

Cancer Genomics for Local Public Health

*Michigan's Premier Public Health Conference
Creativity and Innovation: Keys for A Healthier
Michigan*

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October 18, 2006

Presentation Objectives

- Participants will:
 - Increase cancer genomics knowledge, interest and perception of relevance
 - Start to integrate cancer genomics into practice, programming, policy and services
 - Appreciate collaboration between local public health, state public health, and genomic experts on cancer genomics initiatives

What is Cancer Genomics?

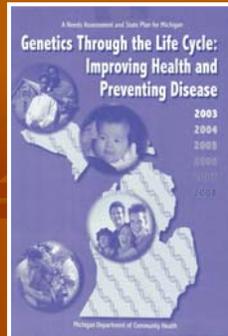
Who can Benefit from Cancer Genomics?

How can Cancer Genomics be Integrated into My Program?

Where are Additional Cancer Genomics Resources?



<http://cagle.msnbc.com/news/gene/gene14.asp>



A Vision for the Role of Genetics in Public Health

Michigan Genetics Plan 2003-2008

Improved health outcomes and an enhanced quality of life for the people of Michigan through appropriate use of genetic information, technology, and services.

<http://www.migeneticsconnection.org/stateplan.shtml>

How do you see your department's role in providing genetic-related health care services for your population?

(Michigan Genetics Needs Assessment, 2000-02)

Please indicate how you see your department's role in providing genetic-related health care services for your population.

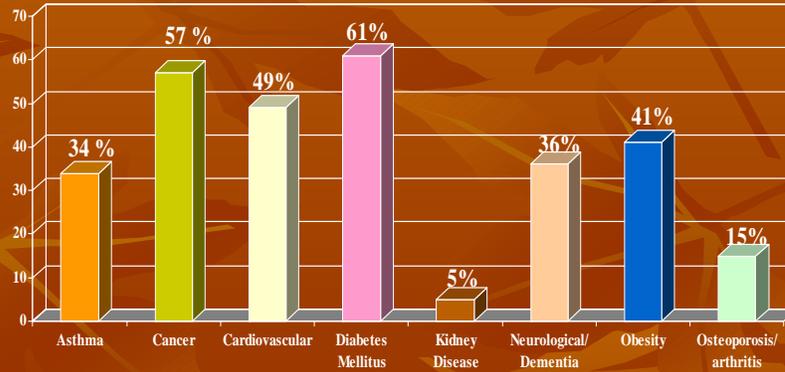
	Total N	Very Important	Important	Somewhat Important	Not Important	N/A
9. Educate the public about birth defects/genetic diseases	105	65 (61.9%)	24 (22.8%)	14 (13.3%)	0	2 (1.9%)

About 38% (n= 104) felt it was very important to 'Educate the public about the role of genetic risk factors in common chronic diseases.'

14. Refer clients/families with birth defects/genetic disease to community support services and programs.	105	61 (58.1%)	31 (29.5%)	10 (9.5%)	0	3 (2.9%)
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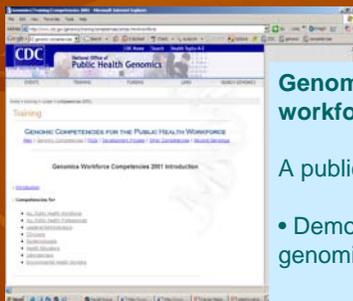
<http://www.migeneticsconnection.org/stateplan.shtml>

Chronic disease programs that will need to incorporate new genetics information over the next 3 - 5 years
(Select 3 priorities. N=100)



<http://www.migeneticsconnection.org/stateplan.shtml>

CDC Genomics Competencies for the Public Health Workforce



Genomic competencies for the public health workforce at any level in any program

A public health worker is able to:

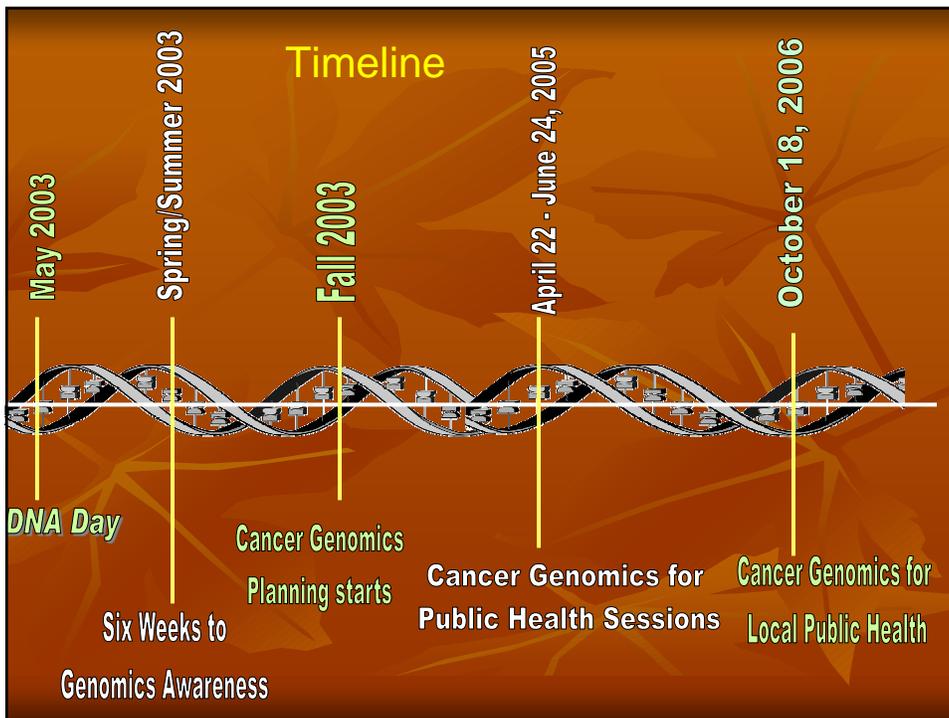
- Demonstrate basic knowledge of the role that genomics plays in the development of disease
- Identify the limits of his/her genomic expertise
- Make appropriate referrals to those with more genomic expertise

www.cdc.gov/genomics/training/competencies/

Past Genomics Training Strategies: Importance of Collaboration

Strategy	Examples
1. Building a Foundation – know your audience	Genomics Workgroup at Michigan Department of Community Health (MDCH)
2. Raising awareness and stimulating interest	<i>An introduction to Genomics for Public Health Professionals</i> developed by CDC and Centers for Genomics and Public Health in MI, NC, and WA http://www.cdc.gov/genomics/training/GHP/default.htm
3. Increasing knowledge	<i>Six Weeks to Genomics Awareness</i> http://www.cdc.gov/genomics/training/sixwks.htm http://lessons.umm.umich.edu/2k/sixweeks/reg_1
4. Strengthening skills	Graduate Summer Sessions in Epidemiology at UM-SPH
5. Using evaluation to improve thinking	Evaluation by organizers, trainers and participants

<http://www.cdc.gov/genomics/activities/ogdp/2003/chap12.htm>



Cancer Genomics for Public Health

- 6 sessions, 13 speakers
- 11 hours of content and practical application exercises
- Presented over a 6 week time period
- Mandatory for all cancer section staff
- Also attended by local public health, oncology nurse, family medicine physician and a prostate cancer survivor
- Focus on MDCH Cancer Priorities
 - Breast
 - Colon
 - Lung
 - Prostate
 - Cervical

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CDC Cooperative Agreement for Chronic Disease Prevention and Health Promotion: Genomics Component

- **Goal:** Increase use of genomics in public health programs
- Five year cooperative agreement awarded in 2003 to four states (*Michigan, Minnesota, Oregon and Utah*)

<http://www.cdc.gov/genomics/links/regional.htm#fund>

From 20th to 21st Century: A paradigm shift

- **“Medical model” addressing rare disorders**
 - Newborn Screening
 - Maternal and Child Health
 - Clinical Genetic Services
- **“Public health model” addressing common diseases**
 - Many people affected
 - Gene-environment-behavioral interactions
 - Major impact on public health
 - Potential for prevention

From “Genetics” to “Genomics”

