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## **Use of a Business Approach to Improve Disease Surveillance Data Management Systems and Information Technology Process comprehensive review**

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1. Medical tower
2. Salwa General Hospital
3. Aljafer phc
4. ALOYUN CITY GENERAL HOSPITAL
5. Al-Qurain Primary Healthcare Center
6. PHC AlQurayn
7. Prince Saud Bin Jalawi General Hospital-
8. King Fahad hospital, Alahssa
9. King Salman Specialist hospital
10. Kano kidney Center (DMC)
11. Dhahran Long Term Care Hospital
12. Ad Diriyah Hospital
13. Dhahran general hospital

### **Abstract**

The increasing complexity of global disease outbreaks necessitates robust and efficient disease surveillance data management systems (DSDMS). Traditionally, disease surveillance has been managed within public health frameworks, focusing on public health-specific methodologies. However, integrating business approaches such as Business Process Management (BPM), strategic planning, risk management, and IT governance into these

systems has proven to be beneficial. These approaches optimize resource allocation, streamline processes, and improve system interoperability, enabling faster responses to health crises. This review explores the application of business strategies to improve the effectiveness of disease surveillance, focusing on process optimization, performance measurement, technological innovations, and workforce development. Case studies from the Ebola outbreak and COVID-19 pandemic highlight the effectiveness of these approaches in real-world scenarios. The review concludes by offering recommendations for improving DSDMS using business

models and modern technologies, emphasizing the need for data governance, cross-sector collaboration, and continuous improvement.

## 1. Introduction

Disease surveillance is a critical public health function that allows for the early detection and control of infectious diseases. As global mobility increases and new diseases emerge, the need for more efficient and integrated disease surveillance systems is paramount. Public health agencies traditionally approach disease surveillance with a focus on epidemiological methods, but the integration of business strategies can enhance the effectiveness of these systems. Business Process Management (BPM), strategic planning, and information technology (IT) frameworks provide the tools necessary to optimize workflows, ensure data integrity, and improve responsiveness in real-time scenarios (1). This review explores how business approaches can improve disease surveillance data management systems (DSDMS) and information technology processes.

## 2. Core Concepts of a Business Approach in Public Health

### 2.1 Business Process Management (BPM)

BPM is a business approach that focuses on optimizing organizational processes. Applied to disease surveillance, BPM can streamline the processes involved in data collection, transmission, and analysis (2). By identifying bottlenecks and eliminating inefficiencies, BPM ensures that surveillance systems are responsive and efficient. For example, BPM can be used to design workflows that allow data to flow seamlessly across different agencies and health organizations, improving coordination and decision-making.

### 2.2 Strategic Planning and Project Management

Strategic planning and project management are vital for setting clear goals, allocating resources, and ensuring that disease surveillance systems meet public health objectives. Business frameworks, such as SWOT analysis, help organizations prioritize initiatives and allocate resources effectively (3). Additionally, adopting project management methodologies like Agile or Lean can ensure that surveillance systems are developed iteratively, with constant improvements based on feedback and emerging needs (4).

### 2.3 IT Alignment with Business Goals

Aligning IT solutions with business goals ensures that technological investments support the overarching objectives of disease surveillance (5). Information technology must be flexible and scalable to handle increasing volumes of health data and support real-time data sharing and analysis. Interoperability between different systems and agencies is critical for enabling effective disease surveillance, which is achieved by adopting standardized protocols for data

exchange and utilizing cloud-based platforms for easier collaboration.

## 3. Challenges in Disease Surveillance Data Management

### 3.1 Data Fragmentation

Disease surveillance data is often fragmented across various geographic regions, agencies, and platforms, which makes it challenging to maintain a comprehensive and unified dataset. This fragmentation hinders real-time decision-making, as health officials may not have access to the full scope of data during critical moments. The use of data integration platforms and standardized data formats can help resolve this issue (6).

### 3.2 Data Quality and Timeliness

The quality and timeliness of disease surveillance data are essential for quick decision-making and timely interventions. However, inconsistencies in data collection, entry errors, and delays in reporting can undermine the effectiveness of disease surveillance (7). Business approaches like Lean management can streamline processes and reduce the occurrence of such errors by improving data validation mechanisms and automating routine tasks (8).

