

BDC Community Hours will begin shortly

Teaching with BDC

While you wait:

**Gut microbiota and genetic associations with
asthma and among US Hispanic/Latino adults**

Register now: <https://bit.ly/3PYVKAQ>

Dr. Maggie Stanislawski and Dr. Liz Litowski will share
and expand on their presentation from the
February TOPMed Annual Meeting



Let's get started.



National Heart, Lung,
and Blood Institute

BioData

CATALYST

®

Statement of Conduct

The BioData Catalyst Consortium is dedicated to providing a harassment-free experience for everyone, regardless of gender, gender identity and expression, age, sexual orientation, disability, physical appearance, body size, race, or religion (or lack thereof). We do not tolerate harassment of community members in any form. Sexual language and imagery is generally not appropriate for any venue, including meetings, presentations, or discussions.

Resource: [Statement of Conduct](#)



National Heart, Lung,
and Blood Institute



Session Materials and Housekeeping

- Please type your questions into the chat. We will pause every ten minutes or so for questions and discussion.
- Check the chat for relevant links during the session.
- We encourage you to submit unanswered questions, no matter how big or small, to our [help desk](#)
- Join the ecosystem:
<https://biodatacatalyst.nhlbi.nih.gov/contact/ecosystem>
- Check your email inbox and the [community forum](#) materials by the end of the week. Please pass them on to your colleagues and networks.

Hosts and Support



Fayuan Wen

Assistant Professor
Howard University



Emily Hughes

Bioinformatics Systems Analyst
Harvard Medical School



David Roberson

Community Engagement Manager
Velsera



Amber Voght

Instructional Design Specialist
BDC Coordinating Center



Nathalie Volkheimer, PhD

User Engagement Specialist
BDC Coordinating Center

Agenda

- Lessening the Cognitive Load
- Success: BDC in the Classroom with Dr. Fayuan Wen
- Data
- How BDC Can Support You and Your Students
- Next Steps: Get Started with BDC in Your Course
- Questions and Discussion



