



An Introduction to the CDC Public Health Genomics Knowledge Base

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Office of Public Health Genomics**

CDC Office of Public Health Genomics (OPHG)

Effective and responsible translation of genome-based discoveries
➡ into disease prevention and population health

<https://www.cdc.gov/genomics>

1. Identify
evidence-based applications

2. Inform
and communicate

3. Integrate
into practice & programs

OPHG, DPHID, CSELS



NIH-CDC Public Health Genomics Webinar

February 14, 2018



OBESITY AND GENOMICS: READ
NEW CDC BLOG



INFLUENZA, GENOMICS AND
PUBLIC HEALTH



WORLD CANCER DAY: PREVENTING
HEREDITARY CANCERS



WEAR RED DAY ON FEBRUARY 2:
KNOW YOUR FAMILY HISTORY

WEEKLY UPDATE

Weekly summary of genomics and health impact information

PHGKB

Online searchable knowledge base on genomics and health impact information

AMD CLIPS

Weekly news and publications on pathogen genomics and bioinformatics

IMPLEMENTATION

What public health can do now to save lives using genomics

REPORTS AND PUBLICATIONS

CDC reports and publications in genomics

GENOMICS & HEALTH IMPACT BLOG

A blog devoted to genomic issues in research, policy and practice

PODCASTS AND VIDEOCASTS

GENETICS 101

Genetics basics explained including a glossary of genetic terms

FAMILY HEALTH HISTORY

Family health history is known to be a risk factor for most diseases

GENOMICS AND DISEASES

Genomics is important for many diseases of public health significance

GENETIC COUNSELING

Helping to inform individuals and families about genetic risks, testing and interventions

GENOMIC TESTING

Genomic tests are used in many diseases

PATHOGEN GENOMICS

New tools are changing the landscape in the fight against infectious diseases

EPIDEMIOLOGY

The CDC Office of Public Health

Genomics provides timely and credible information for the effective and responsible translation of genomics research into population health benefits.

[About Us](#) [At A Glance](#)



MyPHGKB
provides personalized features based on your preferences of databases and topics

[VISIT MyPHGKB](#)

Genomics Across CDC

- [Advanced Molecular Detection](#)
- [Birth Defects](#)
- [Blood Disorders](#)
- [Cancer Genomics](#)
- [Diabetes Prevention](#)
- [Laboratory Practice](#)
- [Newborn Screening](#)



Dr Khoury's Tweets

[@DrKhouryCDC](#)

Check out the NEW customized education toolkit for physicians. Via [@genome_gov](#)
<https://t.co/Ncu89vTuq4>



Public Health Genomics Knowledge Base (v2.1)

PHGKB

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MyPHGKB

Specialized PHGKB +

Genomics (A-Z)

Office of Public Health Genomics

State Public Health Genomics Programs Map

Genomics & Health Impact Weekly Scan (Current Edition)

Advanced Molecular Detection Weekly Clips (Current Edition)

All Databases +

DataSet Download Center

Release Note



Search PHGKB

Search



Hot Topics of the Day

Last Posted: Feb-04-2018 10AM



Disparities

[Integrating the Genetics of Race and Ethnicity Into Cancer Research: Trailing Jane and John Q. Public.](#)

Newman Lisa A et al. JAMA surgery 2018 Jan

[Study Finds Biological Differences in Lung Tumors of African Americans and Whites](#)

NCI Blog, Jan 2018

Announcement



Announcement

"Public health genomics information is now easily accessible online", a new blog

post about PHGKB authored by Wei Yu and Muin Khoury. [Check it out!](#)

Content Summary

- CDC Information (886)

Database Content (Last Updated:)

Genomics & Health Impact Weekly Scan

This weekly update features emerging roles of human genomics, testing and interventions in a wide variety of noncommunicable diseases across the life span, including, birth defects, newborn screening, reproductive health, childhood diseases, cancer, chronic diseases, pharmacogenomics, family health history, guidelines and recommendations. The weekly sweep also includes news, reviews, commentaries, tools and databases.

Advanced Molecular Detection Clips

Advanced Molecular Detection(AMD) Clips are selected weekly from a variety of sources, including PubMed, journal tables of contents, and online media. Special emphasis is given to the use of next-generation genetic sequencing in public health surveillance, investigation, and development of new diagnostics and interventions. The collection is not comprehensive but aims to capture highlights, while surveying a wide range of topics. CDC-authored articles are flagged.

CDC Information Database

This database includes general CDC public health information on specific diseases and health related topics. When available, the database displays genomic information from various CDC web pages. Users are also encouraged to conduct searches of CDC website for additional information.

