MLDS Center
Maryland Longitudinal Data System

Better Data • Informed Choices • Improved Results

December 2019

2019 Annual Report on the Maryland Longitudinal Data System and Center

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This Annual Report of the Governing Board of the Maryland Longitudinal Data System Center is submitted to the Governor and the Maryland General Assembly in compliance with Education Article § 24-705 of the Annotated Code of Maryland.

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Highlights

The Maryland Longitudinal Data System (MLDS) Center is pleased to report on the significant progress it has made over the past year to refine and improve the System and increase output.

- Provided actionable data for state agencies and other stakeholders including data to help administer the Nurse Support Program, data for federal reporting, and data for program analyses.
- Added 167 new data elements to the Data Inventory, including two new data collections – Apprenticeship and Student Discipline – and substantially revised and enhanced the collection of Adult Education Data.
- Responded to 30 data requests, created 12 new dashboards and updated 18 existing dashboards.
- Presented student and school poverty research to the Maryland Taskforce on Reconciliation and Equity at Morgan State University.
- Continued to focus on IT system security by engaging in a voluntary security audit conducted by the U.S. Department of Homeland Security's Computer Emergency Readiness Team.
- Supported seven grant applications, including an ambitious application to the National Science Foundation for a $20 million infrastructure grant. While not funded, the feedback encouraged resubmission in the next funding cycle.
- The Research Branch had three manuscripts published in peer reviewed journals and presented at six national and international conferences and six local research and policy presentations.
- The 2019 Fiscal and IT Security Audit by the Office of Legislative Audits resulted in no findings.

Introduction

This Annual Report is submitted in fulfillment of the requirement under Education Article, §24-705, Annotated Code of Maryland. The Governing Board must provide information to the Governor and General Assembly annually on the following:

1. An update on the implementation of the MLDS and activities of the MLDS Center;
2. List of all studies performed by the Center during the reporting period;
3. List of all currently warehoused data that are determined to be no longer necessary to carry out the mission of the Center;
4. Any proposed or planned expansion of data maintained in the database; and
5. Any other recommendation made by the Governing Board.

The following sections of the report will address of each of the five statutorily required topics.

Section 1. Implementation of the MLDS and Activities of the Center

1.1 System Implementation and Management

A. Records Count

As of November 2019, the MLDS contained records for 3,150,079 unique individuals. Table 1, below provides the number of individual records provided by each data partner agency.

Table 1: Number of Individual Records in the MLDS by Data Source

Data Source	Count as of 11/8/2019
MSDE	2,223,982
MHEC	1,762,466
Labor	1,612,290

Figure 1: Overview of Cross-Sector Data

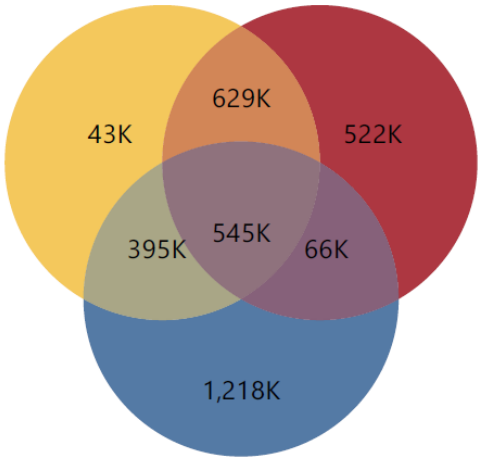

Figure 1, shows the breakdown of cross-sector matches. Close to 545,000 individuals have records that can be linked across all sectors and 1.5 million have records in at least two sectors. The reason there is a high number of MSDE records that are not matched to another sector is because more than half of MSDE data is K-8 students – a population generally not engaged in higher education or the workforce.

B. Match Rate

The Center calculates match rates based on the number of 12th grade students from Maryland public schools with a record in at least one other sector. The Center's match rate has remained at **94%** over time.[1] The high match rate indicates that if a student is not matched to a higher education or workforce record it is most likely due to the fact that the student is not in either of those data sets, as opposed to insufficient data or weak data matching routines. Table 2 provides a breakdown of the match rate for each cohort year.

Table 2. 12th Grade Cohort Cross-Sector Match Rate Analysis

Cohort Year	Total 12th Grade	K12 Only	K12 & College	K12 & Workforce	All 3 Sectors	% Matched ANY Sector	% Matched ALL 3 Sectors
2018	61,808	6,079	8,658	14,884	32,187	90%	52%
2017	60,553	4,225	6,382	14,156	35,790	93%	59%
2016	60,355	3,561	5,326	13,502	37,966	94%	63%
2015	61,348	3,423	4,694	13,218	40,013	94%	65%
2014	60,483	2,867	3,932	12,208	41,476	95%	69%
2013	60,991	2,753	3,512	12,117	42,609	95%	70%
2012	60,525	2,580	3,378	11,830	42,737	96%	71%
2011	62,333	3,179	3,310	12,464	43,380	95%	70%
2010	61,963	2,843	3,355	11,780	43,985	95%	71%
2009	61,760	3,222	3,637	11,399	43,502	95%	70%