Lessening Cognitive Load

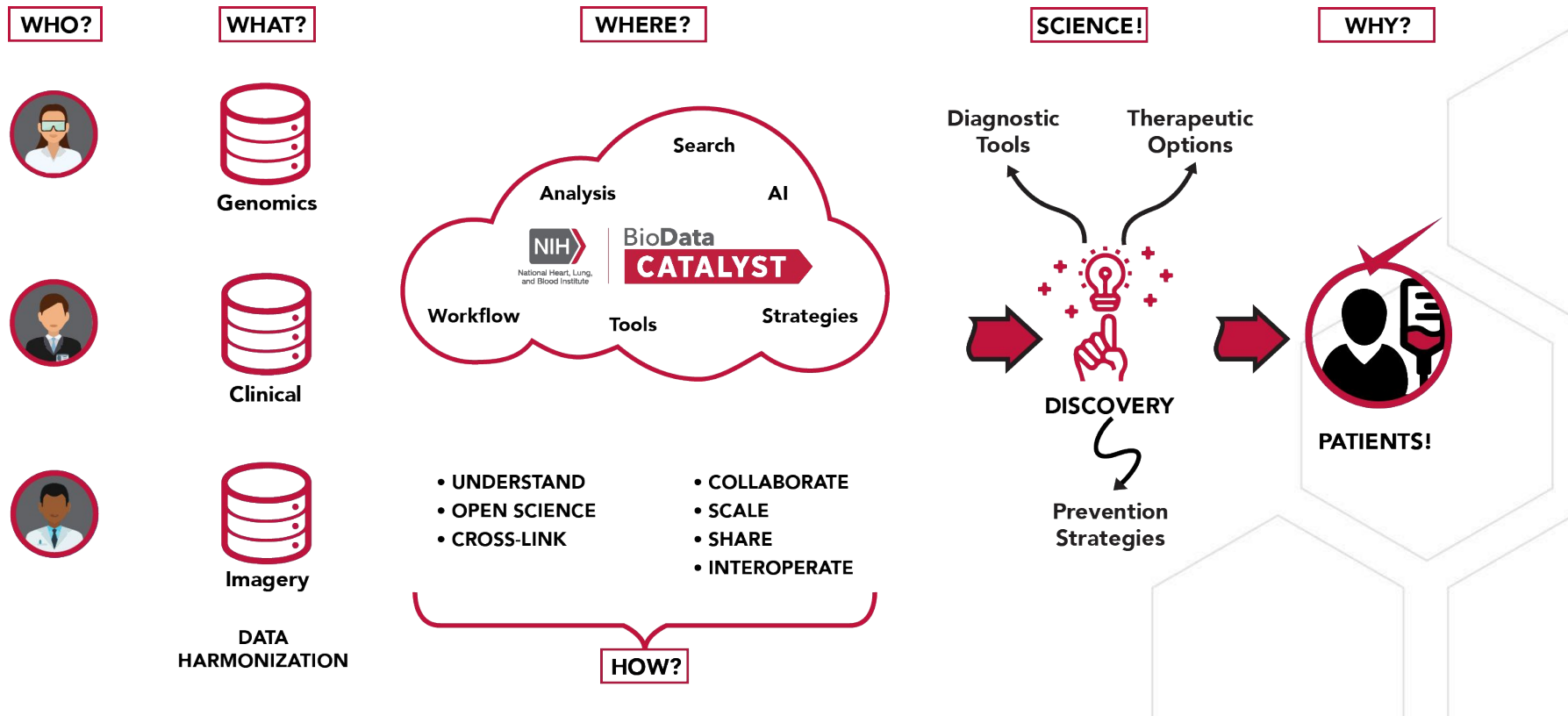


David Roberson

Community Engagement Manager
Velsera

**With current tech growing
so fast, the education
system can't match the
technology being used.**

NHLBI BioData Catalyst® (BDC) is a **cloud-based ecosystem** that offers researchers data, analytical tools, applications, and workflows in secure workspaces.



Cognitive Load During Problem Solving: Effects on Learning

Relevant

- Students are learning something new
- This is where you want students focused!

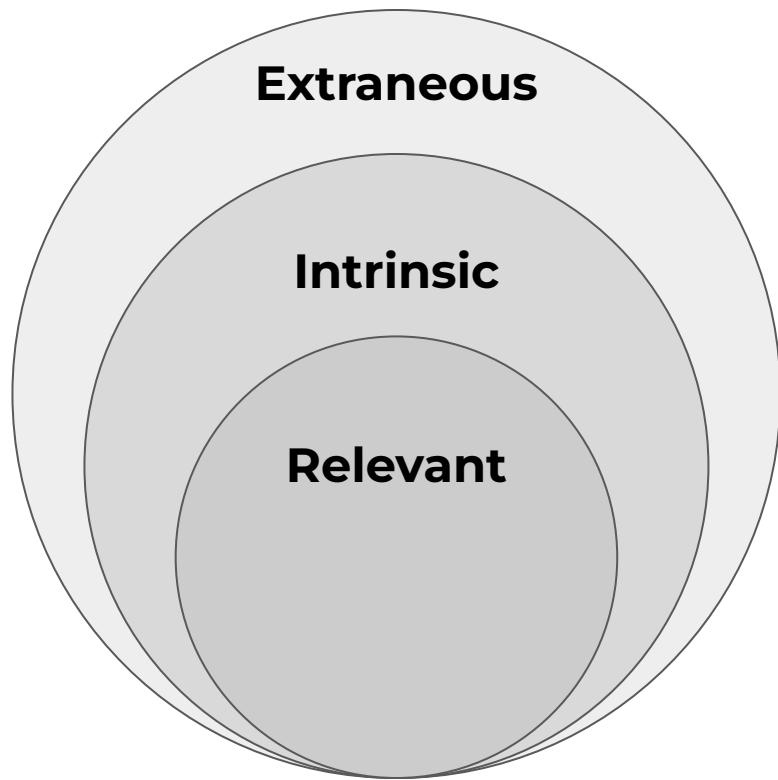
Intrinsic

- New things to learn that are necessary, but not the primary focus
- Examples: Names of software tools; `bash` commands

Extraneous

- Distracts from learning
- Examples: Different computational environments between students and instructor; pop-up notifications on instructor's computer

Prevent Cognitive Overload



- **Reduce** extraneous load
- **Manage** intrinsic load
- **Maximize** relevant load

BDC Minimizes and Removes Unwanted Cognitive Load

- Minimize extraneous load:
 - Students and teachers use the same environment - what they see is what you see
- Manage intrinsic load:
 - Cloud-based analysis without having to first learn how to run on 'bare metal'
 - Data already in place or easy to access - no downloading and unpacking
 - Tools already installed – no worries about dependencies
- You can focus on relevant cognitive load:
 - Teach the research questions and the methods
 - Run the analysis
 - Interpret the results

BDC is training the next generation of HLBS and genomics scientists.