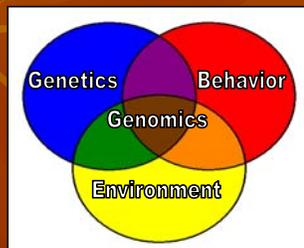
Genetics

The science of heredity; refers to a single gene and its effects

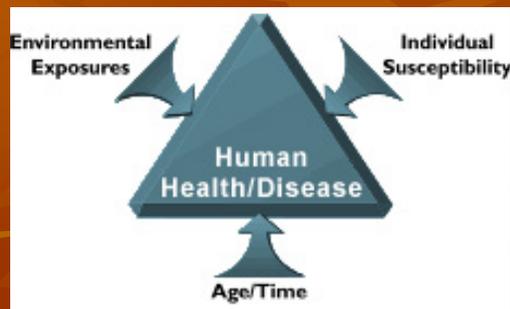


Genomics

The study of the entire genome including the complex interactions among multiple genes as well as between genes and the environment



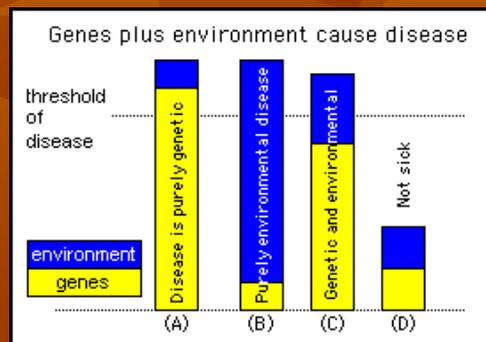
Current Disease Model



National Institute of Environmental Health Sciences (NIEHS); <http://www.niehs.nih.gov/envgenom/home.htm>

Gene-Environment Interaction

- Colon Cancer
 - FAP (A)
- Breast Cancer
 - BRCA (C)
- Prostate Cancer
 - Familial Clustering (C)
- Lung Cancer
 - Most cases (B)
- Cervical Cancer
 - Most cases (B)



<http://www.agingresearch.org>



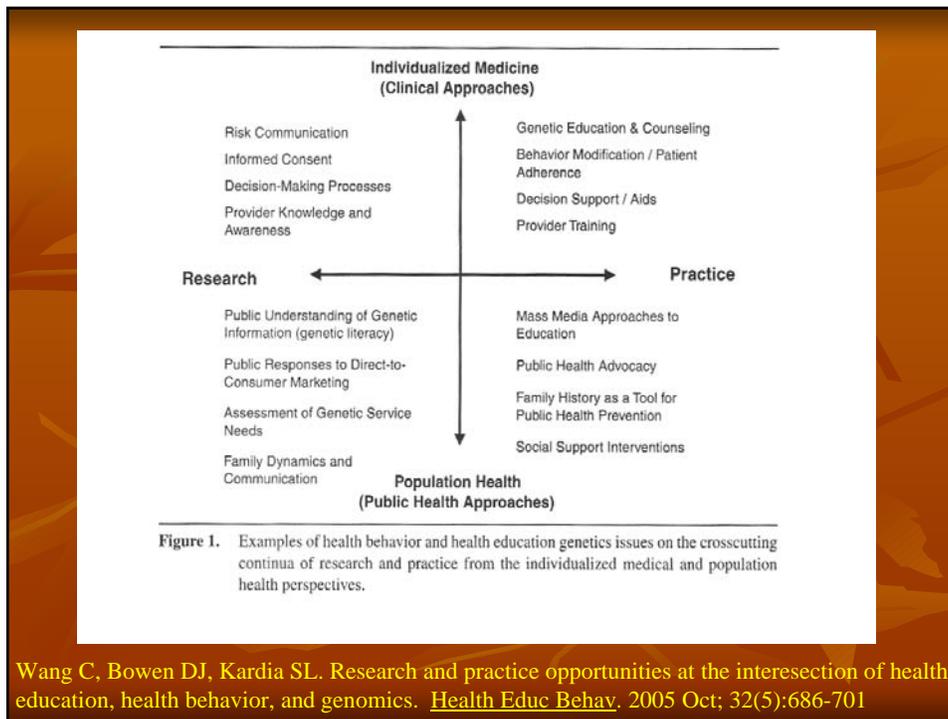
Population-based versus Individual Care

Population-based Approaches

- Chronic Disease Registries
- Population-wide Screening
- Targeted Media Campaigns

