



**Committee:** ECON  
**Committee Review:** Completed  
**Staff:** Marlene Michaelson, Executive Director  
**Purpose:** To make preliminary decisions – straw vote expected  
**Keywords:** Economic Development

AGENDA ITEM #7  
 May 11, 2023  
**Worksession**

**SUBJECT**

FY24 Operating Budget: UM 3 – Institute for Health Computing Non-Departmental Account

**EXPECTED ATTENDEES**

None

**FY24 COUNTY EXECUTIVE RECOMMENDATION**

	<b>FY23 Approved</b>	<b>FY23 Supplemental Appropriation</b>	<b>FY24 CE Recommended</b>
<b>UM3 NDA - Total</b>	<b>\$0</b>	<b>\$15,000,000</b>	<b>\$5,000,000</b>
Personnel Costs	\$0 0 FTEs	\$0 0 FTEs	0 0 FTEs
Operating Costs	\$0	\$15,000,000	\$5,000,000
<b>Total Expenditures (All Funds)</b>	<b>\$0</b> <b>0 FTEs</b>	<b>\$15,000,000</b> <b>0 FTEs</b>	<b>5,000,000</b>

**COMMITTEE RECOMMENDATIONS**

- Reduce FY24 funding by \$1.3 million since money allocated for lease payments in FY23 was not used due to delayed occupancy.
- Continue to strongly support the project and an overall commitment for \$40 million over six years.

**SUMMARY OF KEY ISSUES**

- The UM3 Institute for Health Computing did not open in February/March as originally anticipated and is now projected to open early in FY24. The delay means that money allocated for lease payments in FY23 was not used and is available to offset some of the FY24 appropriation.

**This report contains:**

Staff Report	Pages 1-3
Executive recommended FY24 UM3 – Institute for Health Computing budget	© 1
MOU for UM3 – Institute for Health Computing Collaboration	© 2
Racial Equity Statement for Special Appropriation to support the Institute	© 18

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**MEMORANDUM**

April 26, 2023

TO: Economic Development (ECON) Committee

FROM: Marlene Michaelson, Executive Director

SUBJECT: **FY24 Operating Budget – UM3 – Institute for Health Computing Non-Departmental Account**

PURPOSE: Make recommendations for Council consideration

**Expected Participants:**

Tom Lewis, Development Ombudsman, Office of the County Executive (CEX)  
Jake Weissmann, Assistant Chief Administrative Officer, Office of the County Executive (CEX)  
Julie Knight, Fiscal and Policy Analyst, Office of Management and Budget (OMB)  
Dr. Amitabh Varshney, Dean – School of Computer, Mathematical and Natural Science, University of Maryland, College Park  
Dr. Brad Maron, Sr Assoc Dean – Precision Medicine, UM School of Medicine; Co-Director and Director – Scientific Operations, UM Institute for Health Computing

**I. Background**

The Executive’s recommendation for this new non-department account (NDA) budget is shown on ©1. The UM3 Institute for Health Computer (IHC) will explore how artificial intelligence, machine learning and clinical analytics can facilitate knowledge discovery for human health and wellbeing. It is being developed through a partnership with the County, the University of Maryland, Baltimore, the University of Maryland, College Park, and the University of Maryland Medical System Corporation. The IHC was first funded by the Council in November 2022. Attached on © 2-17 is the Memorandum of Understanding among the parties.

Ultimately IHC will be the anchor of a new research-focused, transit-oriented, mixed-use development on the WMATA property at the North Bethesda Metro Station. The goal is to create a life science focal point in the middle of the Montgomery County Red Line/Rockville Pike Corridor at the North Bethesda Metro Station that links the public sector assets in Bethesda (National Institutes of Health (NIH) and Bethesda Naval Hospital/Walter Reed) to the world-leading, p+private sector life science companies located in Montgomery County’s Shady Grove

Life Science Cluster. While the permanent location for IHC is being planned, designed, and constructed, it will be located in rental space in the North Bethesda area.

The projected timeline presented to the Council when it approved the Special Appropriation including the following milestones:

- Nov. 15 to Feb. 1 (dependent on date of MOU and subject to Council budget approval) – Recruitment of leadership, signing of lease, and beginning of purchases for computational equipment (note: much of the required equipment is specialized and some may be subject to supply chain issues).
- Feb./March – Opening of Institute in leased space with Institute senior staff and leadership (subject to transition timing for senior leaders).
- March through October 1, 2023 – Buildout and installation completion for initial computational assets beginning in FY 23 and continuing into the beginning of FY 24. Continue staffing up.
- FY 28-29 – Expectation is to move to a permanent building or larger space in a shared building on the Washington Metropolitan Area Transit Authority (WMATA) property at North Bethesda Metro Station

In response to staff questions, Executive staff indicated that they will not sign a lease until late FY23 or early FY24 and do not believe the physical space will be available until July 1 or shortly thereafter.

## **II. Budget Overview**

The County provided \$15 million seed funding and committed to contributing \$5 million toward the cost of operations for 5 years beginning in FY24 (for a total of \$40 million). After six years, the Institute is expected to be self-supporting. The County contribution towards the startup costs was broken down as follows:

- \$3.0 million for new equipment
- \$1.6 million for installation staff and services
- \$3.0 million for tenant improvements (e.g., raise the ceiling of the leased floor)
- \$1.3 million for the lease
- \$6.3 million for staff costs of the new Institute (e.g., the research team)

The anticipated funding commitments from the Universities for the new Institute (in addition to previously spent money on create the Center on Artificial Intelligence) include:

- \$10 million during the next three years to purchase related health system clinical data.
- \$5 million annually for ongoing operating expenses of the new Institute.

## **III. FY24 Funding**

Delays in selecting a site mean the Institute did not open in February/March as anticipated and there is still uncertainty about the exact date of occupancy. While the opening date is delayed, staff believes that funding provided in the \$15 million special appropriation late in calendar year 2022

for staffing, equipment, installation, and tenant services should remain available to facilitate occupancy as soon as they have selected a rental site and completed lease negotiations. However, the portion of the special appropriation dedicated to lease payments in FY23 (\$1.3 million) will not be used and can be used to offset a portion of the FY24 operating costs. As noted above, the County agreed to contribution \$5 million to cover operating costs and University partners agreed to also provide \$5 million per year, both for a five-year period beginning in FY24. This should not change the County’s commitment to provide a total of \$40 million for the project but to make sure the money is available when needed. The Council should not appropriate more than necessary in FY24 given the fiscal constraints.

Since the County signed an MOU, staff recommends that \$3.5 be kept in the operating budget and unused lease payment of \$1.5 million in FY23 be rolled over to FY23 24 for this purpose.

#### **IV. Racial Equity and Social Justice**

The Office of Racial Equity and Social Justice did not conduct a review of NDAs for the FY24 budget. However, a Racial Equity Impact Statement was prepared in November 2022 when the Council was considering the Special Appropriation. It concluded that the Institute “has the potential to advance racial equity and social justice in the long-term, though its short-term impacts are unlikely to reduce racial inequities affecting employment and business ownership in life science and biotech industries.” Some of the other initiatives being considered by the ECON Committee are more directly linked to this goal.

