


Developing a Diverse Research Community

SESSION 4:


**Diversifying the Scientific Workforce:  
Innovation Programs in West Tennessee  
from High School to Graduate School**



# St. Jude STEMM Education and Outreach Program

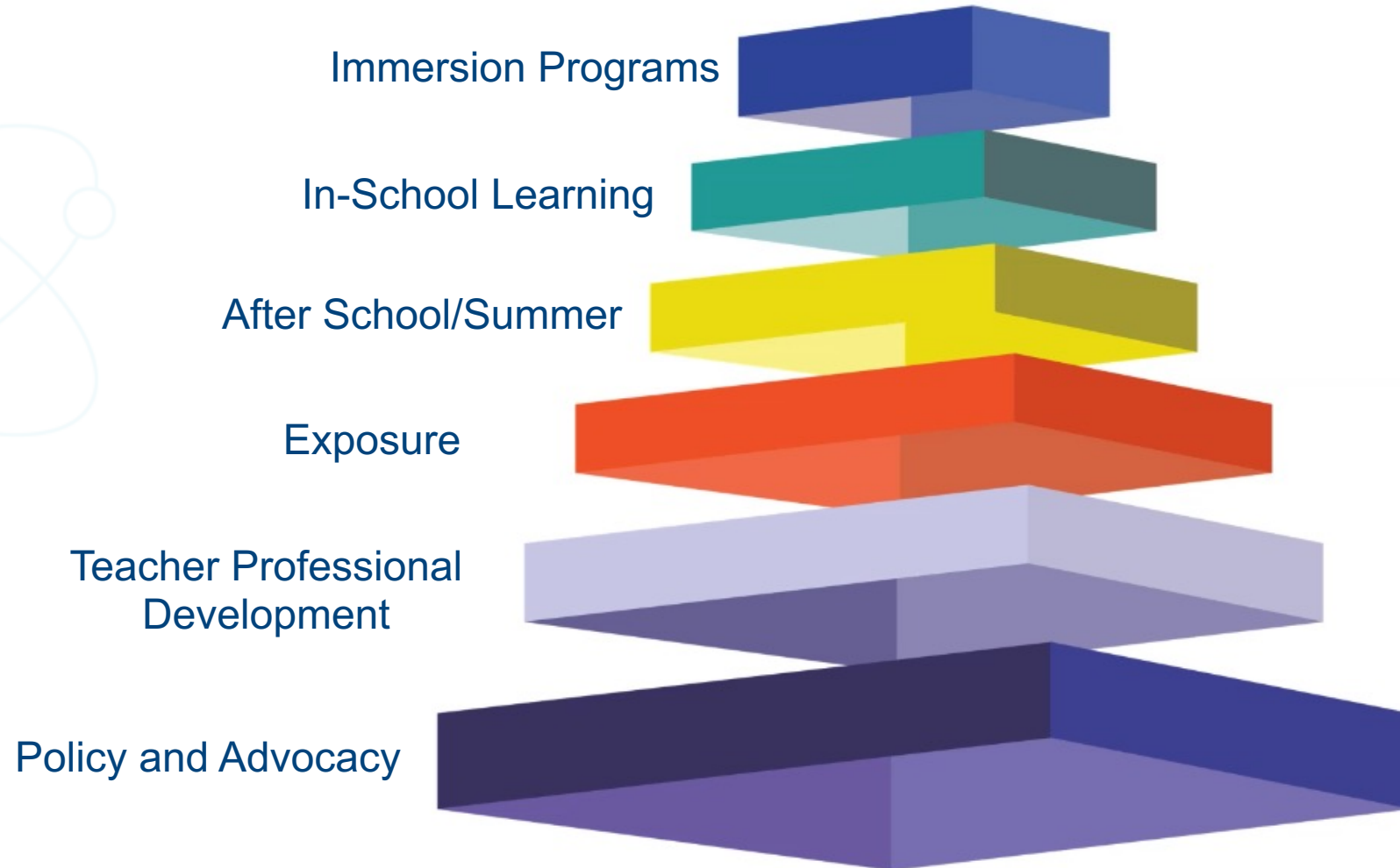


Katherine A. Ayers, MS  
February 23, 2023



**Cancer Education  
& Outreach Program**

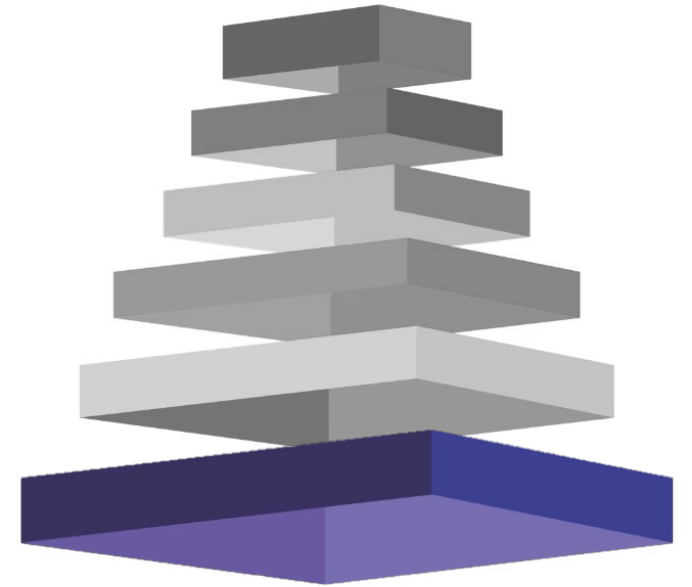
# Program Model





# Policy and Advocacy

to gain political commitment, policy support, social acceptance, and system support to address issues of racial equity in STEM education



