National Journal of Multidisciplinary Research and Development
ISSN: 2455-9040
Impact Factor: RJIF 5.22
www.nationaljournals.com
Volume 3; Issue 1; January 2018; Page No. 570-582

Health surveillance and political economy of HIV/AIDS: critical view from public health framework

Joydeb Patra
Doctoral Research Scholar, Department of Sociology, Vidyasagar University, Medinipur, West Bengal, India

Abstract

The term surveillance, “to watch over”, may be defined as a system which keeps close observation of all aspects of disease, not only occurrence but the distribution, through the systematic and logical manner. ‘Public Health Surveillance ‘ – which focus on surveillance, as mechanism tools, to used keep control and make a preventive action against disease, like HIV/AIDS. Herewith, surveillance is more than merely descriptive, archival and historical, rather dynamics, current and more purposeful, to promote and effective control over disease. HIV/AIDS, is not merely as medical issues rather politically strategic paradigm ‘centre around with AIDS. After, 1990, the economics of HIV/AIDS has received more attention than the politics ones of AIDS. While, Public Health Framework, reflecting the response and receive health consultation with power exercise and legitimization of surveillance tools. Framework not just about extending public life, but covers the contribute to healthy life expectancy.

Keywords: surveillance, HIV/AIDS, political-economy, public health framework

Introduction

The term “surveillance”, derived from the French roots, *sur* (over) and *veiller* (to watch), is defined in the dictionary as the “close and continuous observation of one or more persons for the purpose of direction, supervision, or control”.Public health surveillance is considered to be an essential public health function. A public health system is said to have five essential functions: population health assessment, health surveillance, health promotion, disease and injury prevention, and health protection. Public health surveillance is considered the best weapon to avert epidemics.

Records of Major Epidemics in Human History

Public health surveillance dates back to the time of Pharaoh Mempses in the First Dynasty, when an epidemic was first recorded in human history. Manetho, the Egyptian priest and historian, stated in his list of pharaohs, “*Mempses, for eighteen years. In his reign many portents and a great pestilence occurred*”. The “great pestilence” is now known to have occurred in 3180 B.C. It also provides the necessary background and context for the discussion below of the major milestones and historical development of the concepts and definitions of public health surveillance.

According to Marks and Beatty, the three most devastating epidemics to hit the human race were “The Plague of Justinian” (A.D. 541–591) which lasted 50 years, "The Black Death" (1348–1351) which lasted 4 years, and “Spanish Influenza” (1918) which lasted five months. From an analysis of, it can be seen that three types of information were included in the historical records of epidemics. These are health outcomes, risk factors, and interventions. These are also the types of information that should be included in a modern day public health surveillance system. They are the forces guiding the changes in public health. Health outcomes measure the state of public health. Risk factors move the state of public health towards undesirable health outcomes, and interventions if successful move the state of public health towards desirable health outcomes.

Major Milestones in the Historical Development of Public Health Surveillance

Simply recording epidemics is not exactly public health surveillance as we know it today. Major milestones in the historical development of concepts in public health surveillance are given in The first record of an epidemic was made in 3180 B.C., starting the practice of collecting and recording data.

The idea of collecting and analyzing data dates back to Hippocrates (460 B.C.–370 B.C.) an ancient Greek physician who is also known as the father of medicine and the first epidemiologist.He is credited with being the first person to believe that diseases were caused naturally and not because of superstition and gods.Disease was a consequence of local conditions, which had to be favourable for a particular disease to occur. He introduced the concept of categorizing illnesses as acute (short duration) or chronic (long lasting). He also coined the terms endemic (for diseases usually found in some places but not in others; steady state) and epidemic (for diseases that are seen at some times but not others; abrupt change in incidence).In his book On Airs, Waters, and Places he wrote,

“*The men are subject to attacks of dysentery, diarrhea, hepialus, chronic fevers in winter, of epinyctis, frequently, and of hemorrhoids about the anus. Pleurisies, peripneumonies, ardent fevers, and whatever diseases are reckoned acute, do not often occur, for such diseases are not apt to prevail where the bowels are loose. Ophthalmies occur of a humid character, but not of a serious nature, and of short duration, unless they attack epidemically from the change of the seasons. And when they pass their fiftieth year, defluxions* *supervening from the brain, render them paralytic when exposed suddenly to strokes of the sun, or to cold. These diseases are endemic to them, and, moreover, if any epidemic disease connected with the change of the seasons, prevail, they are also liable to it.”*

According to the Hippocratic definition, an endemic is a disease determined by the nature of a certain place, and climatic, hydrological, and behavioural determinants are seen as the main forces.This provides the concept of collecting data on place, natural environment and people for determination of illness.

The first public health action that can be attributed to surveillance occurred during the 1348 bubonic plague epidemic which started the “Black Death”. The Venetian Republic appointed 3 guardians of public health to detect and exclude ships which had infected people aboard.Quarantine as a means to control the spread of infectious diseases was used again in 1377 in Marseilles to detain travellers from plague-infected areas for 40 days.

The concept of systematic ongoing collection of mortality data was first used in 1532 when the town council of London, England started to keep a count of the number of persons dying from the plague [.These Bills of Mortality were collected on and off for over 100 years [.However, these data were not used for surveillance purpose until the 1600s, when the clerks of London reported the number of burials and causes of death to the Hall of the Parish Clerk's Company and released in a weekly Bill of Mortality.

Comprehensive analysis and interpretation was introduced by John Graunt (1620–1674), a haberdasher and serious amateur scientist in London, who analyzed the weekly bills and published in 1662 his book *Natural and Political Observations Made upon the Bills of Mortality*.For this work he was subsequently elected a fellow of the Royal Society, whose members initially were uncomfortable with the idea of a haberdasher being elected.Graunt was the first to quantify the patterns of disease and to understand that numerical data on a population could be used to study the cause of disease.He was the first to estimate the population of London and to count the number of deaths from specific causes.

The practice of epidemic field investigation began with the personal diary Samuel Pepys (1633–1703) kept from 1660 until 1669. His diary is an important primary source of data and first-hand account for London, with personal revelation and eyewitness reports of many great events.During the “Great Plague of London” in 1665, Pepys' diary made almost daily reference to the epidemic :

“*15th [June]… The towne grows very sickly, and people to be afeard (afraid) of it: there dying this last week of the plague 112, from 43 the week before… 20th [July]…Walked to Redriffe, where I hear the sickness is, and indeed is scattered almost everywhere, there dying 1089 of the plague this week… 31st [August]… In the City died this week 7496, and of them 6102 of the plague… 30th [November]… Great joy we have this week in the weekly Bill, it being come to 544 in all, and but 333 of the plague*”.

Not using the modern terminology, he actually introduced the concept of proportionate mortality, or the proportion of total deaths resulting from the index disease. According to the numbers kept in Pepys' diary, the proportionate mortality for plague was 81% (6102/7496) on August 31, 1665, which decreased to 61% (333/544) on November 30, 1665 when the epidemic started to subside. These numbers recorded by Pepys from the beginning of June to the end of November indicate the effectiveness of the natural intervention, that is, the coming of the November frosts and the winter.The plague ended with the “Great Fire of London” in 1666 that destroyed and cleansed the overcrowded neighbourhoods.