<u>This packet contains:</u>	<u>Circle #</u>
Executive recommended FY24 UM3 – Institute for Health Computing budget	1
MOU for UM3 – Institute for Health Computing Collaboration	2
Racial Equity Statement for Special Appropriation to support the Institute	18

This NDA provides for the County's payment of two items to the State Retirement System:

- Maryland State Retirement System: Unfunded accrued liability, as established by the Maryland State Retirement System (MSRS), for employees hired prior to July 1, 1984, who are members of the MSRS (including former Department of Social Services employees hired prior to July 1, 1984), and for those who have retired (all County employees participated in the State Retirement System until 1965.) The County's contribution for this account is determined by State actuaries. Beginning in FY81, the amount due was placed on a 40-year amortization schedule. The funding of the 40-year amortization schedule was completed in FY20.
- State Library Retirement: Accrued liability for retirement costs for three Montgomery County Public Library retirees who are receiving a State retirement benefit. These were County employees prior to 1966 who opted to stay in the State plan. The County no longer receives bills for these costs.

FY24 Recommended Changes	Expenditures	FTEs
<b>FY23 Approved</b>	<b>3,754</b>	<b>0.00</b>
Decrease Cost: Funding Adjustment Due to End of Accrued Liability	(3,754)	0.00
<b>FY24 Recommended</b>	<b>0</b>	<b>0.00</b>

**☀ Takoma Park Library Annual Payments**

The annual amount provided in this NDA is a function of County expenditures for the Montgomery County Public Libraries (as a share of property tax-funded spending) and the City of Takoma Park's assessable base. The payment is authorized by Section 2-53 of the Montgomery County Code.

FY24 Recommended Changes	Expenditures	FTEs
<b>FY23 Approved</b>	<b>167,911</b>	<b>0.00</b>
Increase Cost: FY24 Reimbursement Calculation Increase	4,505	0.00
<b>FY24 Recommended</b>	<b>172,416</b>	<b>0.00</b>

**☀ Telecommunications**

This NDA provides the operating expenses appropriations for telecommunication charges incurred by departments, including land-line charges and Private Branch Exchange System (PBX) maintenance and support charges. Prior to FY17, the Department of Technology Services charged individual departments and funds for expenses incurred.

FY24 Recommended Changes	Expenditures	FTEs
<b>FY23 Approved</b>	<b>5,356,382</b>	<b>0.00</b>
Add: Cloud Subscription	200,000	0.00
Reduce: Verizon Disconnects	(200,000)	0.00
Decrease Cost: Transition to Hybrid Phone System	(270,256)	0.00
<b>FY24 Recommended</b>	<b>5,086,126</b>	<b>0.00</b>

**☀ UM 3 - Institute for Health Computing**

In cooperation with partners in the University of Maryland System, including the University of Maryland College Park, University of Maryland, Baltimore, University of Maryland Medical Center, Universities at Shady Grove, and others, the Institute for Health Computing (UM-IHC) is a planned research facility and academic presence at the North Bethesda Metro Station in the Pike District that will serve as an anchor and attraction to developers and businesses. The Institute will include research in Artificial Intelligence (AI), Machine Learning and Virtual and Augmented Reality (VR/AR). The new facility will bring together world-class researchers from the University System of Maryland's partner institutions prominent in artificial intelligence, machine learning, and the virtual/augmented reality fields with researchers and clinicians at the UMMS. The Institute is expected to open in leased space in early 2023, with final completion of laboratory and office space at the North Bethesda Metro location in 2028.

FY24 Recommended Changes	Expenditures	FTEs
<b>FY23 Approved</b>	<b>0</b>	<b>0.00</b>
Enhance: Operating Expenditures by the Universities for Ongoing Space, Staffing, Electrical and Infrastructure Costs of the Center	5,000,000	0.00



## MEMORANDUM OF UNDERSTANDING

This MEMORANDUM OF UNDERSTANDING ("MOU") is entered into by and among Montgomery County, Maryland (the "County"); University of Maryland, Baltimore ("UMB"); University of Maryland, College Park ("UMCP"); and University of Maryland Medical System Corporation ("UMMS"), each a "Party" and collectively the "Parties." UMB and UMCP are collectively referred to as the "Universities."

### BACKGROUND

The Parties agree to a collaboration that will be called "***The University of Maryland 3 - Institute for Health Computing (UM-3-IHC)***" (the "Institute") in North Bethesda, which will leverage UMMS's provision of customized unique and diverse de-identified data sets and bring together world-class researchers exploring how artificial intelligence ("AI"), machine learning ("ML"), and clinical analytics can facilitate knowledge discovery for human health and wellbeing.

The Institute will be a transformative collaboration between the County, UMMS, and the Universities to establish North Bethesda as a national epicenter of computationally enabled biomedical research, population health, and precision medicine.

The Institute will employ state-of-the-art analytics, algorithms, and computation to address fundamental challenges in clinical medicine through a unique partnership between the County, UMMS, and the Universities. Additionally, the Parties will work together to provide collaboration opportunities to the Universities at Shady Grove ("USG").

The Institute will catalyze a clinical data science ecosystem at North Bethesda that draws FDA and NIH investigators, UMB and UMCP faculty, medical bioinformatic educational programs and students, and industry partners, allowing expansion of computational "dry" laboratories, virtual meeting rooms and classrooms.

The Institute will connect the University of Maryland ecosystem, with appropriate federal and state government agencies (NIST, NIH, FDA, USAMRIID, AHRQ, Walter Reed, the Naval Medical Research Center), and industry partners.

The Institute will align three pillars of expertise to advance population health in the State of Maryland and to serve patients and communities through innovations in computation:

- UMB, home to top-ranked health science professional schools including Medicine, Nursing, Pharmacy and Dentistry.
- UMCP, harnessing state-of-the-art expertise in public health, AI, ML, and virtual and augmented reality ("VR/AR").
- University of Maryland Medical System Corporation ("UMMS"), which serves a 5.5 million patient population across allied member organizations, all linked through electronic health care records ("EHR"), and with a formal linkage to primary care and population health and historic and longitudinal data across the care continuum.

NOW THEREFORE, in consideration of the mutual promises set forth in this MOU and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the County, UMMS, UMB, and UMCP agree as follows:

1. Establishment of Institute.

a. The Parties agree that the Institute will advance clinical analytics and improve patient care, by using real-time access to patient populations, driven and refreshed by UMMS's custom de-identified data curation connected with electronic medical record (EMR) data, pursuant to appropriate data licenses:

- Real world data;
- Population health;
- Pragmatic adaptive clinical trials; and
- Immersive computing for medicine and healthcare.

b. Detailed information regarding the four initial major initiatives of the Institute is set forth on **Schedule A**, attached hereto and incorporated herein by reference. The Parties acknowledge that Schedule A is conceptual in nature, non-binding, and will be formalized in subsequent written agreements signed by authorized officials of the Parties.

c. As part of establishing the Institute, UMB, UMCP, and UMMS will create appropriate governing documents that establish the Institute's entity formation and govern the Institute's internal operations, including without limitation bylaws; an operating agreement; and agreements related to the use and protection of intellectual property, confidentiality, data use, and other relevant matters.



