Driving Innovation and Job Creation through Higher Education in Montgomery County

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MARGRAVE
STRATEGIES

MONTGOMERY COUNTY
ECONOMIC DEVELOPMENT
CORPORATION MARYLAND

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Introduction

As the most populous county in Maryland, Montgomery County is an economic engine for the state of Maryland, and for the greater Washington DC metropolitan region. Montgomery County is a cornerstone of the state's economic base, and draws residents to its high quality K-12 school system, access to high paying jobs, diverse housing stock available at a variety of price points and seemingly limitless opportunities for recreation and entertainment. Yet, with all of its strengths, Montgomery County is still lacking investment from academic research institutions to grow and support the private and federal industry anchors within the county. Additional higher education investment within the borders of Montgomery County will galvanize the talent pipeline, foster research opportunities and funding, and catalyze job creation through innovation and entrepreneurship.

Existing Private Industry & Federal Lab Anchors

Federal Government Presence

Uniquely positioned adjacent to the District of Columbia, Montgomery County benefits from many outposts of the federal government within its borders. Federal agencies that have a headquarters or significant presence within Montgomery County include:

- Food and Drug Administration (FDA);
- National Institutes of Health (NIH);
- National Geospatial-Intelligence Agency (NGA);
- National Institute of Standards and Technology (NIST);
- National Oceanic and Atmospheric Administration (NOAA);
- Naval Medical Research Center (NMRC);
- Naval Surface Warfare Center (NSWC);
- Uniformed Services University of the Health Sciences (USU);
- US Department of Energy (DOE);
- US Consumer Product Safety Commission (CPSC);
- US Nuclear Regulatory Commission (NRC);
- Walter Reed National Military Medical Center and Walter Reed Army Institute of Research (WRAIR).

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

NIH

UNITED STATES NUCLEAR REGULATORY COMMISSION

Walter Reed National Military Medical Center

FDA U.S. FOOD & DRUG ADMINISTRATION

NIST

Prominence in Life Sciences and Technology

In addition to the high volume of federal workers employed within Montgomery County, the county has established itself as a national magnet for life sciences and technology. More than 300 private biotech and life sciences companies call Montgomery County home, including global leaders and emerging trailblazers such as Akonni Biosystems, AstraZeneca's MedImmune, Autolus, GlaxoSmithKline, Kite Pharma, REGENXBIO, RoosterBio, Supernus Pharmaceuticals, Thermo Fisher Scientific, United Therapeutics, and Westat. These BioHealth clusters result in nearly 14,000 private sector jobs, and another estimated 49,000 in related federal government jobs[1].

The Interstate 270 (I-270) corridor is frequently noted as the engine driving the greater DC region's prominence and growth in the field of life sciences. This puts Montgomery County in esteemed company with well-known biotech clusters in Boston, San Francisco, San Diego, and North Carolina's Research Triangle.

Montgomery County has received multiple accolades recently for its national prominence in the life sciences and technology sector, including:

#2 **2018 Venture Capital by Cluster**
JLL, 2019[4]

#3 **Top Markets for New Talent**
CBRE, 2019[3]

#4 **Largest Life Science Markets by Employees**
CBRE, 2019[3]

#4 **US BioPharma Cluster**
GEN, 2019[5]

#5 **US Life Science Cluster Ranking**
JLL, 2019[4]

#6 **Top 10 Leading US Life Science Clusters**
CBRE, 2019[3]

According to Avalanche Consulting's Talent Gap Analysis Report (2019), 'industry cluster strengths in Montgomery County, where local concentrations far exceed national levels, are found in government (federal), research, software, professional services, and biomedical manufacturing." Engaging major players in these industries will help leverage additional investment in these highly specialized fields. The forecasted growth for Montgomery County for the next 10 years anticipates steady significant growth in many fields, including biomedical, healthcare, research, and software / info tech[2].

At the end of 2018, the Washington DC market had the unique distinction of not only being the fourth largest life science market by number of employees, but is also the ninth fastest-growing life sciences market (2014-2017)[3]. It also had the largest percentage increase in life sciences venture-capital funding of any major market in the country[3].

Significant higher education infrastructure is needed to support the growing demand for research and talent development to nurture one of the country's top life science markets.