- Code-forward and no-code informatics methods
- Administrative tools, allowing instructors to help or provide feedback to students in real-time or asynchronously
- You may be short on the coding skills needed to get started in other environments, but can start using BDC resources immediately
- Focusing on teaching and learning the science, rather than learning a new coding language

Success: BDC in the Classroom



Fayuan Wen

Assistant Professor
Howard University

The inclusion of BDC has added significant value to my class in two key ways:

1. *Broadening students' perspectives by introducing them to **cloud computing**.*
2. *Improving **teaching efficiency** by streamlining the troubleshooting process and enhancing collaboration among students and instructor.*

Success Story: Dr. Fayuan Wen

Case Study

Assistant Professor in **Computational Biology**, Department of Biology at Howard University

Most recently, integrated BDC into labs in **Biostatistics** and **Bioinformatics** courses



RESEARCH

Used BDC to identify genetic markers related to iron overload as a complication of sickle cell disease

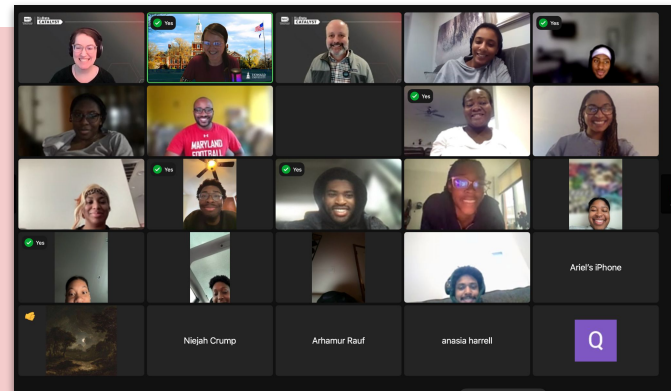


CLASSROOM

Incorporating BDC into coursework and championing BDC to my colleagues at Howard

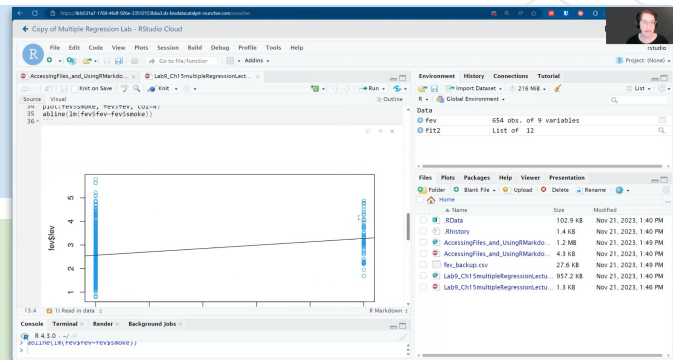
How it worked: Biostatistics

- **Hands-on** demo of R Studio in the **cloud** - class had experience using it on their laptops
- Designed a multiple linear regression model lab in R and provided data.
- Focus: learn how cloud computing worked, how to launch an R Studio interactive session and run a multiple linear regression model on a cloud instance.



- 28 active users, 60 total in the class
- One grad student section and two undergrad sections

- All students were part of a \$150 cloud credit billing group funded by NHLBI - used \$10 total.