CDC-Authored Genomics Publication Database

This database contains CDC-authored scientific publications on genomics-related topics, and includes articles on infectious diseases, reproductive health, newborn screening, birth defects, developmental disabilities, genetic testing, chronic diseases such as cancer and diabetes, environmental and occupational health, laboratory methods, bioinformatics, and statistical methods.

Weekly Scan
(Current Edition)

Advanced Molecular
Detection Weekly Clips
(Current Edition)

All Databases -

CDC Information Database
(886)

CDC-Authored Genomics
Publication Database (1920)

Genomics & Health Impact
Scan Database (12166)

Tier Table Database (181)

State Public Health
Genomics Programs
Database (275)

Advanced Molecular
Detection Clips Database
(8379)

HuGE Navigator +

DataSet Download Center

Release Note

Contact Us

CDC Information Database

Why did we build it?

- **Challenge:** *Finding information about genomics- and family health history-related activities at CDC*
- **Opportunity:** Provide a centralized, searchable, publicly available database for CDC resources related to genomics and family health history

CDC-Authored Genomics Publications Database

Why did we build it?

- **Challenge:** *Finding CDC-authored publications on genomics and family health history*
- **Opportunity:** Provide a centralized, searchable, publicly available database for these CDC publications
- **Challenge:** *CDC's work in genomics and family health history is not well known*
- **Opportunity:** Showcase CDC publications to highlight work related to genomics and family health history

CDC-Authored Genomic Publications Database continued

- Scientific articles and reports with at least one CDC author
 - CDC Science Clips: <https://www.cdc.gov/library/sciclips/>
 - PubMed
 - Scopus
 - Author notifications
- } *affiliation search*

Genomics and Health Impact Scan Database

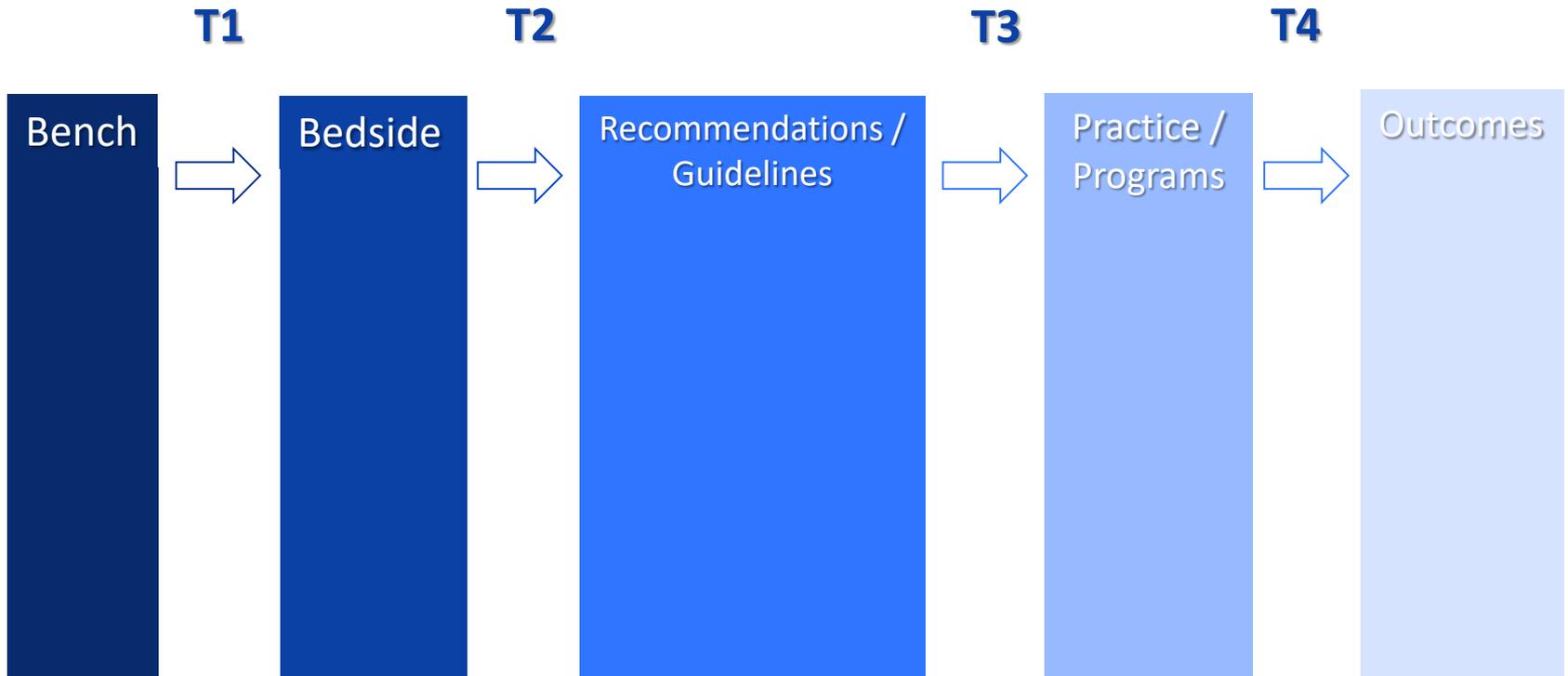
Why did we build it?