Evaluating Existing Higher Education Assets

When compared to its peers in the region and nation, Montgomery County is an under producer of college graduates[2]. This can, in part, be explained by the lack of a comprehensive research university within Montgomery County's borders. However, there is an existing higher education presence within the county, and an evaluation of the existing higher education assets is necessary to gain insight into the gaps and opportunities for an expanded higher education investment.

Established in 2000, the Universities at Shady Grove (USG) is a unique partnership of nine University System of Maryland (USM) universities on one campus in Montgomery County. This integrated approach allows USG to offer accessible pathways to more than 80 upper-level undergraduate, graduate, professional degree and certificate programs. USG serves approximately 3,000 students at a given time, and seeks to connect students to career opportunities while providing regional employers with a highly educated, skilled workforce.

Additionally, the recently completed Biomedical Sciences and Engineering Education Facility is a state-of-the-art academic building at USG that will help to expand STEMM, healthcare, biosciences, engineering and computational science degree program offerings.

Although USG does not host traditional research activities by University System of Maryland universities, research does occur in its proximity at the Institute for Bioscience & Biotechnical Research (IBBR). IBBR was established in 2010 by the University System of Maryland Board of Regents to foster cross-disciplinary teams working towards scientific discovery, education and commercialization of bioscience and technology ventures in the state of Maryland. IBBR brings together the University of Maryland, College Park, the University of Maryland Baltimore, and the National Institute of Standards and Technology (NIST) for research collaborations in the fields of medicine, biosciences, technology, quantitative sciences and engineering.

While the University System of Maryland has continued to increase its investment within Montgomery County, Johns Hopkins University recently announced that starting in May 2020 it will be closing its Rockville outpost, the Center for Biotechnology Education. This location served as a base for six graduate degree programs in biotechnology and health sciences. Approximately 275 students attend classes at the campus, which will permanently close in late summer 2020. This announcement places further pressure on the county, state and private sector to bolster higher education, innovation and economic development efforts.

Shady Grove at a Glance[6]

1,979 undergraduate students

1,043 graduate students

12,000 degrees earned since 2000

80 degree programs

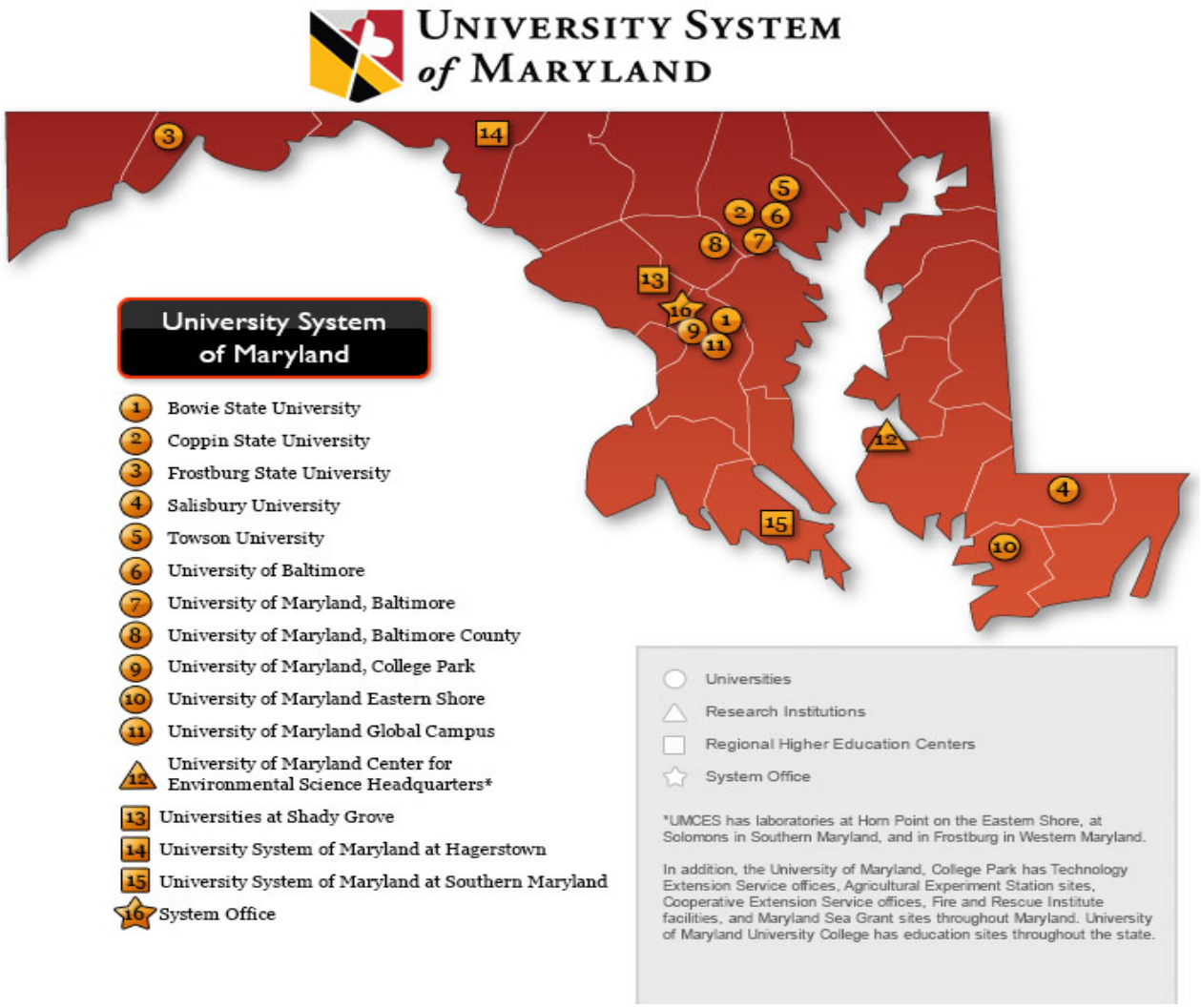
80% of undergraduate students transfer from community college

