



Timothy Baker and Kristin L. Peterson-Oehlke

What are Genomic Tools?

As we continue to learn more about the role that genes play in health and disease, public health practitioners will need genomic tools—approaches and products based on genomic information that can be used to address public health issues. These tools may be used at the same time as other, more familiar approaches, or integrated so seamlessly that they are not recognized as “genomic”.

A good example is family history, which is an amalgam of genetic, environmental, behavioral, social, and cultural data that has significant impact on health. *Chapter 6, The Family History Public Health Initiative*, emphasizes that genomic tools are meant to be immediately relevant, practical, responsive to needs, and somewhat proven prior to their promotion and use. New developments in genomics create the need for tools in order to transfer that development into practice effectively. These tools will need to be updated consistently and replaced as knowledge and practice evolves.

Genomic Tools in Practice and The Genomics Toolkit

Currently, genomic tools (that have been developed and used by several states and community-based programs, and exist in one form or another) may address all three of the public health core functions:

- assessment,
- policy development, and
- assurance.

Innovative states that produced the initial tools received an overwhelming volume of requests, resulting in the initiation of a “toolkit” project designed to collect these tools and reduce the burden on the states. The Association of State and Territorial Health Officials (ASTHO) coordinated this effort to begin identifying and collecting tools that have been shown to be effective in public health settings. This project was supported with funding from the CDC and developed by a workgroup of representatives from ASTHO affiliates. The idea was to provide a rolling inventory of the best tools to use in program technical assistance.

Table 1 lists the groups that were represented on the Genomics Toolkit Project Workgroup:

Table 1. Groups Represented on the Genomics Toolkit Project Workgroup

ASTHO	Association of State and Territorial Health Officials http://www.astho.org/
AMCHP	Association of Maternal and Child Health Programs http://www.amchp.org/
APHL	Association of Public Health Laboratories http://www.aphl.org/
ASTDHPPHE	Association of State and Territorial Directors of Health Promotion and Public Health Education http://www.astdhpphe.org/
CDC OGDP	Centers for Disease Control and Prevention http://www.cdc.gov Office of Genomics and Disease Prevention http://www.cdc.gov/genomics
CDD	Chronic Disease Directors http://www.chronicdisease.org/
CSGC	Coalition of State Genetics Coordinators http://www.stategeneticscoordinators.org/
CSTE	Coalition of State and Territorial Epidemiologists http://www.cste.org/
NACCHO	National Association of County and Community Health Officials http://www.naccho.org/
NCSL	National Council of State Legislatures http://www.ncsl.org/

As part of the Genomics Toolkit, a broad guidance document was developed with the purpose of providing assistance for initial program development efforts; this document is available online at <http://www.genomicstoolkit.org/index.shtml>.

- It provides an overview of the role of genomics in health and disease, and why genomics is important to public health activities.
- It provides guidance and materials for identifying stakeholders, stimulating interest, recruiting an advisory committee, identifying needs and goals, developing a work plan and evaluating the process of integrating genomics into public health.
- The resource guide section of the toolkit includes information on associations and organizations, education and training, funding, planning and policy, publications and communications, tools, and presentations.

In developing this toolkit document, ASTHO collected input from several states. Many of the states also provided specific tools used for various applications; these tools can be found on their Web sites. The State Snapshots in Table 2 describe how those health agencies have applied genomics into public health practice and disease prevention programs.

Table 2. State Snapshots

Indiana	http://www.genomicstoolkit.org/moxie/gettingstarted/forums/indiana.shtml
Michigan	http://www.genomicstoolkit.org/moxie/gettingstarted/forums/michigan.shtml
New York	http://www.genomicstoolkit.org/moxie/gettingstarted/forums/newyork.shtml
North Carolina	http://www.genomicstoolkit.org/moxie/gettingstarted/forums/ncarolina.shtml
Utah	http://www.genomicstoolkit.org/moxie/gettingstarted/forums/utah.shtml
Washington	http://www.genomicstoolkit.org/moxie/gettingstarted/forums/washington.shtml

Table 3 provides a list of specific activities and strategies taken by some states to integrate genomics into public health practice and disease prevention programs.