# Advisory Councils



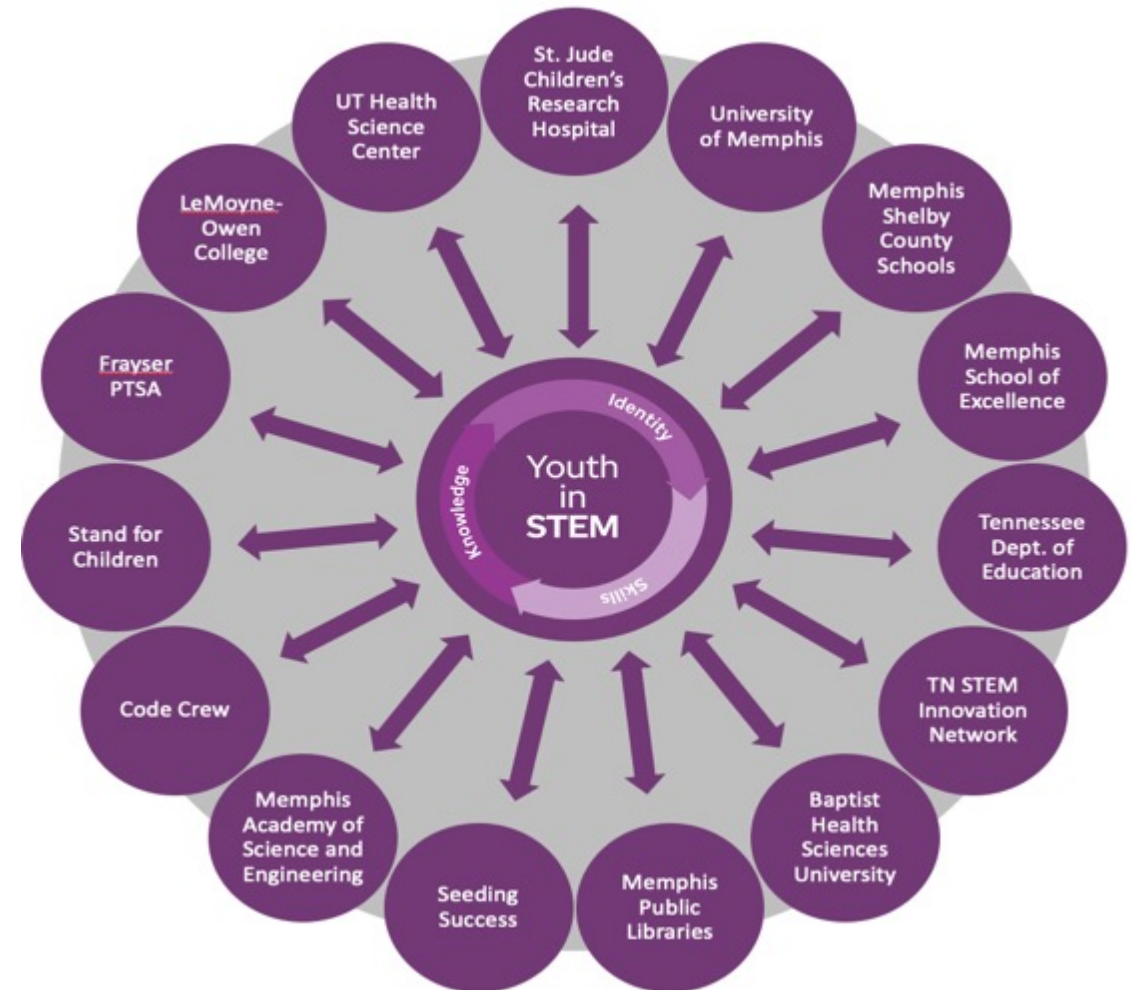
- State-level School Health Advisory Council (SHAC)  
School Culture Landscape Analysis
- STEM Advisory Councils  
Brewster Elementary School  
Sea Isle Elementary School



# Memphis STEM in Medicine Ecosystem



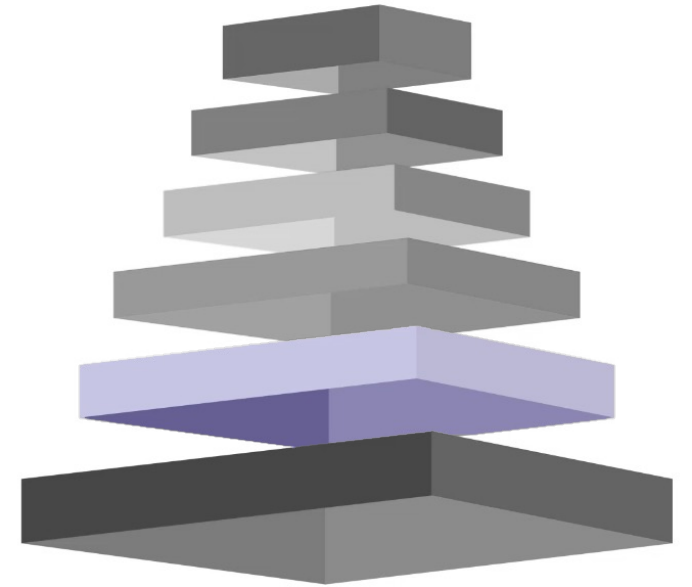
- Established November 2021
- Joined the STEM Learning Ecosystem Community of Practice in 2022
- Aims to address issues related to racial equity in STEM education through collaborative action





# Teacher Professional Development

to ensure that teachers have the knowledge, skills, and resources necessary to prepare students for careers in biomedical research



# The Cancer Educator's Classroom



- Loan Kit Training Workshops
- Curriculum Collaboratives
- Laboratory Skills Development Workshops





# Conferences



- National Association of Biology Teachers (NABT)
- National Association of Science Teachers (NAST)





