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*Special Issue on Big Data and e-Health*

# Big Data and Public Health Systems: Issues and Opportunities

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## ABSTRACT

Over the last years, the need for changing the current model of European public health systems has been repeatedly addressed, in order to ensure their sustainability. Following this line, IT has always been referred to as one of the key instruments for enhancing the information management processes of healthcare organizations, thus contributing to the improvement and evolution of health systems. On the IT field, Big Data solutions are expected to play a main role, since they are designed for handling huge amounts of information in a fast and efficient way, allowing users to make important decisions quickly. This article reviews the main features of the European public health system model and the corresponding healthcare and management-related information systems, the challenges that these health systems are currently facing, and the possible contributions of Big Data solutions to this field. To that end, the authors share their professional experience on the Spanish public health system, and review the existing literature related to this topic.



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## KEYWORDS

Big Data, Health System, Healthcare Organizations, Health Information Systems, Epidemiological Surveillance, Strategic Planning.

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## I. INTRODUCTION

### A. The Health System

According to the World Health Organization (WHO), “a health system consists of all organizations, people and actions whose primary intent is to promote, restore or maintain health. This includes efforts to influence determinants of health as well as more direct health-improving activities. A health system is therefore more than the pyramid of publicly owned facilities that deliver personal health services” [1]. Furthermore, every health system performs the following set of basic functions [2]:

- Delivering health services to individuals and to populations.
- Creation of resources.
- Stewardship.
- Financing the system.

The center of any health system must be the first of these functions, since healthcare constitutes the paramount goal and therefore the reason for the existence of the health system itself. Around it, other functions are organized, essential for ensuring healthcare delivery and public health. Among these, the following ones must be remarked:

- Epidemiological surveillance, which comprises the collection and analysis of large volumes of data directly or indirectly related to people’s health, so as to detect or prevent possible health problems regarding public health.
- Planning and overseeing the management of the health system,

which allows healthcare organizations to set out their strategic goals, allocate the necessary resources, assess the degree of compliance of these goals and apply corrective measures if required.

- Clinical research, focused on generating knowledge and applying it to the development of new diagnostic and therapeutic techniques.
- Education and teaching, in order to train new professionals and keep the practicing ones appropriately updated and competent.

### B. The Health Cluster or Ecosystem

From a structural point of view, a health system is neither an isolated nor homogeneous entity, but it comprehends or relates to entities of diverse nature, both public and private, with interests of their own as well as shared interests. This ensemble is known as health cluster or ecosystem, and among its components the following ones must be pointed out:

- Central or federal government and regional or local authorities.
- Healthcare services, conceived as organizations responsible for the management of a determined healthcare network.
- Hospitals.
- Primary care centers.
- Emergency services.
- Pharmacies.
- Convalescent centers.
- Health professionals acting as external providers to the health system.
- Public health services.
- Insurance companies, mutual societies and other entities which finance healthcare.
- Schools for the education and training of doctors, nurses and other

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