Legislation for surveillance was first introduced in 1741 in the Americas, when the colony in Rhode Island passed an act requiring tavern keepers to report contagious disease among their patrons. In 1743, the colony passed a law requiring the reporting of smallpox, yellow fever, and cholera.This started the concept of compulsory reporting of infectious diseases.

Surveillance was felt to need to link to policy development. In 1776, Johann Peter Frank in Germany advocated a comprehensive form of public health surveillance which dealt with school health, injury prevention, maternal and child health, and public water and sewage treatment.Frank formulated comprehensive health policy which had considerable impact both within Germany and in countries such as Hungary, Italy, Denmark, and Russia that had close cultural contact with Germany.

In addition, leaders of the French revolution (1788–1799) declared that the health of the people was the responsibility of the state.This started the concept of a welfare state. Surveillance efforts were used to develop legislation and social change. Sir Edwin Chadwick, secretary of the Poor Law Commission in England, using surveillance data, demonstrated the link between poverty and disease.. He published the report of 1834 recommending the reform of the old Poor Law. The new Poor Law system was in existence until the emergence of the modern welfare state after the Second World War (1939–1945).The New Poor Law is considered to be one of the most “far-reaching pieces of legislation of the entire Nineteenth Century”.At about the same time, Louis-René Villermé (1782–1863) studied the mortality rate variations across the 12 *arrondissements* (districts) of Paris 1817–1826, by district, population density, and income and showed the association between poverty and mortality.

William Farr (1807–1883) is recognized as the founder of the modern concept of surveillance.In 1836, the General Register Office was established in England and Wales to provide more accurate and complete mortality data.Medical certification of death and universal death registration was introduced in 1837.Farr was the first Compiler of Abstract (medical statistician) at the General Register Office. He began the practice of collecting and analyzing vital statistics to describe the impact of diseases in various populations.From 1838 to 1879 (for 41 years), he concentrated his efforts on collecting vital statistics, on assembling and evaluating those data, and on reporting his results to both the responsible authorities and to the general public and created a modern surveillance system.

Surveillance was proposed to link to statewide public health infrastructure. In the United States, Lemuel Shattuck published in 1850 his “Report of the Massachusetts Sanitary Commission”, based on the survey of sanitary conditions in Massachusetts.This report was a landmark publication that related death, infant and maternal mortality, and communicable diseases to living conditions.In this report, Shattuck proposed the creation of a permanent statewide public health infrastructure and recommended establishing health offices at the state and local levels in order to gather statistical information on public health conditions.He recommended a decennial census, standardization of nomenclature for diseases and causes of death, and the collection of health data by age, sex, occupation, socioeconomic level, and locality.Although the legislature did not adopt his comprehensive plan, his specific proposals became routine public health activities over the course of the twentieth century.

John Snow (1813–1858), an anaesthesiologist, is famous for his investigations into the causes of the 19th century cholera epidemics and is also known as the father of modern epidemiology.In 1849, Snow mapped cholera cases in London and identified the source of the outbreak as the public water pump on Broad Street (now Broadwick Street). Using a dot map, he illustrated the cluster of cholera cases around the pump. Snow wrote:

"*On proceeding to the spot, I found that nearly all the deaths had taken place within a short distance of the [Broad Street] pump. There were only ten deaths in houses situated decidedly nearer to another street-pump. In five of these cases the families of the deceased persons informed me that they always sent to the pump in Broad Street, as they preferred the water to that of the pumps which were nearer. In three other cases, the deceased were children who went to school near the pump in Broad Street… With regard to the deaths occurring in the locality belonging to the pump, there were 61 instances in which I was informed that the deceased persons used to drink the pump water from Broad Street, either constantly or occasionally… The result of the inquiry, then, is, that there has been no particular outbreak or prevalence of cholera in this part of London except among the persons who were in the habit of drinking the water of the above-mentioned pump well. I had an interview with the Board of Guardians of St James's parish, on the evening of Thursday, 7th September, and represented the above circumstances to them. In consequence of what I said, the handle of the pump was removed on the following day*".

On September 8, 1854, Snow removed the pump handle and the epidemic waned.Snow's work is a good illustration of collection, analysis, interpretation, and dissemination of data leading to public health intervention. Systematic reporting of various diseases started in the United States in 1874 in Massachusetts.The Massachusetts State Board of Health inaugurated a plan for weekly voluntary reporting of prevalent diseases by physicians.A sample postcard was designed to "*reduce to the minimum the expenditure of time and trouble incident to the service asked of busy medical men*".In Europe mandatory reporting of infectious diseases started in Italy in 1888, and in the United Kingdom in 1890. Finally, the 20th century brought the expansion and diversification of public health surveillance systems..

The United States has been taking a lead in the development of concepts and models for public health surveillance. A detailed account of the development of the public health surveillance system in the United States for 1850–1950 is given elsewhere.It is of interest to know the brief history of the US agency known as "CDC" that is responsible for public health surveillance in the United States. The CDC was founded in 1942 as the Office of National Defense Malaria Control Activities [.Atlanta was chosen as the location because malaria was endemic in the Southern US. In 1946, the agency changed its name to Communicable Disease Center, and hence the acronym "CDC".In 1947, CDC took over the Public Health Service Plague Laboratory in San Francisco, thus acquiring an Epidemiology Division. In 1955, CDC established the Polio Surveillance Program, in order to prove that an epidemic could be traced to a single vaccine manufacturer [.In 1961, CDC took over publication of Morbidity and Mortality Weekly (MMWR). The Communicable Disease Center was renamed the Center for Disease Control in 1970, then the Centers for Disease Control effective 1980.An act of the United States Congress appended the words "and Prevention" to the name effective 1992. However, Congress also specified that the agency continue to use the acronym "CDC" because of its recognition within the public health community and among the public.

Globally, the public health surveillance program is coordinated by the World Health Organization (WHO). In 1965, the Director General of the World Health Organization established the epidemiological surveillance unit in WHO's Division of Communicable Diseases. The first communicable disease surveillance report was published in 1966. In 1968, the 21st World Health Assembly established surveillance as an essential function of public health practice.