# Exposure

to generate awareness and excitement around STEM programs and careers



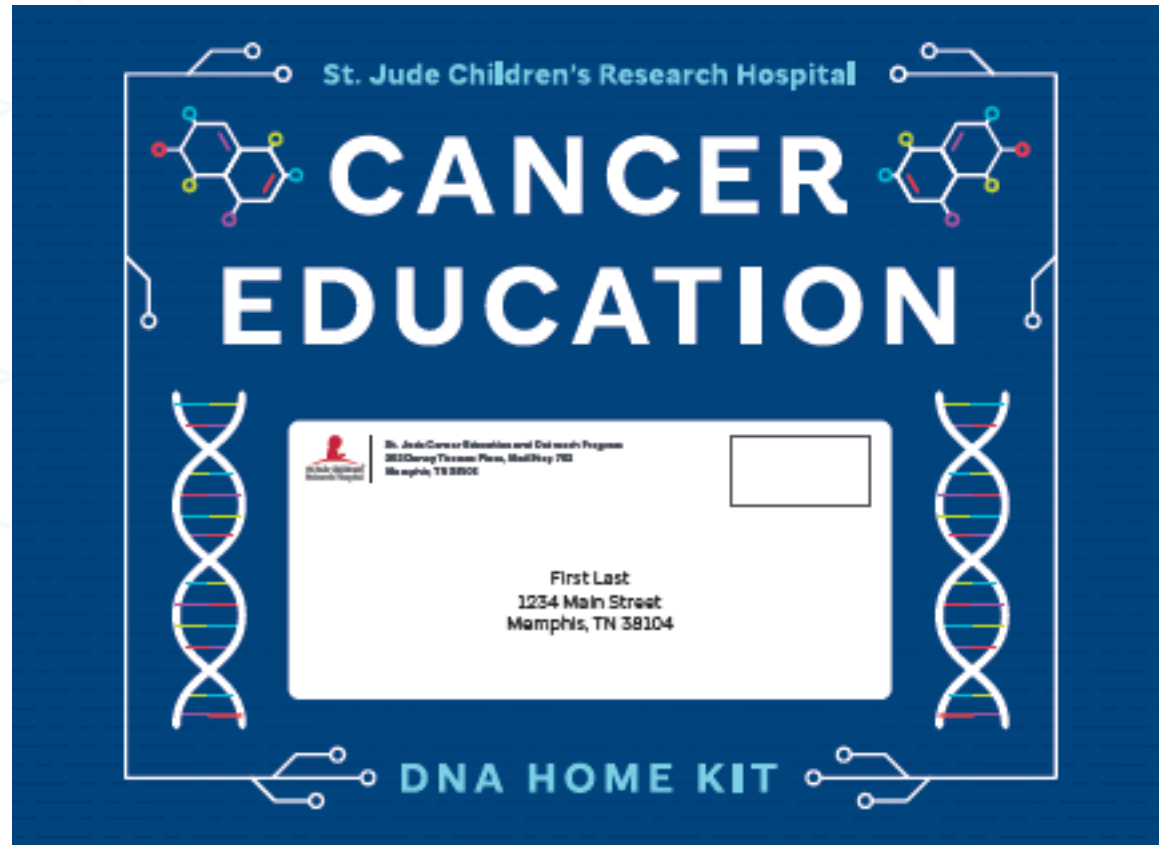
# Science Ambassadors Program



- Classroom Career Talks
- DNA Day Activities
- Memphis Public Libraries
- Career Fairs/STEM Expos



# DNA Day Home Kits – 4<sup>th</sup> Grade



- DNA extraction kit
- Model of DNA double helix
- DNA Day activity booklet
- Scientist trading cards





# After School / Summer

to increase engagement with STEM by coupling  
STEM concepts with hands-on; minds-on activities  
related to real-world scenarios

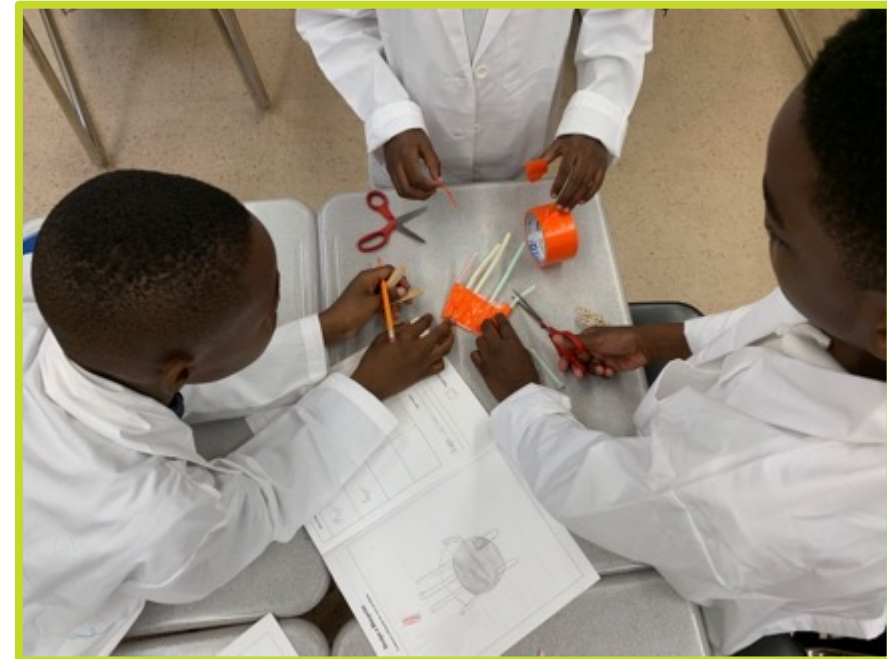


# 5<sup>th</sup> Grade STEM Club



## Case Study Logic Model

Central Issue	Stacey, a 12-year-old girl, begins to develop signs and symptoms of osteosarcoma, a cancer of the bone.
Central Assumptions	The diagnosis and treatment of pediatric cancers is conducted by a team of scientists and physicians who work collaboratively to provide the best level of patient care.
Central Problem	Stacey presents with persistent pain in her left knee. We need tools to help us diagnose Stacey's disease. <ul style="list-style-type: none"><li>• Students compare an x-ray and bone biopsy of a healthy knee to Stacey's knee to diagnose disease</li><li>• Students compare a healthy PET scan to Stacey's to determine the extent of disease</li></ul> Pediatric patients with osteosarcoma often require removal of the affected area as part of their treatment protocol, resulting in the loss of a limb.
Central Question	What is wrong with Stacey's knee?



# Middle School Community Health Clubs



CCDC Logic Model	
Central Issue	Differences in cancer measures, such as incidence, prevalence, and mortality, can be observed across population groups. Population groups can be defined by race/ethnicity, disability, gender identity, geographic location, income, education, age, etc.
Central Assumptions	Social determinants of health are a major driver of cancer disparities. They include factors that affect health beyond biology or genetic inheritance, such as employment, income, housing, food, and transportation.
Central Problem	<p>Cancer disparities exist in Memphis, TN.</p> <ul style="list-style-type: none"> <li>Students use online databases to explore cancer characteristics, cancer mortality, and cancer incidence in their community.</li> <li>Students use the social determinants of health framework to think about root causes of disparities.</li> </ul> <p>Students develop an infographic to communicate their findings to others.</p>
Central Question	How can we reduce cancer disparities in our community?

## BREAST CANCER

Breast cancer is a disease in which cells in the breast grow out of control. There are different kinds of breast cancer and the kind of breast cancer depends on which cells in the breast turn into cancer. Breast cancer is the most common cancer diagnosed in women and rarely in men.

**Breast cancer accounts for 33% of all new female cancers including ovarian and cervical.**

**About 1 in every 100 cases of breast cancer are found in men**

**There are over 2.9 million breast cancer survivors in the United States.**

**In Shelby County, breast cancer is equally diagnosed in both white women and women of color. However, black women are 42% more likely to die of the disease.**

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### RISKS

**Gender**  
Breast cancer is commonly diagnosed in women.

**Age**  
Breast cancer is commonly found among women aged 45 and older.

**Genetics**  
Breast cancer is often found in those with familial history of said disease. This form of cancer may also result from genetic mutations.