88% of graduates work or continue education in the region

Analyzing Potential for New Higher Education Anchors

University System of Maryland Assets

The University System of Maryland is comprised of 12 distinct public universities and research institutions throughout the state of Maryland. Each of these universities has unique strengths that serve each university's students, faculty and staff, alumni, surrounding community and the state of Maryland. The universities and research institutions within the System are: Bowie State University; Coppin State University; Frostburg State University; Salisbury University; Towson University; University of Baltimore; University of Maryland, Baltimore; University of Maryland, Baltimore County; University of Maryland, College Park; University of Maryland Eastern Shore; University of Maryland Global Campus; University of Maryland Center for Environmental Science.



Each of the 12 universities in the University System of Maryland has its own unique campus, and the location of these campuses is rooted in historical decisions, that in many cases, reflect past growth trends of Maryland. The breakdown of locations is as follows:

County	# Locations	USM Presence
Baltimore City	3	Coppin State, University of Baltimore, UM Baltimore
Prince George's	3	Bowie State, UM College Park, UM Global Campus
Baltimore	2	Towson, UM Baltimore County
Alleghany	1	Frostburg
Dorchester	1	UM Center for Environmental Science
Somerset	1	UM Eastern Shore
Wicomico	1	Salisbury

This geographic distribution leaves Montgomery County, the most populous county in Maryland, and one of the largest in terms of land area, without a USM research university. In fact, five of the eight most populous counties in Maryland (Montgomery, Anne Arundel, Howard, Frederick and Harford) lack one of the 12 USM universities.

Over the past few decades, USM has attempted to address the imbalance of higher education resources by establishing University Centers in locations of need. There are three regional higher education centers within USM: the Universities at Shady Grove (USG), the University System of Maryland at Hagerstown and the University System of Maryland at Southern Maryland.

Although Montgomery County does not have a USM university located within its borders, it is important to note the flagship University of the System, the University of Maryland, College Park is located just 3 miles from the Montgomery/ Prince George's border. UMCP confers an estimated 7,100 bachelors degrees and 2,800 graduate degrees (masters and PhDs) annually, and has nationally recognized strengths in fields of computer science, engineering, quantum computing and business, among others.

