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## Stronger national public health institutes for global health

Although strengthening health-care systems is receiving increased attention, strengthening public health systems and institutions could save far more lives at lower cost. Public health institutes monitor, implement, and oversee programmes to prevent disease. Life-saving and cost-saving programmes include immunisations, control of communicable diseases including diarrhoeal disease, reduction of motor-vehicle crashes, and tobacco control. Over the past decade, many countries have considered, strengthened, or created national public health institutes (NPHIs), often following a major event such as the outbreak of severe acute respiratory syndrome.<sup>1,2</sup>

The core function of an NPHI is monitoring and responding to health threats. Monitoring requires reference laboratories and surveillance. Response

requires outbreak control and implementation of evidence-based public health actions. NPHIs can include disease-specific control programmes, support to state, provincial, or local public health entities, surveillance and control for non-communicable diseases and injuries, occupational and environmental health, and vital registration (table).<sup>3</sup> These functions can be done by more than one institution in a country, and some countries have collaborated to establish regional institutions. Effective public health responses often require a multidisciplinary team, including skills needed for communicable and non-communicable disease control programmes. For example, the response to biosecurity threats involves expertise in infectious diseases, chemical hazards, engineering, environmental remediation, and risk communication.

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	Characteristics	Considerations
Collection and dissemination of surveillance information	Core information includes reportable conditions, including reporting for compliance with international health regulations	Can include vital registration, community surveys, phone surveys; new technologies include mobile devices for data collection and internet-based information collection
Reference laboratory	Definitive confirmation of diseases and conditions	Can include infectious, environmental, biomarker, and other laboratory tests
Infectious disease outbreak detection and control	Rapid response to suspected outbreaks of disease	Requires close coordination with state and local health departments, and ability to mobilise response within hours or less
Disease-specific infectious disease programmes	Immunisation, tuberculosis control, malaria prevention and control, HIV/AIDS, prevention and control of sexually transmitted diseases, etc	Some countries maintain disease-specific control programmes in different institutes for historical or other reasons; there are potential synergies among programmes
Surveillance and control of non-communicable diseases	Tobacco control, nutrition, reproductive and maternal and child health, cancer, cardiovascular disease	Interactions with civil-society groups and other parts of national government (finance, revenue, planning, etc) are crucial
Surveillance and control of injuries	Includes both intentional (homicide, suicide, civil conflict, sexual violence) and unintentional (road traffic, falls, drug misuse, etc)	Transportation policy, addressing both prevention and response, with epidemiological analysis to identify opportunities for prevention, are all essential
National public health leadership	Priority setting, policy analysis and implementation, public health research agenda, technical guidelines, and recommendations	Responsibility often shared with other national and subnational entities
Support to state, provincial, or local public health entities	Can include funding, guidance, technical support, or provision of some or all staff to subnational public health agencies	Arrangements vary from countries in which state or provincial health staff are employed by NPHI to others where there are limited interactions
Occupational health	Monitoring and establishing science-based guidelines to promote workers' safety and health	Regulation might be done by other entities; mediating between worker and union and business and industrial interests can be challenging
Environmental health and safety	Water and sanitation, food safety, air quality	Community concerns often drive activities, and highest risk exposures might not be those that receive most attention
Regulation of pharmaceuticals and biologicals	Can include standard setting, testing, approval, and safety monitoring	Some institutes, currently or previously, produced drugs and vaccines
Workforce training and development	Internal to agency at all levels (programme, epidemiology, laboratory, specialty), other public health agencies, medical staff, and others	Distance learning increasingly important and effective
Emergency preparedness and response	Generally via organised incident-management system with specific sections addressing epidemiological, clinical, communications, logistical, and other elements of response	Coordination with other national, international, and subnational response units is key
Prevention of birth defects	Fortification of foods with iodine and folic acid particularly important; surveillance and support to affected populations	Scaling up effective interventions is key; better understanding burden and amenability to intervention in birth defects is needed to further reduce incidence
Health communications	Communication with the general public, mass media, electronic media, specific risk/interested groups, policy makers, and health-care workers	Speed, clarity, and credibility are key; electronic media bring new risks and opportunities
Monitoring and improvement of health-care quality	Ongoing community surveys and surveys of health-care institutions, with focus on adherence to and results of prevention efforts	Can be facilitated by electronic health records; community surveys are expensive but generally essential to complement surveillance of health-care system

**Table: Core and potential functions of a national public health institute**

The evolution of one NPHI—the US Centers for Disease Control and Prevention (CDC)—illustrates key issues.<sup>4,5</sup> The CDC grew out of a 1940s domestic malaria-control programme and initially focused on infectious disease control through laboratory and epidemiological expertise. Over decades, it expanded to include surveillance, prevention, and control of non-communicable diseases, injuries, and birth defects as well as occupational and environmental health. The CDC has been increasingly involved in global health activities since the 1950s. Emergency preparedness and response, always a core function, received increased attention after the 9/11 World Trade Center and anthrax attacks. CDC's role in the US health-care system continues to evolve with the passage of health-reform legislation and increased focus on prevention through clinical care.

To be effective, an NPHI must have credibility and be independent, technically expert, and apolitical, which requires independence from parent ministries of health on technical issues. But if an NPHI is seen as being too independent, it might not be able to address important health challenges. A related issue is whether the entity has regulatory authority—the US CDC has limited regulatory authority but provides guidance to other federal agencies and state and local public health agencies which have more. In other countries, the role of the NPHI can include regulation of pharmaceutical production or sale, and of medical care.

Supporting state/provincial and local public health entities is critically important; providing funds and personnel (through training, staffing, or short-term and long-term staff deployed from the NPHI) is the most effective way to increase implementation of technical guidance. NPHIs can provide only reference laboratory services or can also provide oversight, technical support, and materials to subnational laboratories.

There is potential for tension between service provision, training, and research. In the USA, this was addressed through the Epidemic Intelligence Service, in which trainees learn by doing.<sup>4,6</sup> The US CDC and international partners have helped start 37 similar programmes.<sup>7</sup> These programmes provide public health leadership and contribute to the development of the NPHI. Some NPHIs do basic research; in the USA, this function is more often done by the National Institutes of Health.

NPHIs might also seek to improve individual and community health directly. Health-communication efforts often include websites, targeted to both medical staff and the public, and active media outreach to provide prompt and accurate health information. Policy changes, such as laws to promote immunisations or reduction of behavioural and environmental risks, can be effective, although critics might see such efforts as too directly political. Some NPHIs lead community mobilisation, such as immunisation and anti-tobacco campaigns.

NPHIs can provide crucial expertise to protect the public's health. Increasing the number, scope, and effectiveness of NPHIs in developing countries will enable better prevention and control of infectious diseases and reduce the burden of non-communicable diseases and injuries. Success will depend on accurate collection, analysis, and dissemination of data to implement and monitor evidence-based programmes. NPHIs require more staff and resources, although on a much smaller scale than the need for additional clinical personnel. Stronger NPHIs enable countries to implement and monitor health programmes that save money and lives by basing decisions on country-specific data on health burden, efficacy of interventions, and implementation status of health programmes. To improve both health and health systems, developing countries need to greatly increase resources and authority of NPHIs.

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