Individualized Clinical Approaches

- Genetic Counseling and Testing
- Behavior Modification
- Pharmacogenetics (the tailoring of drug therapies to an individual's genetic variation)



A Case of Avoidable Tragedy: Real People, Real Situation, Real Opportunities*

- 22 year old male presents with rectal bleeding, diagnosis of probable irritable bowel made by primary care provider
- Symptoms persist until 24 years old, when colonoscopy performed.
- Diagnosis of metastatic colon cancer at 24 years, surgery to remove most of colon
- Death at 27 years from metastatic colon cancer

* provided by Kris Peterson Oehlke, MS, CGC, Minnesota Genomics Coordinator

A Case of Avoidable Tragedy (Continued)

- Relevant Family History:
 - Brother had rectal bleeding at 29 years of age, and found to have large colon polyp (two years prior to patient's onset of symptoms)

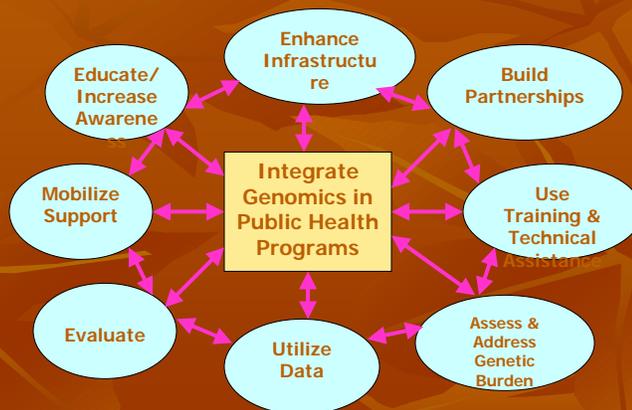
Core Public Health Functions



Is There a Role for Public Health Genomics in this Case?

- Assessment:
 - How often does colon cancer occur in 24 year olds? How often does death occur in 27 year olds?
 - Was the Family Health History documented in the chart?
- Policy:
 - Do professional standards exist for ordering colonoscopy before the standard of 50 years of age?
 - For families identified at risk, can their privacy be protected? Can they be protected against discrimination in insurance and at the workplace?
- Assurance:
 - Is the primary care provider, patient and family aware of the importance of Family Health History? aware of cancer genetic services in their area?
 - Can public health help to assure proper services for this patient/family?

Conceptual Model of Genomics Integration*



*adapted from CDC, Conceptual Model of Comprehensive Cancer Control Planning

Possible Sites for Inherited Cancer Surveillance System Appendix C

Type of Cancer	Usual age @ Dx	Ca Registry Data Age at Diagnosis <50 ^a				Ca Registry Data for Age at Death <50 ^a				Associated Hereditary Cancer Syndromes
		<20	20-29	30-39	40-49	<20	20-29	30-39	40-49	
Breast (based on cell type)	Postmenopausal (After age 50)	8	331	3459	1163	0	44	555	1692	BRCA1* & BRCA2* LI-Fraumeni Syndrome* Cowden's Syndrome Peutz-Jeghers Syndrome* MEN1* Ataxia Telangiectasia*
Ovary (based on cell type)	Postmenopausal (After age 50)	102	242	569	1228	6	21	94	304	BRCA1* & BRCA2* HNPCC* Familial Ovarian LI-Fraumeni Syndrome* Basal Cell Nevus*
Colorectal	After age 65	30	186	872	2891	4	34	237	795	HNPCC* FAP* LI-Fraumeni Syndrome* Peutz-Jeghers Syndrome* BRCA1* & BRCA2* Bloom Syndrome*
Pancreas	60 - 80 Yrs	5	19	120	611	0	14	82	450	HNPCC* BRCA2* Hereditary Pancreatitis* Ataxia Telangiectasia* Peutz-Jeghers Syndrome* MEN1* FAMMM*
Type of Cancer	Usual age @ Dx	Ca Registry Data				Ca Registry Data for				Associated Hereditary

^a Data Source - Michigan Resident Cancer Incidence and Death Files, Michigan Department of Community Health, Vital Records and Health Data Development Section 1992 - 2001
* Genetic Testing is Available