- **Challenge:** *Keeping up with the latest developments in genomics and family health history relevant to public health*
- **Opportunity:** Identify the latest publications and other resources on population-based applications of genomic discoveries
- **Challenge:** *Addressing misconception that genomics applies only to research or clinical practice*
- **Opportunity:** Highlight public health applications of genomics—and the role of public health at the health care interface

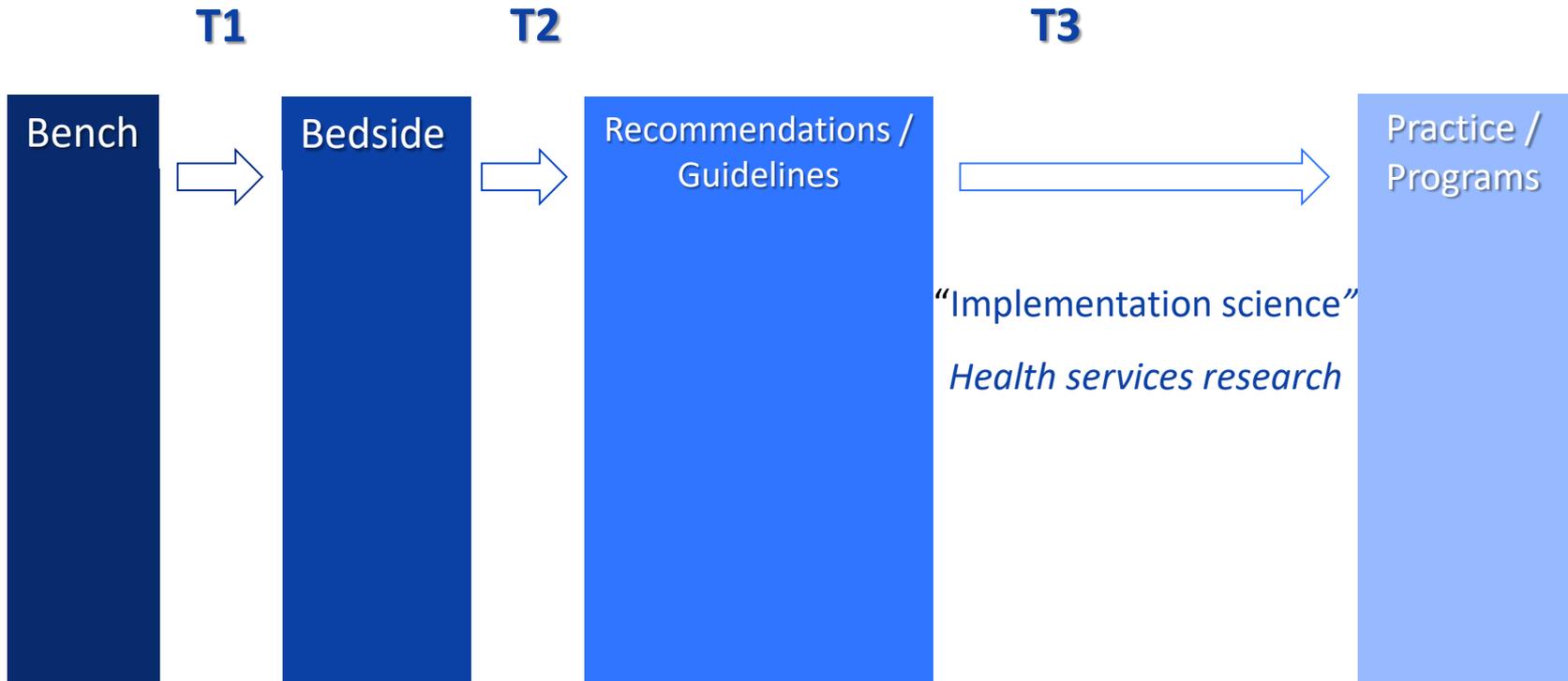
Genomics and Health Impact Scan Database