### PREVENTION

**Move Your Body**

**Eat Healthy**

**Get Screened Regularly**

**Drink Responsibly**





# In-School Learning

to integrate St. Jude science into the school day through the co-creation of learning activities with classroom teachers

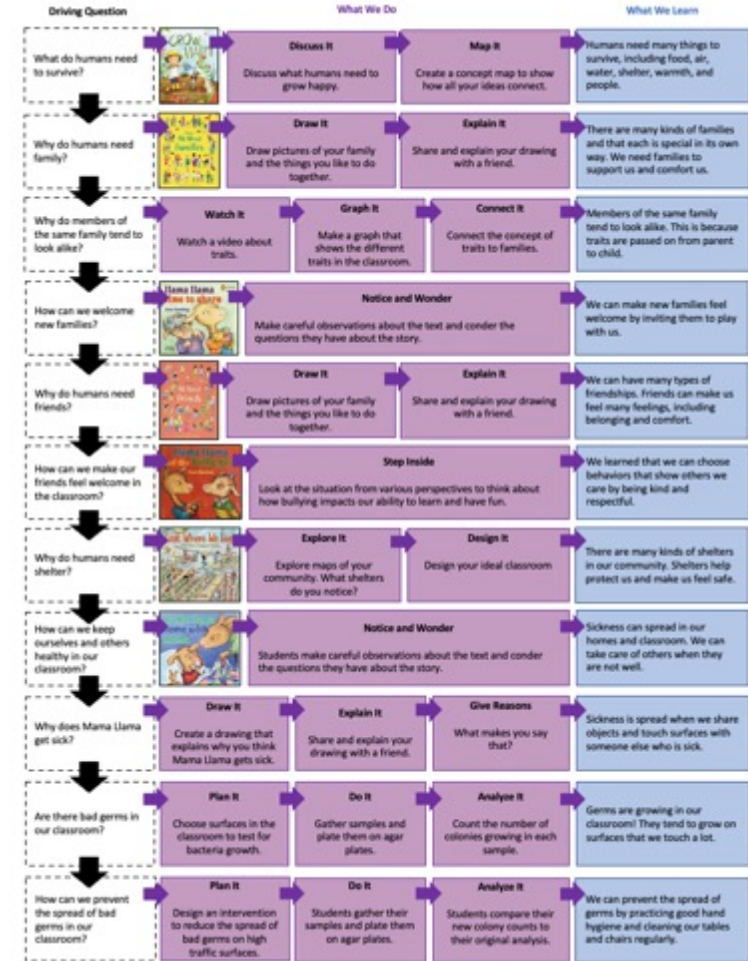




# Kindergarten Collaborative



- 26 kindergarten teachers from 6 partner schools, reaching more than 600 students
- Learning centers on how science can be used as a tool to help individuals and communities care for the wellbeing of others.
- Students design an intervention to identify effective strategies for preventing the spread of germs in their classroom and leverage their findings to co-create a set of group norms.



# Virtual Science Journal Clubs



- Couples Scientists' professional development with high school outreach
- Scientists participate in a workshop series aimed at enhance science communication skills
- Students participate in a journal club where they hear 3 scientists present on their research



# St. Jude Online Educational Initiative



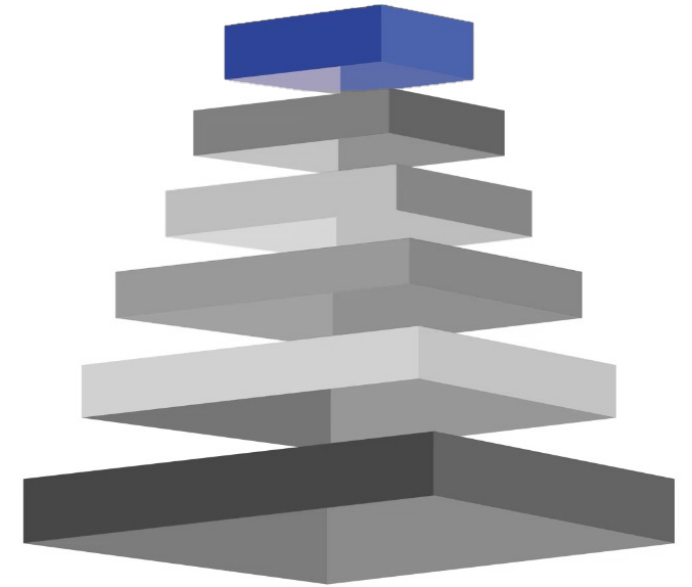
A project-based learning experience that engages high school students in authentic, inquiry-driven science related to St. Jude "big data" problems. Through these experiences, students will develop skills as biologists and data scientists to gain an understanding of how bioinformatics helps further the mission of St. Jude.





# Immersion Programs

to provide students with access and opportunity to engage in mentored research experiences



# High School Research Immersion Program



The vision for this program is to create a mentored research experience that discovers and develops the potential in local Memphis high school students.



# Future Considerations



# Science for Teachers Events



- 2-hour event with dinner that occur on a regular cadence throughout the academic year (i.e., 4 events per year, monthly events)
- Themes connect to relevant topics in society (i.e., CRISPR, Immunotherapy, vaccines)
- A faculty member presents a scientific talk that connects to the theme
- Teachers are partnered with a trainee (i.e., postdoc, grad student) to discuss the scientific concepts, how they connect to large discourses in society, and student's lives



# St. Jude Blue Sky Proposal



## St. Jude Science Discovery Center

- Virtual simulations
- Laboratory field trips
- Hands-on exhibits
- Middle school and high school summer camps



