

Technology in Public Health

Sumanth Mallikarjuna Majgi¹, Sushantha²

¹Assistant Professor, ²Post-graduate student, Department of Community Medicine, Mysore Medical College & Research Institute, Mysuru.

Introduction:

One of the fastest developing aspect of the current world is technology. Technology is being used for processes comprising the root elemental needs of life like communication and payment mode and for things paramount up to rocket launching.

This evinces the inexorable need of utilization of the developments in technology in health sector as well, and more so in public health. The word technology has changed over time from arts to all tools, machines, utensils, weapons, instruments, housing, clothing, communication and transportation devices and the skills with which we produce and utilize them. The current day technology rather refers to use of tools, mainly electronic.(1)

Technology can be used in various domains of public health right from survey tools to interventions.

- a. Survey methods
- b. Screening methods and Diagnosis
- c. Data compilation and Analysis
- d. Telemedicine
- e. Communication
- f. Health system strengthening: Health management and information system (HMIS)
- g. Surveillance
- h. Awareness

A. Survey methods:

The use of technologies in survey methods helps in saving time for data entry(2), especially in large surveys like NFHS, DLHS or GATHS etc. Use of technology helps to gain lag time of up to 6 months to 1 year in releasing the information related to these survey.

Anonymous : There are forms that can be created online, using which data can be collected rapidly and extensively, while it provides the participant an option of maintaining

complete anonymity. Within a short period of time, we can expect maximum response. However selection bias is to be kept in mind.

Mistakes in data entry: No scope for mistakes in data entry, as these platforms help in the direct storage(3) of data in various backhand formats namely MS Excel, MS Access, dBase.

Locking of data: Since there is also scope for locking of the data(4) through the software, there is no scope for modifications and hence genuineness can always be maintained.

Less scope for loss of data(5): This method do away with physical sheets, this also takes away the chance of loss of physical sheets, more so with the cloud-based data, makes it free of any kind of data loss. There is also no need for internet in all situations. Data once collected will be stored in the backhand, and then once connected to the internet, when the network is available, that can send it to cloud, and hence stored and used even in remote situations of developing counties like India, even in hard to reach locations.

Auditing of data collection: validation of data and monitoring of surveys can be done when large multiple centers field studies are done.

Various platforms used of the purpose are using software called Epidata, Epi-info, fulcrum health, Google form, Survey monkey, Oracle, Gofomz, Device magic, Epicollect. All these can be done in tablets or android mobile phone, which revolutionized the field based data collection. These technologies also help in data storage in the cloud.

B. Screening methods and Diagnosis: (in vivo diagnostics and in vitro diagnostics)

Smartphones are also used for in vivo diagnostics like heart rate sensing, spirometric measurements sensing breathing, blood oxygen saturation and R-R intervals. These types of equipment use inbuilt sensors. There are some which use additional sensors like USG probes. Mobile connected

Corresponding author : Dr Sumanth M.M.
Department of Community Medicine, MMCRI, Mysore.
Email ID: drsumanthmmc@rediffmail.com

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devices are available for various like hearing impairment screening through hear Screen smartphone application provides time-efficient identification of hearing loss, retinopathy screening in diabetes like Automated diabetic retinopathy detection in smartphone-based fundus photography using artificial intelligence, it is called 'Fundus on phone' (FOP) device and smartphone-based digital images for the detection of cervical intraepithelial neoplasia are also done.(6) Sometimes these are also termed as Smartoscopy.

There are some in vitro Point of care (POC) testing available which need a built-in camera or microscope. Smartphones are now used for even infectious diseases like the Zika virus, Chikungunya, and Dengue, helminthic infestations, syphilis, HIV, TB etc.

Foldscope(7): These are the simple cost-effective tools used for visualizing the parasites microscopically. (Simple paper made microscopes, and hence foldable). This can also be used for spreading the awareness about parasitic infections prevention among school children, as they believe in what they see.

Advantages: cost-effective, no need for highly trained manpower. With limited training, the job can be done successfully.

C. Data compilation and Analysis:

There are various tools like SPSS, SAS, STATA, epi info, and various other tools for data analytics and storage. However, these have replaced manual analysis long back for last 3 decades. This facilitates the adjusting for confounding in a more robust manner, through regression and other advanced analytics of multivariate analytics.(8)

D. Telemedicine:

A tool for diagnosis and management of diagnosed diseases even in places where there is no specialist, through specialist available in a distant location. So, there are various forms called teleradiology, tele-ophthalmologyetc.(9)

Control of diseases : this is done mainly by the mHealth(10) wherein, the subject with chronic diseases are reminded about the visit to be done for testing and refill like diabetes and hypertension, which help in the regular control of glycemia and also blood pressure.

E. Communications:

The fast and timely communications is needed in many situations like disaster management, disease outbreak, and project meetings. Modes may be a telephone, WhatsApp, Zoom, Skype, Google duo etc. this helps real-time communications vis a vis email, which may not be real time, thus, helping in timely action when needed.

F. Health system strengthening:

• Health management and information system (HMIS):

Digitization helps in the planning and management of health

and disease. The way health information is collected and stored and transmitted has undergone a sea of change. The progressive improvement in it is also seen. The software used in the health centers/hospitals record system has helped in maintaining ICD and hence uniformity in documentation has helped, which was once regarded as very tough.(11)

• Geographic Information System (GIS):

Geotagging of the attributes of health/ health related points have helped in the prevention and control of disease, planning and management. Also, health system strengthening by appropriate location of health centers, disease clustering, understanding disease determinants are the other benefits of GIS. This has also a role in disaster management (risk identification, risk mitigation, rehabilitation.)(12)

G. Surveillance:

The disease surveillance system in India through the Integrated Disease Surveillance Project (IDSP) is collecting and transmitting data related to some common disease through digital technology. This can give real-time information on disease outbreak, action taken, in single click within few minutes. This helps public health action to be taken at a brisk pace.

H. Awareness:

The use of the messaging system has helped immensely in creating awareness through email, text message, WhatsApp, which can spread the message like wildfire in a short time among large masses. Especially social media such as Facebook and WhatsApp can be of great help in spreading the awareness of the health and related events.

Conclusions and way forward

Despite a down to the ground availability of internet and similar resources, the use of the facilities in public health is not ubiquitous in India and other developing countries. This marks the requirement of awareness about these technologies in countries like India.

There is a plethora of impediments and hurdles in course of the rapid utilization of modern technology. In a number of countries, including India, the required infrastructure does not exist. There are also troubles about the exorbitant initial investment compared to basic health needs and other abreast priorities. Demonstrating the cost-effectiveness of modern technology in promoting health, therefore becomes a priority. Innovative ways of investments and cost sharing should be planned so that technology may have health as one of its critical applications. Capacity building of health care workers regarding the use of technology in public health through training is also a dire need. There are prevailing issues of legality, security and ethicality in the use of technology, For example, those related to security and safety of medical

information.

Also, there is a certain need for the development of legal, ethical and security guidelines related to technology and its use in public health. Nevertheless, technology should be used appropriately, lest it causes harms to us. Whether the technology turns out to be salubrious or deleterious will largely depend upon the way it is used.

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