The rapid spread of HIV means that AIDS is looming as a huge threat to most developing countries, particularly in Africa and south Asia, where it threatens to assume epidemic proportions far beyond the resources of governments to control. Responsible United Nations officials have compared AIDS to the great plagues of history, with some countries close to an adult infection rate of 25 percent; and the U.N. Population Division estimates that life expectancy is falling in 29 African countries due to AIDS. The particular nature of the transmission of HIV through intimate personal connections raises immediate questions about appropriate public health responses, and the balance between human rights and respect for existing religious and cultural norms. In developing countries particularly AIDS poses central challenges to existing social, economic, and gender relations. For all these reasons the unprecedented degree of involvement of community-based activity in United Nations AIDS programs has implications for both the creation of new forms of global co-operation and the idea of global citizenship. The dominant paradigms in ``social'' research around HIV/AIDS have been psychological, focusing heavily on questions relating to ``risk,'' individual behavior and how to change it. Many in the community sector would stress the fragility of human rights and the extent to which HIV remains stigmatized, will include both cultural and socioeconomic factors, as well as those more usually invoked by epidemiologists. As early as 1988 the political scientist A. J. Fortin discussed the relations among AIDS, the response of international agencies, and the dominant world order, writing of: ``the use-value the epidemic possesses for an expansionary development `establishment,' as well as for the international power relations between the West and Third World that this sector has traditionally mediated through its development program." Perhaps the Frst attempt to relate HIV/AIDS explicitly to globalization came in a 1990 paper by John O'Neill, who referred to AIDS as ``a potential Globalizing panic on two fronts; namely (a) a crisis of legitimation at the level of global unisexual culture; and (b) a crisis of opportunity in the therapeutic apparatus of the welfare state and the international medical order." (O'Neill uses the term, ``a global unisexual culture" to mean ``a same-sex culture whose technological infrastructure is in different, benign or emancipated with respect to its male and female protagonists," an odd use which need not detain us.) This remains an uncommon perspective. Caroline Thomas has remarked that:

``Disease is a transnational phenomenon which pays no heed to territorial state boundaries; yet it rarely features in the discussion of International Relations."

At best AIDS is mentioned in throwaway lines as yet another symptom of the social and political disintegration associated with the ``new world order."

The relevance of political economy

A Canadian expert in health promotion, Ronald Labonte, has written that: ``Most of what creates `health'... lies beyond organized health care sectors. Poverty, income inequalities, social inequalities, environmental pollutants/degradations, violence and other complex social phenomena are far more important health determinants than access to health care services." I want to tease out this argument as it might apply to HIV/AIDS. I have already suggested that ``development" is often a major determinant of the spread of HIV. In the same way HIV impinges on economic growth, both slowing it and distorting the allocation of resources because of the demands it places on health and care systems. There exists a limited amount of analysis of the economic impact of HIV, most of it concentrating on the decline in life expectancy and production in some key sectors of the economy. For example, UNAIDS has calculated that: ``In Botswana life expectancy, which rose from under 43 years in 1955 to 61 years in 1990, has now fallen to levels previously found in the late 1960s" and elsewhere it has been claimed that: ``In Zimbabwe all the gains in life expectancy of the last 40 years have been lost." 55 Some work has been done on the reject of large-scale illness and death among young adults and a resulting increase in disrupted families and the number of orphans requiring care. There exists some speculation about the relationship between very high rates of HIV and civil disturbances in places such as Zaire and Rwanda, although almost nothing has been published on this connection. More generally attempts to combine political and economic analysis are largely underdeveloped in respect of AIDS. Clearly the resources available for HIV/AIDS prevention and treatments will reject larger economic and political realities. The economic crisis in some southeast Asian economies from the end of 1997 have meant severe cuts in HIV programs, to the extent that in Indonesia screening of blood supplies has been rejected because of the cost of imported chemicals58 and there are fears that the successful ``100% condom use" campaign among Thai prostitutes has been imperiled by pressures to cut costs and the importation of cheaper workers from outside Thailand. A political economy approach would stress the significance of political as much as economic factors: the extraordinary importance of political space for the discussion and articulation of ways to respond to the threats of HIV, as well as the need for sufficient resources to support these responses. In many parts of the world, the greatest problems are a compound of a lack of political will, the existence of barriers (usually religious or cultural in origin) against admitting the causes of infection and addressing them in practical ways, the severe stigma directed against both those with HIV and those from groups associated with AIDS (sex workers, needle-users, homosexuals, etc.) and often underlying all of these is the pressure for survival on large numbers of people who are poor, homeless, and ill educated. In some countries, non-governmental organizations have worked in ways that are inimical to AIDS control, for instance religious objections to the provision of condoms or clean needles. Cardinal Sin, one of the leaders of the popular movement that helped bring down the Marcos regime in the Phillippines, has also been a strong voice against certain measures intended to help strengthen AIDS prevention, thus emphasizing the impact of particular cultural and ideological positions on HIV/AIDS. In the same way, church opposition to condoms in a number of Latin American and African countries has been a major problem for anti-HIV interventions.61 Equally Islamic opposition to discussion of sex is a major problem in a large range of countries, and condom promotion and discussion of homosexuality or even extramarital heterosexual intercourse is extremely difficult in most Muslim countries.In short, receptive AIDS interventions depend upon a number of variables most of which are outside the control of those immediately concerned with HIV/AIDS programs and their delivery. These center around the resources available to mount both prevention and care programs, resources in this case encompassing cultural and political factors as much as economic. Indeed Jonathan Mann argued that there is a basic link between a strong civil society that protects human rights and vulnerability to HIV infection. Yet in many countries it is not the absence of civil society that is involved, but rather the reality that the organizations that civil society comprises will not necessarily be in agreement. Once infected, one's access to ejective treatments is increasingly a matter of economic resources and access to expensive and sophisticated pharmaceuticals. Recent advances in AIDS treatments have accentuated the gulf between rich and poor, with a minority of people with HIV now seemingly able to live for long periods without major disease, while the majority of infected people face a series of debilitating and painful illness en route to a reasonably rapid death. A report for the World Bank has warned that antiviral therapies are both expensive and uncertain, claiming that even if the costs were reduced to *``one-hundredth of current costs... they would still be several times the total annual per capita expenditure on health in many low-income countries."*

One should note that most people with HIV do not have access to even common drugs used to treat opportunistic diseases nor to palliative and terminal care. This argument is likely to be politically unattractive as rapid improvements in health due to sophisticated anti-retrovirals are widely reported in both the medical and lay press. At the 1996 International