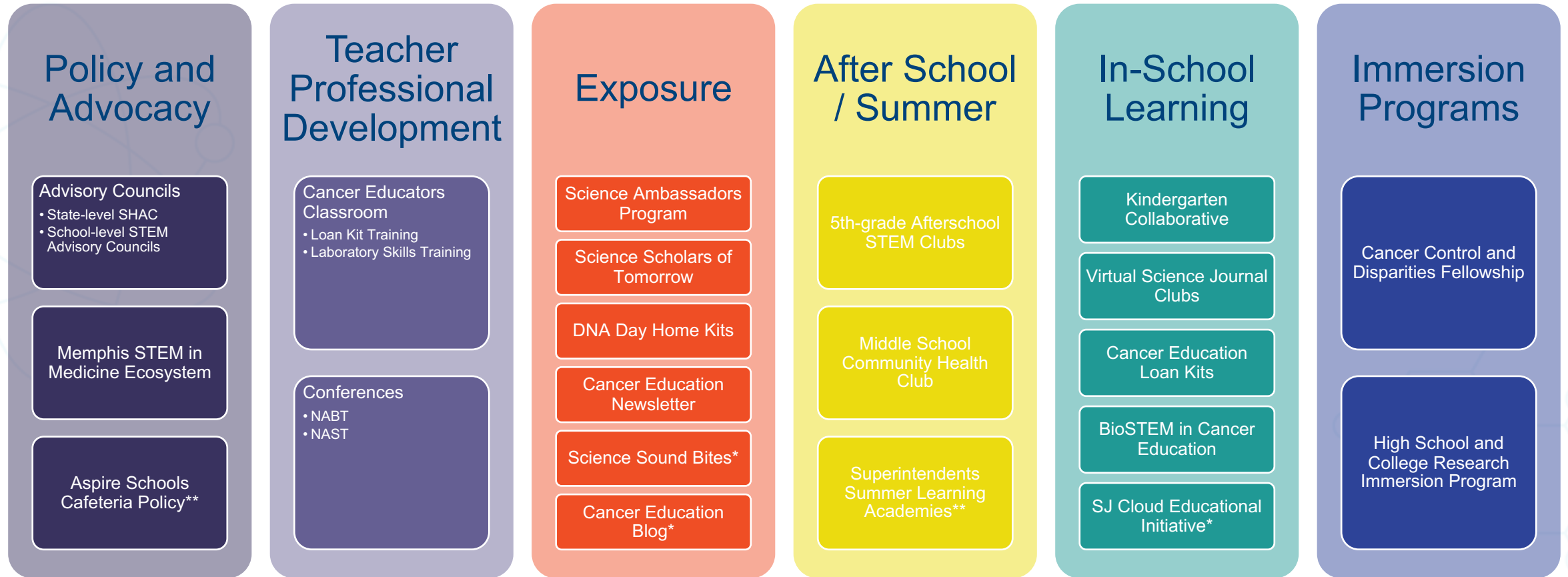




# Program Summary



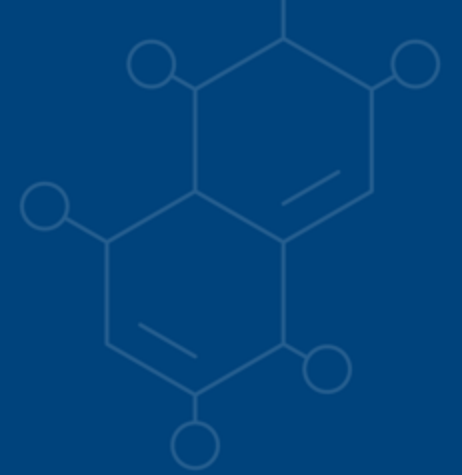
# Program Summary



\* indicates future programs

\*\* indicates programs that may not continue post pandemic





# Cancer Education & Outreach Program



**Thank you!**

# Community Engagement: An Essential Component of Genomics Research



February 23, 2023

Chester W. Brown, MD, PhD  
Professor and Genetics Division Chief  
Department of Pediatrics

# The Biorepository and Integrative Genomics (BIG) Initiative

Facilitating highly effective genomics-based research to establish a personalized healthcare delivery platform.

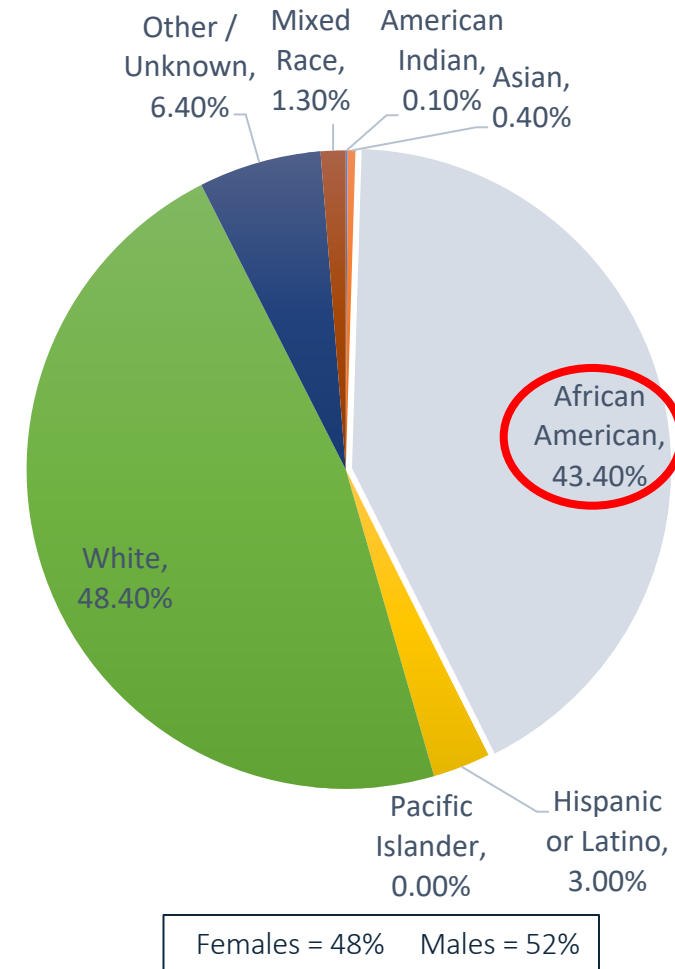


<https://www.lebonheur.org/research/biorepository-and-integrative-genomics-initiative/>

# The BIG Initiative

- Hospital enrollment and lab operations began Nov. 2015 (Le Bonheur)
- Current enrollment is ~31,100 participants
- Consent rate has ranged from 70%-88%
- Enrollment in Le Bonheur Outpatient Clinics began in 2017, in the NICU in 2018, and in the ER in 2019\*
- Enrollment at Regional One Health (adults) began in May 2022.
- DNA samples are extracted from leftover blood
- Archive now contains DNA samples from 14,080 consented participants
- 9,500 data sets have been provided by RG (WES + SNP genotyping).
- 3,400 additional samples were recently shipped to RG
- Each sample is linked to de-identified patient data from the EDW, constructed from the Methodist Le Bonheur EHR back to 2010.
- Patient data and DNA data are de-identified but can be linked to one another through a code that connects them.
- Sample request and review process became operational in 2018 and data request in 2022.

\*Enrollment was restricted to a virtual process in the hospital and NICU from March 2020 until April 2021 due to COVID-19 regulations



# The Importance of Community Engagement and Education

*Community Genet.* 2005;8(3):161-72.

## Attitudes about genetics in underserved, culturally diverse populations.

Catz DS<sup>1</sup>, Green NS, Tobin JN, Lloyd-Puryear MA, Kyler P, Umemoto A, Cernoch J, Brown R, Wolman F.

### ⊕ Author information

#### Abstract

**OBJECTIVE:** New medical discoveries regarding genetic susceptibility to common chronic diseases, and the decoding of the human genome have increased public attention to genetics. What information is understood and what attitudes exist towards genetics and genetic research have not been well examined in underserved, culturally diverse communities.

**METHODS:** To better understand attitudes and beliefs towards genetics and genetic testing in these groups, we conducted eight focus groups with 55 patients and health care workers in New York City and Westchester, N.Y., in English, Spanish, and Chinese.

**RESULTS:** Focus group participants had limited understanding about genetics or genetic testing. Newborn screening was the least-known genetic issue, even among health care workers. Regardless of their cultural group, most participants expressed a desire for more information about genetics and genetic tests. Latinos and Chinese participants generally expressed positive attitudes towards genetic studies and genetic testing, with the possibility of preventing diseases cited as the main advantage. Black Americans and Non-Hispanic Whites reported mixed feelings about genetic research and genetic testing. Concerns expressed included: anxiety before receiving test results or waiting for a disease to develop, fear of genetic discrimination by health and life insurance companies and employers, not having the financial means to deal with genetic diseases in themselves or a sick child, concern that children and adults are having too many tests. Black Americans expressed the most concern for possibly harmful use of genetic information.