### 3.3 Interoperability Issues

A major barrier to effective disease surveillance is the lack of interoperability between the different systems used by various health agencies. Without common data standards or exchange protocols, agencies struggle to share information in real-time. This challenge can be addressed through the adoption of shared data frameworks, cloud solutions, and application programming interfaces (APIs) that enable seamless data exchange .

### 3.4 Resource Constraints

Many public health agencies face limitations in terms of budget, staffing, and technical expertise, which can restrict their ability to implement or maintain modern surveillance systems (9). Business approaches, including performance benchmarking and strategic resource allocation, can help maximize the utility of available resources and ensure that surveillance systems remain efficient even in the face of financial and personnel constraints .

## 4. Business Models to Improve Disease Surveillance Systems

### 4.1 Lean Management

Lean management principles focus on eliminating waste, improving process efficiency, and enhancing value. In the context of disease surveillance, Lean can be applied to streamline data collection and reporting processes. By

eliminating redundant steps, such as duplicate data entry or excessive paperwork, Lean management ensures that only valuable data is collected and processed, ultimately speeding up decision-making .

#### **4.2 Data Governance and Risk Management**

A business-oriented data governance framework can help establish clear guidelines for data accuracy, privacy, and security. By incorporating risk management strategies into disease surveillance, public health agencies can better anticipate potential challenges, such as data breaches or system failures, and create contingency plans to mitigate these risks. Data governance ensures that all stakeholders adhere to the same standards, improving the overall integrity of disease surveillance systems.

#### **4.3 Performance Metrics and KPIs**

Performance metrics and Key Performance Indicators (KPIs) are essential for evaluating the effectiveness of disease surveillance systems. These metrics can assess response times, data quality, and the efficiency of resource utilization. By using KPIs, public health agencies can track their progress, identify areas for improvement, and ensure that surveillance systems are operating optimally.

#### **4.4 Artificial Intelligence and Machine Learning**

The integration of AI and machine learning (ML) into disease surveillance systems can improve the prediction and analysis of disease outbreaks. AI algorithms can analyze large volumes of data and identify early warning signs of potential outbreaks, enabling public health authorities to respond more effectively(10). Additionally, machine learning models can automate routine tasks, such as data entry and anomaly detection, further improving system efficiency.

#### **4.5 Cloud Computing and Data Integration**

Cloud-based solutions enable scalable and flexible data storage, which is critical for handling large volumes of surveillance data. Cloud platforms can also facilitate real-time data sharing between different health organizations, improving collaboration during disease outbreaks. Integration platforms that connect disparate data sources ensure that public health agencies have access to a unified dataset for decision-making .

### **5. Case Studies**

#### **5.1 The 2014-2016 Ebola Outbreak**

During the Ebola outbreak, West African countries used logistical models to streamline the distribution of medical supplies and personnel. By employing strategic planning, supply chain management, and information technology

solutions, these countries were able to improve their surveillance systems and reduce the spread of the disease .

### **5.2 COVID-19 Pandemic**

The COVID-19 pandemic highlighted the critical role of business strategies in disease surveillance. Countries like South Korea and Singapore employed project management frameworks and real-time data analytics to monitor and control the spread of the virus. These countries' adoption of AI and machine learning for predictive modeling helped them anticipate outbreaks and deploy resources efficiently (11)

## **6. Recommendations for Improving Disease Surveillance Systems**

### **6.1 Data Governance Framework**

Establishing a clear data governance framework is crucial for ensuring data accuracy, security, and consistency. Public health agencies should work to standardize data formats and establish clear guidelines for data sharing

### **6.2 Cross-Sector Collaboration**

Collaborating with private-sector IT companies can help public health agencies leverage cutting-edge technologies to improve disease surveillance. Partnerships between public health organizations and tech companies can lead to more innovative solutions .

### **6.3 Continuous Workforce Development**

Investing in training and capacity building for public health professionals is essential for maintaining effective disease surveillance systems. Business-oriented training in areas such as project management, IT governance, and performance measurement will enhance the effectiveness of disease surveillance efforts .

## **7. Conclusion**

The integration of business strategies into disease surveillance data management systems can significantly improve their efficiency, effectiveness, and scalability. By adopting business principles such as Lean management, strategic planning, and performance metrics, public health agencies can enhance their ability to respond to emerging diseases and global health threats. The continued use of advanced technologies like AI, cloud computing, and data integration will further strengthen disease surveillance systems, enabling faster, data-driven decision-making.

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