College Park at a Glance[6]

31,511 undergraduate students

10,232 graduate students

250 academic programs

377,000 alumni

837 students taking classes at USG towards a UMCP degree

38% of in-state students hail from Montgomery County

Options to Expand UM Presence in Mongtomery County

Since the cost of establishing a new comprehensive university is prohibitive, efforts to bolster higher education investment in the county should focus on the establishment of institutes and/or centers focused on the unique challenges and opportunities of Montgomery County. A logical avenue through which to grow this investment is the MPower partnership between the University of Maryland, College Park and the University of Maryland, Baltimore.

MPower

MPower is a partnership between the University of Maryland, College Park (UMCP) and the University of Maryland, Baltimore (UMB) which provides a platform for collaboration between the flagship university of the state of Maryland and the professional school campus in Baltimore. MPower was codified in Senate Bill 1052 in 2016, sponsored by now Senate President, Bill Ferguson. This collaboration marries the complementary strengths of both institutions and has resulted in successful partnerships leveraging significant research funding. This relationship has connected researchers working on critical issues of our time, including the opioid epidemic and sports medicine and traumatic brain injury.

In January 2020 it was announced that because of the MPower initiative, the joint research and development expenditures of UMB and UMCP would appear as one figure in the National Science Foundation (NSF) rankings. In fiscal year 2019, UMB and UMCP faculty and staff were awarded $1.2 billion in grants and contracts. This dollar amount places the University of Maryland in the top 10 nationally for research expenditures. Dr. Laurie E. Locascio was recently appointed as the Vice President for Research at both UMB and UMCP, building on her background as a biomedical engineer working for NIST in Montgomery County.

The MPower platform provides an excellent framework for additional higher education and research investment in Montgomery County, since the MPower institutions share the strengths of the private sector and federal labs in areas such as life sciences and technology, including cyber security, artificial intelligence, machine learning and data analytics.

UNIVERSITY OF MARYLAND
STRATEGIC PARTNERSHIP
MPOWERING THE STATE

New Institutes & Alliances

A powerful tool for mixing academia with private sector and federal researchers is through the creation of an institute or alliance to provide a collaborative research environment. There are many existing institutes and alliances focusing on life science and technology research throughout the world. The success and growth of these examples prove that there is not only a market for cross disciplinary research opportunities, but that this research results in great scientific discovery and achievement. A few existing institutes that could serve as models for Montgomery County:

- **Broad Institute**: A collaboration between Harvard University and the Massachusetts Institute of Technology (MIT), the Broad Institute uses genomics to advance the understanding of biology and the treatment of human disease. Established in 2014, the Broad Institute merges the fields of biology, chemistry, mathematics, composition and engineering to better understand prevention, diagnosis and treatment of disease. The Broad Institute has more than 3,000 scientists working on these issues.

- **Janelia Research Campus**: Located in Ashburn, Virginia, the Janelia Research Campus is a project by the Howard Hughes Medical Institute dedicated to expanding and diversifying how scientists perform research. At Janelia, research scientists and tool builders come together to work on research areas in biology and medicine for approximately 15 years at a time. Advancements and discoveries made during this time period are then shared with the broader research community. Once a 15-year project has expired, the group focused on a new research question for the next 15-year period.
- **Big Ten Academic Alliance**: The Big Ten Academic Alliance is a model for collaboration amongst the 14 research universities in the Big Ten conference. The alliance forms community of practice among peers of member universities to establish best practices, as well as provide project management for large scale research projects that each university could not manage on its own. The alliance also heavily involved the libraries of the member institutions, together amassing more than 110 million shared book volumes and journals.

MPower Platform

Through MPower, a new Institute of Technology and Health could be launched in Montgomery County. This institute would promote medical breakthroughs through the development and application of advanced data science and computing. It would co-locate researchers from the University of Maryland's Schools of Medicine, Pharmacy, Computer, Mathematical and Natural Sciences, and Engineering in partnership with Montgomery County to pursue and unlock human health outcomes that directly impact citizens of Maryland, the country, and the world.

Maryland's School of Medicine is an innovator in translational medicine with 600 active patents, and dozens of start-up companies. The School works locally, nationally and globally, with research and treatment facilities in 36 countries around the world. More than half of its academic departments rank in the top 20 nationally. The University of Maryland also ranks in the top 5 for its programs in quantum computing, artificial intelligence and transportation engineering, and is the proud home of one of the most diverse and successful student populations in STEMM.