2. Goals. The project goals for the Institute are set forth on **Schedule B**, attached hereto and incorporated herein by reference. As with Schedule A, the Parties recognize that Schedule B is in early conceptual stages and will be formalized pursuant to subsequent written agreements signed by authorized officials of the Parties.

3. Commitments of Parties. The Parties' commitments under this MOU are as follows:

a. Subject to the appropriation and availability of funds and to a future grant agreement that the Parties will negotiate, the County intends to commit \$40 million to the Universities and UMMS to support the Institute over six years, starting in FY 2023 with a \$15 million Supplemental Budget amendment, then \$5 million per year for the following five fiscal years for operating support for the Institute.

b. The Universities commit to spending a roughly equivalent amount (although not on the same schedule) over the next six fiscal years. That amount may include funds already expended within the last three fiscal years by the Universities on aspects of AI, ML, and VR/AR that are directly related to the establishment of the programs at the Institute.

c. Subject to the appropriation and availability of funds, the County, commits to (and has already applied for) a \$3 million federal earmark for the Institute. Subject to federal budget approval, the County has been designated to receive that additional \$3 million in start-up funding.

i. Of the \$15 million FY 2023 County intended commitment for the Institute, \$3 million will be designated as the required match for the federal earmark, with the result that the combined County and federal start-up funding for the Institute will be \$18 million.

ii. The earmark funds are contingent on the passage of an omnibus budget for the fiscal year in the current term of Congress. If the earmark is not passed, the County does not commit to replace those federal funds with County funds.

d. The County, UMMS, and the Universities commit to jointly seek additional funding from the State of Maryland to support the programs of the Institute.

e. The County may assist the Universities in identifying appropriate leased space for the Institute in the area immediately around the North Bethesda Metro Station for the next five to six years. The Parties expect that the Institute will relocate to the WMATA property at the North Bethesda Metro Station (the "Intended Site") at the end of the lease (assuming that the development of that site is proceeding). If the Intended Site is not ready, the Institute will pursue an extension of the existing lease or lease another space in the immediate area but will not move outside the North Bethesda Metro Station property area.

f. The County has already committed \$10 million in infrastructure to support the development of the Intended Site to ensure that it is viable for development within the time

frame for the planned relocation of the Institute to a free-standing building on the Intended Site, or a portion of an appropriate shared building on the Intended Site. D

g. Insofar as permitted by law, the County commits to continuing its efforts to redevelop the surrounding area to support the environment in which the Institute will be located to help ensure its success. This provision does not bind the Montgomery County Council.

h. The County, through its business and economic development function, will also work with the Universities to identify private sector life sciences, hospitality, and other sector companies in Montgomery County that could benefit from the research and consulting services of the Institute.

4. Term and Termination.

a. The term of this MOU will commence upon the signing by all Parties, and will be in effect until December 31, 2028, unless terminated earlier in accordance with this Article. Any renewals of this MOU must be exercised by the mutual written agreement of the Parties hereto in advance of December 31, 2028.

b. In the event of any breach, default, or other failure by a Party to perform any material provision of this MOU, another Party may terminate this MOU if the breach, default, or other failure is not cured within one hundred eighty (180) days of written notice thereof, subject to the dispute resolution provisions herein and the subsequent written agreements that address Institute operations, wind-down, and/or amended activities of the Parties.

c. The Parties may terminate this MOU at any time for convenience by unanimous mutual written consent addressing all appropriate required wind-down actions and responsibilities.

5. Miscellaneous.

a. *Relationship of Parties.* The Parties are not (and nothing in this MOU may be construed to constitute them as) partners, joint venturers, agents, representatives, or employees of the other. No Party has any right or authority to bind or obligate another Party in any manner or make any representation or warranty on behalf of another Party.

b. *Liability of Parties.* The Parties agree that each Party shall be responsible for its own actions and omissions, and the acts or omissions of that Party's officers, employees, agents, and contractors, in the performance of this MOU. Furthermore, the liability of the Universities shall be governed exclusively by the terms and provisions of the Tort Claims Act, Title 12 of the State Government Article, Annotated Code of Maryland, as amended from time to time. The County's liability and performance under this MOU is subject to, limited by, and contingent upon the appropriation and availability of funds, as well as the notice requirements and damages limitations stated in the Local Government Tort Claims Act, Md. Code Ann., Cts. & Jud. Proc. Sec. 5-301, et seq. (the "LGTCA"); and Md. Code Ann., Cts. & Jud. Proc. §5-5A-02, (together the "County Indemnification Statutes"), all as amended from time to time. This MOU is not intended

to create any rights or causes of action in any third parties or to increase the Applicant's liability over and above the caps provided in the Indemnification Statutes. This MOU does not bind the County in its regulatory capacity.

c. *Insurance.* Each Party shall maintain adequate insurance, in the forms (including self-insurance), types and amounts, that it deems appropriate, in its sole and absolute discretion, for its provision of services under this MOU, including as applicable, professional liability, errors and omissions insurance, commercial general liability insurance, cyber liability insurance, and worker's compensation insurance.

d. *Confidential Information.* Prior to any sharing any confidential information, including but not limited to UMMS data, the Parties will enter into separate agreements to address confidentiality and data use.

e. *Notices.* Any written notice required under this MOU shall be sent to the attention of the signatories hereto at the addresses set forth on the signature page.

f. *Governing Law.* This MOU shall be governed by the laws of the State of Maryland without reference to its conflicts of laws principles.

g. *Modifications.* The Parties agree to periodically meet and discuss the terms of this MOU to make any necessary amendments or modifications. This MOU shall only be modified by written agreements signed by the authorized representatives of each Party.

h. *Disputes.* The Parties will work to resolve disputes amicably and shall elevate disputes to their chief executives if such disputes cannot be resolved at the project level within thirty (30) days of good faith resolution efforts. Additional executive resolution and collaboration procedures shall be memorialized in the anticipated operating agreement or other governing document between the Parties.

i. *Assignment.* This MOU and any rights and obligations hereunder shall not be assigned without the prior written consent of the non-assigning Parties, which shall not be unreasonably withheld.

j. *Waiver.* No provision of this Agreement shall be waived unless done so in a writing signed by all Parties to this MOU. The waiver of any provision of this MOU shall not be deemed to be a continuing waiver or the waiver of any other provision of this MOU.

k. *Entire Agreement.* This MOU and its attachments constitute the entire understandings of the Parties with respect to the subject matter of this MOU. All prior agreements, whether oral or written, are superseded by this MOU.

l. *Counterparts.* This MOU may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. Counterparts may be delivered via facsimile, electronic mail (including PDF or any electronic signature complying with the U.S. federal ESIGN Act of 2000, e.g., [www.docusign.com](http://www.docusign.com)),

or other transmission method. Any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes.