Michigan Cancer Registry Chart Audit

- 853 charts reviewed from Dec 2003 to Oct 2004
- **82.5%** of charts documented the presence or absence of any family history of cancer
 - 89% were gender-specific in identifying the affected relative
 - 82% were site-specific in the relative's diagnosis
- Among charts with a documented family history of cancer:
 - 94.3% were missing information on the relative's age at diagnosis
 - 99.5% were missing information on the relative's date of diagnosis

2005 Michigan BRFSS

- 37% of Michigan adults actively collect health information for purpose of family health history
- 66.4% of Michigan adults thought family health history was very important to personal health
- Focus on Family History of Colon Cancer
 - 7% of Michigan adults had immediate family member diagnosed with colorectal cancer
 - 37.4% thought their chances of getting colorectal cancer was high or very high (compared to 4.6% without the family history)
 - 55.6% reported making some lifestyle changes to try and prevent colorectal cancer

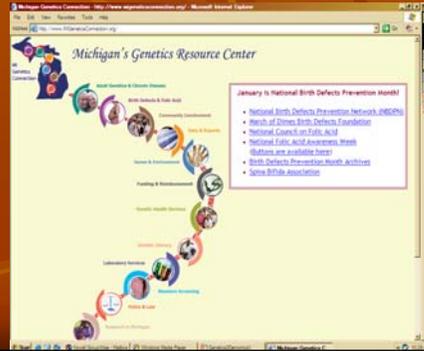
Important Message For Those with Family Health History of Colorectal Cancer

- **Screening for Individuals With a Family History**
 - Individuals with a first-degree relative (brother, sister, parent, child) or two or more second degree relatives (grandparents, uncles, aunts, nephews, nieces, half-brothers, half-sisters) with a history of colorectal cancer should be screened with colonoscopy when they are 40 years of age or ten years younger than their relative was at the time of diagnosis, whichever is younger*

* National Comprehensive Cancer Network

Access to Genetic Information and Services

- www.MIGeneticsConnection.org
- Call toll-free 1-866-852-1247 or e-mail genetics@michigan.gov



Mission:

The Michigan Cancer Genetics Alliance is a statewide collaborative network that provides leadership, education and advocacy to promote the translation of cancer genetics research into clinical and public health practice.

Vision:

The Michigan Cancer Genetics Alliance strives to influence the appropriate application of genomics to improve cancer detection, prevention and treatment throughout Michigan

<http://www.migeneticsconnection.org/cancer/>

Referral to Services

- When referral to genetic specialists is needed, public health practitioners utilize the Michigan Cancer Genetic Alliance “Directory of Cancer Genetic Service Providers”
- This directory of providers in Michigan includes contact information, types of cancers addressed, and certification



<http://www.migeneticsconnection.org/cancer/directory.html>

Importance of Genomics to Local Public Health

- Access includes knowledge of and referral to genetic specialists when necessary
- Reducing morbidity and mortality requires knowledge regarding the role of genetics in prevention
- Coordination and empowerment involve understanding the importance of family history in cancer

Michigan Cancer Consortium (MCC) Guidelines 2005 Risk Assessment Subcommittee Recommendations

- Identification of those with increased risk for colorectal cancer
 - Questions to assess risk; annually
- Screening for those at increased risk for colorectal cancer
 - Risk stratified screening recommendations
- Genetic counseling/testing for those at increased risk for colorectal cancer
 - Included in screening recommendations
- Chemoprevention for those at increased risk of colorectal cancer
 - No evidence at this time for the role of chemoprevention

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<http://www.migeneticsconnection.org/cancer/Presentations.html>

MCC Risk Assessment Subcommittee Risk Assessment Questions

- Has the patient had colorectal cancer or an adenomatous polyp?
- Does the patient have ulcerative colitis or Crohn's Disease?
- Has a family member had a colorectal cancer or an adenomatous polyp?
- If so, how many, was it a first-degree relative and at what age was the cancer or polyp first diagnosed?
- Has patient or family members had other visceral cancers (e.g. endometrial, ovarian, gastric, hepatobiliary, or small bowel cancer or transitional-cell carcinoma of the renal pelvis or ureter) at a young age?