- Horizon Scan
 - Monitor Google Alerts, PubMed queries, key websites
 - Select news stories, blog posts, scientific articles, websites
 - Publish online in Weekly Update
- Categorized by
 - Translation and implementation studies
 - Evidence synthesis (systematic reviews, modeling)
 - Guidelines
 - Tools/Methods
 - Reviews/Commentaries

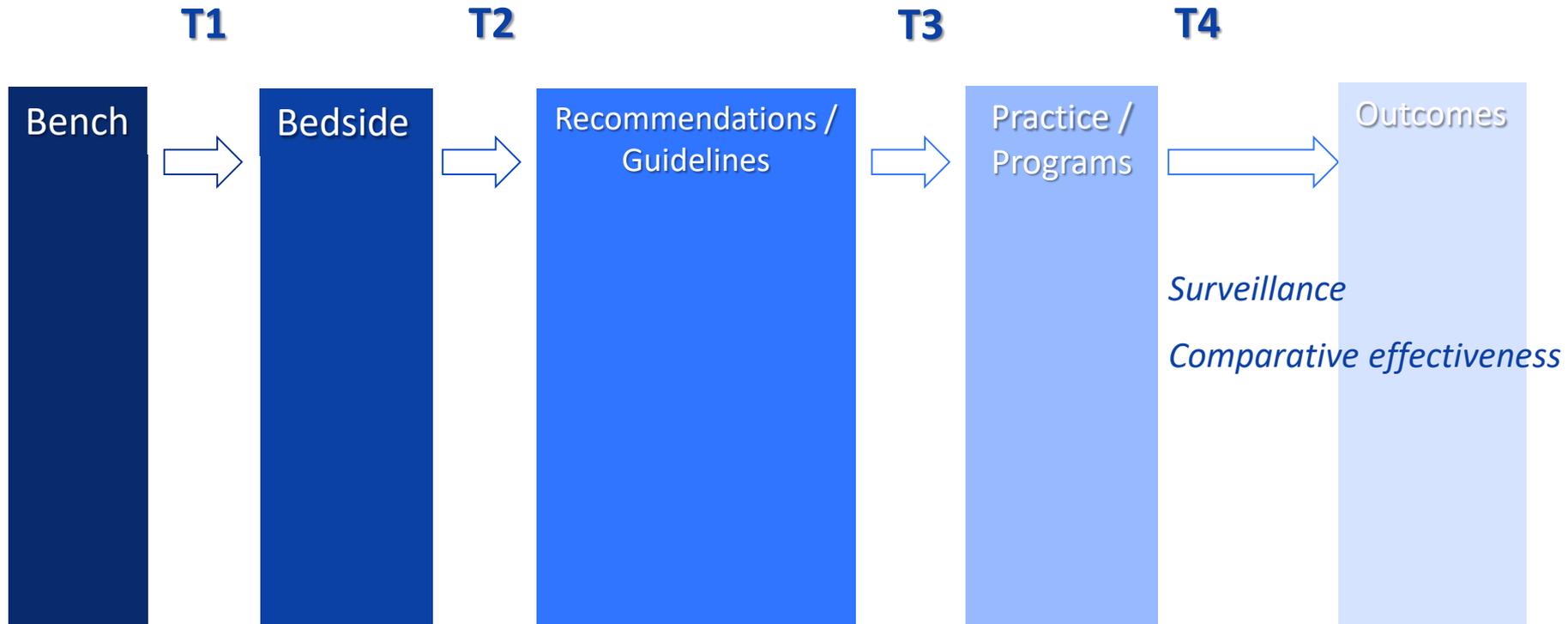
Organizing Information for Public Health Genomics: “4 Phases of Translation”



Organizing Information for Public Health Genomics: “4 Phases of Translation” continues



Organizing Information for Public Health Genomics: “4 Phases of Translation” continues...



Tier Table Database

Why did we build it?

- **Challenge:** *The public and health care providers are bombarded with information on genomic tests, many with unproven utility*
- **Opportunity:** Educate providers and the public about potential benefits and harms of genomic tests and the need for evidence
- **Challenge:** *There is no widely agreed upon threshold level of evidence for determining whether genomic tests are ready for use*
- **Opportunity:** Develop flexible method(s) for classification of tests by level of evidence to aid in research/evaluation and help define which aspects of evidence should be considered in developing thresholds

Tier Table Database

Tier 1:

Green

- FDA label requires use of test to inform choice or dose of a drug
- CMS covers testing
- Clinical practice guideline based on systematic review supports testing

Tier 2:

Yellow

- FDA label mentions biomarker*
- CMS coverage with evidence development
- Clinical practice guideline, not based on systematic review, supports use of test
- Clinical practice guideline finds insufficient evidence but does not discourage use of test
- Systematic review, without clinical practice guideline, supports use of test
- Systematic review finds insufficient evidence but does not discourage use of test
- Clinical practice guideline recommends dosage adjustment, but does not address testing

Tier 3:

Red

- FDA label cautions against use
- CMS decision against coverage
- Clinical practice guideline recommends against use of test
- Clinical practice guideline finds insufficient evidence and discourages use of test
- Systematic review recommends against use
- Systematic review finds insufficient evidence and discourages use
- Evidence available only from published studies without systematic reviews, clinical practice guidelines, FDA label or CMS labels coverage decision

*Can be reassigned to Green or Red if one or more conditions in these categories apply

Examples of Tier 1 Genomic Applications

Disease/Disorder	Test to be Assessed	Intended Use	Tier Classified	Detail
31 core conditions	Newborn screening panel	Screening	Tier 1 ?	Detail
Osteoporosis	Parental history of hip fracture	Estimate fracture risk to inform osteoporosis screening	Tier 1 ?	Detail
Familial hypercholesterolemia (FH)	DNA testing and LDL-C concentration measurement	Cascade testing of relatives of people diagnosed with FH	Tier 1 ?	Detail
Hereditary breast and ovarian cancer	Family history of known breast/ovarian cancer with deleterious BRCA mutation	Risk prediction; referral to counseling for BRCA genetic testing	Tier 1 ?	Detail
Lynch syndrome	Various strategies	Screening, cascade testing of relatives	Tier 1 ?	Detail

State Public Health Genomics Programs Database

Why did we build it?

- **Challenge:** *State, local, and territorial health departments need practical information that they can use to integrate genomics and family health history into their activities*
- **Opportunity:** Provide a searchable database of available resources categorized by resource type, disease, and state so that health departments can find new resources and learn from other states
- **Challenge:** *State, local, and territorial public health departments and policymakers want to know about genomic and family health history activities in their state and communities*
- **Opportunity:** Activities can be searched by state and can also be identified through the clickable map

Advanced Molecular Detection (AMD) Clips Database

Why did we build it?

- **Challenge:** *Genomic technology is transforming the work of CDC and other public health laboratories in infectious diseases.*
- **Opportunity:** Help public health labs keep abreast of this fast-moving field by providing a curated selection of scientific articles and resources.
- **Challenge:** *CDC laboratories are moving forward on many different fronts through the AMD Program.*
- **Opportunity:** Showcase work by CDC laboratories and allow quick look-up in a cumulative database.

HuGE Navigator

Why did we build it?

- **Challenge:** *The scientific literature on human genetic associations with disease has been growing rapidly. Epidemiologic data are key for evaluating clinical validity but are not easily identified by PubMed queries.*
- **Opportunity:** Use machine learning and automated indexing to maintain a searchable database of PubMed articles on gene-disease associations.
- **Challenge:** *Examine relationships from either genotype or phenotype (disease) perspective*
- **Opportunity:** Build navigation tools using PubMed structures and data.

Public Health Genomics Knowledge Base (v2.1)

- PHGKB
- About
- MyPHGKB
- Specialized PHGKB 
- Genomics (A-Z)
- Office of Public Health Genomics
- State Public Health Genomics Programs Map
- Genomics & Health Impact Weekly Scan (Current Edition)
- Advanced Molecular Detection Weekly Clips (Current Edition)
- All Databases 
- DataSet Download Center
- Release Note

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Search PHGKB:



What's New

Last Posted: *Feb 01, 2018*

- [\[Genetic counselling is relevant in familial as well as sporadic cases of amyotrophic lateral sclerosis\]](#). 
Lindquist Suzanne Granhøj et al. Ugeskrift for læger 2014 Oct 176(43)
- [Colorectal Cancer Screening and Surveillance in Individuals at Increased Risk](#). 
Wilkins Thad et al. American family physician 2018 Jan 97(2) 111-116
- [Communicating with Daughters About Familial Risk of Breast Cancer: Individual, Family, and Provider Influences on Women's Knowledge of Cancer Risk](#). 
- [Peipins Lucy A et al. Journal of women's health \(2002\) 2018 Jan](#)
- [Genes and genetics in eye diseases: a genomic medicine approach for investigating hereditary and inflammatory ocular disorders](#). 

