

Several capacity-building activities to strengthen the laboratory and epidemiological surveillance system were carried out during 2014–2016 as part of the PIP Implementation Plan.

Out of the 12 indicators against which the countries of the Region are regularly assessed, the WHO review mission in June 2016 rated Egypt as satisfactory for all but one indicator – genetic sequencing against output 1 which was not fully functioning at the time of review.

Egypt consistently utilized PIP PC funds during 2014–2016. USD 391 000 were spent in 2014 which declined to USD 280 000 in 2016.

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

Key activities for laboratory surveillance included assessment of current capacities to establish needs and outline a training strategy. Training was carried out for designated staff of the NIC on sub-national influenza virus specimens using sequencing and HI neutralization assay and for staff of the Central Public Health Laboratory and the NIC on the use of PCR machines and safety cabinets. Moreover, basic laboratory equipment and supplies for routine influenza detection were procured.

Steps to strengthen epidemiological surveillance included organizing 30 training workshops for health care workers, meetings with key stakeholders to update the national pandemic influenza preparedness plan, and seven training sessions for surveillance officers and five for local surveillance staff on new methodologies. Designated staff of epidemiological surveillance offices at district and governorate levels were trained on surveillance methodology, outbreak investigation and intervention strategies.

For effective programming on the human–animal interface, quarterly meetings between partners of the human and animal health sectors were held during 2015–2016.

Output 2: National capacities to monitor trends in circulating influenza viruses are strengthened.

Key activities for laboratory surveillance included training on shipment and cold chain preservation, and training of laboratory staff on sampling techniques and on influenza virus isolation and advanced virus characterization. Training workshops to improve the capacity of laboratory staff at the Central Public Health Laboratory were also carried out. To strengthen the influenza disease surveillance (SARI and/or ILI), 16 sentinel sites were established in the country. Several training sessions were held on: proper infectious substance sampling techniques, surveillance methodology and outbreak investigation and intervention strategies

for designated staff of epidemiological surveillance offices at district and governorate levels. Moreover, 25 frontline physicians working in the intensive care units were also trained on WHO SARI critical care.

Systems for periodic collection and publication of data were established to enhance national data-sharing capacity to ensure monitoring and assessment of influenza events of international concern.

More specimens were laboratory-tested in late 2015 and 2016 than before (Fig. 2). Most were influenza type A (lineage not subtyped) in 2014–2015 and influenza A(H1N1)pdm09 type in 2015–2016.

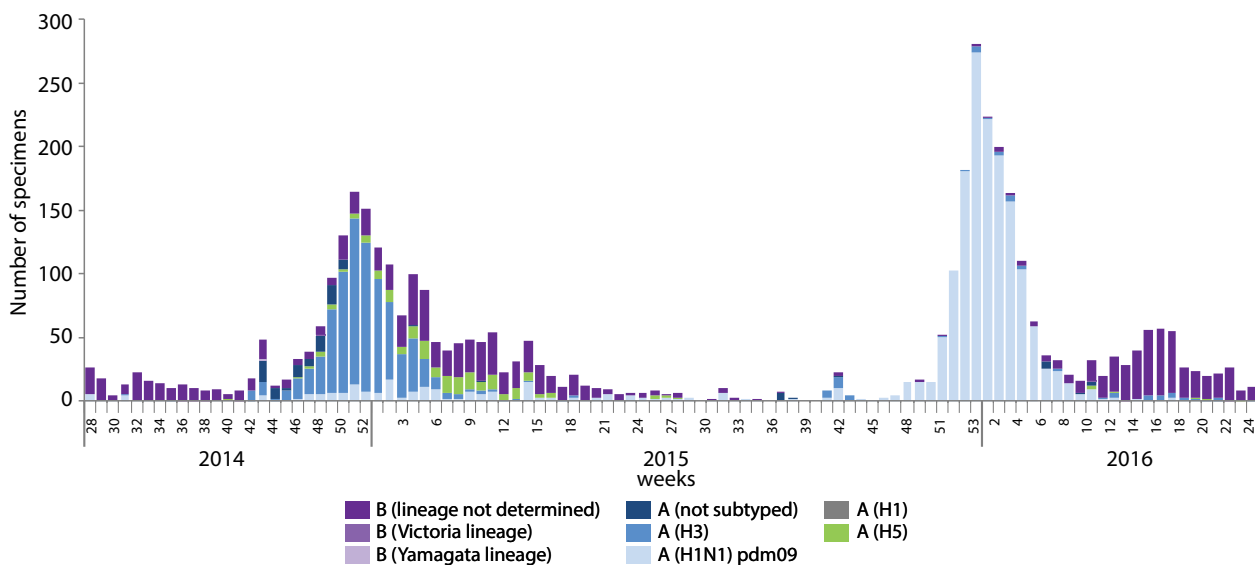


Fig. 2 Number of tested specimens positive for influenza by subtype, Egypt, 2014–2016 (Source: Global Influenza Surveillance and Response System)

Jordan

The Ministry of Health of Jordan is committed to the effective implementation of the PIP Framework. Through the partnership fund contribution the Ministry of Health is carrying out SARI/ILI surveillance activities on a sustained basis. There is a functioning NIC under the umbrella of the Central Public Health Laboratory. NIC standard operating procedures follow international standards and the increasing number of specimens tested reflects the strengthened NIC laboratory capacity.

With PIP PC funds, the Ministry of Health has sustained and expanded the SARI surveillance system. The number of sentinel sites has increased from three to four which has helped improve coverage and representativeness. A national SARI protocol is available that provides standardized case definitions, standard operating procedures, and specimen collection, storage, shipment and reporting procedures. PIP PC funds have also enabled the Ministry of Health to establish a national, electronic event-based surveillance system. This allows case-based, real-time reporting of unusual events related to respiratory diseases from nearly 300 health facilities across the country.

The performance of the PIP programme in Jordan was mixed during the first years of its implementation. The 12 performance indicators were assessed during a WHO review mission in April 2016; four were assessed as “capacity established”, six as “partial capacity” and two as “no capacity”. The areas with no capacity included sequencing and animal–human interface. Between 2010 and March 2016, a total of 8211 influenza specimens were collected and tested at the NIC, with a significant increase between 2014 and 2016 attributed to PIP support (1078 in 2014; 2333 in 2015 and 1542 in the first three months of 2016).

PIP PC funding in 2014 and 2016 was USD 253 000 and USD 284 000 respectively with no funding allocated in 2015.

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

A needs assessment of laboratory surveillance was carried out to determine the capacity to detect influenza and respiratory disease outbreaks. Following this, a network of laboratories within the country was established with a view to detect any novel influenza/respiratory viruses and training workshops on early detection, recognition and response to respiratory outbreaks were conducted.

Digitizing event-based surveillance in Jordan

In order to identify unusual or unexpected illness events, PIP funds have enabled the Ministry of Health Jordan to introduce mobile tablets to its early warning, event-based surveillance system. These tablets have been provided to nearly 300 clinics across the country; this enables real time information to be made available within one hour to decision-making at all levels of care. Disease information is coded in a structured manner according to the *International classification of diseases* (ICD-10). The case-based reporting form is available in Arabic and English and helps collect patient demographic information as well as relevant clinical, laboratory and prescribing information. An electronic version was developed for the tablets that replicates the paper-based data entry form for severe acute respiratory infection (SARI) and is used by hospital sentinel sites for submission of SARI case-based data. Data are uploaded in real-time from tablets to a central server based at the Ministry of Health. Data are anonymized and aggregated over time and location and displayed via a website. The website displays demographics and proportional disease morbidity at governorate, directorate and health centre level and displays data using tables, charts and maps.

Epidemiological surveillance assessments were also carried out to determine the capacities to detect influenza and respiratory disease outbreaks. Training workshops for health care workers were held with an emphasis on rapid response to outbreaks and on identification, detection and verification of unusual events related to influenza and respiratory diseases. Surveillance staff training was also carried out to build their capacity.

Output 2: National capacities to monitor trends in circulating influenza viruses are strengthened.

The capacity of potential sentinel sites was assessed, a capacity-building strategy was formulated and essential supplies and equipment were purchased. Training of NIC laboratory staff was completed on characterization of influenza virus specimens using sequencing and HI neutralization assay. Training for ILI/SARI surveillance data analysis was also conducted and workshops held for electronic reporting and enhancing information-sharing at the national level. Training of local surveillance officers on analysis and interpretation of SARI/ILI surveillance data, data management, and periodic collection and publication of data was carried out. Intercountry training was also conducted on data analysis, and scientific writing and publishing for epidemiologists and virologists in collaboration with the Mailman School of Columbia University.