C. System Security Audits

Department of Homeland Security

The Department of Homeland Security's National Cybersecurity and Communications Integration Center (NCCIC) offers the following National Cybersecurity Assessment and Technical Services:

1. Cyber Hygiene: Vulnerability Scanning
2. Phishing Campaign Assessment (PCA)
3. Risk and Vulnerability Assessment (RVA)
4. Validated Architecture & Design Review (VADR)

The Center utilized the above assessments and services, which were conducted by NCCIC's U.S. Computer Emergency Readiness Team (U.S. CERT). The process took several months and considerable staff resources to participate in all facets of the assessments. The process concluded in April of 2019 with an in person meeting with two members of U.S. CERT. Generally, the review was very positive. U.S.

[1] The match rate is an average of all years (2009 -2018). The match rate for any given year will change over time. For example, the 2018 match rate of 90% will likely increase over time as more students move into college and the workforce, or return to Maryland from an out-of-state college and join the Maryland workforce.

CERT representatives complemented the Center's system knowledge, its layered defenses, and overall focus on security. There were also recommendations for improvements to certain technical and procedural processes. All of the recommendations have been implemented.

Office of Legislative Audits

The Office of Legislative Audits conducted a fiscal and information technology security audit of the Center. Both audits did not result in any findings or required corrective actions.

D. System Architecture

Currently, the Center's system is a fully integrated Oracle environment that is hosted at the Maryland State Department of Education Data Center. This current arrangement is advantageous because MSDE does not charge for hosting and the Oracle license costs are reduced because they are shared with several divisions within MSDE. However, due to anticipated changes at MSDE, the Center needed to begin planning on how to proceed with potential changes to the location and management of the data system. Accordingly, the Center hired a consultant to consider the following three options:

1. Work with DoIT to build an Oracle environment within the State's enterprise data center;
2. Move the system to Oracle's cloud; or
3. Migrate the system to SQL Server and reside within DoIT's enterprise data center.

The consultant analyzed the Center's technical, functional, financial, and security needs to formulate a recommendation on which of the above options most effectively address the following considerations:

1. Security – This is the highest priority when considering the future location and management of the system. The Center maintains a strong security posture. The future environment must be able to maintain or exceed the current standard.
2. Management and Oversight – In order to maintain control and accountability over the system, Center staff want to ensure the continued ability to manage and oversee the maintenance, security and operations of the system.
3. Cost – The Center wants a cost effective solution, taking into consideration both the short and long term costs and conditions that might cause changes in the cost assumptions. If a more expensive option is recommended for security or technical reasons, the analysis should provide sound and compelling justification for that recommendation.
4. Technical specifications –The Center needs to select an option that takes into consideration the size of the data set, the expectations for growth, and storage, backup, and performance needs.

The consultant spent close to three months studying the MLDS and each of the proposed options. A final report was completed and presented to the MLDS Governing Board at the September 2019 meeting.[2] The consultant highlighted the pros and cons of each option, and ultimately recommended that the Center work with DoIT to establish a dedicated Oracle environment within DoIT's enterprise data center. The consultant had the opportunity to tour the DoIT enterprise data center and

[2] The report contains detailed technical information about the system that, if made public, could compromise system security. Accordingly, the report is confidential and the presentation at the Board meeting was done in closed session.

determined that it delivered high level, state-of-the-art data center operations and security. Continuation of the Oracle environment, which is more expensive than the MS SQL environment, was due to the cost, complexity, and disruption of operations that would be necessary to migrate to a new environment. The report was well received by the Governing Board.

1.2 Activities of the Center

A. Stakeholder Engagement

The Center continues to work directly with stakeholders to provide information and analysis to help them use data to inform decision making. Directly engaging stakeholders ensures that the Center's work is focused on the critical policy needs of the state.

1. Maryland Higher Education Commission

Nursing Support Program II

The Nurse Support Program II (NSPII) is a grant program funded by the Health Services Cost Review Commission (HSCRC) and is administered by the Maryland Higher Education Commission (MHEC). The program focuses on increasing the number of nurses and nurse faculty in Maryland. One goal is to increase to 80%, the number of registered nurses with a bachelor's degree. One option in the grant program is to offer fast-track pathways to qualified students to begin their nursing education in a community college and then complete their BSN or MSN through a partnership with a Bachelor's degree-granting institution. Approximately $6 million will be awarded in FY 2020 to nine nursing programs in Maryland. The MLDS Center met with representatives from MHEC's Department of Academic Affairs (DAA) and Office of Outreach and Grants Management (OGM) on May 1st to discuss developing a report and dashboard to provide data on outcomes for community college graduates in NSPII. Specifications for the report and dashboard were developed and the first set of data tables were provided to OGM in early June with a full set of data tables and draft report completed later this year.