Information in Specialized Databases

CDC Information (16)	NIH Resources (6)	CDC-Authored Publications (14)	State Public Health Genomics Programs (93)	
Tier Table (4)	Epidemiologic Studies (3018)	Translation/Implementation Studies (681)	Evidence Synthesis (59)	Guidelines (25)
Reviews/Commentaries (113)	Tools/Methods (14)	Ethical/Legal and Social Issues (3)	GWAS Catalog (18)	

From [CDC Information Database](#)

This database includes general CDC public health information on specific diseases and health related topics. When available, the database displays genomic information from various CDC web pages. Users are also encouraged to conduct searches of CDC website for additional information.

-
- [Colorectal Cancer Family History](#)
CDC YouTube Video
 - [Six Tips for Healthy Aging Include Knowing Your Family History](#)
 - [Family History and Other Characteristics That Increase Risk for High Cholesterol](#)
 - [Preventing Suicide](#)
Risk factors include family history of suicide
 - [Don't Let Glaucoma Steal Your Sight!](#)
Family history is a risk factor

[more](#)

Information in Related Databases

Genetic Testing (GTR)

Genetic Disease (OMIM)

PubMed Review

PubMed Clinical Queries

PharmGKB

From NIH The Genetic Testing Registry [↗](#)

The Genetic Testing Registry (GTR®) provides a central location for voluntary submission of genetic test information by providers. The scope includes the test's purpose, methodology, validity, evidence of the test's usefulness, and laboratory contacts and credentials. The overarching goal of the GTR is to advance the public health and research into the genetic basis of health and disease.

- [Search the Genetic Testing Registry for "Family history" \[↗\]\(#\)](#)

Disclaimer: Articles listed in the Public Health Knowledge Base are selected by the CDC Office of Public Health Genomics to provide current awareness of the literature and news. Inclusion in the update does not necessarily represent the views of the Centers for Disease Control and Prevention nor does it imply endorsement of the article's methods or findings. CDC and DHHS assume no responsibility for the factual accuracy of the items presented. The selection, omission, or content of items does not imply any endorsement or other position taken by CDC or DHHS. Opinion, findings and conclusions expressed by the original authors of items included in the update, or persons quoted therein, are strictly their own and are in no way meant to represent the opinion or views of CDC or DHHS. References to publications, news sources, and non-CDC Websites are provided solely for informational purposes and do not imply endorsement by CDC or DHHS.

Specialized PHGKB Databases: Cancer

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Specialized PHGKB

Cancer PHGKB

Infectious Diseases PHGKB

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Cancer Genomics

- Cancer PHGKB -

What's New

Last Posted: Nov 25, 2017

- [LinkedOmics: analyzing multi-omics data within and across 32 cancer types.](#) 
Vasaikar Suhas V et al. Nucleic acids research 2017 Nov
- [A metastasis biomarker \(MetaSite Breast™ Score\) is associated with distant recurrence in hormone receptor-positive, HER2-negative early-stage breast cancer.](#) 
Sparano Joseph A et al. NPJ breast cancer 2017 342
- [Access to Guideline-Recommended Pharmacogenomic Tests for Cancer Treatments: Experience of Providers and Patients.](#) 
Wu Ann Chen et al. Journal of personalized medicine 2017 Nov 7(4)
- [Analysis of factors influencing molecular testing at diagnostic of colorectal cancer.](#) 
Thiebault Quentin et al. BMC cancer 2017 Nov 17(1) 765
- [Clinical testing with a panel of 25 genes associated with increased cancer risk results in a significant increase in clinically significant findings across a broad range of cancer histories.](#) 

Common Type

- Bladder Cancer
- Breast Cancer
- Colorectal Cancer
- Endometrial Cancer
- Kidney Cancer
- Liver Cancer
- Lung Cancer
- Melanoma
- Non-Hodgkin Lymphoma
- Pancreatic Cancer
- Prostate Cancer
- Thyroid Cancer

Cancer

Search

MyPHGKB – A Special Informatics Tool in PHGKB

- Customize the user interface display for your MyPHGKB home page.
- Customized search result based on your own preference on information sources.
- Automatic email alerts for the information you are interested based on your preference on topics and information sources.



MyPHGKB – A Special Informatics Tool in PHGKB continues

- Create an account with your email address information only

Public Health Genomics Knowledge Base (v2.1)

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Password:

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Forgot PHGKB username or password?
Register for a PHGKB account



MyPHGKB provides following features:

- Customize the user interface display for your MyPHGKB home page.
- Customized search result based on your own preference on information sources.
- Automatic email alert (daily or weekly) for the information you are interested based on your preference on topics and information sources.



MyPHGKB – A Special Informatics Tool in PHGKB continues ..