The number of specimens testing positive for influenza is shown in Fig. 3. Cases spiked in the winters of 2014–2015 and 2015–2016. The greatest proportion tested positive for influenza A(H1N1)pdm09 followed by influenza B (undetermined lineage).

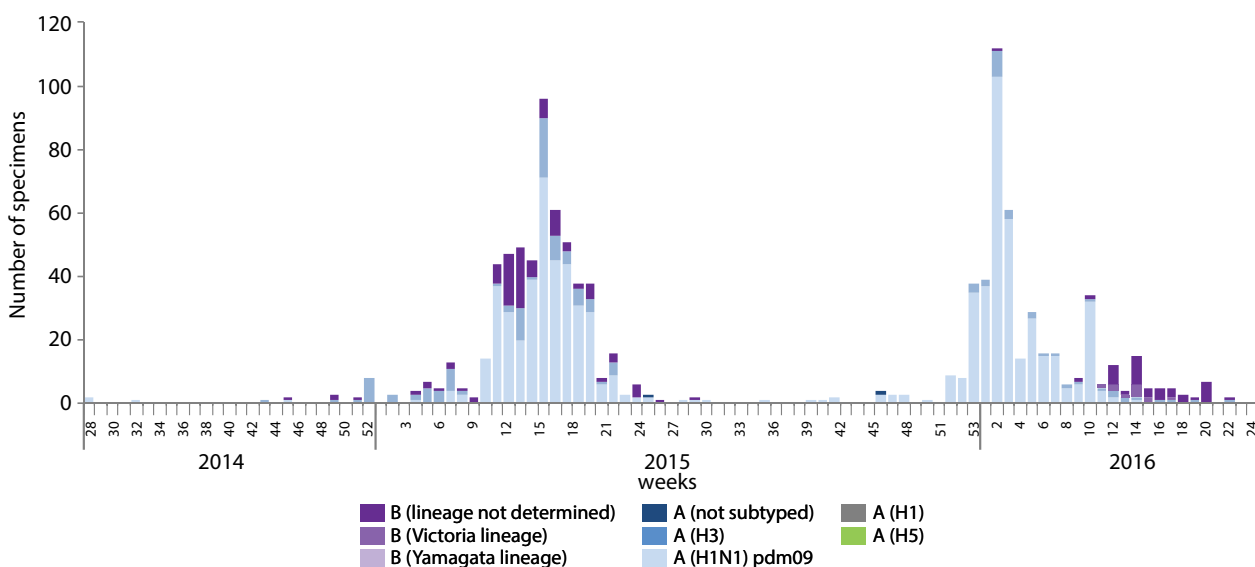


Fig. 3 Number of tested specimens positive for influenza by subtype, Jordan, 2014–2016 (Source: Global Influenza Surveillance and Response System)

Lebanon

Between 2014 and 2016, Lebanon carried out a number of capacity building activities in order to strengthen the laboratory and epidemiological components of its surveillance system, as outlined in the PIP Implementation Plan.

Lebanon established a surveillance system for influenza through a network of sentinel sites in the country in December 2014, for which the WHO Regional Office provided technical and financial support (Figure 8). The strengths of the preparedness programme in Lebanon are the meticulous documentation, trained health workers, follow-up mechanisms between the Ministry of Public Health and sentinel sites and the collaboration between the Ministry of Public Health and WHO.

There is a functioning NIC at Rafik Hariri University Hospital which has a role in SARI surveillance; it was recognized by WHO in 2009. The sentinel SARI surveillance programme established in December 2014 includes a dedicated team of professionals working at all programme sites, protocols and guidelines on data collection and analysis, regular training, and available equipment and supplies for the NIC and sentinel sites.

A review mission to Lebanon was commissioned by WHO in December 2015 to assess ongoing sentinel surveillance for SARI, which was initiated with the support of PIP funds. The mission noted with appreciation the availability of documentation, training of health workers, follow-up mechanisms between the Ministry and sentinel sites and collaboration between the Ministry and WHO. However, it observed that efforts are needed to strengthen representativeness of the sentinel sites, data management and analysis, sharing of feedback with different levels, dissemination of protocols, sampling strategy, shipment/transportation of samples to NIC and sustainability of the SARI surveillance in the context of health system.

Efficient coordination is in place between the NIC, the sentinel sites and WHO. WHO also extends technical and financial support, and monitors and evaluates activities to ensure continuation of the SARI surveillance component of the preparedness programme.

Lebanon consistently spent the PIP PC funds allocated during the period 2014–2016. The greatest amount, USD 297 000, was used in 2015.

Sentinel surveillance in Lebanon

The first step in establishing a surveillance system was to select sites based on factors such as geographical coverage, representation and sustainability. A severe acute respiratory infection (SARI) expert group composed of representatives from medical societies, syndicates and the Lebanese Epidemiological Association was convened. The role of the group was to decide on critical scientific aspects and help monitor the overall indicators of SARI surveillance. A draft protocol was developed as a guideline for SARI surveillance in Lebanon. Through consultations, the expert group finalized the methods of reporting and will reconvene to finalize a method of specimen sampling once enough data are available. Several training sessions were conducted targeting focal points at the SARI sentinel sites on topics such as case definitions, findings, reporting and basic analysis. The programme's pilot phase began with the implementation of SARI surveillance in two sentinel sites in different geographical locations. Data showed a sizeable number of SARI cases, the majority of which tested positive for influenza B.

The Ministry of Public Health aspires to estimate the seasonality of SARI and influenza in Lebanon as well as to estimate its burden. This will require years of surveillance, but the first step to reach this goal has been taken. These efforts have resulted in the institution of 11 sentinel sites for SARI surveillance in the six districts of Lebanon

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

The activities for laboratory surveillance started with assessment of the national capacity to detect influenza and respiratory disease outbreak followed by implementing a training strategy. One reference laboratory technician was trained on sequencing and cell culture and isolation, another was sent on a fellowship to Romania to study epidemiological and laboratory handling of specimens. Both technicians were certified by the International Air Transport Association (IATA).

Epidemiological surveillance activities included assessment of the influenza programme for its capacity to detect influenza and respiratory disease outbreaks in Lebanon. Prior to initiation of SARI surveillance, assessment of a geographically representative sample of 13 hospitals was conducted to explore their capacities and the possibility of their joining the SARI sentinel site network in Lebanon. A two-day training session was provided on active and passive surveillance for 12 focal points and 12 back-up staff of 12 of the sentinel sites assessed after which 11 sites were retained. Following the assessment, 210 health care workers, nurses and medical doctors in the 11 sentinel sites progressively joined the network. They were instructed on the epidemiology of influenza and trained on the SARI protocol, including case definitions, and specimen withdrawal and handling.

Output 2: National capacities to monitor trends in circulating influenza viruses are strengthened.

The activities for laboratory surveillance included specific training for hospital focal points (with national experts) and for NIC staff with WHO regional/international experts, and training for SARI focal points on data management. The activities for monitoring trends through epidemiological surveillance included assessment of potential sentinel sites and SARI surveillance system capacities.

Key activities for strengthening data management and data sharing included relevant training, as well as training on Microsoft Publisher for four surveillance officers at the Ministry of Public Health.

The number of specimens positive for influenza is shown in Fig. 4. In early and late 2015, the majority of cases were influenza B (undetermined lineage) while the most common cases reported in early 2016 were influenza A(H1N1)pdm09 followed by influenza A(H3) and B (undetermined lineage).