WHAT

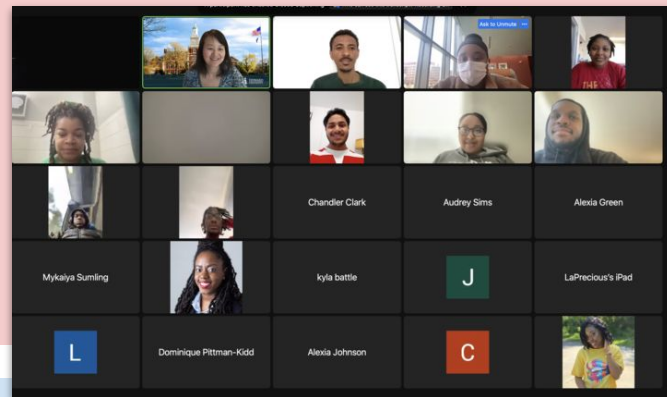
WHO

COST

How it worked: Bioinformatics

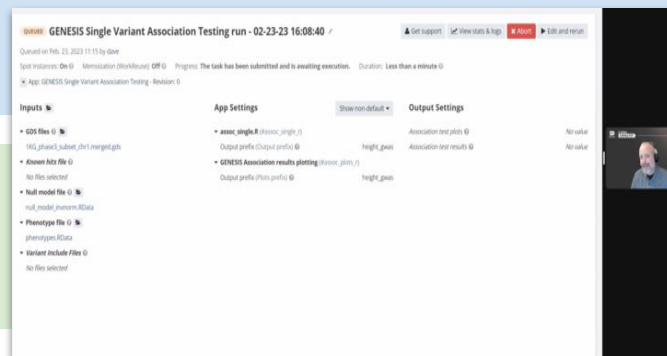
Hands-on demo of GWAS and RNA-seq

- Each student received a customized template project on BDC
- GWAS covered single variant association test, RNA-seq covered differential gene expression of a case study on heart failure.



- 64 total in the class
- One grad student section and two undergrad sections

- All students were part of a billing group funded by NHLBI; some students applied for additional credits to continue using the ecosystem.



WHAT

WHO

COST

What's Next

- Dr. Wen's use of BDC as a teaching tool **influenced two other professors** at Howard University to use BDC in their course courses: **Bioinformatics** (spring, completed) and **Genomics** (fall, upcoming).
- Dr. Wen was funded by BDC Cloud Credits from NHLBI, with ~\$217 assigned per student.
- Continuing to work with BDC on future labs.

BDC Supported My Course...

“

*While teaching bioinformatics and biostatistics, students often encounter challenges in **setting up their own computational environment** on their personal computers and struggle with **limited computational power**. As an instructor, I find it challenging to provide individualized assistance to each student, especially in large online classes where time constraints are a concern...*

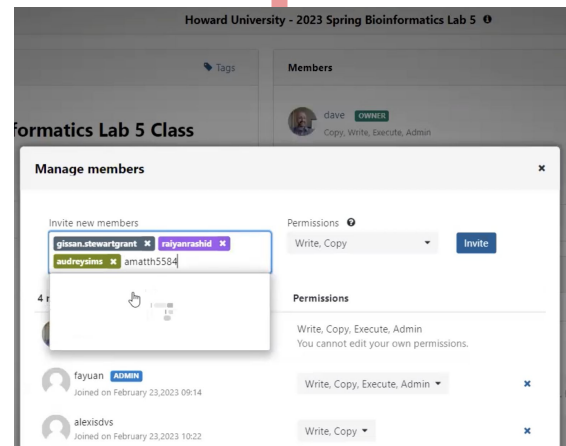
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BDC Supported My Course...

BDC provides valuable cloud resources that address these issues.

- Students can **readily access** and learn on the cloud platform without the need to set up the software on their own computers.
- Cloud computing offers the advantage of **collaboration**, allowing students to work together on the same projects.
- Additionally, it **facilitates troubleshooting** for instructors when errors arise, as they can easily access and troubleshoot within the same project as the students.

*The support team and office hours provided BDC contribute significantly to fostering a **supportive learning environment**, ensuring that students have the necessary guidance and support to maximize their learning experience.*



Questions on how I used BDC?

Data



Emily Hughes

Bioinformatics Systems Analyst
Harvard Medical School



David Roberson

Community Engagement Manager
Velsera

What Data Can I use in the Classroom?

Identify harmonized public datasets of interest - without the need for **downloading** - or provide your **own data**



Simulated Data & Phenotypes

1000 Genomes data



Open Data

BioLINCC training datasets



Bring your own data

"BYOD"

COMING SOON:

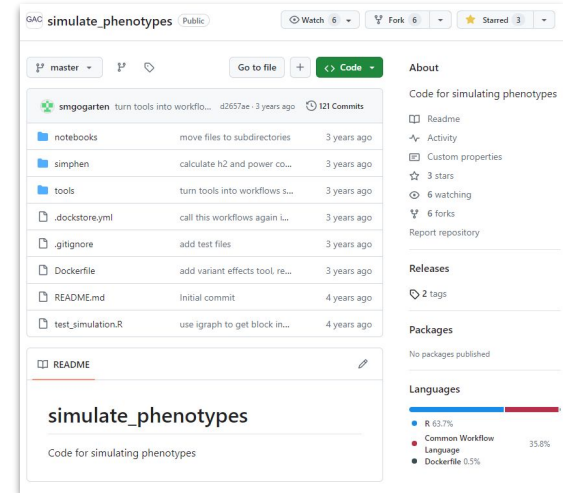
Data

GENESIS Tutorial with *BDC-Seven Bridges* and *BDC-PIC-SURE*

- Easily access synthetic phenotypes for 1000 Genomes
- Linked genomic data files in the cloud
- Workflows and tools for variant calling and genome-wide associated studies

Data Science Education is enhanced with synthetic data

- **Privacy and Compliance:**
 - Ensures protection of patient privacy.
 - Complies with legal standards (e.g., HIPAA).
- **Practical Skills Development:**
 - Provides hands-on training with complex datasets.
 - Encourages safe experimentation and error learning.
- **Research Preparedness:**
 - Equips students for the data challenges in NIH and healthcare projects.
 - Fosters innovation and problem-solving skills.



