Integrating Genomic Information Into Public Health Practice

Recent scientific discoveries are illuminating specific genetic traits as possible risk factors for common diseases that affect public health. Translation of genomic research to medical practice should yield new opportunities for health promotion and disease prevention.

Increasing public understanding of genomics is important in building confidence among consumers about the appropriate use and benefits of genomic information and technologies. The full benefits of genomics in population health will not be realized, however, without the development of a genomically literate public health workforce that is capable of interpreting and applying relevant genomic information in the practice setting. The following Centers for Disease Control and Prevention (CDC) activities are related to integrating genomics into public health practice and programs:

- Genomic tools development,
- Workforce development,
- Building capacity for future genomic response, and
- Evaluating genomic applications in practice and prevention.

Genomic Tools Development

As we continue to learn more about the role that genes play in health and disease, public health practitioners will need practical and relevant genomic tools, including approaches and products based on genomic information. These tools can be used to address public health issues, support related policy development, and strengthen state and community programs.

Examples include:

- Materials to help public health agency staffs integrate genomics into public health practice (http://www.genomicstoolkit.org),
- Resources for genomic education and training, and
- A validated tool for collecting family history information about common chronic diseases in primary health care settings.

Workforce Development

Public health workers will need additional knowledge and skills in order to interpret genomic information for the general public. To encourage the integration of genomics knowledge, skills, and attitudes into routine practice, CDC collaborated with a range of partners, from state and local public health agencies to academic institutions, to develop *Genomic Competencies for the Public Health Workforce*. This draft document provides a set of general competencies for all members of the public health workforce, as well as specific competencies for individual professional groups.

CDC is also helping health professionals learn how to use genomic information in clinical practice and disease prevention efforts through the development of training courses, such as *Genetics in Clinical Practice*. *An Introduction to Genomics for Public Health Professionals* and *Six Weeks to Genomics Awareness* were also developed collaboratively by CDC and the Centers for Genomics and Public Health at the Universities of Michigan, North Carolina, and Washington.

Building Capacity for the Future

In 2001, CDC provided the funding for the Universities of Michigan, North Carolina, and Washington to establish the first Centers for Genomics and Public Health. These Centers serve as regional hubs of expertise in genomics and population health, and work with public health programs, health care providers, and community groups.

In order to help develop the capacity required to respond to genomic needs, Center activities focus on three important areas:

- Contributing to knowledge on genomics and public health,
- Providing technical assistance to local, state, and regional public health organizations, and
- Developing and providing training for the current and future public health workforce.

In 2003, the CDC established cooperative agreements with state health agencies in Michigan, Minnesota, Oregon, and Utah to integrate genomics into new and existing chronic disease prevention programs.

Evaluating Genomic Applications in Practice and Prevention

More than 600 genetic tests are currently available for clinical testing. Most are used for diagnosis of rare single-gene disorders and a few for newborn screening. A growing number of genetic tests may have population-based applications, such as determining the risk of developing a disease or condition in the future (e.g., predictive testing for breast cancer) and identifying genetic variations that can influence response to medicines (pharmacogenomics). These genetic tests have the potential for broad public health impact, and concerns have been raised about the need for pre- and post-market test assessment and surveillance.

In 2001, CDC funded the Foundation for Blood Research to develop a model system for assembling, analyzing, updating, and disseminating existing data on the safety and effectiveness of DNA-based genetic tests. This model process is described by the acronym ACCE, which stands for the four criteria used to evaluate a test:

- **A**nalytic validity,
- **C**linical validity,
- **C**linical utility, and
- **E**thical, legal, and social implications.

In addition to supporting evidence-based reviews, CDC activities include assessing laboratory practice (http://www.phppo.cdc.gov/dls/genetics) and surveillance of genetic testing.

One example of post-market evaluation of genetic testing occurred in 2002, when a prominent biotechnology company began piloting a direct-to-consumer advertising campaign in two cities to promote a genetic test for susceptibility to hereditary breast and ovarian cancer (*BRCA1* and *BRCA2* gene testing). CDC coordinated a study to assess the impact of the advertising campaign based on knowledge, attitudes, and actions of health care providers and consumers. Survey results suggested that both women and health care providers would benefit from more education about genetic susceptibility to breast and ovarian cancer and about genetic testing for *BRCA1/2*. Assessing the public health impact of *BRCA1/2* testing will also require a broader strategy that includes measuring test utilization and access.

For more information, please visit the CDC's Office of Genomics and Disease Prevention Web site at http://www.cdc.gov/genomics.