**CONCLUSIONS:** Minority populations of diverse cultures have limited knowledge about genetics and genetic testing, would like to have more information, and are not well reached by the current educational approaches. Participants knew the least about newborn screening, a test that is mandatory in the New York State. While genetic knowledge by minority populations was perhaps not different from the level of knowledge of consumers in general, minority populations are at particular risk of being left behind because of historically poor access to information and services.

# Community Engagement





# Community Advisory Boards

## Le Bonheur Family Partners Council

- Founded in 2007
- Comprised of Le Bonheur patient families who work to improve processes within the hospital
- Work directly with staff and physicians to encourage partnerships with families
  - Focus areas
    - Advocacy and Public Policy: to recruit, educate and engage families on child health issues
    - Patient and Family Experience: support families' emotional, spiritual, physical and educational needs
    - Quality Improvement: Help families partner with caregivers to improve quality of care and patient safety
    - Staff Education: To assist staff in learning the principles, skills and attitudes of patient- and family-centered care



## UTSHC Community Advisory Board

- Trinity Baptist Church
- Red Door Urban Ministries
- JUICE Orange Mound
- Literacy MidSouth
- Consilience Group
- The Works
- MSCS
- Flex
- FedEx Employees Federal Credit Union
- Education Concierge
- Moxie Way

# Community Engagement and Genomics Education



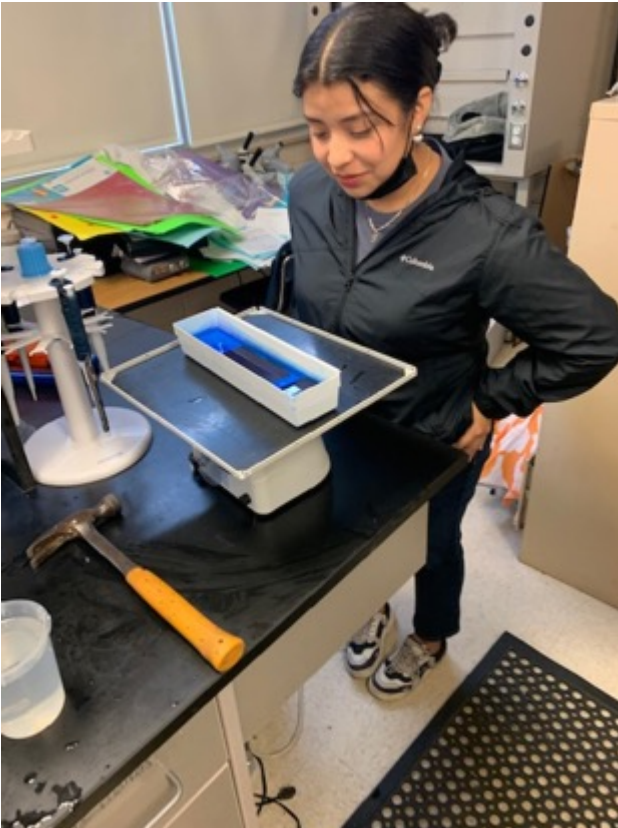
Charles Wray, PhD  
VP for Education  
The Jackson Laboratory



*Teaching the Genome Generation* White Station HS, Dr. Chikezie O. Madu



# Teaching the Genome Generation (TtGG)



- stimulating hands-on lab activities
  - Broad spectrum of techniques
    - DNA extraction from strawberries
    - Comparison of sequences from students in the classroom
    - Forensic analysis of DNA samples to identify a culprit
    - CRISPR engineering of cells
  - publication of review articles and experimental results in scientific journals
- inquiry-oriented activities
  - Discuss the ethics of resurrecting the Woolly Mammoth
  - CRISPR engineering of human embryos

**Currently in the process of expanding the program to East, Craigmont, and Central High Schools in 2023 with enthusiastic support from the MSCSD administration.**