- Configuration

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MyPHGKB (wby0)

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Search MyPHGKB: Enter a search term Search

What's New in My Databases

Last Updated: Nov 22, 2017

- CFR Modulator Therapy for Cystic Fibrosis: [ip](#)
- Grasmann Hartmut et al. The New England journal of medicine 2017 Nov
- Taiwan Biobank: making cross-database convergence possible in the Big Data era: [ip](#)
- Lin Jui-Chu et al. GigaScience 2017 Nov
- The Actionability of Exome sequencing testing results: [ip](#)
- Silvera Tanya et al. Sociology of health & illness 2017 Nov 39(8) 1542-1556
- Errors in Genetic Testing: Common Causes and Strategies for Prevention: [ip](#)
- Mahon Suzanne M et al. Clinical journal of oncology nursing 2017 Dec 21(6) 679-676
- Ethics and Genetics: Examining a Crossroads in Nursing Through a Case Study: [ip](#)
- Curr Beamer Laura Curr et al. Clinical journal of oncology nursing 2017 Dec 21(6) 730-737
- Genetics and Genomics: An Oncology Nurse's Journey in Practice: [ip](#)
- Mahon Suzanne M et al. Clinical journal of oncology nursing 2017 Dec 21(6) 715-721
- Precision Medicine: Accelerating the Science to Revolutionize Cancer Care: [ip](#)
- Brant Jeannine M et al. Clinical journal of oncology nursing 2017 Dec 21(6) 722-729
- Pharmacogenomics: Principles and Relevance to Oncology Nursing: [ip](#)
- Dodson Crystal H et al. Clinical journal of oncology nursing 2017 Dec 21(6) 739-745
- The evolving role of genomic testing in assessing prognosis of patients with myelodysplastic syndromes: [ip](#)
- Steensma David P et al. Best practice & research: Clinical haematology 2017 Dec 30(4) 295-300

Email Alert

Setup an email alert on update information.

My Topics

- asthma
- colon cancer
- breast cancer
- lung cancer

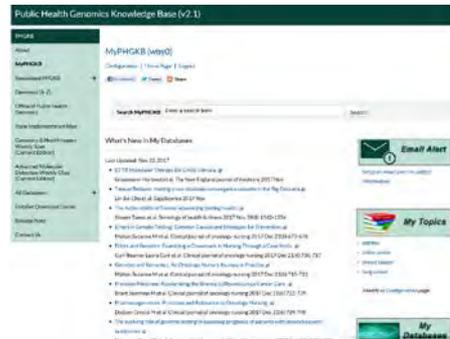
Modify in Configuration page.

My Databases



MyPHGKB – A Special Informatics Tool in PHGKB continues

- Automatic email alerts for the information you are interested based on your preference on topics and information sources.
 - Daily hot topics picked by experts
 - Daily or weekly alert based on your configuration.



MyPHGKB – A Special Informatics Tool in PHGKB continues



Mon 11/27/2017 10:00 PM

noreply@cdc.gov

Hot Topics of the Day from MyPHGKB (November 27, 2017)

To:  Yu, Wei (CDC/OPHSS/CSELS/DPHID)



Dear why0:

The Hot Topics: Expert picks on public health and genomic insights into specific diseases and health related topics. Sources include published scientific literature, reviews, blogs and popular press articles on current newsworthy genomics discoveries and potential applications for policy and practice.

Personal Genomics

- [Genome Culture: Welcoming in a New Era of Direct-to-Consumer Genetic Testing](#)
L Hercher, Genome Magazine, Nov 24, 2017

Alzheimer's Disease

- [Alzheimer's Disease Fact Sheet](#)
Risk factors for Alzheimer's disease include genetics and family history

Chronic Obstructive Pulmonary Disease

- [National COPD Awareness Month](#)

Genome Editing

- [The FDA says it's illegal to sell do-it-yourself kits to edit human genes. But what, exactly, does that mean?](#)
I Swetlitz, StatNews Plus, Nov 24, 2017

Autism

- [Elevated polygenic burden for autism is associated with differential DNA methylation at birth.](#)
E Hannon et al, BioRxIV, Nov 26, 2017
- [Common risk variants identified in autism spectrum disorder](#)
J Grove et al, BioRxIV, Nov 25, 2017



MyPHGKB – A Special Informatics Tool in PHGKB continues



noreply@cdc.gov

Yu, Wei (CDC/OPHS/CSELS/DPHID)

New Information Weekly Alert From MyPHGKB



Dear why0:

Articles in this email alert were added to the [Public Health Knowledge Base \(PHGKB\)](#) this week and sent based on your preference setting on [MyPHGKB](#).