Title II Reports on the Quality of Teacher Preparation

The Center received data requests from University of Maryland, College Park (UMD) and Towson University (Towson) to support their annual federal teacher employment and retention reporting as well as internal reporting requirements. The Center developed specifications for expanding the dashboard and presented those specifications to the Maryland Assessment Collaborative working group. The dashboards will be implemented early next year once an additional year of data are received.

Program Approval

One of MHEC's responsibilities is to approve the addition of new programs at Maryland colleges. One aspect of the approval process is determining whether there is a need for the program, especially if that program is already being offered at another college. To help MHEC with this analysis, the Center provided data on the workforce outcomes for graduates completing specified programs, which MHEC used to inform its decision on whether additional programs are warranted and sustainable.

2. Maryland State Department of Education

Maryland Assessment Collaborative

In 2016, fifteen institutions with teacher preparation programs established a voluntary network that meets 3 to 4 times per year to discuss common program assessment needs. The MLDS Center met with the collaborative on May 29th to discuss data needs to support required state and federal reporting as well as data needs for accreditation reporting for the Council for the Accreditation of Educator Preparation (CAEP) and the Association for Advancing Quality in Educator Preparation (AAQEP). Data are needed to report on the number of students completing Maryland Approved Programs, hired as public and private teachers within 3 years, retained as teachers or in any educational capacity over a five year period, and completing Master's degree programs in teaching or education. The collaborative will collect samples of current reports and work together to agree on standard reporting parameters.

Bridge Program

Last year, at the request of MSDE, the Center's Research Branch began an analysis on the postsecondary outcomes of students who complete a Bridge project to meet their high school assessment graduation requirements. Significant progress has been made on the project by the Research Branch, including:

1. Identifying members of four high school cohorts who entered 9th grade from fall 2008 to fall 2011.
2. For cohort members, tracking progress to graduation/dropout for up to 5 years of high school;
3. Coding HSA performance, eligibility for Bridge (i.e. failed the HSA twice), and completion of Bridge across 4 subjects;
4. Identifying two or four year college enrollment for up to 4 years after high school;
5. Identifying wages and employment for up to 4 years after high school;
6. Creating aggregate indicators of high school quality, demographics, and resources; and
7. Merging these files together to form an analytic data file.

Currently researchers are in the process of creating summary statistics to answer some descriptive questions, including:

(1) What are the demographic and performance characteristics of students who pass HSA's, complete Bridge, and dropout?
(2) Are Bridge completers concentrated in certain school districts or schools?
(3) What are the post-secondary college and work patterns for students who pass HSA's, complete Bridge, and dropout?

3. Department of Labor/Governor's Workforce Development Board

Adult Education

The Center had several meetings with the Division of Workforce Development & Adult Learning (DWDAL) at the Maryland Department of Labor to discuss Adult Education data that DWDAL collects and maintains in LACES (Literacy, Adult Community Education System). These meetings helped provide insights on the LACES files, and determine what data elements would allow policy makers to gain insights into important policy questions. The result of the meetings were an agreed upon enhancement

to the data elements being collected from DWDAL (see section 4 of this report for a complete list of the new adult education data elements added to the MLDS this year).

Federal OCTAE Report

The DWDAL is required to report to the Federal Department of Labor, Office of Career, Technical, and Adult Education (OCTAE) on common performance measures required under the Workforce Innovation and Opportunity Act (WIOA). One component of the report requires matching student outcomes with wage data. To accomplish this, DWDAL requested that the Center match students in a WIOA program with UI Wage data in the MLDS to obtain the following information about the students:

1. Employment in the second quarter after program exit,
2. Employment in the fourth quarter after program exit, and
3. Median earnings in the second quarter after program exit.

The request was made September 17th and the Center was able to provide the requested data on September 27th, prior to the requested September 30th due date.

Career Preparation Expansion Act

In 2018, the Center, with input from the Governor's Workforce Development Board (GWDB), developed and submitted the first report in fulfillment of the requirement in the Career Preparation Expansion Act (CPEA), Chapter 695 of 2017 (see Education Article § 21-205, Annotated Code of Maryland) for a report on high school graduates for the five-year period after graduation on wages earned, hours worked per week, and the industry in which the individuals are employed.

Prior to producing this year's report, the Center met with various stakeholders to get input on additional information to include in the report. Based on that feedback, the Center added:

a) Additional contextual data indicators, including:
    a. Minimum wage in Maryland, which provides another comparison point to the wages earned by the CPEA population;
    b. U.S. Bureau of Economic Analysis gross domestic product by state, which is used to provide context for the percentage of graduates employed in an industry sector as compared to that sectors' contribution to the Maryland economy; and
    c. Maryland Department of Labor, labor market information to gain a better understanding of the size, projected growth, and wages of the overall Maryland workforce.
b) Supplemental analyses on:
    a. Wage outcomes for high school graduates with no college enrollment by high school program completion type; and
    b. Student loans for high school graduates with wage data.