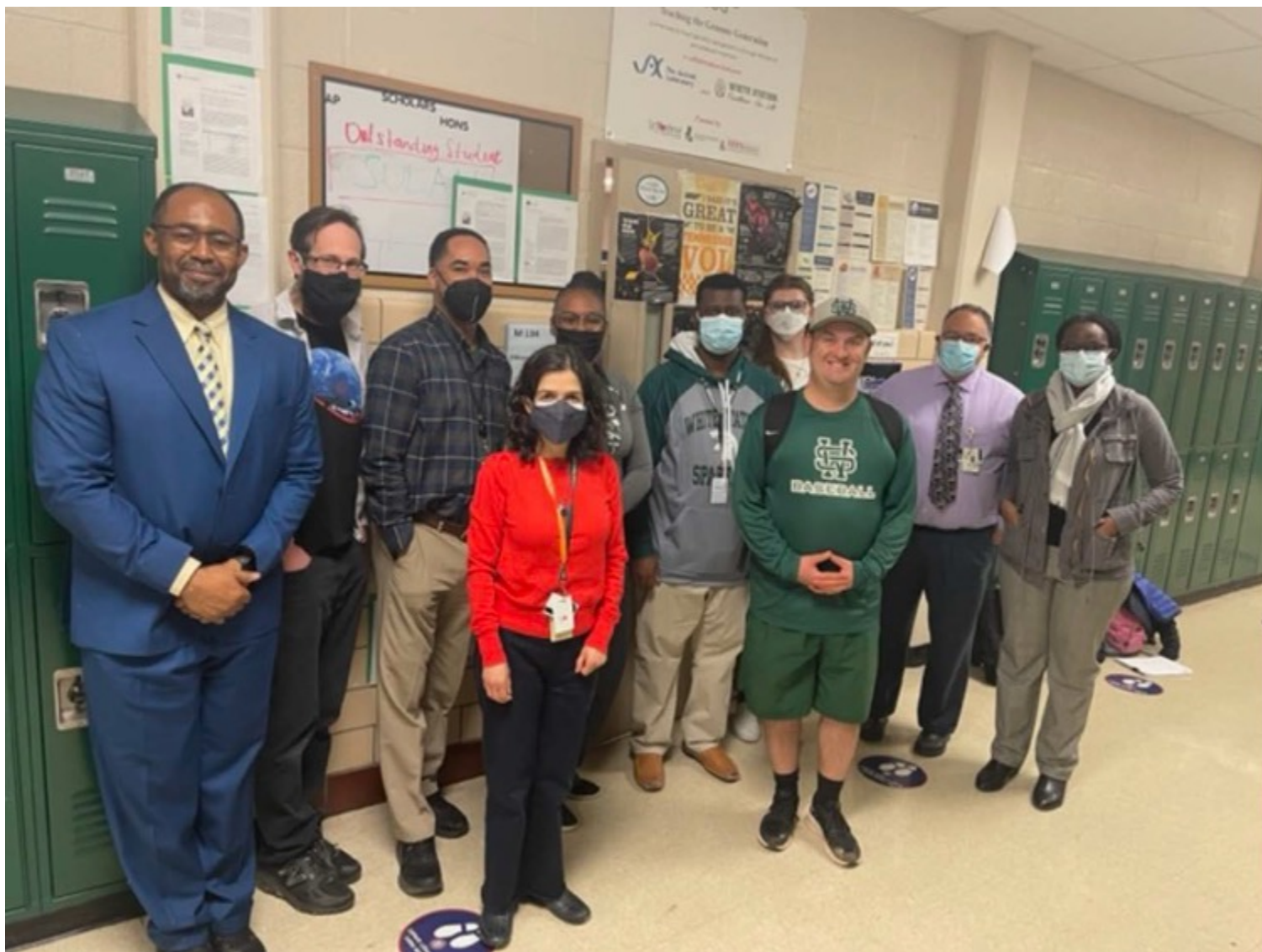
# Teaching the Genome Generation

## Outcomes



- Historically high performance on the AP Biology examination
- We hypothesize enhanced training will improve students' and teachers' knowledge and skills and will motivate students to pursue additional science activities, STEM higher education and STEM careers
- We will examine the impact of TtGG on the following:
  - genomics and other related scientific knowledge before and after participation
  - topic-specific standardized exam performance
  - decisions regarding pursuit of STEM careers
  - student attitudes regarding science in general and its importance in their lives
  - teacher confidence in their ability to effectively teach advanced genomics concepts and broader effects on teaching strategies.

# Thank You!



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Children's Foundation  
Research Institute



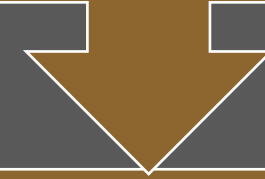
Jacen S. Moore, Rebecca Reynolds, Keisha Burnett  
College of Health Professions



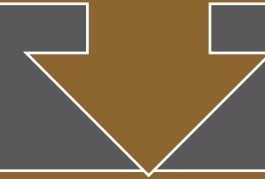
# Health Care Professions Experiencing Critical Shortages

\*U.S. Bureau of Labor Statistics. Occupational Employment and Wages; [www.bls.gov/oes/current/oes292010.htm#st](http://www.bls.gov/oes/current/oes292010.htm#st).

The Bureau of Labor Statistics estimates laboratory and data science jobs will need to increase by 11% from 2018 to 2028\*



Insufficient training programs for allied health fields



Difficulty in recruiting students

Lack of knowledge/understanding regarding professions

Fears and misconceptions about the professions

# NIH Science Education Partnership Award (SEPA)

- The NIH Research Education Program (R25)
  - P-12<sup>th</sup> grades
- The overarching goal-
  - support educational activities complementing and/or enhancing workforce training
  - biomedical and clinical research
- Primary foci of the R25 award-
  - *Courses for Skills Development*
  - *Research Experiences*
  - *Mentoring Activities*
  - *Curriculum or Methods Development*
  - *Outreach*





# About the High School 2 Health Care (HS2HC) Program

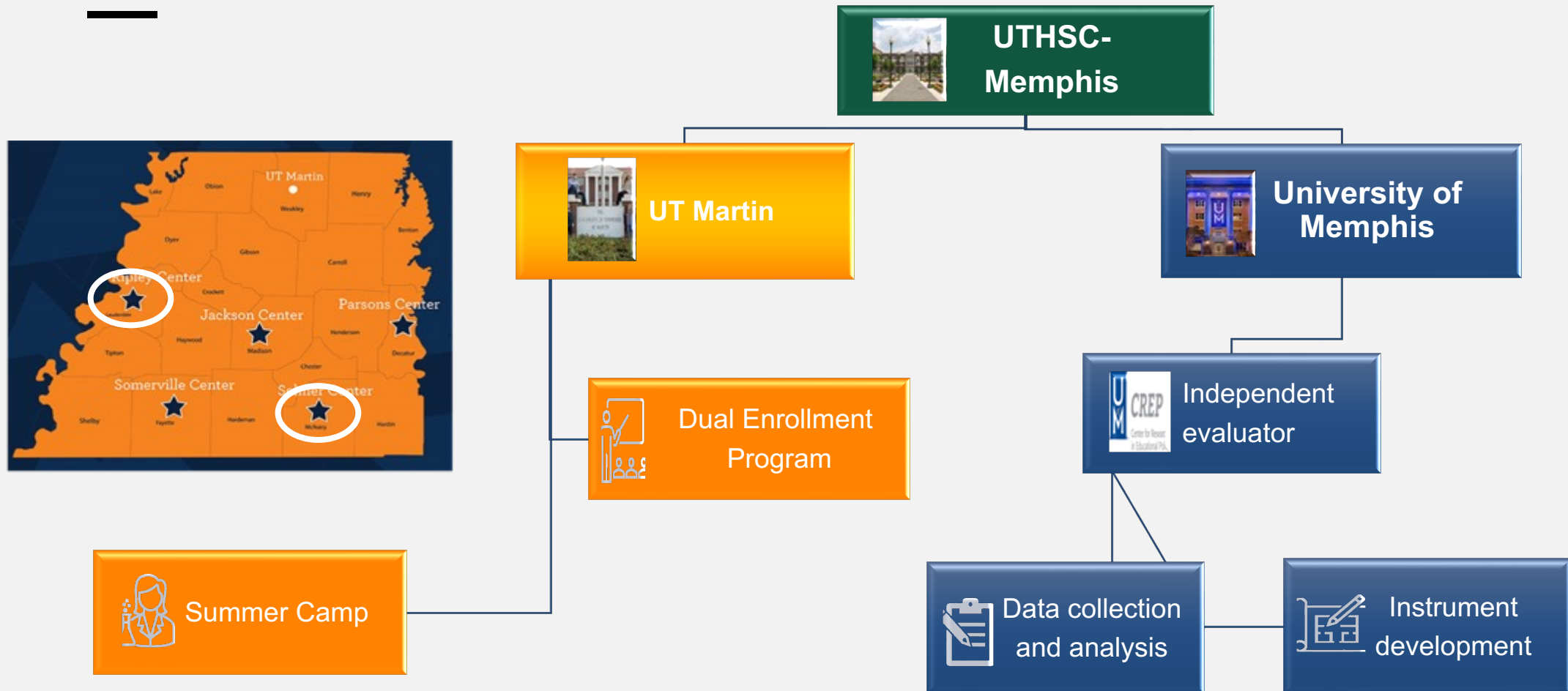
## NIGMS NIH-funded grant program

- Over \$1.2 million
- 5-year award (2022-2027)