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Colorectal Cancer (CRC) Pilot Program 2005-2006

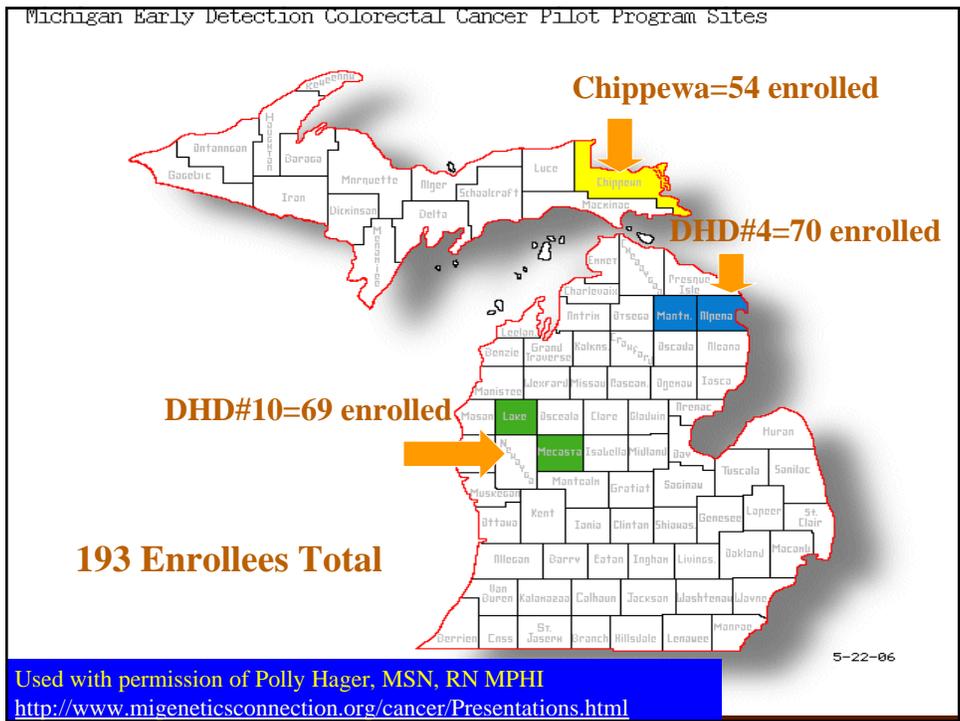
- Goal: Pilot test a CRC early detection program for uninsured residents of counties with high crc mortality rates
 - Ages 50 – 64 & incomes at or below 250% of poverty
- MCC CRC Screening Guidelines used
 - Risk assessment on every participant
- Planning Phase
 - July – September 2005
- Implementation Phase
 - October 2005 – September 2006

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Colorectal Cancer Pilot Program Clinical Services

- Persons of **average risk** that meet age, income and insurance eligibility will receive a Fecal Occult Blood Test kit, if positive will receive colonoscopy.
- Persons of **higher than average risk** will be referred for colonoscopy.
- Persons in **high risk categories** will be identified as possible candidates for genetic counseling.

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<http://www.migeneticsconnection.org/cancer/Presentations.html>



Results to Date from CRC Pilot

- Enrollees to colonoscopy
 - Above Average Risk = 33
 - Signs and Symptoms = 38
 - Positive FOBTs = 6
- Colonoscopies resulting in polyp removal = 23
 - Adenomatous polyps = 22
 - Hyperplastic polyps = 14
 - Other = 3
- Genetic counseling referrals identified= 37
 - Not all identified were referred

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<http://www.migeneticsconnection.org/cancer/Presentations.html>

Next Steps: CRC Screening Program Plans for 2006-2007

- A revised risk assessment will be used
- Expansion into 15 counties
- Screen more people
 - Will include the underinsured
- A patient navigation component will be added
 - Risk assessment and genetic counseling referrals are included
- Tracking and reminder system will be implemented at each site

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<http://www.migeneticsconnection.org/cancer/Presentations.html>