The Center plans to provide a briefing for the members of GWDB at a future meeting.

4. Department of Legislative Services

High School Pathways

The Center updated the High School Pathways analysis for the 2008 high school exiting cohort. The original analysis completed at the request of the Department of Legislative Services (DLS) reported the number of exiters that enrolled immediately in college and graduate from the college of initial enrollment within 150% of degree time frame (3 years for Associate's degrees and 6 years for Bachelor's degrees). The updated analysis, also at the request of DLS, expands the timeframe to 200% (4 years for Associate's degrees and 8 years for Bachelor's degrees). This document was used in the Higher Education Overview analysis and hearing.

Dual Enrollment Report

The Center filed the *2019 Annual Report on Dual Enrollment.* The report is a requirement under Ed. Art. Sec. 24-703.1, Annotated Code of Maryland, which directs the Center to report, disaggregated by local school system, on the number of students who are dually enrolled under Title 18, Subtitle 14A of the Education Article and the number and course name of the courses in which students dually enroll at the high schools and at the public institutions of higher education. This was the seventh Annual Dual Enrollment Report that the Center has filed. The report is still not able to provide a complete picture of dual enrollment course taking because the course information at the high school level is incomplete (but improving each year) and the college course taking is not yet available (but should be for next year's report)

Center staff has received input from staff at the Department of Legislative Services about the report and ways to tailor it to meet some of their specific policy inquiries. The Center also has dual enrollment dashboards on its website that are updated and expanded as new data becomes available.

Commission on Innovation and Excellence in Education (Kirwan Commission)

Last year the Center's Research Branch provided presentations and reports to the Kirwan Commission on the role of student poverty and school level poverty on student outcomes. This year, the Research Branch has continued that research in the following ways.

a) The Research Branch was initially asked how the relationships found between poverty and long-term outcomes might differ by levels of student poverty. In response, the research branch has extended the poverty study to examine outcomes for three groups of students: (1) never FARMS or homeless, (2) FARMS but never homeless, (3) homeless. (All homeless students are by law also eligible for FARMS so there is no 4th group.) This conceptualization treats homelessness as an extension of poverty - the most severe form.

b) The Research Branch was initially asked about the relationship between poverty and wage outcomes, and results indicated complex relations. In response, the research branch expanded the study to provide updated and improved wage trajectory analyses. Repeated measures growth modeling is being used to examine wage trajectories from high school into several years post high school. This method provides a better understanding of the average wages in the first quarter after high school graduation and the average growth in wages after high school graduation. Additionally, the Research Branch is able to examine the variation in this overall

trajectory by location and sector, the effects of college enrollment and degree attainment, and the variation in those effects by race, gender, and poverty.

c) The Commission asked the Research Branch whether relationships between poverty and outcomes varied by local school system. In response, the research branch looked at student and school level poverty and long term outcomes specific for each local school system in Maryland. In most local school systems, student and school level poverty was negatively related to long term outcomes. However, in a few local school systems, poverty was positively related to long term outcomes. Since this information may be useful for local school systems, the research branch has created a prototype draft of a local school system specific research report.

Taskforce on Reconciliation and Equity at Morgan State University

Drs. Henneberger and Rose from the Research Branch were invited to present testimony to the Taskforce on Reconciliation and Equity at Morgan State University. The charge of the task force is to foster reconciliation and inclusionary justice toward achieving racial equity. The presentation focused on the overlap of poverty and race/ethnicity at the individual and school levels and the effects of each variable on high school, college, and career outcomes.

5. Governor's Office of Crime Control and Prevention

GOCCAP is leading a multi-agency effort to explore the feasibility of gathering and using criminal justice data for policy analysis and decision making. GOCCAP met with the Center to learn about the MLDS, its governance, data management, and system security. GOCCAP was also interested in learning about the Center's capabilities to provide analysis on the outcomes of students in the Juvenile Justice System.

6. Baltimore City

Promise Heights

The Promise Heights initiative was established in 2009 by the University of Maryland, School of Social Work (SSW) to improve educational outcomes for youth and ensure families are healthy and successful in the West Baltimore communities of Upton/Druid Heights. SSW received a grant from the U.S. Department of Education to fund programs and interventions in the Promise Heights Neighborhood schools. The MLDS Center is partnering with SSW to fulfill the grant's evaluation and reporting requirements. The Center's Research Branch has been collaborating with the Promise Heights team to discuss the indicators for reporting to the federal government and the data available in the MLDS to meet the reporting requirements. Evaluation strategies for selecting comparison schools and methodologies for implementing a rigorous quasi-experimental design have also been a major focus.

Poverty Task Force

Over the summer, two members of the Research Branch participated in meetings of the Baltimore City poverty task force. The goal of this task force is to identify the degree to which the reduction in poverty counts in City Schools was due to under-reporting of the English Language Learner population after the implementation of the Community Eligibility Provision. A secondary goal is to identify a measure of poverty that can be used in place of eligibility for free/reduced price meals.