## Sought to address:

- High levels of unemployment in rural Tennessee
- Need for qualified lab and data science professionals in the State of Tennessee
- Promote lab and public health information technology education in a region where health care is a primary workforce focus

# HS2HC Collaboration Statewide to Provide Programming and Research in CLS/PHIT



# Specific Purpose of the HS2HC Program

Promote MLS and PHIT professions in TN High Schools

Introduce MLS/PHIT content into the current STEM curriculum

- Provide free training and course content about NGSS and CLS/PHIT to high school teachers that can be integrated into their current courses
- Provide pipelines to students interested in MLS/PHIT professions
- Offer free programs that provide knowledge and training to teachers and students in CLS/PHIT content

# What does the HS2HC Program Offer?

Online Dual Enrollment course for High School students (grades 11-12)

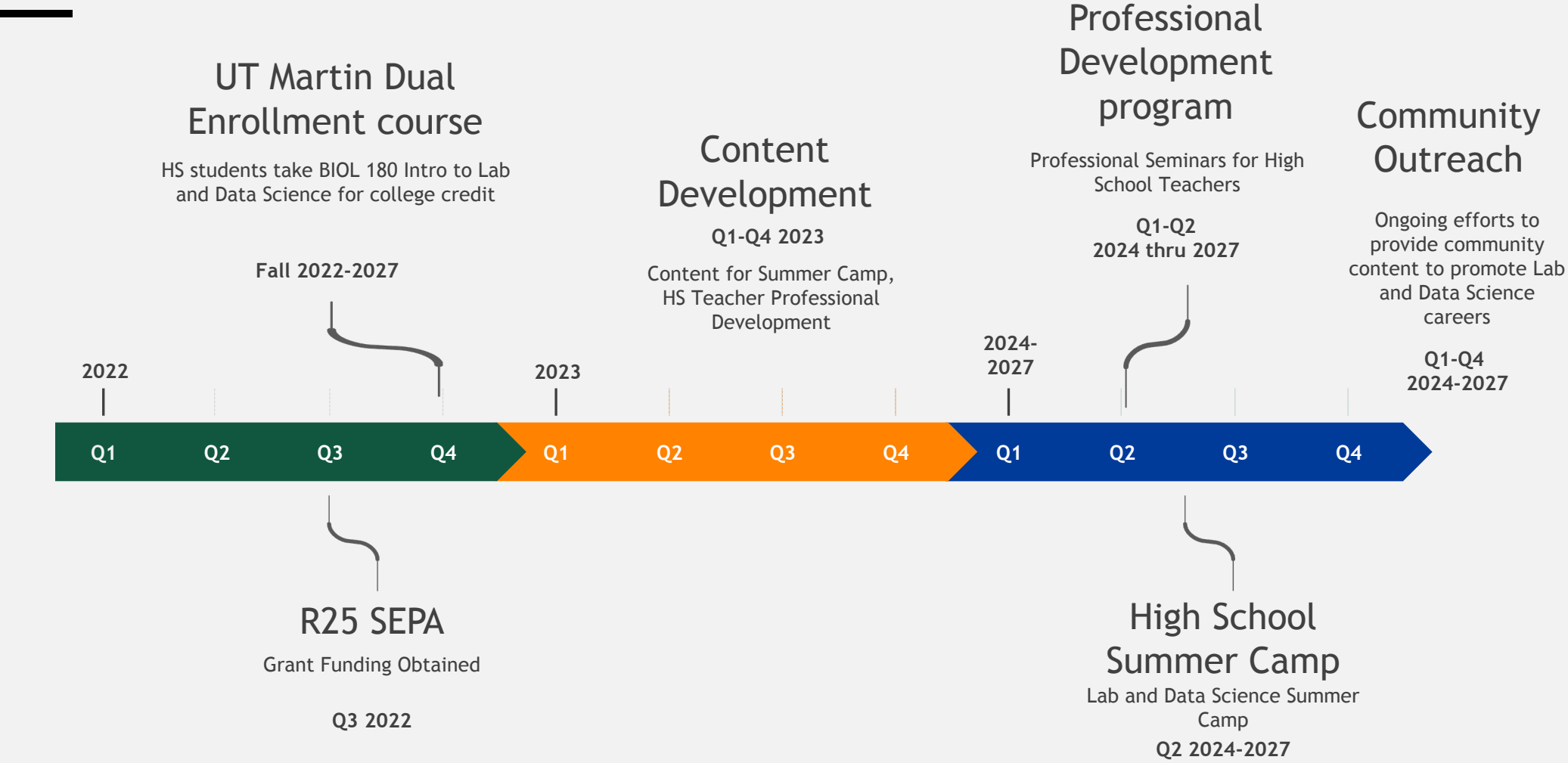
- Collaboration with UT Martin
- BIOL 180 Intro to Laboratory and Data Science

Free 1-week Lab and Data Science Summer Camp (grades 9-12)

Free High School Teacher Professional Training

- NGSS Standards
- Free CLS/PHIT materials
- Integration of CLS/PHIT Content into current curricula

# How is the HS2HC Program Structured?



# What are the HS Student Benefits of HS2HC?

- Increase awareness and knowledge of CLS/PHIT careers
- Explore real-life CLS/PHIT content with fun activities in a camp setting
- Improve health literacy in self and families
- College credit for BIOL 180 course



# What are the HS Teacher Benefits of HS2HC?

- Increase awareness of and how to promote CLS/PHIT careers
- Applying NGSS standards to CLS/PHIT curricula
- Use real-world health data to inform STEM programming
- Free prepared curricula for implementation in current science courses
- Mentoring from College Faculty in CLS/PHIT content



# What are the HS State Benefits of HS2HC?

- Increase awareness and promotion of CLS/PHIT careers in high school education
- Create educational pipelines for professional training in CLS/PHIT
- Improve health literacy in families





# Promoting Diversity in STEM Graduate Education

Donald B. Thomason, Ph.D.

Dean, College of Graduate Health Sciences

The UT Health Science Center

# Basic Building Blocks

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- Develop an ecosystem
- Outreach
- Admissions



Ecosystem – a group of interconnected elements that can function as a whole

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- Maintain interest in K-12 students
  - Memphis STEM ecosystem
  - Physical presence by our graduate students and Postdoctoral Scholars
  - Establish relationships with the teachers to help provide STEM curriculum



Ecosystem – a group of interconnected elements that can function as a whole

- Opening up possibilities for undergraduates
  - Summer Research Scholars Program
  - Expansion of SRS to include BSURE students



## Outreach – making trusted connections

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- Active recruiting
  - Building relationships with influencers
  - Marketing the programs
- Graduate students as ambassadors





# Admissions

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- Holistic
  - GRE optional
  - Letters of recommendation
  - Interviews, on campus visits
- Long-standing knowledge about applicants



# CGHS Demographic Trends