Other Population-Based Cancer Genomics Initiatives in Michigan

- Breast Cancer Genetics
 - Project funded by Komen Foundation
 - Targets Kent County BCCCP program
 - Provides cancer genetic services at Spectrum Health
- UM Cancer Genetics Registry
 - Any person with multiple primary cancers
 - Any person diagnosed with cancer under age 50
 - Individuals with 2 or more close family members with cancer
 - Individuals from families where at least one family member was diagnosed with cancer under age 50
- MCC Breast Cancer Risk Assessment in Primary Care Settings Pilot
- UM Prostate Cancer Genetics Research
- Karmanos Lung Cancer Genetics Research
- Tribal Colleges and Tribal Clinics
 - MDCH sponsored Linda Burhansstipanov to provide educational workshops
 - Genetics Education for Native Americans (GENA)
 - On the Path to Colon Health

<http://www.michigancancer.org/WhatWeDo/AnnualMeetingArchive-2006/VirtualPostersIndex.cfm>

Michigan Center for Genomics and Public Health



<http://www.sph.umich.edu/genomics/>

The Michigan Center for Genomics & Public Health seeks to integrate genomic discoveries into public health practice, with consideration of the ethical, legal, and social issues associated with the application of these discoveries, as well as the involvement of the community at large

Ethics, Policy, and Future Directions

- Genomic advances have enormous potential to create a public health revolution
- However, we are encumbered by the possibility that such advances will intensify health disparities as well as other unintended and yet disastrous outcomes
- It is critical that public health professionals are aware of the ethical and policy issues as well as the future possibilities of genomics

Public Health Ethics & Cancer Genomics

In Cancer Genomics public health ethical issues exist:

- Population Screening
- Health Disparities
- Population Stigmatization/Discrimination
- Community Burden
- Environmental Issues
- Access to Genetic Services

State Genomic Policies

- The majority of states have passed genetic non-discrimination statutes for insurance and employment
- Michigan also has an informed consent statute where informed consent is required for predictive and presymptomatic genetic testing (Act 29 of 2000-SB 593)
 - Informed consent is defined to include the nature and purpose of the test, the effectiveness, limitations, and implications of the test, etc.
 - Predictive genetic testing is testing to determine if a person has one or more genes that increase the risk of developing a certain disease or disability at some time in the future
 - Presymptomatic genetic testing is testing performed before the onset of any symptoms to determine if a person has a gene that will eventually cause a certain disease or disability

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Simple Ideas of Where to Start Next

- Family History and Your Health Newsletters
 - www.MIGeneticsconnection.org
- Look at existing Family Health History questions and/or create new questions
 - If would like assistance, e-mail DuquetteD@michigan.gov
- CDC National Office of Public Health Genomics weekly update
 - <http://www.cdc.gov/genomics/>
- In-Service Presentations
 - If interested, e-mail TeachoutM@michigan.gov
- Michigan Cancer Genetics Alliance (MCGA)
 - <http://www.migeneticsconnection.org/cancer/>

Cancer Genomics and the Future

- NHGRI/NCI launch “The Cancer Genome Atlas”
 - Mission
 - Comprehensive and coordinated effort to accelerate our understanding of the molecular basis of cancer through the application of genome analysis technologies, including large-scale genome sequencing
 - Goal
 - Improve our ability to diagnose, treat, and prevent cancer



Recently discovered “DNA nebula”
80 light years away

<http://edition.cnn.com/2006/TECH/space/03/16/helix.picture.reut/index.html>

Acknowledgements

- Janice Bach, MS, CGC
 - State Genetics Coordinator
- Ann Annis Emeott, BSN, MPH
 - Genomics Epidemiologist
- Mark Caulder, MS, MPH
 - Environmental and Laboratory Genomics Analyst
- Mary Teachout, MAT
 - Genomics Educator
- Valerie Ewald
 - Administrative Assistant
- Sue Haviland, MSN, RN
 - MDCH Cancer Section
- Julie Zenger Hain, PhD
 - Co-Chair of MCGA
- Nancie Petrucelli, MS
 - Co-Chair of MCGA
- Deb Kimball, MSN, RN
 - MDCH Cancer Section
- Polly Hager, MSN, RN
 - MCC Colon Cancer
- Laurie DeDecker
- Pam Clouser McCann, MS
- Lynna Chang, MPH
- Sharon Kardia, PhD
 - MCGPH

This presentation is supported in part by Cooperative Agreement #U58/CCU522826 from CDC. Its contents are solely the responsibility of the presenter and do not necessarily represent the official views of CDC.