B. Data Requests

At the time of writing this report, the Center received 30 data requests, which is consistent with the number of requests received in recent prior years. Below is a brief synopsis of each of the data request.

January

1. *Towson University,* requested data on the number of bachelor degree graduates from a teacher candidate program for the years 2010 to 2018 who accepted a teaching position and, for years 2010 to 2015, whether they were teaching three years later. STATUS – completed
2. *Morgan State University*, requested data on postsecondary degree attainment for Maryland high school graduates, disaggregated by race. STATUS – completed
3. *Maryland Senate,* requested a copy of a prior data request for frequency distributions for high school graduates from Charles, Calvert and St. Mary's Counties enrolling in college. The original data request was made to help USM complete a Joint Chairman's Report (JCR) request. STATUS – completed

February

4. *Maryland Senate,* requested a report that shows the postsecondary graduation rate of students who receive scholarships. STATUS – completed
5. *Maryland Higher Education Commission,* data on the outcomes of Montgomery and Prince George's County high school exiters, including postsecondary enrollment, wages, and completion of GED. STATUS - completed
6. *Maryland State Department of Education,* requested data as part of their participation in the Conference Board of Mathematical Sciences National Forum on High School to College Mathematics Pathways. The data request focused on high school student mathematics course taking and postsecondary outcomes. STATUS – completed
7. *Towson University*, requested data on the employment outcomes for students that graduate from Towson University in a program classified as teaching by NCES. Data points included loan amount, employment, and wages. STATUS – completed
8. *University of Maryland, College Park*, requested data on the retention of graduates from the teacher education program. STATUS – Completed

March

9. *Morgan State University*, requested data on the top 20 out-of-state colleges attended by Maryland public high school students one year after graduation (2014-2018). STATUS – Completed
10. *University of Baltimore*, requested the average wages of University of Baltimore degree recipients, by award level (Bachelor's, Master's) and by industry. STATUS – Completed

April

11. *Morgan State University*, requested the employment status of fall 2017 full-time undergraduates, including the industry of employment. STATUS – Completed
12. *Maryland Higher Education Commission*, requested data on the number of students in Maryland colleges and universities who have wages while in school. STATUS – Completed

May

13. *Morgan State University*, requested the wages for December 2017 Bachelor's degree recipients six months after graduation. STATUS – Completed

14. *Morgan State University,* the median salary/wage in 2018 for the class of 2008 Bachelor's degree recipients. STATUS – Completed
15. *Maryland Higher Education Commission,* data on the outcomes of Baltimore City high school exiters, including postsecondary enrollment, wages, and completion of GED. STATUS-completed
16. *Harford Community College,* requested last known address for contacting students who may be eligible for a One Step Away Grant. STATUS – Denied, MLDS Center cannot provide unit record, identifiable data.

June

17. *Maryland Higher Education Commission,* requested data on first-time, degree seeking students at four year institutions who had a dual enrollment experience in high school and earned an Associate's degree at a community college. The request was to support policy decisions by the Student Transfer Advisory Committee. STATUS – completed
18. *University of Maryland, School of Social Work (SSW),* requested data on Renaissance High School students who enroll in college and graduate. The request supports SSW's Promise Neighborhoods[3] project. STATUS – completed
19. *University of Maryland, College of Education,* requested outcomes (see request #8 above) for graduates of teaching programs disaggregated by specific program type. STATUS – Completed
20. *Towson University,* requested a follow-up to a prior data request for employment outcomes of Towson Bachelor's degree recipients. STATUS – completed

July

21. *Maryland Association of Community Colleges,* requested data on the number of Associate of Arts in Teaching (AAT) graduates who become teachers in Maryland public schools. STATUS – Completed
22. *University of Maryland, SSW,* requested follow up information on the Renaissance High School Students (see 18 above), including top five colleges enrolled and breakdown between two-year and four-year college enrollment. STATUS – Completed
23. *ASA Research,* requested data on enrollment of Baltimore City 12th grade high school students, including school attended, gender, race/ethnicity, and FAFSA completion. STATUS – Denied, COMAR 14.36.04.07 requires the Center to deny a request for *non-longitudinal data*[4] and to refer the requestor to the appropriate agency.

August

24. *Montgomery College,* requested data on the workforce outcomes for students who complete an Associate in Nursing Degree and then enter and complete a Bachelor's of Science in Nursing. STATUS – completed
25. *Maryland Business Roundtable for Education* – Requested a refresh of a prior data request. The request compares the postsecondary enrollment and retention of high students that met the *Maryland Scholars*[5] program requirements and those that did not. STATUS - Completed

[3] Promiseheights.org

[4] A data set is non-longitudinal if it contains data provided by only one of the agencies (MSDE, MHEC, or DoL) that contribute data to the Center.