BDC Fellow Dr. Stephanie Gogarten has developed CWL tools and notebooks to aid phenotype simulation for GWAS
github.com/UW-GAC/simulate_phenotypes

PIC-SURE allows you to search data and build cohorts to jump start science.

Search:

Search

Reset

Search Results:

31 variables match your search. [Learn More](#)

Show

10

 entries

Study	Variable Name	Variable Description	Actions
1000Genomes	SAMPLE NAME		▼
1000Genomes	BIOSAMPLE ID		▼
1000Genomes	POPULATION ELASTIC ID		▼
1000Genomes	POPULATION NAME		▼
1000Genomes	POPULATION CODE		▼
1000Genomes	DATA COLLECTIONS		▼
1000Genomes	SUPERPOPULATION NAME		▼
1000Genomes	HUMAN GENOME STRUCTURAL VARIATION CONSORTIUM, PHASE 3		▼
1000Genomes	HUMAN GENOME STRUCTURAL VARIATION CONSORTIUM, PHASE 21000		▼
1000Genomes	90 HAN CHINESE HIGH COVERAGE GENOMES		▼

Results Panel

Data Summary


[What is this?](#)

1123


Total Participants

Tool Suite

[What is this?](#)



Participant Count by Study






Variable Distributions

Added Filters

Active filters applied to your cohort.

Filter on variable



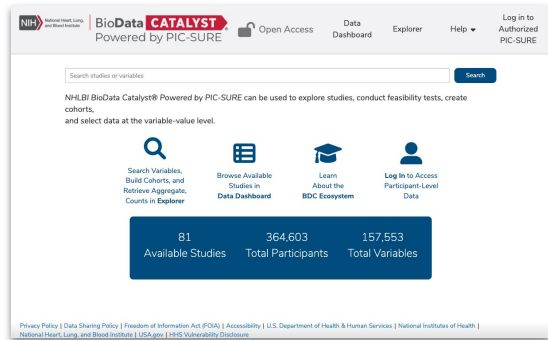
SYNTHETIC_HEIGHT

Study: 1000Genomes (open_access-1000Genomes)

Value: Include only participants with values between 120 and 210

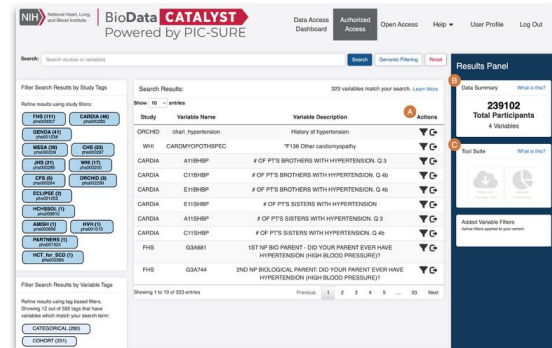
Open and Authorized PIC-SURE

Data



Publicly available **Open PIC-SURE** allows you to explore all data and conduct feasibility studies.

<https://openpicsure.biodatacatalyst.nhlbi.nih.gov/picsureui/>



Authorized PIC-SURE requires login and allows you to export data you are authorized to access.

<https://picsure.biodatacatalyst.nhlbi.nih.gov/psamaui/login>

How BDC Can Support You and Your Students



David Roberson

Community Engagement Manager
Velsera

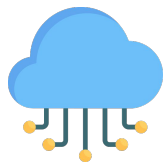


Amber Voght

Instructional Design Specialist
BDC Coordinating Center

Out of the Box

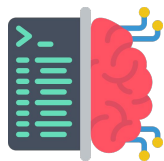
What we can support



**Intro to
Cloud Computing**



**RNA
Sequencing
Analysis**



**Machine
Learning**



**Variant Calling &
Genome-wide
Association Studies**

Custom Lectures and Plans

What we can support

Our formula:

*Scientific
questions*

+

Dataset(s)

+

*Analysis
Method*

=

YOUR Custom Lesson Plan with BDC



Access and Cost

What we can support

On-demand cloud computing + NHLBI-funded Cloud Credits is providing **equity, access, and inclusion** for tomorrow's scientists.