*[Signatures on following page]*

IN WITNESS WHEREOF, the parties enter into this Memorandum of Understanding.

**MONTGOMERY COUNTY**

By: \_\_\_\_\_  
Marc Elrich  
County Executive

Date: \_\_\_\_\_

*Address: 101 Monroe Street, 2nd Floor  
Rockville, MD 20850*

**UNIVERSITY OF MARYLAND, BALTIMORE**

By: \_\_\_\_\_  
Bruce E. Jarrell, MD, FACS  
President

Date: \_\_\_\_\_

*Address: Office of the President  
220 Arch Street, 14<sup>th</sup> Floor  
Baltimore, Maryland 21201*

**UNIVERSITY OF MARYLAND, COLLEGE PARK**

By: \_\_\_\_\_  
Darryll J. Pines, PhD  
President

Date: \_\_\_\_\_

*Address: Office of the President  
Main Administration Building  
7901 Regents Drive  
College Park, MD 20742-5025*

**UNIVERSITY OF MARYLAND MEDICAL SYSTEM CORPORATION**

By: \_\_\_\_\_  
Mohan Suntha, MD, MBA  
President and CEO

Date: \_\_\_\_\_

*Address: 250 West Pratt Street  
Baltimore, Maryland 21201*

**SCHEDULE A**  
**MAJOR INITIATIVES**

Real-time access to patient populations, driven and refreshed by electronic medical record (EMR) data

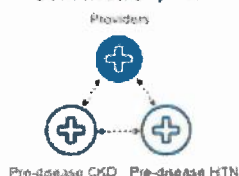
**• Real world data**

Provide investigators with data and analytics to develop study protocols and pursue grants



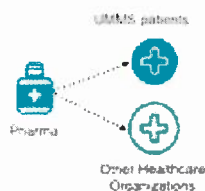
**• Population health**

Identify Pre-disease markers from E.H.R. and activate E-consultation, care coordination, TX



**• Pragmatic trials**

Initiate embedded, pragmatic, adaptive, clinical trials using AI-based outcomes



**• Immersive computing**

Develop immersive computing based next-generation training and analytics



1. **Real-World Data:** Harmonize and analyze UMMS clinical data and UMB research data to create multi-omics and real-world clinical information data sets to advance systems biology and clinical analytics. De-identification systems with removal of >16 identifiers allow for HIPAA-compliant (as applicable) data sharing and analysis across the University of Maryland ecosystem.
  - a. Examples of real-world data include the use of ML algorithms to study emerging disease and risk stratification, such as the risk factors for development of early kidney disease, early predictors of risk in pregnancy, and predictors for the development of addiction and overdose.
  - b. Real-world health records are being increasingly characterized by multiple data streams of heterogeneous data, such as biomedical sensors in an ICU (temperature, blood pressure, respiratory rate), real-time brain imaging (fMRI, fNIRS, EEG, or MEG), and several other sources. Systemic approaches to developing real-time algorithms, software systems and toolkits for ingestion, filtering, visualizing, and analyzing multiple interacting data streams will revolutionize the use of big data in health care and medicine.
  
2. **Population Health:** UMMS has a uniquely diverse and vulnerable patient population, presenting a critically important opportunity to identify early signs of disease that are easily accessible from the electronic health care record. Programs will be developed to reach out to patients with these risk factors via electronic consultation, nurse educators and care coordinators, and specialty services to recommend early interventions and to partner with the primary care community and patients to bend the curve of “pre-disease” towards health.

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Schedule A: Page 1

*CONFIDENTIAL INTRA-AGENCY MATERIAL. DO NOT ALLOW INSPECTION OR RELEASE WITHOUT AUTHORIZATION. (Maryland Public Information Act, General Provisions Article, §4-344, Annotated Code of Maryland)*

- a. Examples include programs that identify pre-diabetes or out of control diabetes using lab values like high glucose and hemoglobin A1C to target health education and drug treatment. Similar approaches target early kidney disease by rising creatinine, and early high blood pressure in pregnancy, known to worsen pregnancy outcomes. Identification of rapidly rising weight allows opportunities to improve healthy living, target food desserts, and introduce new highly potent weight loss treatments, like the GLP1 agonists and SGLT-2 inhibitors.
  - b. As physicians and scientists engage with data-driven models of disease progression, it is critical that they incorporate fairness from the ground up by bringing together scholars of medicine, data science, and AI/ML with members of the very communities suffering from the burdens of race and history. Disparities in race, gender, and socioeconomic status impact healthcare systems in ways that are hard to identify, and yet they are often reproduced in biased AI/ML predictions because their training data incorporate biases arising from population health disparities.
3. **Pragmatic Adaptive Clinical Trials:** The future of clinical research is to move the trials outside of the “white tower” of academic medical centers and into the community. Patients can be identified through the EHR after diagnosis in outpatient clinics and regional hospitals.

The EHR is “flagged” to ask if the doctor and patient want to enroll in an intervention trial of a new therapy and then a research coordinator remotely calls the patient and family for consent. The patient is randomized to treatment A, B, C, vs. placebo, and outcomes are monitored continuously by blinded artificial intelligence protocols that assess pre-specified efficacy outcomes in the electronic health care record, e.g., *Which treatment is working better to improve organ function, survival, hospitalization, etc.?*

If one treatment is better than the other, the next patients are adaptively randomized in greater and greater proportions to the treatments that work, thus limiting the risk of a patient receiving a treatment that does not work. Once a treatment is statistically superior, the trial is automatically stopped.

- Examples include the REMAP-CAP clinical trials group which adaptively randomized patients with SARS-CoV2 in hundreds of regional hospitals and rapidly established the efficacy of hydrocortisone, anti-IL6, and heparinization, improving mortality during severe COVID-19 pneumonia.
4. **Immersive Computing for Medicine and Healthcare:** Metaverse is the next horizon in healthcare. Immersive VR/AR for medical training has the potential to fundamentally change, improve, and reduce the cost of training and maintaining skills across all aspects of healthcare—in Maryland, across the United States, and in developing countries worldwide.

The Institute will develop VR tools for medical education and training for several scenarios including: (a) clinical encounters and patient interviews, (b) planned medical surgeries and medical procedures, and (c) time-critical surgeries at a shock-trauma center.

The Institute's goal is to facilitate an immersive experience of such medical encounters and procedures, in the form of immersive playback from high-fidelity VR recordings that can be navigated in space and time. Annotations (multimedia, text, graphics) added by experts could further enhance the effectiveness of such reconstructions as compelling education, communication, and archival tools.