[5] mbrt.org/scholars/

September

26. *Anne Arundel County* – requested the number of high school students who graduated with a GPA of 2.0 or less. STATUS – Denied, Request is non-longitudinal

October

27. *Maryland Higher Education Commission,* requested the number of aviation graduates from UMES that are working in Maryland. STATUS – completed
28. *Maryland Higher Education Commission,* requested the number of graduates in health science, marketing, and criminal justice are working in Maryland. STATUS – completed

November

29. *HelioCampus,* requested, by degree type, the wages and industry of employment for UMB graduates. STATUS – ongoing
30. *Education Strategy Group, requested* data to identify schools that help a significant number of students of color and low income students enroll in higher education. STATUS – ongoing

C. External Researcher and Grant Funded Projects

In addition to the Center's regularly planned research and output, the Center also works with researchers seeking MLDS data for a grant supported project or external researchers seeking Center data for a particular research project. These initiatives are important because they add research capacity without cost to the State. The projects are subject to a rigorous review procedure that ultimately requires Governing Board approval. Below is a list of all external researcher and grant funded projects reviewed and approved this year.

1. *Long-Run Relationships Between Teachers, Their Characteristics, and Student Outcomes: Data to Support School-Based Improvement Processes*

   Dr. David Blazar, Professor, University of Maryland, College Park, applied for and received an award from the American Educational Research Association (AERA). The project involves research, in collaboration with MSDE, MHEC, and local education agencies, to examine the characteristics and skills of teachers that contribute to students' long-term outcomes, including academic, behavioral, and workforce outcomes. This research will help to identify policy initiatives around selective recruitment and retention of teachers and professional development for teachers to meet their specific needs. The grant award is for $35,000. The Governing Board approved the use of Center data for this project.

2. *Expanding the Capacity of Statewide Education, Human Capital, and Workforce Development Research: Building a Community Around Data, Quality, Governance, and Privacy*

   Dr. Nancy Shapiro, Associate Vice Chancellor, University System of Maryland, along with a team of researchers across the University System of Maryland applied for grant funding from the National Science Foundation. While the application was not selected for award, it was promoted to the second round of consideration. The project proposed: (a) adding new sources of data to help address current data gaps identified by the MLDS Center; (b) adding prior years of student data from certain local school systems; (c) developing interstate data sharing protocols; and (d) developing additional privacy preserving techniques to allow the Center to more easily expand access to data with high level assurance that student privacy is protected. The grant was for up to $20 million. Final reviews were positive and Dr. Shapiro and team plan to resubmit in 2020.

3. *Postsecondary and Labor Market Effects of Career and Technical Education (CTE) in Baltimore City Schools*

   Dr. Rachel Durham, Director of Evaluation for the Baltimore Education Research Consortium (BERC) and Assistant Research Scientist at Johns Hopkins University, applied for a grant from the Institute for Education Sciences. Previous research has linked CTE participation with benefits related to secondary and postsecondary education as well as labor market outcomes. However, very little is understood about the specific mechanisms by which CTE relates to the wide array of outcomes. This study would be the first to rigorously estimate CTE impacts on student outcomes among Baltimore City Public School students by using a quasi-experimental research method. Outcomes to be examined include completion of CTE pathways, graduation/dropout, college enrollment, and workforce participation and earnings after high school. Further, the study will explore the mechanisms of CTE effects, including skill development, skill complementation, and employability skills. Finally, the research will examine subgroup differences in the effects of CTE on outcomes. The Governing Board approved the use of Center data for this project.

4. *Understanding How Modern Methods in Data Science Should be Used in Education*

   Dr. Tracy Sweet, Assistant Professor, Department of Human Development and Quantitative Methodology, University of Maryland, College Park applied for a grant from the Institute of Education Science. Data science methods have become increasingly popular in education research but are still relatively new. Most of the data science work in education research are applications of machine learning (ML) algorithms on educational data. Less research has been done comparing machine learning algorithms with traditional statistical methods and virtually no work has been done on the performance of machine learning algorithms on the types of nested data common in education. This study proposes a methodological investigation of the extent to which machine learning algorithms can and should be applied to multilevel education data, the conditions under which certain algorithms or models are superior, and how new methods in data science can address substantive research questions in education. The goals include studying ML methods for prediction and classification, exploratory data science methods, and new data science methods for causal inference to provide broad recommendations for education researchers. The Governing Board approved the use of Center data for this project. At this time, awards have not been issued.

5. *2019 Statewide Longitudinal Data Systems Grant*

   The Maryland State Department of Education (MSDE) has applied for and received funding under the SLDS Grant program in 2006, 2009, 2012 and 2015. MSDE submitted a proposal under the new round of funding this year. As in past years, MLDS Center Research Branch has been asked to partner on the grant. The proposal submitted by the Research Branch included: (a) conducting research to help inform policy, programs and practices on educational equity as applied to allocation of resources to Maryland students; (b) exploring technical enhancements to support equity-oriented research; and (c) increasing equitable research access to state longitudinal data. The Governing Board approved the use of Center data for this project.