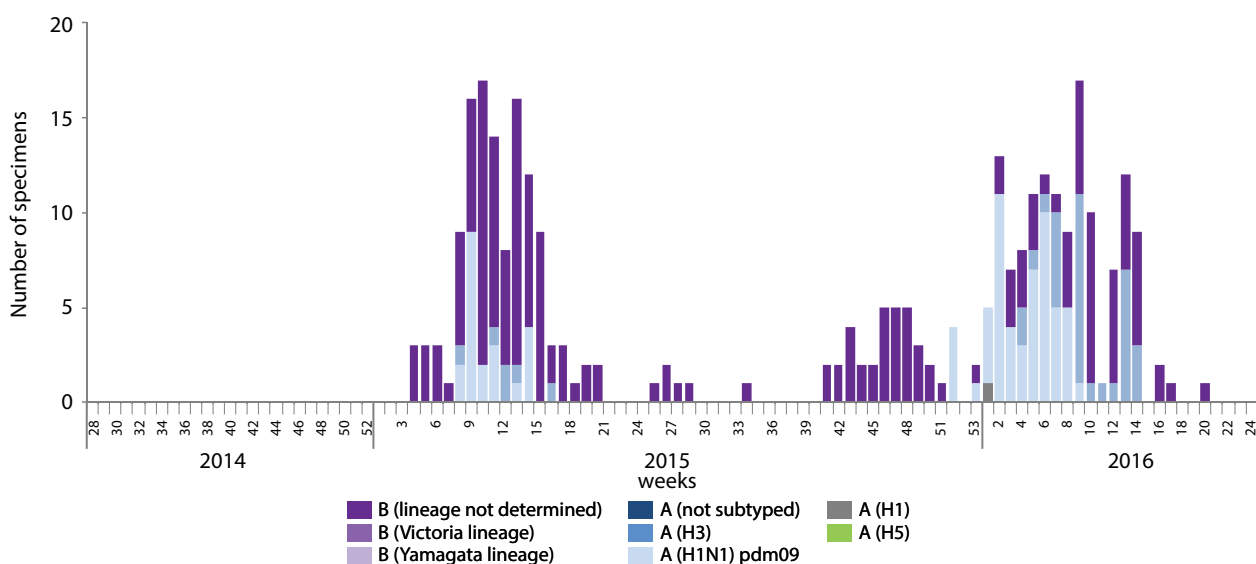


Fig. 4 Number of tested specimens positive for influenza by subtype, Lebanon, 2014–2016 (Source: Global Influenza Surveillance and Response System)

Morocco

Morocco established a SARI surveillance system in 2006 which at that time mainly comprised the NIC surveillance; the epidemiological aspect of surveillance was limited. With support of PIP, the epidemiology component was strengthened and an integrated database was established in 2014. Since then, SARI surveillance is functioning in 10 hospitals which are nationally representative.

Some aspects of the national early warning system in Morocco have existed since 2014 as there is a team to review the media and respond to reported events. A specific protocol for event-based surveillance of respiratory infections has been drafted and will be adopted after pilot testing. The oversight at the directorate level is provided by DELM (La direction de l'épidémiologie et de la lutte contre les maladies) whose team conducts the major work required. An ad hoc collaboration between the animal sector and the Ministry of Interior to identify events such as outbreaks is also in place.

Using the 12 indicators of the PIP PC Implementation Plan, a WHO review mission in March 2016 assessed the capacities of the influenza programme in Morocco. The country had established capacity for six indicators and partial capacity for another five. There was no capacity for the indicator: developing a mechanism to address the human–animal interface of influenza.

Revitalization of SARI/ILI surveillance in Morocco

Integrated (both virological and epidemiological) surveillance of severe acute respiratory infection (SARI) and influenza-like illness (ILI) was halted from 2012 to 2014 in Morocco. With PIP funding, the epidemiological surveillance system was revitalized during the 2014–2015 influenza season. During the first quarter of 2015 extensive training was provided to staff on the procedures for monitoring. As a result, monitoring has become robust and data are regularly and promptly shared with the WHO through FluNet and FluID. With the PIP funding, the Ministry of Health Morocco is able to sustain the SARI/ILI surveillance activities. The PIP funds have contributed to reviving the capacity of the National Influenza Centre, and the number of specimens it was able to process increased from 264 and 268 in 2013 and 2014 respectively to 413 in 2015 and 651 in the first 8 weeks of 2016.

Significant PIP PC funds were used in 2014 and 2016, USD 296 000 and 384 000 respectively, while no use of funds was recorded for 2015.

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

The laboratory surveillance activities started with an assessment of capacity for virological surveillance. The manual for virological surveillance was revised and eight regional laboratories were established to implement new guidelines. Training and refresher courses for laboratory staff on influenza/respiratory virus detection using real time PCR were provided.

The epidemiological surveillance capacity was assessed, followed by specific training for staff of SARI hospital laboratories by regional and international experts. A meeting was organized to improve the integration of laboratory surveillance with epidemiological surveillance for ILI/SARI followed by another with the regional surveillance officers, clinicians and hospital administrators to orient them about this integration. To address the animal–human interface, meetings with animal health staff for coordination on animal–human influenza events were regularly carried out.

Output 2: National capacities to monitor trends in circulating influenza viruses are strengthened

To address this output, eight sentinel sites were selected and training given to their staff. Working group meetings were conducted to estimate the disease burden in these sites. Training of surveillance officers on data management was part of the data improvement and sharing system.

SARI and ILI sentinel surveillance is currently running with governmental and external financial/technical support including WHO support through PIP PC funding. The PIP activities' plan has not yet been integrated into the national plans. For the epidemiological component, the DELM can continue surveillance activities with limited external financial support.

A large number of specimens were laboratory tested during late 2014 and early 2015 and again in early 2016 (Fig. 5). The greatest proportion of specimens tested in 2014–2015 were influenza type B (lineage not subtyped). In 2016, the tested specimens were overwhelmingly influenza A(H1N1)pdm09 type.

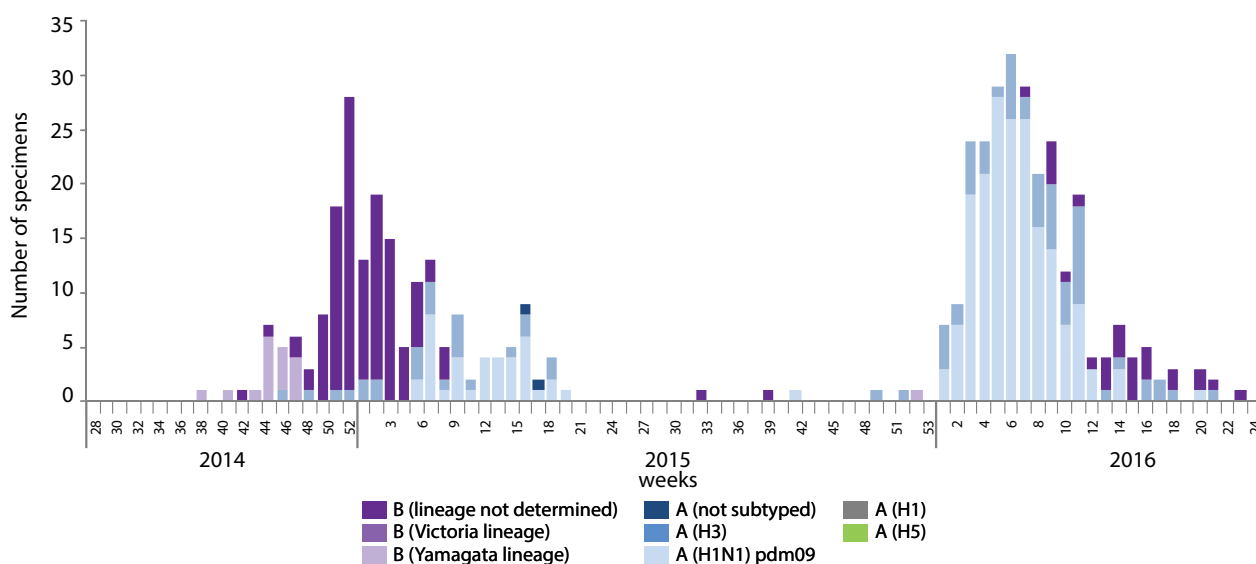


Fig. 5 Number of tested specimens positive for influenza by subtype, Morocco 2014–2016 (Source: Global Influenza Surveillance and Response System)

Yemen

In collaboration with the US Naval Medical and Research Unit-3 and WHO, SARI surveillance started in Yemen in 2010 with two sentinel sites (Sana'a and Aden). In 2012, the country established two ILI sentinel sites in Sana'a. During 2014–2015, a formal countrywide assessment of SARI/ILI surveillance capacities was carried out. This revealed several challenges including those related to infrastructure, functionality and financing.

As regards infrastructure, the sentinel sites were not well distributed and laboratory testing for influenza was not being performed due mainly to a lack of reagents. Moreover, a lack of efficient, consistent and sustainable mechanisms for collection, storage and transport of clinical specimens was also found. Functionally, the reporting channels were unclear in some sites and reporting

Influenza preparedness in Yemen

The WHO country office/PIP programme assisted in the development and establishment of severe acute respiratory infection (SARI) and influenza-like illness (ILI) surveillance in Yemen. The WHO also assisted in the analysis and interpretation of the weekly surveillance data and the sharing of epidemiological data on influenza with the WHO Regional Office and other partners. The following activities were supported and implemented under PIP funding in Yemen.