Table 3. Specific Activities and Strategies for Integrating Genomics into Public Health

Genomics Integration Strategies:	Some of the States Using These Tools:
Models of genomics workgroups made up of members from across the state health agency	Michigan, North Carolina
Assessing needs related to public health goals and genomics across the state	Michigan, North Carolina
Centralized grants writing functions that consider genomics approaches in the development of funding requests	Indiana
Establishing policies for using dried blood spots as source of population-based DNA samples	Michigan, New York
Statewide Genomics Advisory Committees that advise on genomics across all areas of public health policy and practice	North Carolina, Michigan, Utah
Genetics Taskforce for developing public policy related to uses of genetic information and technology	Washington, New York, Michigan
Using family health history as a tool for chronic disease prevention	Utah
Planning, developing and delivering genomics education to multiple audiences, including public health	Michigan, New York, Washington, North Carolina
Regulation of genetic testing practices	New York

Genomics Tools We Need, But Don't Currently Have

Extensive research in human genomics has created a large and growing body of data that must be translated into practical knowledge, so that public health practitioners can apply this knowledge to real-life situations. New and existing genomic tools must be grounded in scientific data, and must be able to accommodate new knowledge as it becomes available.

Public health agencies need guiding principles, processes and strategies to help understand and define the role of genomics in public health. Public health workers also need education to equip them with the knowledge and skills to help interpret genomic information for the general public. See *Chapter 12, Genomics Training for Public Health Practice: The Michigan Experience*, for more information.

Genomics has entered the lexicon of popular culture, and increasing public understanding of this area is important to build confidence and to avoid risks from inappropriate use, as well as to let more people know about the relevant benefits. As genomics increasingly enters health practice, health professionals must be informed, and must also be able to inform the public accurately, using tools that are reliable. Each community will require tools, matched to local population needs, which will allow policy makers to support genomics in practice.

How Will New Tools Be Developed?

New tools will be developed (and old tools refined through use in other settings) in the context of practice in state and local public health agencies and in collaboration with academic partners, such as the Centers for Genomics in Public Health (<http://www.cdc.gov/genomics/activities/fund2001.htm>). These centers are housed within the following schools of public health at their parent universities:

- North Carolina (<http://www.sph.unc.edu/nccgph/>),
- Michigan (<http://www.sph.umich.edu/genomics/index.html>), and
- Washington (<http://depts.washington.edu/cgph/>).

These centers have a primary responsibility for responding to program development needs at the state and community levels, and thus finding, refining, applying, and using tools that directly support those needs. Each center has the capacity and resources to assess needs and develop tools with their practicing partners.

In 2002, the Chronic Disease Directors association convened a Chronic Disease Summit at CDC to focus on the emerging role of genomics in chronic disease prevention (http://www.chronicdisease.org/genomics___chronic_disease_con.html). This meeting focused on disease-specific issues, with emphasis

on specific tools/priorities for states. In response to recommendations from the summit, the National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP, www.cdc.gov/nccdphp) began development of state-based capacity through funding to four states (Michigan, Minnesota, Oregon, and Utah) for integrating genomics into chronic disease prevention programs. The purpose of this program is to develop genomics leadership and coordination within state agencies to allow planning, development, integration and evaluation of genomics as a tool for chronic disease prevention and health promotion. Documenting the activities, experiences and achievements of these states will produce model processes and applications that should be useful to other states. See *Chapter 14, State Capacity Grants for Integrating Genomics into Chronic Disease Prevention Programs*, for more information.

Thinking Genomically—the Vision for the Future

Thinking genomically means including genomics as another factor that is routinely considered when addressing any public health problem, and applying genomic information when it makes sense to achieve public health goals. In the future, genomics will be integrated into the fabric of public health activities as seamlessly and universally as epidemiology is today.

The time will soon be upon us when it is impossible to consider any health or medical condition without considering its genomic basis. In the not-too-distant future, a complete approach to any public health problem will include an assessment of the role of human genes in the life processes underlying health and disease. The tools, approaches, and capacity that we develop today will form the basis of the increasing integration of genomics knowledge into future public health practice.