AIDS Conference in Vancouver there was a strong activist push to demand that drug companies make their latest therapies available to everyone, irrespective of cost, and in 1997 the French government threw its weight behind a campaign to make new treatments widely available in Africa. The French government, UNAIDS, and the French organization AIDES have been working together since 1997 to make new treatments accessible in some of the poorest countries of Africa, although it is not clear how successful these moves will be. Access to antiviral treatments has become the crucial question for most PLWHA activists over the past several years. There was considerable protest in Israel in 1997 when government regulations were interpreted to prevent the subsidy of new HIV drugs (agreed to by the government the following year). Two cases in late 1997 led the Costa Rican Supreme Court to order the National Health system to pay for antiviral drugs for four persons with HIV, following agitation by gay and AIDS activists.65 In other countries of Latin America, e.g., Panama and Venezuela, the question of access to therapy has become a significant political issue that tests the limits of the social system. (In late 1997, for example, an attempt was made in the Mexican Congress to win a special budget to guarantee therapy for all those infected with HIV.) The World Bank Report points to the new inequities that result if those with HIV receive more subsidy for health care than those with other medical needs.66 Given that UNAIDS estimates that only 10 percent or so of people currently rejected with HIV are aware of their status, it is clear that treatments cannot be made available electively in the absence of a system of large-scale testing and counseling. One might also point out that without such testing it becomes very difficult to mobilize those with HIV to demand a response from the health system. Under pressure from PWHA groups and some governments, UNAIDS has now established a pilot program aimed at both providing drugs and improving the medical infrastructure in four countries (Chile, Cote d'Ivoire, Uganda, and Vietnam). For this program to work there will need to be considerable cooperation between the private and public sectors, as well as an investment by relevant governments that they may not be willing or able to make.67 There is little doubt that some of the worst effected countries, particularly those in tropical Africa, could not provide effective medical care for the majority of those infected with HIV even if the entire government budget were devoted to that end. Much richer countries like Thailand, say, or South Africa ^ do not possess the necessary resources to meet the standards of care now available in most of the first world. Even rich countries have constantly make decisions about the allocation of resources for and within their health sectors, and these decisions will directly determine who will live, and under what conditions others will die. One estimate in late 1997 suggested that: ``In Zimbabwe it would at current funding levels take 12 years worth of the public drug budget to treat the HIV-positive population for a single year, while in Cote d'Ivoire the bill would amount to 18 years worth of current spending.

But as in the case of effective prevention, access to treatments is not purely a question of economics, unless we recognize that economic choices are in the end politically determined. Even in rich countries access to treatments is not evenly distributed. (The most effective AIDS activist group, the American ACT UP, did a great deal to focus attention on the inequities of treatment access within the United States) Except for the very poorest of countries, national governments have real choices about how much of their resources to devote to healthcare and how to divide up those resources within the health sector; India, for example, which is one of the worst affected countries, could make a political choice to spend far more on AIDS care and prevention by reducing significantly its enormous military expenditures. Indeed, better coordination and protection against corruption would have a huge impact on India's AIDS programs, even in the absence of more money. The common rhetoric around inequality in access to healthcare tends to reject a rather simplistic analysis of imperialism, in which ``developing'' countries are seen as powerless in face of the dominant capitalist order. There is some support for this view in the ways in which ``structural adjustments'' imposed by the World Bank and the IMF have both increased the vulnerability of many to infection and limited the resources available for public health. In recent years the Bank has itself admitted the validity of some of these criticisms, and indeed a major loan from the World Bank to Brazil has made it possible to provide considerable therapeutic support for those with HIV. Moreover, current international trade and patent laws prevent the production of appropriate drugs more cheaply in a number of affected countries (e.g., Thailand, India, South Africa). But too often governments use global inequality as an alibi to excuse their own failings. Poor countries differ dramatically in their response to the epidemic, particularly in their willingness to admit the seriousness of the epidemic and to encourage effective measures to address it. Compare, for example, the support for effective intervention in Uganda against the general denial at government level in Kenya, or the much stronger support for HIV programs in the Philippines as against Indonesia. (In the latter case the existence of far stronger and more independent community organizations in the Philippines is almost certainly a factor.) We badly need research that might suggest what factors make for an effective government are some respect for human rights of the sort Mann stressed. It would also include a willingness to adopt a pragmatic approach to certain behaviors, both sexual and drug-related, which infringe dominant religious and cultural norms. It is tempting to argue that both of these factors require something like a liberal democratic system, which allows for the free organization of community groups. But it may well be the case that the more authoritarian mobilization of populations associated with governments such as those of Vietnam or China might allow for a more systematic response than an apparently ``open'' society such as, say, India. It is probably more accurate to suggest that both low corruption and tolerance of sexual diversity are significant factors in the control of AIDS. Around the provision of treatments, the example of Costa Rica and perhaps other Latin American countries, as well as the UNAIDS and French initiatives, suggest that the political arena may be as significant as financial restraints in determining what sort of treatments are made available and to what extent. A fuller analysis would need to incorporate the role of the large pharmaceutical companies in drug development and marketing; at an earlier stage in the epidemic they were demonized as the primary target of much AIDS activism, particularly in the United States. (This comment is not intended to defend the companies, only to point out that unequal access to treatments in the United States was as much due to the absence of universal health insurance as it was to the greed of drug manufacturers.) And there is the further complication of pressure from some groups including some PWHAs who remain extremely skeptical of the claims of orthodox biomedicine and advocate a far greater reliance on alternative and traditional therapies. The irony of seeing AIDS as a global epidemic is that in practice the global response is largely at a rhetorical level. At the 1996 International AIDS Conference in Vancouver (whose slogan was ``One World, One Hope") one plenary speaker pointed out that the cost of bringing her to speak for twenty minutes could have supplied food and medicines to her and her family for a year. Indeed, the constant advances in biomedicine's ability to manage infections, leading to a lengthening life span for those who are positive and who have full access to the latest medical technologies is increasing the gaps between two epidemics, one for the rich and one for the poor. These gaps raise practical and moral questions both for official and non-official response to the epidemic, and, indeed, for theories of globalization themselves.response, taking into account available resources.

Historical Development of the Concepts and Definitions of Public Health Surveillance

In 1662, John Graunt first suggested in his book *Natural and Political Observations Made upon the Bills of Mortality* the need for ongoing systematic collection of data and proposed the basic principles for data analysis and interpretation, although he did not conceptualize the link of surveillance information to public health practice. In those days, mortality data collection was simple but routine. Every night, towards twelve o'clock, a cart goes about with a lantern and a bellman (or sexton), and as he rings the bell, he cries out, “Bring out your dead!” As described by Graunt,

“*When any one dies, then, either by tolling, or ringing of a Bell, or by bespeaking of a Grave of the Sexton, the same is known to the Searchers, corresponding with the said Sexton. The Searchers hereupon repair to the place where the dead Corps lies, and by view of the same, and by other enquiries, they examine by what Disease or Casualty the Corps died. Hereupon they make their Report to the Parish Clerk, and he, every Tuesday night, carries in an Accompt of all the Burials and Christnings happening that Week, to the Clerk of the Hall. On Wednesday the general Accompt is made up and printed, and on Thursday published and dispersed to the several Families who will pay four Shillings per Annum for them*”.

Using this method, he was the first to recognize that there were more male than female deaths in London. He tried to interpret the findings and was able to explain the observation by noticing that there were more males than females by counting the number of births, and he suggested that this phenomenon in London should be searched for elsewhere. In Graunt's words, “*There have been Buried from the year 1628, to the year 1662, exclusivè, 209436 Males, and but 190474 Females: but it will be objected, that in London it may indeed be so, though otherwise elsewhere; because London is the great Stage and Shop of business, wherein the Masculine Sex bears the greatest part. But we Answer, That there have been also Christned within the same time, 139782 Males, and but 130866 Females,… What the Causes hereof are, we shall not trouble our selves to conjecture, as in other Cases, onely we shall desire, that Travellers would enquire whether it be the same in other Countries*”.