- Training for a national rapid response team and SARI/ILI focal points on SARI/ILI case management, data management, influenza surveillance and infection control measures
- An awareness campaign through the mass media to convey the right messages on SARI/ILI and prevention measures, especially for individuals
- Support to the Central Public Health Laboratory for influenza reagents and personal protective equipment
- Introduction of SARI/ILI to the national surveillance system (Electronic Diseases Early Warning System and routine surveillance system)
- Production and distribution of weekly and monthly influenza surveillance bulletins
- Design and printing of information, education and communication materials and SARI/ILI tools.

responsibilities were not well defined. No analysis of the data at the sentinel sites was being done. Financially, there was a lack of stable and long-term funding to cover the general costs of the surveillance operations.

In the light of this assessment, new SARI/ILI sentinel sites were established in the country while several that were dormant were reactivated.

USD 265 000 were used in the first year (2014), however, no funds have been used since then.

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

Key activities for laboratory surveillance started with an assessment of surveillance capacity followed by training on detection of influenza virus using the viral HI assay as well as on biosafety, biorisk management and biosecurity. In all, 75 laboratory staff were trained during 2014–2016.

The activities for epidemiological surveillance began with assessment of capacity for epidemiological surveillance followed by training for 120 health care workers. Local health care workers and 115 rapid response teams were also trained on early detection, recognition and response to respiratory outbreaks.

Output 2: National capacities to monitor trends in circulating influenza viruses are strengthened.

Training on influenza surveillance for physicians and laboratory technicians working in the newly expanded and activated sites was conducted. Training was also done for a rapid response team for influenza and other communicable diseases, for surveillance officers and health care workers on the importance of influenza surveillance and training for rapid response teams and SARI/ILI focal points in sentinel sites.

For epidemiological surveillance, four sentinel sites were selected and staff trained. Local training for epidemiological and laboratory surveillance officers on SARI/ILI data reporting was done. Training was also provided for local surveillance officers on analysis and interpretation of SARI and ILI surveillance data using standardized data management. Training on data management and quality was conducted following which the staff compiled and distributed periodic influenza surveillance reports.

Data collection, a sharing tool, laboratory support as well as a salary system for PIP focal points in the WHO country office were developed with financial support under the PIP Implementation Plan.

During the 2015, SARI/ILI sentinel sites submitted 658 respiratory specimens to the Central Public Health Laboratory in Sana'a. Of the specimens tested in NAMRU-3 by real time PCR, 57% were positive for influenza and other viruses (Fig. 6).

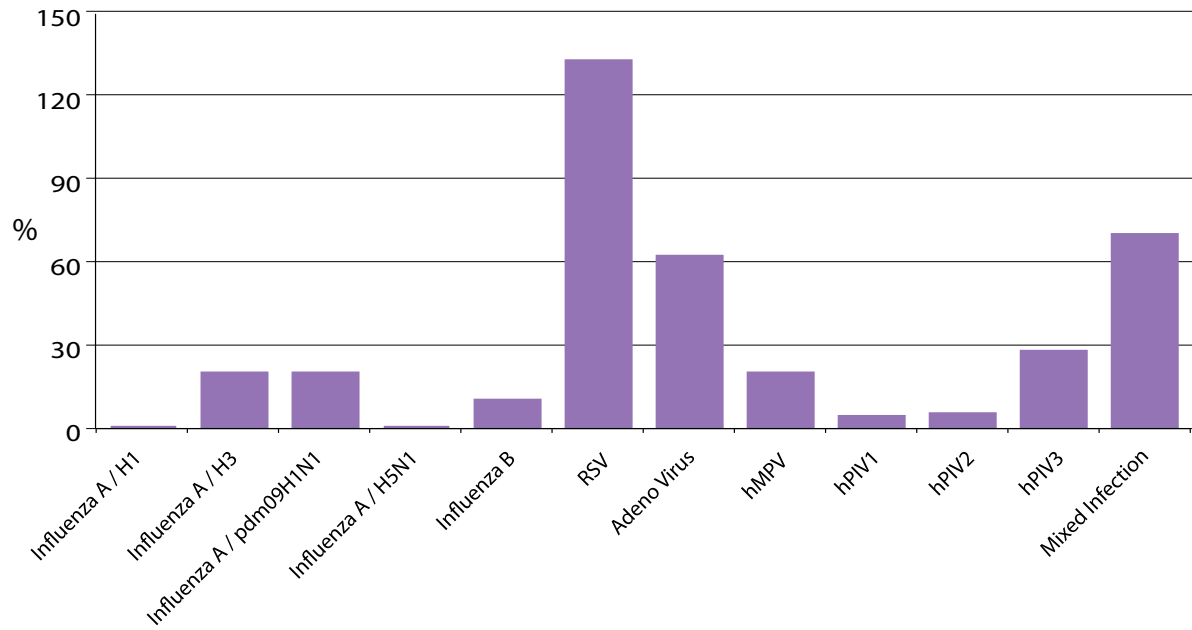


Fig. 6 Type of viruses detected in specimens from patients with severe acute respiratory infection, Yemen, 2015

Eastern Mediterranean Region

The WHO Regional Office for the Eastern Mediterranean has taken several steps towards ensuring regional and global collaboration for influenza preparedness by implementing the PIP framework activities. With availability of financial resources in August 2014, the Regional Office immediately initiated PIP activities. During this month, country-specific activity plans were developed and funds were distributed among countries. PIP beneficiaries in the Region include Afghanistan, Djibouti, Egypt, Jordan, Lebanon, Morocco and Yemen. The selection of the countries was based on criteria including geographic distribution in six influenza transmission zones, country development status, International Health Regulations (2005) core capacities, country needs for influenza epidemiological and laboratory surveillance and H5N1 vulnerability. The rationale for selection for each of the seven countries is shown in Annex 2.

Financial and technical support under PIP is extended through a) WHO country offices and ministries of health for country-specific activities, and b) the WHO Regional Office for intercountry activities. Up to March 2016, there have been three funding cycles. In July 2016, the PIP support had completed two years of implementation. Salient activities by the Regional Office include joint review missions for five countries, three consultative meetings with experts to review surveillance strategies and tools, four training workshops on surveillance, analysis of surveillance data and presentation as evidence for public health policy and practice, development of data sharing portals such as EMFLU, contribution to and support of research to expand the body of knowledge on influenza and participation in an international research conference in Atlanta, Georgia.

The activities undertaken by the Regional Office in relation to Output 3 of the PIP Framework are outlined below.

Output 3: Global collaboration, through the sharing of information and viruses, is strengthened and the quality of the system is improved.

Key Deliverable 1: Share representative viruses in a timely manner

The WHO Regional Office worked side by side with other countries to conduct several activities; for example, training, reinforcement of disease surveillance, establishment of functioning NIC/influenza laboratories and regional surveillance platforms such as EMFLU.

In September 2014, a multicountry training and certification workshop was held to increase the number of certified shippers of infectious substance samples, particularly of influenza and other respiratory diseases in Egypt. Laboratory staff were also trained on influenza virus shipment. An intercountry training and certification workshop on laboratory specimen collection, transportation, shipment of influenza and other pandemic-prone respiratory viruses as per IATA regulations was also organized.

Another highlight was the reinforcement of disease surveillance. To this end, SARI surveillance was initiated in Djibouti and Lebanon, dormant SARI/ILI surveillance was revived in Afghanistan and Yemen, and SARI/ILI surveillance was further strengthened in Egypt, Jordan and Morocco. Fifteen new sentinel sites were established, 13 were revived and, since PIP, 48 functioning sites have been established to date in the Eastern Mediterranean Region (Annex 3).

Strengthening of NIC/influenza laboratories was another important achievement for the WHO Regional Office. In 2016, the number of functioning NICs/influenza laboratories increased and trainings were organized to improve NIC staff capabilities and NIC laboratories. Seven laboratories were provided with equipment, reagents and supplies, and seven training courses and cross-country exchanges of experience were held. Similarly seven assessments have been carried out in the past five years and four laboratories have been linked with WHO Collaborating Centres/regional laboratories.

Key Deliverable 2: Enhance networking to maximize use of limited resources

One of the major successes of the WHO Regional Office was the development of the regional surveillance platform EMFLU for influenza epidemiological and laboratory data to provide support to GISRS and sharing of viruses. After its establishment, five out of seven countries started reporting to FluNet, two countries are sharing viruses with other laboratories while three countries are participating in the WHO External Quality Assessment Programme, having achieved proficiency level. However, no further countries have participated in virus sharing with WHO Collaborating Centres and the number of the countries has remained at four until now.

Another objective of the WHO Regional Office was to create better reporting systems among countries using current technology and systems. For this purpose, training workshops on electronic reporting and *Microsoft Publisher* were conducted. Many intercountry training activities were also organized. These included training on: data analysis, scientific writing and publishing for epidemiologists and virologists in collaboration with the Mailman School of Columbia University; advanced epidemiological data analysis; and influenza virus genotyping by Sanger sequencing.