Currently, surgeons and other healthcare providers must simply remember how to perform operations. This is especially problematic for complex and often emergent operations like femoral artery closure, upper extremity fasciotomy, and subclavian artery procedures. Immersive VR for training has the potential to fundamentally change, improve, and reduce the cost of training and maintaining skills in these procedures, and across all aspects of healthcare.

The State of Maryland is fortunate to have what is arguably the world's finest trauma care facility, the R Adams Cowley Shock Trauma Center in Baltimore. Known simply as "Shock Trauma," the center admits more than 8,000 critically ill and injured patients each year, with a survival rate of approximately 96 percent.

Shock Trauma, working closely with computer science experts at UMCP, will develop a unique program at the Institute that would use the latest advances in immersive networked technologies—VR/AR over 5G networks—to train emergency care providers in Maryland, in the nation, and around the world. These emerging technologies could be rapidly deployed and scaled up, and prototypes of various systems are already under development.

- One example is a virtual training system in development that provides an almost lifelike experience in conducting a lower extremity fasciotomy (LEF), a limb-saving technique of cutting the sheath of tissue encasing a muscle to treat loss of circulation.
- Other telepresence training modules would address the latest advances in onsite stabilization and transportation to medical facilities, specialized diagnostic imaging techniques, emergency airway intubation, and more.

The immersive technologies being developed by Shock Trauma, UMB, and UMCP can be easily scaled up over 5G networks, offering time-critical expertise to almost any number of physicians at virtually any location that has internet access. This includes rural areas in Maryland, which could be used as a testbed for these lifesaving training modules before they are deployed on a global scale.



**SCHEDULE B**  
**CONCRETE PROJECT GOALS**

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**Years 1-2:**

1. Establish initial (temporary) location and begin first endeavors utilizing existing MPower projects.
2. Consolidate de-identified electronic health care data from inpatient and outpatient practices of UMMS and University of Maryland Faculty Physicians, Inc. (“FPI”) into a central data warehouse (and cloud-based systems). This is largely complete (real-world data is currently accessible and informs the demographic presentations contemplated in this MOU).
3. Design deidentification systems to allow clinical and multi-omics patient-centered real-world investigation available at the investigators’ desktops.
4. Design HIPAA-protected clinical analytics systems to improve the efficiency and quality of patient care, design and initiate pragmatic and adaptive clinical trials, and support implementation science.
5. Recruit Institute Director(s), Center Director(s), and data scientists with dual appointments and physical presence at UMMS, the Institute, UMB and/or UMCP. This could include additional physical presence of the director at the Universities at Shady Grove.
  - Examples include population health focused on maternal health, disparities, cardiovascular, renal, oncology, and infectious disease, pharmacoepidemiology, climate medicine, real-world data ML, quantum-biomedical computing, emerging pathogen detection, precision medicine, patient-centered drug design, and pragmatic adaptive clinical trials.
6. Leverage existing educational programs at Universities at Shady Grove and develop “big data” and VR/AR training programs (undergraduate, masters, and graduate programs) virtually and physically integrating with the Institute. Capitalize on undergraduate and graduate student experiential learning opportunities as research integrated with the Institute.
7. Assess the existing and potential partnerships with NIH, NIST AHRQ, FDA, and other federal agencies.

**Years 3-5**

1. Plan and build a new, permanent home for the Institute at the Intended Site.
2. Consolidate multi-omics data sets, provisioned by UMMS, from UMB basic and translational research into a central data warehouse (or cloud-based systems) including genomics,

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Schedule B: Page 1

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(Maryland Public Information Act, General Provisions Article, §4-344, Annotated Code of Maryland)*

transcriptomics, proteomics, metabolomics, lipidomics, and phenomics for project-based and systems-based analysis.

3. Use clinical and linked population-based data analytics to drive programs in population health that identify early disease or pre-disease risk factors and deliver targeted preventive health care for individuals and target populations.
4. Expand embedded randomized adaptive pragmatic clinical trials architecture in all UMMS hospitals and UMMS/FPI clinics.
5. Develop population-based clinical analytics and data-driven interventions designed to eliminate unconscious bias and health care disparity and inequity.
6. Develop competitively funded project partnerships between UMB, UMCP and UMMS that break down silos and catalyze partnerships between basic, clinical, population health, and computational science domains.

### **Program Leadership**

Leadership will be tasked with an overarching mission to rapidly develop the infrastructure and architecture to leverage the vast clinical and biological sciences information in UMMS and UMB, which must be coupled to a parallel major initiative to recruit data scientists and train the next generation of data scientists at UMCP. These data will not be useful without a rich ecosystem of translational data scientists, and the scientists will not succeed without access to rich data sources. These catalytic investments are expected to drive NIH, Patient-Centered Outcomes Research Institute (PCORI), State, County, and industry funding and partnerships.

Dr. Amitabh Varshney, Dean of the University of Maryland College of Computer, Mathematical, and Natural Sciences, and Dr. Mark T. Gladwin, Dean of the University of Maryland School of Medicine will oversee the recruitment of three key leaders representing UMB, UMCP, and UMMS. Dr. Warren D'Souza, PhD, MBA, FAAPM, Vice President, Enterprise Data and Analytics and Chief Innovation Officer, UMMS, will lead the UMMS efforts with additional resources dedicated immediately to accelerate the development of data integration, distribution, programming, and clinical analytics in collaboration with computational partners from UMCP to accelerate development.

Three Institute Directors will be assigned as interim or recruited as co-Institute Directors: one co-Institute Director from UMMS, Warren D'Souza; one co-Institute Director from UMB, ideally a physician-scientist and an expert in systems biology and clinical analytics (real-world evidence, pragmatic and adaptive clinical trials, multi-omics systems biology); and a second co-Institute director from UMCP, who is an expert in mixed reality, advanced computing, and AI.

The Deans and Institute Directors will recruit Center Directors and data scientists, as well as align current faculty, to "mine, analyze, and visualize" the real-world data and develop programming strategies to embed new population health initiatives and pragmatic trials structure into the

electronic health care record and regional hospital/clinic environments. This will require additional recruits in complementary areas of computational science (programming, VR/AR, advanced statistics, and AI/ML Bayesian outcomes analysis).

The Deans and Institute Directors are expected to develop robust partnerships with community representatives, NIH, FDA, DOD, and industry allies to advance the scientific, clinical, and regional development missions.