Graunt's concepts described in 1662 can be translated to a first definition of public health surveillance as follows: surveillance is the successful analysis of population-based ongoing data (such as death records) to reduce volumes of data to a few easy-to-understand tables, then interpret them, and prepare a few brief and precise paragraphs, so as to gain profit from the data analysis, in order to understand the increase and decrease of diseases.

A contemporary of Graunt, Sir William Petty, in his 1687 essay on “Mankind and political arithmetic”, termed the science of Graunt “*Political Arithmetic*”.This term is a good description for today's public health surveillance, which requires arithmetic skills for analysis of data and a keen political sense for interpretation of results.

Before 1963, the term surveillance was used initially in public health to describe the close monitoring of persons who, because of an exposure, were at risk for developing highly contagious and virulent infectious diseases.These persons were monitored so that, if they exhibited symptoms of disease, they could be quarantined to prevent spreading the disease to others.

In his classic 1963 paper, Alexander Langmuir (1910–1993), chief epidemiologist of US CDC, defined surveillance for a disease to mean “*the continued watchfulness over the distribution and trends of incidence through the systematic collection, consolidation, and evaluation of morbidity and mortality reports and other relevant data*”.He illustrated this application with four communicable diseases: malaria, poliomyelitis, influenza, and hepatitis.He explained that the data and their interpretations must be disseminated to all who have contributed and to all others who need to know.But his definition did not include direct responsibility for disease control activities.

In 1968, the 21st World Health Assembly adopted the concept of population surveillance which was defined as “*the systematic collection and use of epidemiologic information for the planning, implementation, and assessment of disease control*”.The Assembly expanded Langmuir's definition to include the assumption that surveillance information is collected in order to take appropriate action to improve health outcomes.In other words, surveillance is “information for action”.The Assembly also affirmed the three main features of surveillance: (a) the systematic collection of pertinent data, (b) the orderly consolidation and evaluation of these data, and (c) the prompt dissemination of results to those who need to know, particularly those in position to take action.

The 1986 CDC definition of surveillance reflects Langmuir's view that the concept of surveillance did not encompass direct responsibility for control activities and avoids the use of the term surveillance for control activities, although it states that the final link in the surveillance chain is the application of these data to prevention and control.

The 1988 definition by Stephen Thacker and Ruth Berkelman is very similar to the 1986 CDC definition. While the 1986 CDC definition uses the term "*epidemiologic surveillance*," the 1988 Thacker and Berkelman definition introduces the new term "*public health surveillance.*" Epidemiologic surveillance focuses on using surveillance information for epidemiologic research, while public health surveillance focuses more on public health practice.Thacker and Benkelman compared the distinctions between public health surveillance and epidemiologic research and decided that the term epidemiologic surveillance is misleading, and surveillance does not equal research.

In his 1998 paper on "Perspectives on epidemiologic surveillance in the 21st century", Bernard Choi presents arguments why it is important for epidemiologic surveillance to come back full circle in the 21st century and become once again the focus of health research:

"*Epidemiologic surveillance dates back to the time of John Graunt ... In the subsequent 300 years, however, the focus of health research shifted to sample-based studies: cross-sectional, cohort and case-control studies, and clinical trials. In recent decades, awareness of the limitations of sample-based epidemiologic studies has grown. ... [H]ealth research can be conducted in the next century using well-maintained and well-validated surveillance databases*".

Epidemiologic research studies that are sample-based are subject to errors caused by the "False Positive Research Cycle": false positive associations (positive associations that are not true) will continue to be confirmed by a multitude of subsequent studies that are designed to test a hot topic due to an initial false positive report that is incorrect (hot topic bias), and subsequent amplification of the errors through cycles caused by the tendency of authors to write up and submit positive findings but not the true negative findings (positive results bias) and of editors to accept and publish positive findings (editor's bias).One way to resolve these errors is population-based epidemiologic surveillance. Choi's 1998 definition of surveillance stresses on the concept of "*population-based*"). Resources required for population-based epidemiologic surveillance systems can be formidable, but progress in technology and informatics may soon make implementation much easier to achieve.

More recent definitions of surveillance, including the 2001 US Centers for Disease Control and Prevention (CDC) and 2006 Public Health Agency of Canada (PHAC) definitions, emphasize on "*public health action.*" The World Health Organization has three web pages that provide definitions of surveillance. The definitions are very similar, except that the phrase "*action can be taken*" on one webpage is interpreted as "*the planning, implementation, and evaluation of public health practice*".

It can be seen that while the components "ongoing," "systematic," "collection," "analysis," "interpretation," and "dissemination" have been consistent in the definitions, there are changes in the other components. For example, "epidemiologic surveillance" shifts to "public health surveillance"; "mortality data" to "health data," and "disease control" to "public health action".

Based on an examination of the trend of use of terms and the most popular components of various definitions given in, the working definition of surveillance for the purpose of this paper is "*Public health surveillance is the ongoing systematic collection, analysis, interpretation and dissemination of health data for the planning, implementation and evaluation of public health acts.*

The Present

It is useful to provide an overview of the current status of public health surveillance and its basic principles and concepts.

For further information, interested readers can consult books written on the basic principles of public health surveillance.The 2000 book edited by Teutsch and Churchill was considered in a 2001 article in the American Journal of Epidemiology as a wonderful one-stop source of information on public health surveillance. There is one book which specifically addresses global surveillance of behavioural risk factors.There are books on the statistical methods for public health surveillance and public health informatics.

Uses of Public Health Surveillance

The World Bank described six categories of uses of public health surveillance :

1. Recognize cases or clusters of cases to trigger interventions to prevent transmission or reduce morbidity and mortality.
2. Assess the public health impact of health events or determine and measure trends.
3. Demonstrate the need for public health intervention programs and resources, and allocate resources during public health planning.
4. Monitor effectiveness of prevention and control measures and intervention strategies.
5. Identify high-risk population groups or geographic areas to target interventions and guide analytic studies.
6. Develop hypotheses that lead to analytic studies about risk factors for disease causation, propagation, or progression.

Components of Public Health Surveillance

Public health surveillance starts with defining the type of data to collect (systematic data framework development) and then the public health surveillance process cycles through three stages: data collection, analysis and interpretation, and the timely dissemination of findings.In addition, the surveillance system should be able to evaluate public health actions (including the surveillance system itself which is a public health action).

A step-by-step guide is available for the creation of a new surveillance system when existing systems cannot answer a specific public health questions or address new information need.

A conceptual framework for health information, the Health Template, was put forward in 1991 by the National Task Force on Health Information.The Health Template classifies health information into three major areas: individual characteristics, external milieu, and "health-affecting" interventions and can potentially be used as a model for selecting indicators. Among the indicators, the definition of what constitutes a "case" is important, especially in infectious disease surveillance.Case definitions for surveillance purposes may be different from the criteria used for clinical diagnosis.. For non communicable diseases, the World Health Organization recommends a stepwise approach to surveillance that has a core and expanded set of indicators.

Evaluation of Surveillance Systems

Every surveillance system should be evaluated periodically to ensure that it is serving a useful public health function and is meeting its objectives.Several guidelines have been proposed for the evaluation of surveillance systems.