Key Deliverable 3: Maintain high quality influenza virus detection capacity

Specific training was organized for NIC staff with regional/international experts to build and enhance their capacity for influenza virus detection. They were also given on-site training. In addition, the designated staff were given training on detection of influenza virus specimen using viral HI testing.

Eastern Mediterranean Flu Network

The Eastern Mediterranean Flu Network (EMFLU) is a web-based, regional platform for sharing of epidemiological and virological data on influenza in the WHO Regional Office. The platform provides quantitative and qualitative data on trends, spread, intensity and impact of influenza in the Region. EMFLU connects existing databases at the country level in the Region and can also be used to directly enter data at the country level using a web-based interface.

The sentinel site based surveillance for severe acute respiratory infection (SARI) and influenza-like illness (ILI) is more common than the routine surveillance approach in the Region. The format of the data collected from these sentinel sites sometimes differs from one country to another and is mostly not shared with other countries or at the regional level. The Pandemic and Epidemic Disease Unit at the WHO Regional Office assisted in the development of this regional database bearing in mind the epidemiological importance of SARI/ILI data, and it provides a regional platform for aggregation, analysis and sharing of epidemiological data on influenza.

The application is able to generate periodic reports, including charts, graphs, maps and summary reports, at various levels of user and can export data in *Excel* for quantitative analyses. EMFLU has a user guide and help function to help define terms used and guide the user to enter, extract or generate reports.

EMFLU shares data with FluID and FluNet by summarizing the data from sentinel sites and the national level and linking it the two WHO GISRS databases. It complements these databases and provides a bridging platform between country and global information sharing.

Organizing funds and supporting countries with their management of PIP funds is an important responsibility. With availability of financial resources in August 2014, the Regional Office helped countries develop their country-specific activity plans, receive and manage the funds to initiate implementation and take the necessary steps to enhance productivity. The PIP PC funds for the Region consistently increased during the period 2014–2016 with a total of USD 1 739 000 spent over the three years (Table 1).

Three of the seven countries (Afghanistan, Egypt and Lebanon) received and spent PIP PC funds throughout the period. Two (Jordan and Morocco) had no financial data to show for 2015 while another two (Djibouti and Yemen) started in 2014 but could not continue during the subsequent years because of their country situation.

Data on the number of specimens positive for influenza by subtype were available for 2015 and 2016 for the Region (Fig. 7). Overall, the highest number of cases was recorded during the winter weeks of 2015 and 2016. The greatest proportion of specimens were positive for influenza A(H1N1)pdm09 type, followed by influenza type B (lineage not determined) and influenza type A (not subtyped).

Table 1. PIP Partnership Contribution funds utilized in the Eastern Mediterranean Region

Country	2014	2015	2016	Total
Afghanistan	121 000	380 000	312 000	813 000
Egypt	391 000	380 000	280 000	1 051 000
Jordan	253 000	0	284 000	537 000
Djibouti	75 000	0	0	75 000
Lebanon	238 000	297 000	104 000	639 000
Morocco	296 000	0	384 000	680 000
Yemen	265 000	0	0	265 000
WHO Regional Office	335 000	555 000	849 000	1 739 000

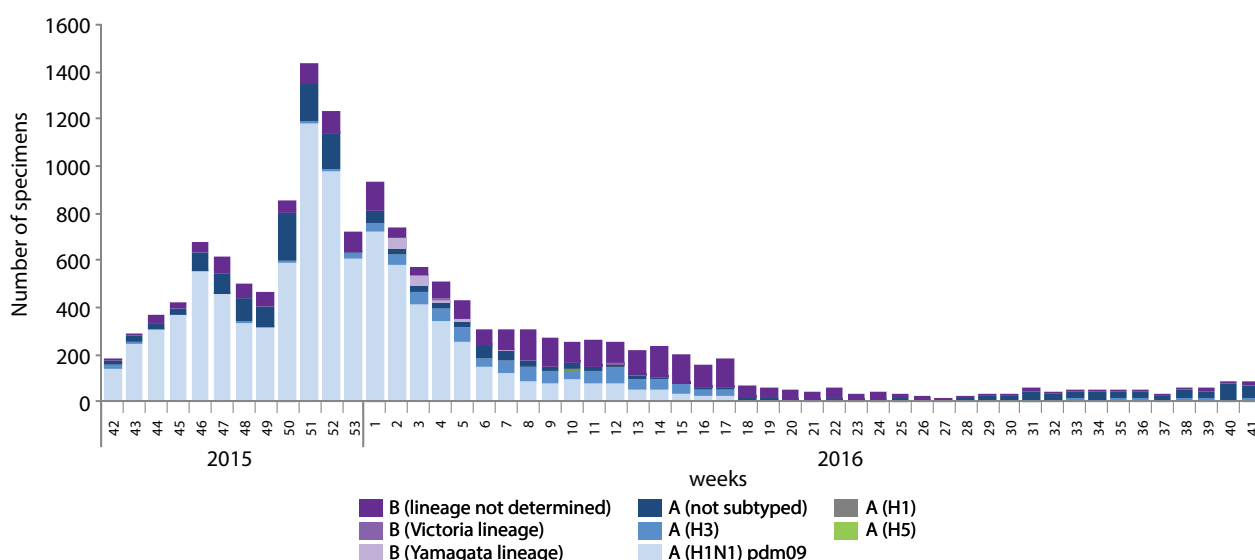


Fig. 7 Number of tested specimens positive for influenza by subtype, Eastern Mediterranean Region, 2014–2016

Enhancing influenza research in the Eastern Mediterranean Region

The WHO Regional Office for the Eastern Mediterranean is following a multi-pronged approach to influenza research, which includes:

1. Enhancing evidence through national disease burden estimation studies and reviews of existing research and knowledge
 2. Strengthening national capacity in data analysis, scientific writing, publishing and dissemination
 3. Facilitating scientific publications
 4. Support activities
- 1) *Enhancing evidence*: Several countries in the Region have initiated or scaled up efforts to finalize ongoing initiatives on disease burden studies including Afghanistan, Egypt, Islamic Republic of Iran, Jordan, Morocco, Oman, Pakistan and Tunisia.
 - a. By December 2015, Egypt, Islamic Republic of Iran and Tunisia had completed disease burden studies and were in the process of refining results and making them publishable.
 - b. Jordan and Morocco are in the process of conducting studies.
 - 2) *Strengthening national capacity*: Capability to design studies, carry out data collection and interpret through meaningful analysis is the focus here. The activities include:
 - a. Use of mathematical modelling for influenza and respiratory disease burden estimation in collaboration with Imperial College London and the Aga Khan University
 - b. Data analysis, scientific writing and publishing for epidemiologists and virologists
 - c. Advanced epidemiological data analysis.
 - 3) *Facilitating scientific publications*: To develop understanding of existing knowledge on influenza and respiratory diseases with epidemic and pandemic potential, the following reviews of published and unpublished literature have been prepared:
 - a. Influenza research in the WHO Eastern Mediterranean Region: a narrative review
 - b. Acute respiratory diseases of epidemic and pandemic potential in the Eastern Mediterranean Region
 - c. Middle East Respiratory Syndrome – novel coronavirus: current knowledge and future considerations.
 - 4) *Support activities*:
 - a. An expert consultation was conducted in 2015 on influenza research and policy in the Eastern Mediterranean Region
 - b. A network of individual experts and institutions have supported influenza research in the Region including the Aga Khan University, Imperial College London, Pasteur Institute Tunisia and Edinburgh University
 - c. Edinburgh University has been engaged to develop a manual on disease burden estimation among refugee/displaced populations
 - d. A thematic issue of the Eastern Mediterranean Health Journal, a regional, peer-reviewed journal published by WHO Regional Office for the Eastern Mediterranean, was issued in 2016. The issue includes disease burden studies and reviews on influenza and emerging respiratory infections in the Region.

Publications, and conference presentations, posters and abstracts on influenza are shown in Annex 4.

Challenges faced



In view of the economic and geopolitical context, the Eastern Mediterranean Region faces several health challenges. Many factors, including the increasing number of conflicts, humanitarian crises and emergencies in the Region generally and in PIP priority countries specifically, compound these challenges. The major challenges reported by the countries and also documented by the WHO review missions are outlined below.