## North Bethesda Institute Capital Expenditures

### EQUIPMENT

(40) TensorEX TS4-194492555 @ \$12,089.45	\$483,578.00
(320) Nvidia A6000 GPU @ \$4,450.00	\$1,424,000.00
(10) APC AR3100 42U Rack @ \$1,303.19	\$13,031.90
(10) ServerTech Dual PDU Bundle @ \$4,352.00	\$43,520.00
(4) Mellanox SN4600C 100GbE Switch @ \$29,769.83	\$119,079.32
(20) DellEMC H400 Storage Node @ \$28,073.94	\$561,478.80
(20) VR/AR computers with headsets and displays	\$120,000.00
(2) High intensity laser projectors	\$220,000.00
<b>SUB-TOTAL EQUIPMENT (CDS REQUEST)</b>	<b>\$2,984,688.02</b>

### INSTALLATION PERSONNEL

IT Director, 20% FTE	\$33,937.28
Platform Engineer, 2 FTE	\$203,548.80
Network Engineer, 30% FTE	\$22,270.56
Help Desk Manager, 40% FTE	\$30,542.72
<b>INSTALLATION PERSONNEL</b>	<b>\$290,299.36</b>

### FRINGE BENEFITS

Calculated @ 35.40 or 29.30% for the personnel	\$85,057.71
<b>TOTAL INSTALLATION PERSONNEL COSTS</b>	<b>\$375,357.07</b>

Annual Computer Networking and Electricity	\$298,468.80
Hardware Service Contract	\$447,703.20
<b>TOTAL INSTALLATION and SERVICE</b>	<b>\$1,121,529.08</b>

<b>Data Center Renovations (raised floor, HVAC, Power)</b>	<b>\$1,000,000.00</b>
<b>Office Renovations from the Shell Space</b>	<b>\$2,000,000.00</b>
<b>Space Lease 25,000 sq ft @ \$50/sq ft</b>	<b>\$1,250,000.00</b>
<b>Startup Costs for New Professional Researchers &amp; Faculty at North Bethesda Institute</b>	<b>\$6,268,425.00</b>

Recruit start up for PIs and research teams on site for three areas:  
 SOM Co-director of institute, Center director or PI focused on  
 Population health, Center director or PI focused on Real world  
 data-clinical analytics.

<b>TOTAL INSTALLATION and INSTITUTE COSTS</b>	<b>\$14,999,999.17</b>
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***Projected Milestones/Timeline:***

- 11/1/22 – Introduction of \$15M Supplemental Budget Proposal – Institute
- 11/15/22 – Council Hearing on \$15M Supplemental for Institute – Testimony expected Office of the County Executive, Development Ombudsman, and Dean of partnering University computational sciences department.
- Mid-November - (date between 11/10 and 11/17, yet to be determined) – MOU signature between County and Partnering Universities’ Presidents.
- Nov. 15 to Feb. 1 (dependent on date of MOU and subject to Council budget approval) – Recruitment of leadership, signing of lease, and beginning of purchases for computational equipment (note: much of the required equipment is specialized and some may be subject to supply chain issues).
- Feb./March – Opening of Institute in leased space with Institute senior staff and leadership (subject to transition timing for senior leaders).
- March through October 1, 2023 – Buildout and installation completion for initial computational assets beginning in FY 23 and continuing into the beginning of FY 24. Continue staffing up.
- FY 28-29 – Expectation is to move to permanent building or larger space in a shared building on the Washington Metropolitan Area Transit Authority (WMATA) property at North Bethesda Metro Station.

***Commitments:***

***By County:***

- \$40M to the Universities to support the Institute at North Bethesda over six (6) years:
  - \$15M in FY 23 (Supplemental Budget Appropriation Required);
  - \$5M per year for five (5) years beginning in FY 24.

***By Universities:***

- Establishment of a joint Institute for Intelligent and Immersive Computing for Life Sciences and Medicine at North Bethesda and commit to spending a roughly equivalent amount of funds as the County, although not on the same schedule, over the next six (6) years:
  - \$23M spent between 2018 and 2022 in faculty and staff expense in anticipation of establishing a Center on AI and VR/AR (many of whom will remain in UMCP).
  - \$2M per year for at least five (5) years for a total expenditure of \$10M beginning in 2021 and extending through at least the first three (3) years for an “informatics core” for the translation and application of raw, anonymized data to clinical research.

- At least \$10M in funding in the first three (3) years for an expedited ramp-up of related health system clinical data analytics necessary to support the ongoing operation and innovation
- At least \$5M per year in operating expenditures by the Universities to meet the ongoing space, staffing, electrical and infrastructure costs of the Center, matching the County expenditures for the first five (5) full years of operations.
- After year six (6), it is anticipated that the Center will sustain itself without the support of the County, through research consulting with private life sciences and other private corporate entities, federal grants, and continued support from the Universities where necessary.

*By County and Universities Jointly:*

- The County and the Universities commit to jointly seek significant additional funding from the State to support the programs at the Institute at North Bethesda.
- The County and the Universities commit to applying their current diversity and inclusion commitments to this project, and further commit to make a conscious focus on including research that addresses disease that has disproportionate impact on minority populations.



OFFICE OF RACIAL EQUITY AND SOCIAL JUSTICE

Marc Elrich  
County Executive

Tiffany Ward  
Director and Chief Equity Officer

MEMORANDUM

November 28, 2022

To: Jennifer Bryant, Director  
Office of Management and Budget

From: Tiffany Ward, Director  
Office of Racial Equity and Social Justice *Tiffany Ward*

Re: Racial Equity Impact Assessment (REIA) for Supplemental Appropriation (SA) #23-49 Institute for Intelligent and Immersive Computing for Life Science and Medicine

- I. **FINDING:** The Office of Racial Equity and Social Justice (ORESJ) finds that Supplemental Appropriation #23-49 Institute for Intelligent and Immersive Computing for Life Science and Medicine has the potential to advance racial equity and social justice in the long-term, though its short-term impacts are unlikely to reduce racial inequities affecting employment and business ownership in life science and biotech industries.
- II. **BACKGROUND:** The purpose of Supplemental Appropriation #23-49 Institute for Intelligent and Immersive Computing for Life Science and Medicine is to provide start-up and operational funds for said Institute, which is envisioned to support the County's life science industry and employment base. Researchers at the Institute will conduct advanced computing research in Artificial Intelligence, Machine Learning, and Virtual and Augmented Reality (VR/AR) and will support advanced (VR/AR) research and training capabilities in life sciences and manufacturing in the County. The Institute will be headquartered in the vicinity of the North Bethesda Metro Station and operate in partnership with the University of Maryland College Park and the University of Maryland Baltimore.

Based on available information, the Institute will support the County in the following ways:

- Enhance the County's academic research capabilities

- Complement higher education assets at the University of Shady Grove and Montgomery College
- Support private-sector life sciences industry; create new high-paying jobs
- Attract high-tech companies to the area
- Produce research that advances public health and related fields.

For this racial equity impact assessment, ORESJ will focus on the extent to which the Institute advances racial equity in the areas of education and employment in the life science industry (and STEM fields more broadly). ORESJ will also offer recommendations for how the Institute can help strengthen the County's small business ecosystem and advance equitable access for business owners of color, women, and other structurally excluded groups.

### **Employment and Education:**

One of the main goals of the Institute is to create new, high-paying jobs in the life science industry. It is estimated that within the first three years of operation, the Institute will hire approximately 120 employees. The following is a snapshot of the life sciences industry in the County, including top subfields and major occupations and their wages.