Asthma

- [Treatment response heterogeneity in asthma: the role of genetic variation.](#)
Vijverberg Susanne J H et al. Expert review of respiratory medicine 2017 Nov (From *Genomics & Health Impact Scan Database*)
- [Pharmacogenetic and pharmacogenomic considerations of asthma treatment.](#)
Matera Maria Gabriella et al. Expert opinion on drug metabolism & toxicology 2017 Nov 13(11) 1159-1167 (From *Genomics & Health Impact Scan Database*)

Lynch syndrome

- [Immunohistochemical Pitfalls: Common Mistakes in the Evaluation of Lynch Syndrome.](#)
Markow Michael et al. Surgical pathology clinics 2017 Dec 10(4) 977-1007 (From *Genomics & Health Impact Scan Database*)
- [Universal determination of microsatellite instability using BAT26 as a single marker in an Argentine colorectal cancer cohort.](#)
González María Laura et al. Familial cancer 2017 Nov (From *Genomics & Health Impact Scan Database*)
- [Mismatch Repair Deficiency Testing in Patients With Colorectal Cancer and Nonadherence to Testing Guidelines in Young Adults.](#)
Shaikh Talha et al. JAMA oncology 2017 Nov e173580 (From *Genomics & Health Impact Scan Database*)
- [Risk of colorectal cancer for carriers of a germ-line mutation in POLE or POLD1.](#)
Buchanan Daniel D et al. Genetics in medicine : official journal of the American College of Medical Genetics 2017 Nov (From *Genomics & Health Impact Scan Database*)
- [An NRG Oncology/GOG study of molecular classification for risk prediction in endometrioid endometrial cancer.](#)
Cosgrove Casey M et al. Gynecologic oncology 2017 Nov (From *Genomics & Health Impact Scan Database*)

Breast cancer

- [Budget impact analysis of gene expression tests to aid therapy decisions for breast cancer patients in Germany.](#)
Lux M P et al. Breast (Edinburgh, Scotland) 2017 Nov 3789-98 (From *Genomics & Health Impact Scan Database*)
- [Considerations in Testing for Inherited Breast Cancer Predisposition in the Era of Personalized Medicine.](#)
Powers Benjamin et al. Surgical oncology clinics of North America 2018 Jan 27(1) 1-22 (From *Genomics & Health Impact Scan Database*)
- [Impact of ABCB1 and CYP2D6 polymorphisms on tamoxifen treatment outcomes and adverse events in breast cancer patients.](#)



MyPHGKB – A Special Informatics Tool in PHGKB continues.....

- User Management

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PHGKB

MyPHGKB (v2.1)

Search PHGKB

What's New in My Databases

Last Update: Nov 22, 2017

- [CTRNA Analysis: Therapy for Cystic Fibrosis at](#)
[GenomInforma et al. The New England Journal of Medicine 2017 Feb](#)
- [Tumor-Derived, High-Resolution Genomes for Analysis of Copy Number](#)
[Lin Liu, et al. Cell Genomics 2017 Nov](#)
- [The Accuracy of Exome Sequencing: Next-Gen](#)
[Bainy, Steve et al. Genome Biology 2017 Nov 16th 18th 1554](#)
- [Ethnicity Genetic Testing: Consumer Goods and Misrepresented Research](#)
[Mohan Sankaran, M et al. Ethical journal of landscape nursing 2017 Dec 21st 43-47](#)
- [Ethnic and Genetic Learning of Complex Traits Using High-Density SNP](#)
[Curt Beaman, Laura Curran et al. Ethical journal of landscape nursing 2017 Dec 21st 130-137](#)
- [Genetic and Genomics: An Oncology Nurse's Journey in Practice](#)
[Mohan Sankaran, M et al. Ethical journal of landscape nursing 2017 Dec 21st 113-121](#)
- [Pharmacogenomics: Developing the Science to Revolutionize Patient Care](#)
[Brent J. Goldstein, M et al. Ethical journal of landscape nursing 2017 Dec 21st 102-109](#)
- [Pharmacogenomics: Precision and Personalized to Develop Nursing](#)
[Cohen-Cory, et al. Ethical journal of landscape nursing 2017 Dec 21st 124-131](#)
- [The leading role of genetic testing in precision aspects of patient health: molecular](#)
[diagnosis](#)

Research News Post @ [Bioinformatics & Informatics Clinical Informatics 2017 Dec 22 0: 294-300](#)

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My Topics

My Databases



For more Information

<https://phgkb.cdc.gov>

<https://www.cdc.gov/genomics>

genetics@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Center for Surveillance, Epidemiology, and Laboratory Services
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