Combining these strong assets from Baltimore and College Park with the intellectual power of the workforce in Montgomery County will position the Institute of Technology and Health to become a world-class research institute located in the heart of the national capital region. A new institute increases the value of the USG investment by connecting the existing primarily undergraduate student body with additional opportunities for basic and applied research.

This research should be in areas where the major challenges facing our world are tackled, such as:

- **Decoding Data for Patient Action**: Harness the power of artificial intelligence to fuse and rapidly uncover the need to escalate patient care and treatment. Link technology with medicine to save lives.

- **Disruptive Discovery Through Advanced Computing**: Optimize and unlock molecular efficacy and drug discovery potential through the power of data science and advanced computing. Unlock future medical discovery through quantum computing and additional over-the-horizon computing excellence.

- **Transportation to Trauma**: Leverage world-class transportation data science and shock trauma teams to dramatically reduce transportation related injuries and fatalities. Reduce time from injury to care; reduce distance from care to injury.

The aforementioned IBBR also provides a framework to build upon during the execution of this endeavor.

Leveraging NIH

One of the most unique existing assets in Montgomery County is the National Institutes of Health (NIH). With a budget of $37 billion (2018), NIH is the largest single public funder of biomedical research in the world. NIH is made up of 27 separate institutes and centers focusing on various biomedical disciplines.

NIH provides a robust array of opportunities for post degree studying and research right in the heart of Montgomery County at its Bethesda campus. The largest of these programs, the NIH Intramural Research Program (IRP), provides an opportunity for post-doctoral scholars to work in the collaborative research environment of over 1,200 laboratories/research projects that exist at NIH. While at NIH, these postdocs explore areas such as bioinformatics, biophysics, epidemiology, immunology, cell and molecular biology, neuroscience, health sciences, structural biology, sensory and communication neuroscience, molecular pathology, biobehavioral research, and developmental biology. There are currently approximately 3,100 postdoctoral researchers at NIH.

NIH also provides opportunities for researchers who have recently complemented their baccalaureate degree, or are currently completing their graduate studies. Approximately 1,200 postbaccalaureate students work at NIH continuing their research and studies. More than 400 enrolled graduate students also complete their coursework and/or dissertation at NIH. There are also opportunities for clinical fellowships for those individuals who already have a professional doctoral degree, but seek to provide clinical services and conduct research. There are approximately 300 clinical fellows hosted at NIH at any given time.

Given the large number of opportunities for students and recent graduates to pursue clinical and research opportunities at NIH, Montgomery County can leverage this asset by connecting directly to higher education research activity in the county. Additionally, an opportunity exists to create a robust residential option for the thousands of researchers who come to Montgomery County from around the world for these NIH programs.

Developing a Strategy to Complement and Connect

The most compelling areas of focus for this new endeavor exist at the intersection of life sciences and big data. This intersection is also at the heart of the MPower partnership. Montgomery County should work with the University System of Maryland leadership, and the leadership of UMB and UMCP, to launch a research institute which is uniquely designed for the county. This new research institute should work hand in glove with USG to complement, but not duplicate, the important work taking place there, as well as to build upon the state and local investment that is occurring at USG.

The Universities at Shady Grove provides access to programs both in the liberal arts and STEMM fields. The strategy should also call upon the University of Maryland, College Park and University of Maryland, Baltimore with their life science, technology and engineering strengths to create a truly collaborative and crossdisciplinarity institute. This effort should focus on concepts that fill a void in producing the needed workforce for the county, and by doing so, the county can create innovative solutions to some of the world's most important challenges that can only naturally occur in the knowledge corridor of Montgomery County.

There may also be roles for other USM schools to expand their work in Montgomery County based on their postgraduate and research strengths. UMGC and UMBC both provide programs which provide important elements which round out the higher education environment in Montgomery County.

Higher Education investment can provide a direct nexus to innovation and entrepreneurship when coupled with experienced partners who prioritize commercialization and job creation. Within the USM, three significant examples of place based innovation ecosystems exist:

- **UMBC - BW Tech**
- **UMB - Bio Park**
- **UMCP - Discovery District**

Each of the above examples provide lessons which apply to a place based focus in Montgomery County and each institution has unique strengths to leverage.