In the County, the second-largest industry (based on the number of jobs) is the Professional, Scientific, and Technical Services industry, with approximately 75,000 jobs in 2020<sup>1</sup>. The fifth-largest subsector in this industry is Research and Development in Biotechnology (an area in which the Institute will operate), which is expected to grow by 7% by 2025<sup>2</sup>. Within the R&D in the Biotechnology subsector, the largest occupation group is Medical Scientists (except epidemiologist) at 12.1%, followed by Natural Sciences Managers at 6.7% and Biological Scientists, All Others at 4.5%<sup>3</sup>. According to the US Bureau of Labor Statistics (BLS), life and physical science occupations are generally higher paid than the average of all occupations. This is largely due to the education and skills required to work in these professions<sup>4</sup>. For example, in Montgomery County in 2020, the top qualifications in the Biotechnology and Life Sciences were Doctor of Pharmacy (PharmD), Doctor of Medicine (MD), medical license, Master of Business Administration (MBA), and Medical Technologist. For the top three occupations in the biotechnology subsector in Montgomery County, the hourly mean wage in Maryland in 2021 is as follows<sup>5</sup>:

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<sup>1</sup> WorkSource Montgomery. Local Area Workforce Plan. 2020-2024. Available at: <http://worksourcemontgomery.com/wp-content/uploads/2022/01/2020-2024-Montgomery-County-Local-Workforce-Plan.pdf>

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> John I. Jones. "A Concise Look at Occupations in the Life and Physical Sciences". 2007. Available at: <https://www.bls.gov/oes/physical.pdf>

<sup>5</sup> Occupational Employment and Wage Statistics. May 2021 State Occupational Employment and Wages Statistics. Maryland. Available at: [https://www.bls.gov/oes/current/oes\\_md.htm#19-0000](https://www.bls.gov/oes/current/oes_md.htm#19-0000)



Occupation	Mean hourly wage in Maryland
Medical Scientist (except epidemiologist)	\$52.36
Natural Sciences Manager	\$70.96
Biological Scientists, all other	\$51.85

Wages from these occupations exceed the self-sufficiency standard in Montgomery County in 2019—\$23/hour, \$8,096/month, and \$97,150<sup>6</sup>.

Based on the Institute’s research emphasis, it’s likely that many if not all the initial Institute jobs will fall into these three occupation categories. It is, therefore, clear that those initially employed by the Institute are likely to earn wages higher than the County’s self-sufficiency standard, creating sustained economic security for those hired by the Institute.

Given the likely economic benefits created by jobs at the Institute, ORESJ looked at employment trends across the top three occupations within the R&D in the Biotechnology subsector in the county (Medical Scientist (except epidemiologist), Natural sciences managers, and Biological Scientists, all other) as well as the three subfields making up the Professional and Technical Services industry to assess whether employment in these occupations is equitable by race, ethnicity, and gender. Using national data from 2021, ORESJ found an underrepresentation of Black and Latino workers in these three occupations. The trend is similar for Asian workers, except for in the medical sciences occupations. Women were underrepresented across most of the above occupations and industries, except Other professional, scientific, and technical services industries. *See the data analysis section for details.* Data at the County level show similar patterns of underrepresentation, where Black and Latino workers are less likely to be in management, business, science, and arts occupations than White and Asian workers<sup>7</sup>.

Research shows that the lack of diversity in science, technology, engineering, and math (STEM) fields (of which life sciences is a subcategory) is persistent and structural. Black and Hispanic workers are underrepresented in the STEM workforce compared to their representation in the workforce overall<sup>8</sup>. Black workers make up 11% and Hispanic workers make up 17% of the total US workforce, but only 9% and 8% of the STEM

<sup>6</sup> This is the self-sufficiency standard in Montgomery County in 2019 for Two adults, pre-school, and school-age child. Montgomery County level data from the 2019 Maryland Dataset available here for download:

<https://selfsufficiencystandard.org/Maryland/>

<sup>7</sup> Montgomery County Racial Equity Profile.

[https://www.montgomerycountymd.gov/OLO/Resources/Files/2019%20Reports/OLO2019-7-6\\_20\\_19.pdf](https://www.montgomerycountymd.gov/OLO/Resources/Files/2019%20Reports/OLO2019-7-6_20_19.pdf) Pg. 14  
“MANAGEMENT, BUSINESS, SCIENCE, AND ARTS OCCUPATIONS”

<sup>8</sup> Richard Fry, Brian Kennedy, and Cary Funk. Pew Research Center. “STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity”. April 1, 2021. Available at:

<https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/>

workforce respectively. These gaps vary by job clusters within the STEM workforce<sup>9</sup>. For the life science field, specifically: Black workers hold 6% of jobs, Hispanic workers hold 8% of jobs, while White workers hold 65% of jobs<sup>10</sup>.

ORESJ and The Office of Legislative Oversight (OLO) have documented in multiple racial equity impact assessments the root causes and structural factors creating the underrepresentation of Black, Latino, and women workers in STEM fields. From the colonial era to the present, racial inequities have characterized many aspects of the healthcare system and by extension the biotech (and life sciences) industry—the composition of the workforce as well as the treatment and outcomes of Black, Indigenous, and people of color within it<sup>11</sup>. Persistent occupational and educational segregation<sup>12</sup>, underinvestment in training and support for STEM teachers<sup>13</sup>, and inequitable access to higher education attainment continue to limit the participation and advancement of Black, Latino, and women workers in STEM fields. See the following analyses for additional details:

- Racial Equity and Social Justice (RESJI) Zoning Text Amendment and Statement. The Office of Legislative Oversight. ZTA 22-02 Density and Height Limits, Parking – Biohealth:  
<https://www.montgomerycountymd.gov/OLO/Resources/Files/resjis/ZTA/2022/ZTA22-02.pdf>
- Racial Equity Impact Assessment (REIA) of Supplemental Appropriation (SA) #23-10 for ignITe Hub. The Office of Racial Equity and Social Justice:  
<https://www.montgomerycountymd.gov/ore/Resources/Files/23-10.pdf>

The University of Maryland College Park and the University of Maryland Baltimore have public-facing statements demonstrating a focus on diversity and a commitment to it as an organizational value. ORESJ hopes that these values will be carried forward in the recruitment, hiring, advancement, and retention policies and practices of the Institute.

Based on the structural factors limiting the participation and advancement of Black and Latino workers in STEM fields, it is unlikely in the short term that the employment inequities described above will be narrowed by the creation of the initial Institute jobs. The development of robust policies and programs to address the upstream barriers to

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<sup>9</sup> Ibid.

<sup>10</sup> Ibid.