6. *High School Determinants of STEM College and Career Outcomes*

   Dr. Jane Lincove, Associate Professor, University of Maryland, Baltimore County, School of Public Policy applied for a grant to the National Science Foundation. This proposed study will provide insight into how to improve pathways to STEM careers for all students by examining how high

school resources influence these pathways. This proposal was submitted last year to the National Science Foundation, but not awarded. It was resubmitted to NSF this year. At this time, awards have not been issued.

7. *Effects of Classroom Peer Groups on Long-Term Academic and Career Outcomes for At-Risk Students*
   The University of Maryland, School of Pharmacy's Pharmaceutical Research Computing (PRC) center invited principal investigators with an interest in data analysis services to submit proposals for pilot project funding. Services include data cleaning, data set creation, statistical analysis, project coordination, and programming assistance. Dr. Henneberger, MLDS Center Research Branch Director and Assistant Research Professor at UMB, proposed a project on "Effects of Classroom Peer Groups on Long-Term Academic and Career Outcomes for At-Risk Students." The proposed project was accepted and PRC will provide technical data analysis assistance for the project.

D. Research Series

During the academic year, the Center holds a monthly Research Series open to the public that provides presentations on the Center's research or areas of interest. The presentation materials and additional information can be found on the MLDS website.[6]

1. *Using Social Network Methods to Inform MLDS Center Research: An Example with Student Mobility (February)*
   Dr. Tracy M. Sweet, Associate Professor, UM College of Education and Ms. Tessa L. Johnson, Graduate Research Fellow, presented their exploration of the use of social network methods. A social network consists of a group of individuals (or entities) and the relationships (or connections) among them. Due to the structure of these data, social networks have unique methods for analysis. The presentation included an introduction to social network analysis, a brief introduction to social network models, and a discussion on how quantitative methods used for network analysis can be used in MLDS research.
2. *Early Elementary Science Test Score Gaps: Differences by Race/Ethnicity, Gender, and Language Backgrounds (March)*
   Dr. Chris Curran, Assistant Professor of Public Policy at the UMBC School of Public Policy, presented several recent studies that examine science achievement in the earliest grades of school (kindergarten to second grade), including: how science achievement varies by race/ethnicity and gender; and how these disparities compare to early test score gaps in other subject areas. Findings suggest that early elementary test score gaps are often larger in science than in mathematics or reading. This work explores some of the predictors of these differences, finding an important role for language and immigration status as well as variability explained by both in and out of school factors.
3. *Applying Longitudinal Data Analysis Methods to Examine Poverty as a Predictor of Wage Trajectories (April)*
   Dr. Bess Rose, Statistician for the MLDS Center Research Branch and UMB School of Social Work presented a method researchers could use to examine wage patterns over time in more detail by using repeated measure or growth curve modeling. This method would enable researchers to estimate individuals' initial outcomes at a set point in time, their estimated subsequent growth for

[6] Research Series presentation materials available at: https://mldscenter.maryland.gov/ResearchSeries.html

each increment of time, and the impact of individual events (e.g., enrolling in college, obtaining a college degree) or policy changes (e.g., making two-year college tuition free to all income-eligible individuals) on the shape of these trajectories.

4. *An update on the MLDS Synthetic Data Project (May)*
   Dr. Laura Stapleton, Professor and Associate Dean of Research, Innovation and Partnerships, UMCP presented the in-progress development of a synthetic data system and highlighted potential applications of synthetic data. The presentation covered the steps required to synthesize the data from the Maryland Longitudinal Data System; the challenges that were confronted, the successes experienced, and next steps in the development of the synthetic data system.
5. *Multiple Membership Modeling Versus Traditional Multilevel Modeling for Handling Student Mobility in Maryland (October)*
   Dr. Angela K. Henneberger and Dr. Bess Rose, MLDS Center Research Branch and UMB School of Social Work provided a presentation that: (1) investigates the prevalence of multiple memberships across cohorts and grade levels for students in Maryland public schools; (2) investigates the prevalence of multiple membership for specific subgroups of students and schools in Maryland public schools; and (3) applies multiple membership modeling and compare the results to those obtained from traditional multilevel modeling approaches.
6. *Juvenile Arrest and Peer Relationships: Findings from Rural Schools in Pennsylvania and Iowa* (November)*
   Dr. Wade Jacobsen, Assistant Professor, UMCP, School of Department of Criminology presented his study that examined the association between arrest and friendship ties among school peers. The study focused on three mechanisms of friendship selection implied in stigma theories: rejection, withdrawal, and homophily. The study found that arrested youth are less likely to receive friendship ties from school peers, and also less likely to extend them. Furthermore, these negative associations are attenuated by higher levels of antisocial or deviant behavior among peers, suggesting results are more heavily driven by exclusion from normative peers. Overall, the findings speak to how juvenile arrest may contribute to social inequality among rural youth by excluding already disadvantaged youth from normative peer networks.
7. *Long-term Educational and Workforce Outcomes of Adolescent Poverty and Homelessness (December)*
   Dr. Bess Rose, Statistician with the MLDS Center Research Branch and UMB School of Social Work, presented ongoing Center research related to whether relationships between poverty and long-term outcomes differ by levels of student poverty. Some of this research informed the recommendations of Maryland's Commission on Innovation and Excellence in Education ("Kirwan Commission") to improve the state's public education system. At their request, the Center has continued to examine the variation among levels and types of poverty. This presentation used data from the MLDS to examine homelessness as an extreme form of poverty and its role in long-term college and workforce outcomes. Results compared relationships for students who were never FARMS or homeless, who were ever FARMS but not homeless, and who were ever homeless.