- Influenza is not considered a high priority health issue in the Region. Member countries and the Regional Office are advocating to raise awareness of its importance, however there is a general lack of political commitment and slow response towards investing in influenza and pandemic preparedness in the Region.
- One of the consequences of this lack of commitment is the inadequate prioritization of surveillance for emerging and re-emerging diseases and the required laboratory network.
- Owing to the lack of political commitment, the necessary infrastructure is deficient. This includes a lack of PCR testing, reporting policies and reporting plans for the laboratory, unavailability of international shippers/couriers in certain places, a lack of facilities for viral sequencing, and little dissemination of standard operating procedures and protocols. However, through the consistent efforts of PIP, the infrastructure for influenza surveillance has seen significant improvement in recent years.
- Sentinel sites are not representative of the target populations in certain places.
- There are varying levels of epidemiological and virological surveillance capacity among Member States. The lower capacity in certain countries impedes laboratory and field performance.
- In some countries, the sharing of algorithms, standard operating procedures and surveillance protocols are not ensured resulting in inaccuracy in both identification of the influenza season and estimation of the burden of disease.
- The epidemiological component of ILI surveillance is lacking in some countries.
- Not all SARI or ILI cases are recorded, nor sampling schemes adhered to.
- Epidemiological data are not shared through WHO influenza surveillance platforms such as WHO GISRS.
- A coordination mechanism between human and animal health sectors is generally lacking in all countries in the Region. Where it exists, its performance is below par due to limited coordination in the area of respiratory diseases.
- There is a general lack of systematic feedback among various levels of surveillance which, if present, could ensure the ongoing improvement of the preparedness programme.
- Pandemic preparedness planning, particularly national plans, are inadequately developed or outdated.

Conclusion and recommendations

The implementation of the PIP Framework and its associated PIP PC Implementation Plan is a work in progress. This report describes the capacity and efforts of the PIP support to strengthen laboratory and epidemiological surveillance system during 2014–2016 at the country and regional level in the Eastern Mediterranean Region. The countries have shown progress in terms of putting in place both the hard and soft infrastructure, and building robust systems that cater to local needs and could be sustained over time, which will have a positive impact on overall pandemic preparedness.

Notable is that some of the countries (e.g. Afghanistan and Yemen) were able to build or rebuild their infrastructure despite years of war and conflict. Similarly, countries dealing with large numbers of refugees and their health problems (e.g. Jordan) were nonetheless able to address influenza, a disease perceived to be a low public health priority.

Naturally, there were variations in performance and progress in PIP implementation. Some countries (e.g. Afghanistan, Egypt and Lebanon) consistently carried out their activities and used the PIP PC funds during the three years. At the same time, countries such as Djibouti and Yemen were not able to do so because of varying circumstances in these countries. Consequently, data on influenza-positive specimens were not available from them. Clearly, countries that could not sustain their capacity building need support from within and outside of the country, particularly from WHO and other technical partner organizations.

At the regional level, the Regional Office has contributed to the PIP effort through various activities which include: following up countries through joint review missions, organizing numerous consultative meetings with experts and training workshops to enhance strategies and capacity, developing data sharing portals such as EMFLU, and working to expand the body of knowledge on influenza through research and participation in research conferences.

In view of the experiences and the lessons learned during the PIP implementation period, the following steps are suggested. These are priorities for the PIP priority countries as well as for the Regional Office to pursue in coming years for effective implementation of PIP in the Region.

- System strengthening
 - Introduce and establish event-based surveillance systems where required. At the same time, the sentinel site based influenza disease surveillance (SARI/ILI surveillance) also needs continued attention.
 - Improve the NIC and influenza laboratories through continued capacity building on PCR testing, virus isolation and sequencing (for some countries).
 - Enhance regional and in-country partnerships for influenza surveillance.
 - Explore and establish concrete PIP synergies with International Health Regulations (2005) implementation.
- Implementation
 - Enhance national and regional data sharing, management systems and virus sharing with WHO Collaborating Centres.

- Improve monitoring systems through developing robust indicators and adhering to them while monitoring the sentinel sites.
- Improve sample sharing with the NIC from sentinel sites with better timing and efficiency in cost and human resources.
- Use the EMFLU platform to strengthen regional data sharing on influenza and the integration between epidemiological and laboratory surveillance components, and enhance sharing the information through the WHO GISRS.
- Improve collaboration between the human and animal health sectors.
- Complete disease burden estimation studies in priority countries to facilitate evidence-informed decisions.
- Capacity building
 - Enhance national capacity for data management, risk assessment and response, particularly at the lower level.
 - Enhance the use of surveillance data for advocacy and to support policy commitment at the higher level of the health system.
 - Plan and develop a strategy to sustain current human resources capacity for sentinel surveillance.
 - Carry out joint meetings and planning and training courses to enhance the collaboration between human and animal health sectors.
 - Facilitate the work of the rapid response teams and the triggers to activate and deploy the teams through identification and provision of relevant training.

In conclusion, PIP implementation has gradually progressed in the Region. More time, effort and resources were required in the initial stages to develop an understanding and create an enabling environment for effective implementation of PIP PC resources. After the initial phase, the countries have tried to consolidate their implementation quality, directing PIP investment in key areas of laboratory and epidemiological surveillance capacity building and promoting synergies with other programmes. It is imperative that countries, supported by the WHO Regional Office, steadfastly continue these efforts in order to be prepared for pandemic influenza in the future.

Annex 1. Outcome 1 of the Pandemic Influenza Preparedness (PIP) Framework

The Pandemic Influenza Preparedness (PIP) Framework outlines five outcome areas including laboratory and surveillance, burden of disease, regulatory capacity, risk communications and deployment of pandemic supplies. All of these outcomes require certain capacities at the country and regional level and the Framework provides guidance on the activities, and their outputs, that should be carried out to reach the desired capacity. Since outcome 1 relates to preparedness, which is the focus of PIP implementation for the period 2014–2016, the 3 outputs and respective activities against this outcome are given below.

Output 1: National capacity to detect respiratory disease outbreaks, due to a novel virus, is strengthened.

Key Deliverable 1: Develop national capacity to detect and investigate new influenza virus sub-types

Activities for laboratory surveillance:

- Assess specific gaps in national laboratory capacity to identify and characterize influenza viruses
- Develop or revise laboratory preparedness plans:
 - Develop protocols to detect novel viruses
 - Develop surge capacity protocols
 - Provide training and conduct exercises for laboratory staff to respond to surge situations, e.g. outbreaks of severe respiratory disease
- Provide laboratory training on virus isolation and characterization, use of new technologies such as real time PCR, biosafety procedures and specimen shipment
- Provide support for start-up costs
 - Reagents, primers, etc.
 - Biosafety cabinets, real time PCR machine

Activities for epidemiological surveillance:

- Review national respiratory disease early detection systems, including assessment of
 - Level of awareness of health care professionals of the need for recognizing and reporting unusual events
 - Existence of a reporting mechanism and its linkage with the laboratory
 - Availability of trained epidemiologists for outbreak investigation and response
- Develop or revise national preparedness plans for early detection of, and response to, influenza events
- Provide training on surveillance methodology, outbreak investigation and intervention strategies to address gaps found in the assessment of national respiratory disease early detection systems
- Provide support for start-up costs including IT and data management

Activities for human-animal interface

- Promote partnership building between human and animal health sectors
 - Conduct planning workshops to improve data sharing and surveillance at the human-animal interface
 - Establish joint surveillance for influenza at the human–animal interface in selected pilot districts/governorates at higher risk of animal–human transmission
 - Provide training on joint field investigation at the human–animal interface for influenza and other epidemic/pandemic prone respiratory viruses

Key Deliverable 2: Strengthen information and virus sharing at national level

Key activities:

1. Build, enhance and/or maintain a national information management system for surveillance data. Provide training on data entry, information management and virus sharing
2. Develop software bridges to share data within the country and with regional and global partners
3. Provide support for start-up costs for information systems

Output 2: National capacities to monitor trends in circulating influenza viruses is strengthened

Key Deliverable 1: Strengthen influenza laboratory surveillance and the link with epidemiological surveillance

Activities:

- Evaluate laboratories' capacity to fully characterize novel influenza viruses; this could include genetic sequencing and antiviral susceptibility testing
- Provide training on influenza virus isolation, advanced virus characterization and logistics for advanced characterization of new viruses
- Work with national authorities to ensure the sustainability of these investments; in countries with no NIC
- Provide support for start-up costs for information systems and other advanced capacities

Key Deliverable 2: Strengthen influenza disease surveillance (SARI and/or ILI surveillance)

Activities:

- Evaluate existing ILI and/or SARI surveillance systems for completeness and timeliness of data collection, integration with existing system(s) for respiratory diseases, adherence to global standards, use of data in policy development, representativeness and adequacy of coverage
- Establish or expand sentinel surveillance for SARI and ILI following evaluation
- Conduct training and workshops in data analysis and interpretation, and reporting of surveillance data, including virological information
- Provide training in the development of national influenza bulletins
- Review national influenza data management systems and identify gaps
- Provide technical support to develop regular surveillance data analysis and reporting
- Provide support for start-up costs for information systems

Key Deliverable 3: Enhance national data sharing capacity to ensure monitoring and assessment of influenza events of international concern

Activities:

- Establish/strengthen/expand data management systems to improve external data sharing from the national to regional level.
- Conduct training on information sharing and data management systems
- Provide support for start-up costs for information systems

Output 3: Global collaboration, through the sharing of information and viruses, is strengthened and the quality of the system is improved (PCR detection quality assurance)

Key Deliverable 1: Share representative viruses in a timely manner

Activities at the global level:

- Enhance the WHO Shipping Fund Project
- Update training materials for shipment of infectious substances

Activities at the regional level:

- Develop capacities to select, package and ship quality influenza viruses
- Train staff to select and ship quality viruses/specimens
- Train laboratory staff in logistics, specimen collection packaging and shipment of influenza and other pandemic-prone respiratory viruses as per IATA regulations
- Establish regional fund for shipment of viruses
- Purchase specimen collection kits and other necessary consumables

Key Deliverable 2: Enhance networking to maximize use of limited resources

Activities:

- Support to the WHO GISRS network
 - Coordinate laboratory capacity building activities
 - Update reporting tools and standards related to the functions of the WHO GISRS
 - Strengthen regional networks through the improvement of data sharing between countries with similar transmission patterns.
 - Improve regional databases
 - Support regular reporting of laboratory confirmed cases into regional data bases
 - Develop software bridges to share data within regions and with global partners

Key Deliverable 3: Maintain high quality influenza virus detection capacity

Activities at the global level:

- Continue the WHO External Quality Assessment Programme
- Update diagnostic reagents and protocols

Activities at the regional level:

- Train NIC staff in good laboratory practices and quality management, advanced virus genetic characterization and virus isolation
- Organize academic exchange programme/study tours on good laboratory practices
- Organize intercountry workshops on the WHO External Quality Assessment Programme
- Purchase laboratory equipment and reagents to support laboratory training

Annex 2. Criteria for selection of PIP priority countries in the WHO Eastern Mediterranean Region

Country	Rationale
Yemen	<p>Output 1</p> <ul style="list-style-type: none"> Yemen is a low-income country, GAVI-eligible and has vulnerabilities in its current surveillance system for detecting respiratory disease outbreaks. Due to other competing health priorities, the country could not establish any surveillance system for severe acute respiratory infection (SARI) and influenza-like illness (ILI). The country has demonstrated, in recent years, strong political commitment, willingness and eagerness to strengthen influenza and SARI surveillance system and designate its Central Public Health Laboratory into a national influenza centre (NIC). It is expected that the PIP PC fund) can be used by the country most judiciously to (i) improve its laboratory and surveillance capacities for SARI and ILI and (ii) designate its Central Public Health Laboratory into a functioning NIC that can detect and isolate circulating influenza and other respiratory viruses. It is presumed that the PIP PC funds would work as a catalyst to improve the country's capacity for detection, investigation and confirmation of any respiratory disease outbreaks with major epidemic and pandemic potentials. <p>Output 2</p> <ul style="list-style-type: none"> Yemen is recommended from the Western Asia influenza transmission zone owing to its different geographic terrain, different seasons, and large and impoverished population. As such, it can possibly provide a different set of data that are uncommon from this transmission zone. The country has four seasons and influenza virus is most likely being circulated year round. Therefore, there is greater probability of getting different patterns of circulating influenza virus throughout the year (owing to varying seasonality). The country remains committed to improving its epidemiological and virological surveillance capacity for ILI and SARI and the Central Public Health Laboratory is very close to being designated as an NIC, and such information would be useful to make informed policy decisions about influenza.
Morocco	<p>Output 2</p> <ul style="list-style-type: none"> Morocco is a low-middle income country and has a well-functioning NIC which is providing good quality data. The support will benefit the country by further strengthening the capacity of the existing NIC to sequence influenza viruses and also by expanding its capacity to detect any other novel respiratory viruses. In addition, it is expected that the support will help the country in strengthening its epidemiological and virological surveillance capacity for ILI and SARI within the routine disease surveillance system. As the country draws large number of tourists, there is a probability of getting different patterns of circulating influenza virus(es) from Morocco, especially during the winter season. Understanding these different patterns within the same country would provide a better understanding of the epidemiology of influenza and help to make informed policy decisions.
Lebanon	<p>Output 2</p> <ul style="list-style-type: none"> Little is known about the epidemiology of influenza in the Mediterranean belt of the WHO Eastern Mediterranean Region. The support is expected to benefit the country in (i) refurbishing the NIC, which is currently non-functioning and (ii) in establishing a ILI and SARI surveillance system within the routine disease surveillance system. Currently, there is a gap in surveillance for SARI and ILI despite the strategic location of the country. The PIP PC funds are expected to address these gaps and may help build the capacity of the country to provide good quality, representative baseline data from this influenza transmission zone. Additionally, the country has a large population living abroad who visit the country during the summer season. Such mixing of the population with varying demographic characteristics makes the country vulnerable to co-circulation, which possibly raises the risk of mutations in different influenza viruses. This risk is poorly understood owing to the country's lack of capacity for detection of influenza and other respiratory viruses through its surveillance system.

Country	Rationale
Jordan	<p>Output 1</p> <ul style="list-style-type: none"> • Jordan is a developing country and is recommended because it has had outbreaks of influenza A(H1N1)pdm09 and MERS-CoV in the recent past. • The country has a well-functioning NIC and, with support from PIP PC funds, the capacity of the NIC can be further expanded for identification, detection and characterization of influenza viruses. The NIC has the potential to play the role of regional reference laboratory in the areas of diagnostics as well as production and distribution of diagnostic reagents. It could also provide training to laboratory technicians from other countries in the region on influenza virus isolation and molecular diagnostics. • The PIP PC funds would also help the country to scale up its current sentinel-based surveillance system for SARI and ILI and provide good quality representative data on influenza epidemiology.
Egypt	<p>Output 1</p> <ul style="list-style-type: none"> • Egypt is a low-middle income country and is recommended based on its developing country status, large geographic area, large population, endemic presence of avian influenza A(H5N1) infections and the high likelihood of getting good quality data. • The country's NIC is well functioning and its SARI and ILI surveillance system could provide good quality, representative baseline data on influenza epidemiology with support from the PIP PC funds. • The country draws a large number of tourists. As such, there is a probability of getting different patterns of circulating influenza virus(es) from Egypt, especially during the winter season. • Owing to the co-circulation of seasonal influenza virus and the avian influenza A(H5N1) virus, there is a greater risk and threat from an influenza pandemic if either the H5N1 virus or any of the mutated viruses attain pandemic potential. Therefore, better understanding of these different patterns of circulating influenza virus from the same country would help to make informed policy decisions
Afghanistan	<p>Output 2</p> <ul style="list-style-type: none"> • Afghanistan is a low income and GAVI eligible country. • The country has a geographically large area with different terrains and a large population. • The country has vulnerabilities in its surveillance system and is currently conducting surveillance for ILI only. • It has been observed that there are seasonal patterns for influenza-like symptoms and for circulating influenza viruses. • It is expected that the country will benefit from the PIP PC funds in (i) expanding the ILI surveillance system to include SARI; (ii) strengthening the functions of the NIC to detect and identify influenza viruses from different geographic terrains. • This support will therefore help in providing a good understanding of influenza epidemiology of varying seasonal patterns and of circulating influenza viruses from different geographic terrains. This, in turn, will help to make informed policy decisions about influenza.
Djibouti	<p>Output 2</p> <ul style="list-style-type: none"> • Djibouti is a low-income and GAVI-eligible country. • The Eastern Africa transmission zone only includes Djibouti and Somalia. Djibouti is the better choice as Somalia is a conflict-affected country and there is currently no public health laboratory in the country. There is therefore a higher probability of getting influenza epidemiological and virological data from Djibouti than Somalia. • Djibouti detected a human case of avian influenza A(H5N1) infections in 2006. • There are currently gaps in its surveillance system and it is expected that the PIP PC funds will benefit the country in improving its surveillance and laboratory capacities for detection of any respiratory outbreaks with major epidemic or pandemic potential.