A systematic evaluation should address the following six aspects: (1) importance (2) objectives and components (3) usefulness (4) cost (5) data quality (accuracy, representativeness and completeness) and (6) quality of surveillance system (simplicity flexibility portability stability acceptability sensitivity predictive value positive and timeliness.Data and system architecture of a surveillance system should follow four design principles: automated, real-time, routinely useful, and locally useful.

A number of limitations have been identified for the current surveillance systems.

1. The current surveillance practice is unable to address adequately either current or new potential challenges to public health.
2. The current approach to public health surveillance is fragmented, as the various systems are not well coordinated.Ongoing public health information systems are not always integrated with public health surveillance and prevention activities. Instead, over time, a collection of independent and poorly coordinated surveillance systems has evolved in response to various needs.
3. It is difficult to address a new emerging health problem because surveillance for the specific problem usually does not exist.New health problems are not detected through the collection of routine surveillance data.
4. Existing surveillance systems may not provide timely data.Timeliness has two components: timeliness after the occurrence of the health event and timeliness of access to data.
5. Inadequate funding has been a problem with current systems of surveillance.

Some Current issues: Surveillance Dichotomies

There are a number of concepts in surveillance that are currently under discussion. These dichotomies are described below.

Epidemiologic Surveillance versus Public Health Surveillance. In 1965, the World Health Organization established the epidemiologic surveillance unit in the Division of Communicable Diseases.The Division director, Karel Raska, defined surveillance to include "*the epidemiological study of a disease as a dynamic process involving the ecology of the infectious agent, the host, the reservoirs, and the vectors, as well as the complex mechanisms concerned in the spread of infection and the extent to which this spread occurs*".The 1968 World Health Organization definition of surveillance includes "*the use of epidemiologic information*".

On the other hand, Thacker and Berkelman in 1988 started using the term "public health surveillance" and gave the following reasons: "the use of the term epidemiologic to modify surveillance is misleading. Epidemiology is a broad discipline that incorporates research and training that is distinct from a public health process that we call surveillance. … For this reason, in this paper, we will not adhere to the current practice of using the term epidemiologic to modify surveillance. We propose that a more appropriate term is public health surveillance, because its use retains the original benefits of the term epidemiologic cited previously and removes some of the confusion surrounding current practice".

Surveillance versus Research. According to Thacker and Berkelman "*Surveillance does not encompass research*" and they noted distinctions between public health surveillance and epidemiologic research.Reasons why surveillance is not research include "*Public health surveillance is essentially descriptive in nature. It describes the occurrence of injury or disease and its determinants in the population, and leads to public health action. Research, in contrast, is experimental in design, aimed at testing a hypothesis by comparing and contrasting groups. Surveillance data are usually limited in detail and relatively inexpensive to obtain,… Research data are often quite complex and detailed and are usually expensive to produce. If we confuse surveillance with research, we may be motivated to collect large amounts of detailed data on each case. The burden of this approach is too great for the resources available for surveillance systems and usually leads to failure*".

On the other hand, others pointed out that there are biases and problems in the current sample-based research, what Graunt's work published in 1662 was population-based research, and hope that in the future, population-based research may once again become possible through epidemiologic surveillance. "*Graunt's approach for the analysis of ... Bills of Mortality ... is consistent with the modern technique of population-based epidemiologic surveillance. In the subsequent 300 years, however, the focus of health research shifted to sample-based studies: cross-sectional, cohort and case-control studies, and clinical trials. It appears that epidemiologic surveillance may come back full circle in the 21st century and become once again the focus of health research*".With the advance in information technology, it becomes possible that "*health research can be conducted in the next century using well-maintained and well-validated surveillance databases*".

Surveillance Ending with Information Dissemination versus Surveillance Ending with Public Health Action. Langmuir in 1963 advocated limiting the use of the term surveillance to the collection, analysis, and dissemination of data. His construct of surveillance ended with "*dissemination of (health outcome-specific) data to those who need to know*" and did not encompass direct responsibility for control activities.Others also felt that although data are important for informing policy making, they may not lead immediately to action.Surveillance, *per se,* does not include the public health actions resulting from the interpretation of the data, as few would envisage the inherent responsibility of surveillance practitioners (i.e., those public health officials responsible for interpreting the data collected) for prevention and control actions.

On the other hand, Raska in 1965 defined surveillance much more broadly than Langmuir.In the case of malaria, Raska saw surveillance as encompassing control and prevention activities.Indeed, the WHO definition of malaria surveillance included not only case detection, but also the obtaining of blood films, drug treatment, epidemiologic investigation, and followup.Former CDC director William Foege also felt an essential relationship between information and action: "*The reason for collecting, analyzing, and disseminating information on a disease is to control that disease. Collection and analysis should not be allowed to consume resources if action does not follow*".

Surveillance versus Monitoring. "*Surveillance is the routine tracking of disease (disease surveillance) or, less commonly, risk behaviour (behavioural surveillance) using the same data collection system over time*".Surveillance helps describe an epidemic and its spread and can contribute to predicting future trends and developing prevention programmes. In other words, surveillance is the routine tracking before (or without) an intervention (policy, program, or action), which can lead to the development of an intervention.

On the other hand, "*monitoring is the routine tracking of priority information about a program and its intended outcomes*".Monitoring helps determine which areas are in need of greater effort and flags questions which might contribute to an improved response but that can only be answered by more refined outcome research methods than those used in routine surveillance and monitoring. In other words, monitoring is the routine tracking after an intervention is implemented and can lead to the improvement of the intervention.

There is a difference between a program's monitoring and evaluation.Monitoring tracks changes in outcomes following the implementation of a program or project but is not able to attribute those changes directly to the intervention. Evaluation is designed specifically to be able to attribute the changes to the intervention itself and not the result of non program factors.

When a surveillance system (as a public health action) is monitored or evaluated, that means a second surveillance system is created on the surveillance system itself.While the surveillance system uncovers problems in the general population, the second surveillance system uncovers problems in the surveillance system. In other words, the evaluation of surveillance is "*surveillance of surveillance*".For monitoring or evaluation of policies, the aim is to "*police the policies*.

Passive Surveillance versus Active Surveillance. Passive surveillance systems refer to routine notifiable-disease reporting.This is simple and not burdensome to the health department but is limited by incompleteness in reporting.Also, because passive surveillance depends on people in different institutions to provide data, data quality and timeliness are difficult to control.

To overcome limitations of passive systems, active surveillance systems involve regular outreach to potential reporters to stimulate the reporting of specific diseases.This can be used to validate the representativeness and completeness of passive reporting.As active surveillance employs staff members to regularly contact heath care providers or the population to seek information about health conditions, it provides the most accurate and timely information, but it is also expensive.

Chronic Disease Surveillance versus Communicable Disease Surveillance. There are differences between chronic and communicable disease surveillance methodologies, in terms of temporality, disease course, cause of disease, public health intervention, data sources, data collection, legislation and regulations, and co morbidity.