The challenge and opportunity for Montgomery County is to complement and connect existing higher education resources both within the county and in close proximity, without duplicating and fragmenting. Choosing the best physical locations that provide this connectivity to existing anchors is critical.

bwtech @UMBC RESEARCH & TECHNOLOGY PARK

UNIVERSITY of MARYLAND BioPark

UNIVERSITY OF MARYLAND DISCOVERY DISTRICT

Moving Quickly

An ambitious, yet realistic, timeline should be created to deliver a new MPower based Institute of Technology and Health. While Montgomery County holds regional advantages with regard to strengths in life sciences, neighboring jurisdictions are making significant strides.

For example, Virginia Polytechnic Institute and State University (Virginia Tech) recently announced plans to join Johnson and Johnson's innovation arm, JLabs, and Children's National Hospital to open a Biomedical Research Institute in the District of Columbia at the former Walter Reed campus, on the border of Montgomery County. In northern Virginia, a partnership between Inova hospitals, the University of Virginia (UVA) and George Mason University (GMU) was recently announced to create the Inova Genomics and Bioinformatics Research Institute. Additional significant research endeavors are emerging in Northern Virginia in addition to the aforementioned Howard Hughes Medical's Janelia campus.

Funding Opportunities

While the state of Maryland continues to fund higher education at one of the highest rates in the nation, the existing higher education needs are significant. Montgomery County is in a unique position in Maryland, having the largest operating ($5.8 billion) and capital ($14 billion in total 2021 cumulative project funding) budgets of any county in the state, to jointly fund a new initiative. Montgomery County also has significant funding needs in many areas, however leaders in both the public and private sector have recognized economic and workforce development coupled with higher education research and innovation investment are a priority.

While traditionally counties in Maryland have limited higher education investment to their community colleges, Montgomery County has funded the recently completed garage at USG, which helped facilitate the newly completed Biomedical Science Building. This recent investment underscores the county's understanding and commitment to higher education.

While a mix of state and federal funding, private philanthropy and industry investment should be leveraged to execute this endeavor, funding from Montgomery County itself will be critical. At an early stage, the county can allocate money dedicated to planning for a new institute. Additional support by way of potential land contribution, capital budget commitment or operating commitment may also be important to achieve the desired vision.

The county can also align its economic development investments to facilitate the growth of existing and start-up companies through partnerships resulting from the new higher education research investment. Many of the existing life science anchors in the county have innovation and venture arms which can be aligned with current state and county initiatives to round out a growing innovation ecosystem. A new institute should include engagement through entities such as UM Ventures, MTech, TEDCO and other state drivers.

Timeline

Year 1

Align

Align stakeholder groups of UMB, UMCP, USG, the USM System, and elected officials to coalesce around Institute needs, goals and priorities.

Year 2

Establish

Establish initial (temporary) location and begin first endeavors utilizing existing MPower projects such as the Center for Health-Related Informatics and Bioimaging.

Year 3-5

Plan & Build

Plan and build a new, permanent home for the Institute at a strategic location within Montgomery County.

As BioHealth evolves, Montgomery County is positioned well to proactively demonstrate strengths at the intersection of BioHealth and Big Data. Montgomery County hosts one of the largest and most important clusters of BioHealth and life sciences in the nation. Impressively, unlike its peer clusters nationally, this cluster exists without significant research universities driving it. While Montgomery County is blessed to have federal investment driving the cluster, along with a thriving private sector in this space, one can only imagine the catalytic effect of university driven research and innovation bolstering the existing cluster. County leadership should identify the most advantageous locations and facilities to complement and connect the relevant existing higher education, industry and federal infrastructure with a newly established MPower Institute of Technology and Health. By capitalizing on the annual billion dollar plus research powerhouse of the University of Maryland, Baltimore and the University of Maryland, College Park, through the MPower platform, Montgomery County can accelerate the breakthroughs of science while providing economic development opportunities throughout the county, state, and region.

Footnotes

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2. Montgomery County Talent Gap Analysis – Report 1: Supply-Demand Gap Analysis. Avalanche Consulting, Inc & Council for Adult and Experiential Learning, 2019.
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