Annex 3. Influenza sentinel sites in PIP priority countries in the WHO Eastern Mediterranean Region

Afghanistan (9)

1. Balkh Regional Hospital, Balkh
2. Bamyan Provincial Hospital, Bamyan
3. Herat Regional Hospital, Herat
4. Maiwand Paediatric Hospital, Kabul
5. Kandahar Regional Hospital, Kandahar
6. Kapisa Provincial Hospital, Kapisa
7. Kunduz Regional Hospital, Kunduz
8. Nangarhar Regional Hospital, Nangarhar
9. Paktya Provincial Hospital, Paktya

Djibouti (4)

1. Hopital Général Peltier, Djibouti
2. CSC Khor-Bourhan, Djibouti
3. CSC Einguella, Djibouti
4. CSC Farah Had, Djibouti

Egypt (8)

1. Alexandria Fever Hospital, Alexandria
2. Aswan Fever Hospital, Aswan
3. Abbasia Chest Hospital, Cairo
4. Abbasia Fever Hospital, Cairo
5. Damietta Chest Hospital, Damietta
6. Mahalla Fever Hospital, Gharbia
7. Menia Chest Hospital, Menia
8. Shebin Fever Hospital, Monufia

Jordan (4)

1. Prince Hamza Hospital, Amman
2. Al Karak Hospital, Al Karak
3. Zarka Hospital, Az Zarqa
4. King Abdullah University Hospital, Irbid

Lebanon (11)

1. Rafik Hariri University Hospital, Beirut
2. Zahleh Governmental Hospital, Zahleh, Beqaa
3. Khoury Hoapital, Zahleh, Beqaa

4. Dahr El Beshiq Governmental, Mount Lebanon
5. Notre Dame de Secours, Mount Lebanon
6. Ain Wazein, Mount Lebanon
7. Nabatieh Governmental Hospital, Nabatieh
8. Mounla Hospital, Tripoli, North
9. Tripoli Governmental Hospital, Tripoli, North
10. Saida Governmental University Hospital, Saida, South
11. Hammoud University Hospital, Saida, South

Morocco (8)

1. University Hospital Center (UHC) Al Ghassani, Meknès
2. Regional Hospital Mohammed V, Fès
3. Regional Hospital Béni-Mellal, Béni-Mellal
4. Regional Hospital ibn Zohr, Marrakech
5. Regional Hospital Al Farabi, Oujda
6. UHC Avicennes, Rabat
7. Regional Hospital Hassan II, Agadir
8. Regional Hospital Mohammed V, Tanger

Yemen (4)

1. Al-Jamhuri Teaching Hospital, Sana'a
2. Al-Wahadah Teaching Hospital, Aden
3. Al-Thawra Hospital, Al Hodiedah
4. Al-Souidi Hospital, Taiz

Annex 4. Publications, and conference presentations, posters and abstracts

The Ninth International Conference on Emerging Infectious Diseases, Atlanta, Georgia, USA (24–26 August 2015)

Eastern Mediterranean Region papers and presentations

- Analysing the adverse side-effects of the influenza A/H1N1 vaccine in health care staff in selected provinces of Afghanistan
- Analysis of surveillance data: trends of priority health problems in Afghanistan from 2007 to 2012
- Establishment of a National Influenza Centre (NIC) in a post conflict and resource limited country (Afghanistan): progress and challenges
- Surveillance of ILI/SARI in Republic of Djibouti for pandemic influenza preparedness
- Phylogenetic analysis of Avian Influenza AH5N1 from a recent outbreak in Egypt (2014/2015)
- Molecular characterization and phylogenetic analysis of circulating strains of Influenza A(H1N1)pdm09 and Influenza B from 2013 to 2014 in Egypt
- Severe acute respiratory infection (SARI) and pandemic influenza preparedness in central public health laboratories, Egypt (2007–2014)
- Establishing the sentinel surveillance system for severe acute respiratory infections in Lebanon, 2014: better understanding the epidemiology of influenza
- Epidemiology of fatal cases associated with pandemic influenza reported in Yemen
- Influenza H5N1 in Egypt—increasing risk?
- Epidemiology and outbreak investigation of MERS CoV in Saudi Arabia: an update
- Serial RNA Detections of Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) among laboratory confirmed cases—Abu Dhabi, United Arab Emirates, 2013–2014

Eastern Mediterranean Region specific session "Emerging Respiratory Infections in the Eastern Mediterranean Region"

- The epidemiology of MERS-CoV in the United Arab Emirates
- Emerging respiratory infections in the Eastern Mediterranean Region: current challenges, opportunities, and lessons for global health security
- Monitoring the next pandemic threat: updates on the current surge of H5N1 Infection and other new influenza viruses in Egypt

The Options IX for the Control of Influenza conference, Chicago, USA (24–28 August 2016)

Eastern Mediterranean Region abstracts, posters and presentations

- Predictors of influenza-associated mortality in several countries of the Eastern Mediterranean Region
- Review of the influenza surveillance system in post conflict setting, Afghanistan
- Cross-sectional survey and surveillance for influenza viruses and MERS CoV among Egyptian pilgrims returning from Hajj during 2012–2015

- Event-based surveillance for acute respiratory infections: What is the best surveillance model for Middle Eastern Mediterranean countries: example of Morocco
- Molecular characterization of influenza viruses circulating in Casablanca (Morocco) during post pandemic period, 2010–2015
- Viral coinfections among Lebanese paediatric cancer patients presenting with acute respiratory infections
- Severe acute respiratory infections sentinel surveillance in Lebanon, 2015–2016
- Impact of meteorological factors on influenza activity in Pakistan; a tale of two cities
- Evolutionary analysis of Influenza A(H1N1)pdm09 in post pandemic period in Pakistan
- Genetic variability among the circulating Avian influenza virus serotype H9N2 and its relationship with the vaccine failure in commercial poultry
- Resurgence of Influenza A(H1N1)pdm09 during November 2015–February 2016, Pakistan
- Hospital outbreak of Middle East Respiratory Syndrome (MERS) in a large tertiary care hospital, Riyadh, Saudi Arabia, 2015

Eastern Mediterranean Health Journal (EMHJ) theme on influenza (July 2016)

Editorials

- Influenza in the Eastern Mediterranean Region: identifying the unknowns for detection and control of epidemic and pandemic threats
- Research agenda on persistent and unpredictable threat of influenza and emerging respiratory infections: a public health necessity in the Eastern Mediterranean Region

Research articles

- Estimation of influenza and severe acute respiratory illness incidence (burden) in three provinces of the Islamic Republic of Iran, 2012 and 2013
- Characteristics of severe acute respiratory infection-associated hospitalization in Yemen, 2014–2015
- Contribution of laboratories in the WHO Eastern Mediterranean Region to the selection of candidate seasonal influenza vaccine, 2010–2015
- Detection of influenza B viruses with reduced sensitivity to neuraminidase inhibitor in Morocco during 2014–2015 season
- Modelling of seasonal influenza and estimation of the burden in Tunisia
- An outbreak of Middle East Respiratory Syndrome (MERS) due to coronavirus in Al-Ahssa Region, Saudi Arabia, 2015
- Capacity of the national influenza surveillance system in Afghanistan, a chronic conflict setting
- Circulation of Respiratory Syncytial Virus in Morocco during 2014–2016 Findings from a sentinel-based virological surveillance system
- Molecular epidemiology and evolution of A(H1N1)pdm09 and H3N2 viruses in Jordan, 2011–2013
- Incidence of influenza virus-associated severe acute respiratory infection in Damanhour district, Egypt, 2013

Reviews

- Burden of acute respiratory disease of epidemic and pandemic potential in the WHO Eastern Mediterranean Region: A literature review
- Influenza virus positivity and circulating subtypes among cases of influenza-like illness and severe acute respiratory infection, Egypt, 2012–2015
- Middle East respiratory syndrome coronavirus: current knowledge and future considerations

Short communications

- Characterization of influenza outbreaks in Lebanon during the 2013/14 and 2014/15 seasons
- The H1N1 influenza pandemic of 2009 in the Eastern Mediterranean Region: lessons learnt and future strategy
- Active surveillance of avian influenza viruses in Egyptian poultry

Commentary

- A new paradigm in global health security

The Pandemic Influenza Preparedness (PIP) Framework is a global effort to improve preparedness and response for the next influenza pandemic. The Partnership Contribution mechanism under the PIP Framework aims to, among other things, increase global capacities and contribute to effective preparedness for pandemic influenza. This document reports the PIP activities in the Eastern Mediterranean Region and in the seven countries of the Region that are recipients of grants under the 2013–2016 PIP Partnership Contribution implementation plan.