Surveillance on HIV/AIDS

AIDS case reporting has been the cornerstone of efforts to monitor and track the HIV epidemic. Soon after the first cases of AIDS were reported by the CDC in June 1981 (CDC, 1981), state health departments began to require physicians and hospitals to report by name each newly diagnosed case. In the epidemic's early years, surveillance entailed not only enumerating and mapping cases but also investigating commonalties for which there was no etiological explanation. By the end of 1983 most states required AIDS cases to be reported to public health officials (IOM and NAS, 1986). The system of AIDS reporting evolved over time, primarily through changes in the case definition to reflect growing clinical understanding of the disease and development of appropriate laboratory tests (CDC, 1985, 1987, 1992, 1999). All 50 states, the District of Columbia, and territories report AIDS cases by name using standardized data collection, case definitions, case reporting forms, and computer software (Nakashima and Fleming, 2003). (See sample Adult HIV/AIDS Confidential Case Report form, Annex 3-1.)

AIDS surveillance has been broadly accepted by the community of individuals living with HIV and AIDS. The relatively short time that existed in the past between diagnosis of AIDS and death and the need for health and medical services offset the risks of surveillance (Gostin *et al*., 1997).[6] Due in large part to federal investments in state and local surveillance and strong active surveillance efforts, AIDS case reporting is among the most complete of all reportable diseases and conditions (Doyle *et al*., 2002).

AIDS, the most advanced stage of HIV disease, develops in the absence of treatment an average of 10 years following initial infection (Pantaleo *et al*., 1993). Advances in treating HIV disease have extended that window even further and may prevent some people with HIV infection from ever developing AIDS. Thus, data from the AIDS case reporting system, while still important, have become less informative about current trends in HIV transmission (CDC, 1999).

Following the development of the first antibody test for HIV in 1985, states began to initiate reporting of HIV infection. The first successful efforts to mandate HIV case reporting occurred in Minnesota and Colorado in 1985. In contrast to the "relative ease" with which AIDS reporting was implemented (Bayer, 1989), HIV reporting "ignited a firestorm of community protest" (Gostin *et al*., 1997). Although very few breaches of security had occurred resulting in the release of unauthorized data from the AIDS surveillance system since 1981 (Nakashima and Fleming, 2003), many civil libertarians and gay-rights organizations were strongly opposed to name-based reporting of HIV infection because they did not trust the government to safeguard such information, and were concerned about invasion of personal privacy and discrimination in employment, housing, and insurance (Gostin *et al*., 1997).

Public health authorities justified reporting of HIV infection on several grounds. Reporting would alert public health officials to the presence of individuals with a lethal infection; would allow officials to counsel them about what they needed to do to prevent further transmission; would assure the linkage of infected persons with medical and other services; and would permit authorities to monitor the incidence and prevalence of infection. In the following years, CDC continued to press for name-based reporting of HIV cases, supported by a growing number of public health officials. Indeed, the Council of State and Territorial Epidemiologists adopted several resolutions between 1989 and 1995 recommending and encouraging that states consider the implementation of HIV case reporting by name (CSTE, 1997). Political resistance persisted however, and HIV cases typically became reportable by name only in states that did not have large cosmopolitan communities with effectively organized gay constituencies or high AIDS caseloads. By 1996, although 26 states had adopted HIV case reporting, they represented jurisdictions with only approximately a quarter of total reported AIDS cases (Bayer, 1989, 1991; CDC, 1996). By October 1998, name-based reporting had a stronger foothold with 32 states then reporting cases of HIV by name, although three states reported only pediatric cases (CDC, 1999).

As of October 2003, all states, territories, and cities except Georgia and Philadelphia[7] have implemented a confidential HIV case-reporting system (CDC, 2003a,d). Unlike AIDS case reporting, which uses a standardized name-based reporting system, states had adopted different procedures for reporting HIV cases (). As of October 2003, 34 states, the Virgin Islands, American Samoa, Puerto Rico, Northern Mariana Islands, and Guam had implemented the same confidential name-based reporting of HIV infection as is used for AIDS reporting and other reportable diseases and conditions. Eight states plus the District of Columbia use a coded identifier rather than the patient name to report HIV cases. Five states use a name-to-code system; initially, names are collected and then converted to codes by the local or state health department after any necessary public health follow-up. Connecticut conducts pediatric surveillance using name-based reporting but allows name or code reporting of adults/adolescents over 13 years of age. New Hampshire allows HIV cases to be reported with or without a name (CDC, 2003a,d). Of the 15 areas that use some form of code, only two use the same code.

New face of Public Health Surveillance

Historically, surveillance focused on infectious disease, then broadened to other topics, including chronic diseases, such as cancer, then diabetes.The 1980s and 1990s also saw surveillance concepts applied to such new areas of public health as occupational health environmental health,hazard surveillance (toxic chemicals and physical and biological agents) emerging infectious diseases injury control behavioural risk factors events following disasters pharmaco surveillance and firearm-related injury.At this time, mental health and mental illness are also recognized as domains in public health surveillance.It is expected that further new frontiers will be explored in the future for surveillance.

New frontiers mean new challenges and solutions. Let us take mental health and mental illness as an example. According to the World Health Organization, mental illnesses account for more collective disability burden in developed countries than any other group of illnesses, such as cancer and heart disease.Although mental health measures are now included in established health surveys, there are challenges not seen before. The ways different surveys define and measure mental illnesses often vary and are based on different approaches (such as symptoms, duration, frequency, reference periods, mental health measures, and method of data collection).In discussing future directions for public health surveillance, Freeman and colleagues suggest that *“(F)uture public health surveillance systems should incorporate measures of positive psychological function as both a protective factor against poor health outcomes and a mental health indicator of interest in its own right*”. Surveillance has traditionally focused largely on established disease or symptoms, but collection of additional data on resilience, coping skills, protective factors, and aspects of positive mental health are considerations in devising strategies for disease prevention and mental health promotion. Maintaining focus on the overall health of our population will be critical in the next decades, as will leaving behind the commonly accepted divide between mental and physical illnesses, “*despite the fact that both exist within individuals in an exquisitely integrated fashion*”.In the future, an optimal surveillance system will examine interactions among biological, social, psychological, and environmental factors to support health promotion, intervention programs, and both mental illness and chronic disease prevention.

Use of Computer Technology in Public Health Surveillance

Use of computer technology, although not without problems continues to contribute to the evolution of public health surveillance]. For example, by 1991 in the United States, the National Electronic Telecommunications Systems for Surveillance (NETSS) had linked all state health departments in the country by computer for the routine collection, analysis, and dissemination of information on notifiable conditions.In 2001, the US CDC began implementing the National Electronic Disease Surveillance System (NEDSS) to better manage and enhance the large number of current surveillance systems and allow the public health community to respond more quickly to public health threats (e.g., outbreaks of emerging infectious diseases and bioterrorism). In 2007, 35 US states had integrated public health surveillance systems as articulated in the NEDSS vision.When NEDSS is fully implemented across the United States, public health professionals and government agencies will be able to quickly recognize and respond in real-time to disease outbreaks or bioterrorism attacks.The Minitel system used in France has also demonstrated the essential utility of office-based surveillance for a variety of conditions of public health importance.