Access for all to the same materials (test data, methods, example analyses, files, code)
Institutions without large compute infrastructure investments can still have access to **big data** and **powerful compute resources**

Obtain funding for BDC in your course through **Cloud Credits** (up to \$300/student)

Support and Course Delivery

What we can support



Train the **trainer**, with
optional TA support



Virtual delivery over
Zoom (*most popular*)



Opportunity for
in-person

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Next Steps: Get Started with BDC in your Course



Amber Voght

Instructional Design Specialist
BDC Coordinating Center

Let's power the next
generation of
research, together.

Next Steps: Teach with BDC

Let's have a chat:

- 1. Introduction to you and your course, including focus, number of students, and level**
2. Identify harmonized public datasets of interest - without the need for downloading - or provide your own data
3. Define a customizable lesson plan and syllabus - from a single module to a whole semester - that can be applied to a genomics-focused course
4. Create a course project with all of the files and code needed for lessons and make it available to your students
5. Request NHLBI pilot funding to sponsor learning and training initiatives, up to \$300 per student

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Next Steps: Teach with BDC

**Tell us now:
How can BDC support YOU
in the classroom?**

Reach out directly to Amber Voght (alvoght@renci.org)

Contact our help desk:

<https://biodatacatalyst.nhlbi.nih.gov/contact>

Request Cloud Credits now:

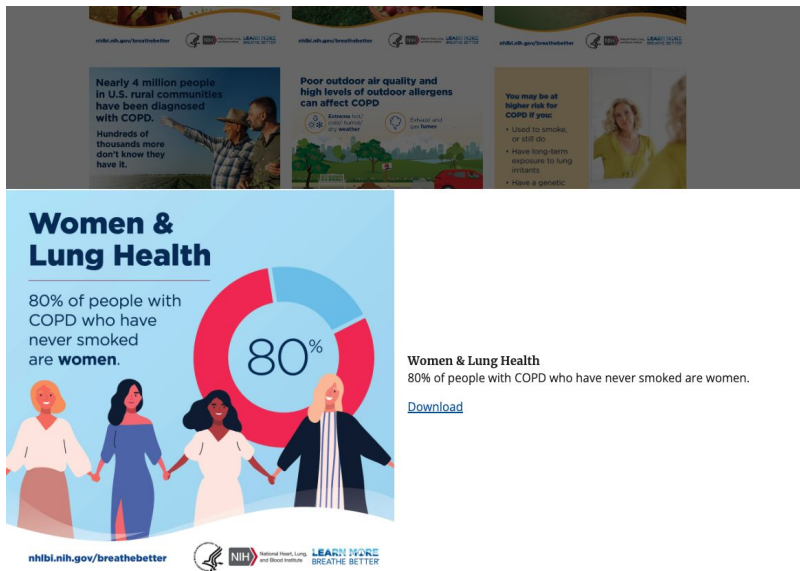
<https://biodatacatalyst.nhlbi.nih.gov/resources/cloud-credits/>

Let's power the next generation of research, together.

Questions?

Until Next Time

- This week's materials coming to you via email: pass them on!
- Subscribe to NHLBI on LinkedIn and Twitter/X
- Repost on your socials using **#BioDataCatalyst** '=
- May is Asthma and Allergies Awareness Month, download content from the NIH web site



Nearly 4 million people in U.S. rural communities have been diagnosed with COPD. Hundreds of thousands more don't know they have it.

Poor outdoor air quality and high levels of outdoor allergens can affect COPD.

You may be at higher risk for COPD if you:

- Used to smoke, or still do
- Have long-term exposure to lung irritants
- Have a genetic

Women & Lung Health

80% of people with COPD who have never smoked are **women**.

80%

Women & Lung Health
80% of people with COPD who have never smoked are women.

[Download](#)

nhlbi.nih.gov/breathebetter

NIH National Heart, Lung, and Blood Institute LEARN MORE BREATHE BETTER

Join us
Wednesday, May 22 at 1PM ET

Register now: <https://bit.ly/3PYVKAQ>

**Gut microbiota and genetic associations with
asthma and among US Hispanic/Latino adults**

Join Dr. Maggie Stanislawski and Dr. Liz Litowski as they share and expand on their recent conference presentation from the TOPMed Annual Meeting