<sup>11</sup> W.M. Byrd and L.A. Clayton. Journal of the National Medical Association. “Race, medicine, and health care in the United States: A historical survey”. March 2001; 93 (3 Suppl): 11S-34S. Available at:  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2593958/?page=15>

<sup>12</sup> Racial Equity and Social Justice (RESJI) Zoning Text Amendment and Statement. The Office of Legislative Oversight. ZTA 22-02 Density and Height Limits, Parking – Biohealth:  
<https://www.montgomerycountymd.gov/OLO/Resources/Files/resjis/ZTA/2022/ZTA22-02.pdf>

<sup>13</sup> Racial Equity Impact Assessment (REIA) of Supplemental Appropriation (SA) #23-10 for ignITe Hub. The Office of Racial Equity and Social Justice: <https://www.montgomerycountymd.gov/ore/Resources/Files/23-10.pdf>

advancement in STEM fields (K-12, community college, and other technical and skill training) coupled with Institute partnerships that provide paid employment opportunities across the career ladder—student, intern, apprentice, fellow, post-doctoral and beyond—will strengthen the Institute’s ability to shrink STEM employment inequities, and relatedly help to shrink income disparities in the County.

### **Small Business Development:**

The Institute aims to attract high-tech businesses to the county, which has the potential to create additional jobs and enrich other sectors of the economy. To ensure that these investments help drive equitable economic development, ORESJ recommends that the Institute develop strategies for partnering with and investing in entrepreneurs of color, women, and other systemically excluded business owners. Many of the same systemic barriers limiting the participation of Black, Latino, and women workers in STEM fields as workers, affect the demographic composition of business owners in STEM fields as well as the size and survival of those businesses. ORESJ and the Office of Legislative Oversight have documented racial inequities in business ownership and their root causes:

- Racial Equity and Social Justice (RESJI) Expedited Bill 31-22. The Office of Legislative Oversight. Finance—Economic Development Fund – Small Business Innovation Research and Small Business Technology Transfer Matching Grant Program:  
<https://www.montgomerycountymd.gov/OLO/Resources/Files/resjis/2022/BillE31-22.pdf>  
<https://www.montgomerycountymd.gov/OLO/Resources/Files/resjis/ZTA/2022/ZTA22-02.pdf>
- Racial Equity Impact Assessment (REIA) of Supplemental Appropriation #22-59 Business Advancement Team, Life Science & Technology Center. The Office of Racial Equity and Social Justice.  
<https://www.montgomerycountymd.gov/ore/Resources/Files/22-59.pdf>

In addition to economic inequities (disparities in wealth accumulation and employment opportunities) that generally affect the startup, growth, and survival of small businesses owned by people of color, ORESJ found the following barriers specific to the biotech industry:

- Access to higher education leading to doctorate-level industry knowledge. Education at the highest levels can be costly. Lower levels of wealth accumulation among Black and Latino people in the US, resulting from historical and current policies and practices of exclusion and exploitation<sup>14</sup>, along with burdens of student loan debt create economic

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<sup>14</sup> Angelita P. Howard, Liane S. Slaughter, Kaylin M. Carey, and James W. Lillard Jr. “Bridges to biotechnology and bioentrepreneurship: improving diversity in the biotechnology sector”. *Nature Biotechnology*. Volume 39, pages1468–1474. 2021. Available at: <https://www.nature.com/articles/s41587-021-01110-3>

barriers to accessing education opportunities necessary for entering the biotech industry.

- Access to start-up capital or seed funding. The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Grants are often the first sources of funding for new ventures or projects that originate in academia<sup>15</sup>. Between 2007 and 2017, 3.6% of SBIR applications were submitted by what the awarding agency calls socially or economically disadvantaged owners, and 2.5% of awards went to this group. For comparison, organizations led by white men had about a 20% chance of having their application granted, whereas for women, socially and economically disadvantaged owners the win rate was less<sup>16</sup>. For socially and economically disadvantaged women the rate was 10%<sup>17</sup>. The picture from venture capital is not much different. In general, less than one percent of new businesses access venture capital<sup>18</sup>. Conversely, 64% of businesses use startup capital from family or personal wealth. Given preceding discussions about racial wealth disparities, this presents a significant barrier for entrepreneurs of color, particularly Black and Latino entrepreneurs<sup>19</sup>.
- Unconscious bias towards funding projects in or hiring from schools with large endowments and prestige. This can leave out students attending smaller schools, Historically Black Colleges and Universities, and Latino-serving Institutions<sup>20</sup>.

**Data Analysis:**

ORESJ focused on the top three occupations within the R&D in the Biotechnology subsector in the county: Medical Scientist (except epidemiologist), Natural sciences managers, and Biological Scientists, all others. Below are the demographics for those employed in these occupations in the US:

Occupation	2021					
	Total employed	Percent of total employed				
		Women	White	Black or African American	Asian	Hispanic or Latino
Biological scientists	94,000	48.1	71.1	12.1	14.4	2.4

<sup>15</sup> Brady Huggett. "Biotech's Pale Shadow". Nature Biotechnology. Volume 6. Number 1. January 2018. Available at: <https://www.nature.com/articles/nbt.4046.pdf>

<sup>16</sup> Ibid.

<sup>17</sup> Brady Huggett.

<sup>18</sup> Victor Hwang, Sameeksha Desai, and Ross Baird. Ewing Marion Kauffman Foundation. Access to Capital for Entrepreneurs: Removing Barriers. April 2019. Available at: [https://www.kauffman.org/wpcontent/uploads/2019/12/CapitalReport\\_042519.pdf](https://www.kauffman.org/wpcontent/uploads/2019/12/CapitalReport_042519.pdf)

<sup>19</sup> Victor Hwang, et al.

<sup>20</sup> Brady Huggett.

REIA for SA #23-49 Institute for Intelligent and Immersive Computing for Life Science and  
Medicine

November 28, 2022

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Occupation	2021					
	Total employed	Percent of total employed				
		Women	White	Black or African American	Asian	Hispanic or Latino
Medical scientists	121,000	49.6	48.0	7.2	43.1	4.5
Natural sciences managers	21,000	–	–	–	–	–

**Source:** US Bureau of Labor Statistics. Labor Force Statistics for the Current Population Survey. Household Data. Annual Averages. Table 11. Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity. Available at: <https://www.bls.gov/cps/cpsaat11.htm>

Looking specifically at the three scientific fields that make up the professional and technical services industry, the demographics in the US are as follows:

Industry	2021					
	Total employed	Percent of total employed				
		Women	White	Black or African American	Asian	Hispanic or Latino
Management, scientific, and technical consulting services	1,651,000	43.9	80.6	8.8	9.1	7.8
Scientific research and development services	728,000	44.7	72.8	4.9	19.3	8.8
Other professional, scientific, and technical services	649,000	55.1	80.7	9.1	6.2	14.0

**Source:** US Bureau of Labor Statistics. Labor Force Statistics for the Current Population survey. Household Data. Annual Averages. Table 18. Employed Persons by detailed industry, sex, race, and Hispanic or Latino ethnicity. Available at: <https://www.bls.gov/cps/cpsaat18.htm>

cc: Ken Hartman, Director, Strategic Partnerships, Office of the County Executive  
Thomas Lewis, Development Ombudsman, Office of the County Executive  
Jake Weissman, ACAO, Office of the County Executive