Public health surveillance relies on public health information systems that have been defined to include a variety of data sources essential to public health action.Computer technology can improve these public health information systems which vary from a simple system collecting data from a single source, to electronic systems that receive data from many sources in multiple formats, to complex surveys. As the number and variety of systems will likely increase, future efforts of public health surveillance should focus on advances in electronic data interchange and integration of data, which will also heighten the importance of patient privacy, data confidentiality, and system security.

There is great interest over the potential that new computer technology will improve the quality, capacity, and effectiveness of public health surveillance systems. One example is the use of a promising interactive health information technology called "eHealth". eHealth (also written e-health) is a relatively recent term for healthcare practice supported by electronic processes and communication.Other technologies include a novel approach that was presented for detecting influenza outbreaks using search engine query data.Historical logs of more than 50 million of the most common online Web search queries in the United States were analyzed to track influenza-like illness in different areas and regions of the country. There was a high correlation of Google queries (influenza-like illness-related search queries) with the percentage of physician visits in patients with influenza-like symptoms. Another example is a recent analysis of how Internet surveillance tools can assist in the early identification of disease outbreaks.The study found that Web-based sources of information allow timely detection of outbreaks, reduce cost, increase reporting transparency, and presented a list of major advantages and disadvantages of "Internet-based surveillance."

New terms like "infodemiology" and "infoveillance" have been coined for the use of informatics methods to analyze queries from the Internet search engines to predict disease outbreaks.Public health informatics is "*the systematic application of information and computer science and technology to public health practice, research, and learning*".Public health informatics can introduce new applications to broaden public health perspectives, strengthen prevention in public health, and build healthier communities.

Enhancing Global Public Health Surveillance

Globalization of trade and the economy has resulted in a constant massive mobilization of commodities and people across countries and continents at unprecedented speed. It takes only a few hours to transport or mobilize thousands of people and goods across the globe. It is possible to travel between most places in the world in less time than the incubation period for many infectious diseases.There is also a need for global surveillance for risk factors for chronic diseases, as risk factors are transferable. International migrants bring with them their cooking styles, hygiene practices, and so forth, thereby affecting both the infectious and chronic disease patterns in the host country.In this sense, chronic non communicable diseases like cardiovascular diseases can be considered communicable.

Three directions of global surveillance are transforming the functions of public health in a globalized world: (1) the role of the new International Health Regulations (IHR) (2) the emergence of new global health surveillance networks, and (3) the reshaping of guidelines for the collection, dissemination, and interventions in global surveillance.The revised IHR of 2005 encourage a new paradigm of global public health intelligence. With mandatory reporting procedures and requirements for building surveillance and response capacity, the revised IHR are a move toward more effective global health security.

In 1997, the "Global Public Health Intelligence Network" was proposed by the World Health Organization in partnership with the Public Health Agency of Canada to help identify significant disease outbreaks around the world taking advantage of the existing globalized virtual communications.This global surveillance initiative is an Internet surveillance system that gathers data and public health reports from diverse countries in 7 languages, aiming to disseminate timely alerts to help control outbreaks, the spread of infectious disease, contamination of food and water, bioterrorism, natural disasters, and exposure to chemical agents and nuclear materials. This system investigates and confirms outbreak reports of global health significance and also monitors questions related to the safety of medications and medical products.

The World Health Organization has created a global network of national influenza centres in 83 countries,the "FluNet" and "DengueNet" as Internet sites dedicated to monitoring global influenza and dengue-related information. A network of Internet-based surveillance, "ProMED-mail", initiated by the International Society of Infectious Diseases, is considered to be one of the largest publicly available Internet-based reporting networks for emerging diseases in the world.

In global chronic disease surveillance, new global health surveillance networks have also emerged. Examples include the World Alliance for Risk Factor Surveillance (WARFS) and the Americas' Network for Chronic Disease Surveillance (AMNET).WARFS is the Global Working Group on Surveillance of the International Union for Health Promotion and Education (IUHPE). It supports the development of behavioural risk factor surveillance as a tool for evidence-based public health, acknowledging the importance of this information source to inform, monitor, and evaluate disease prevention and health promotion policies, services, and interventions. There has been a series of biennial global conferences on risk factor surveillance, beginning in USA (Atlanta), 1999; Finland (Tuusula), 2001; Australia (Noosaville), 2003; Uruguay (Montevideo), 2005; Italy (Rome), 2007; Italy (Venice), 2009; Canada (Toronto), 2011. AMNET was established in Uruguay in 2003 as a regional network for the purposes of sharing information and experiences as well as providing opportunities for enhancing chronic disease surveillance in the WHO Region of Americas (North, Central and South America, and the Caribbean). Global health is seen in several developed countries as a pillar of their foreign policy.Several governments, including US,Canada and UK are expanding their investment in global health and global security.

Conclusion

Health Surveillance is a valuable epidemiologic tool that can used for many purpose.If you look down the acts to reassert a long-standing political economy approach to HIV, and to adapt it to reflect new competing theoretical approaches and new policy initiatives. However, there are many challenges to anyone constructing an alternative analytical approach to HIV. Knowledge about HIV/AIDS is not complete or uncontested.

The debate over some of the key ‘game-changers’, treatment-as-prevention and male medical circumcision, illustrates this well. While UNAIDS believe that the epidemiological evidence from health surveillance for reductions in HIV transmissions is clear-cut, others argue about the quality of the epidemiological data, the consistency of results in different settings or the potential to scale up these interventions (Wamai *et al*. 2011; Wilson *et al*. 2014) On one level, of course, this special issue is a snapshot of what is known in time (about biomedical responses to HIV transmission, about the impact of microfinance or cash transfers. However, at the same time – to connect the current debates about HIV/AIDS to larger discussions about globalization, class differentiation, inequity and uneven development in developing countries. Public health is a complex adaptive system which has evolved from providing clean water and managing human waste, to managing a broader cadre of communicable and non-communicable diseases, and continues to change as we address the influence of social determinants and the environment on health. Contributing to this challenge is the notion that the populations we serve are continually evolving, as are the related public health issues. Each public health practitioner must continually adjust his or her practice, but each adjustment must be based on the building blocks of evidence, risk assessment, policy, intervention and evaluation, which are associated with HIV/AIDS and supported by a foundation of health equity, social justice, and the social determinants of health.

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43. See Jonathan Mann. B Solidarity and the Future of the Global AIDS Movement," Lecture at XI International AIDS Conference Vancouver, 1996.
44. See Alison Rawling, Corporatism, Risk and the Construction of Australian HIV/ AIDS Politics and Policy, Ph.D. thesis (University of Sydney: The lack of more discussion of the relevance of corporatism underlines the general paucity of political analysis of HIV/AIDS, 1997.