E. Presentations

The Center delivered numerous presentations throughout the year at various conferences and to different groups of stakeholders. In addition to generating awareness about the Center and informing people about the Center's research, the presentations were also used to get input on different projects.

The Center has created a page on its website to provide information about presentations and copies of the presentation slides and handouts.

Other States

Given the scope and maturity of the MLDS and the Center's operations and output, it is often cited as an example for other states to learn about. As such, staff have been invited by several states and conferences to present the MLDS Center's governance and data system model. States include Illinois, Massachusetts, Maine, and California. Staff also presented to the Education Commission for the States and the National Governor's Association.

Maryland Higher Education Commission Completion Summit

The Center was invited to present highlights of its Career Preparation Expansion Act Report of 2018 at the Maryland Higher Education Commission Completion Summit on April 25th. The Completion Summit is held every other year and focuses on Maryland's progress toward the 2025 goal that at least 55% of Marylanders hold at least an Associate's degree. Ann Kellogg provided an overview of the report as well as information on wage data for high school graduates that attempt college and leave without graduating and on those who, five years after high school, are still attempting to earn a degree.

Maryland Community College Affinity Groups

MLDS Staff met with various Community College Affinity Groups to provide them with an overview of the MLDS Center, the data, and the capacity of the Center to provide data to assist them with reporting requirements and to answer questions about their students' outcomes.

STATS-DC

STATS-DC is an annual conference hosted by the National Center for Education Statistics (NCES), U.S. Department of Education. The conference focuses on technical and policy issues related to the collection, maintenance, and use of education data for education researchers, policymakers, and data system managers. The MLDS Center was well represented at the conference with three different presentations.

1. Ms. Kellogg, Director of Reporting Services, served on a panel discussing the Centers participation in the Common Education Data Standards (CEDS) work group the last nine months. Ms. Kellogg discussed how participation helped inform the methodological approach for both analyzing wages and educational attainment that the Center adopted for last year's Career Preparation Expansion Act Report last year.
2. Dr. Bess Rose gave a talk entitled: *Applying Longitudinal Data Analysis Methods to Examine Poverty as a Predictor of Wage Trajectories*. This talk introduced longitudinal data analysis methods to examining wage trajectories and used MLDS data to examine the role of college enrollment and degree attainment in wage trajectories, and the roles of race, gender, and poverty in those wage trajectories.
3. Dr. Michael Woolley and Dr. Mark Lachowicz gave a talk was entitled: *The MLDS Synthetic Data Project.* The talk introduced Maryland's federally-funded synthetic data project as a way to balance data access and security requirements associated with administrative data use.

Research Conferences

National and International Conferences

1. American Educational Research Association (AERA), Toronto, Ontario, Canada
    i. Dr. Angela Henneberger presented a symposium presentation entitled *Prevalence of Multiple Membership in a Statewide Longitudinal Data System.*
    ii. Ms. Tessa Johnson, Graduate research assistant with the synthetic data project, presented a symposium presentation entitled *The Effect of Correlated Clusters 0n Parameter Estimates in Multiple Membership Models*
2. Society for Prevention Research, San Francisco, CA
    i. Dr. Bess Rose presented a symposium presentation entitled *Using Big Data to Inform Prevention Science in Maryland*
3. Society for Research on Educational Effectiveness, Washington, D.C.
    i. Dr. Angela Henneberger presented a poster presentation entitled *Estimating Attrition in School-Based Evaluation Studies: Guidance from State Longitudinal Data in Maryland*
    ii. Ms. Tessa Johnson, Graduate research assistant with the synthetic data project, presented a symposium presentation entitled *Design and Analytic Implications in Modeling Student Mobility Across Correlated Schools*
4. Society for Social Work Research, San Francisco, CA
    i. Dr. Dawnsha Mushonga presented a symposium presentation entitled *Using Longitudinal Data to Assess the Long Term Outcomes Associated with Poverty in Maryland Students.*
    ii. Dr. Mathew Uretsky presented a symposium presentation entitled *Prevalence and Upstream Predictors of Remedial Education in Maryland Community Colleges*
5. Joint Statistical Meetings, Denver, CO and Singapore
    i. Dr. Mark Lachowicz, Postdoctoral Fellow with the synthetic data project presented a talk entitled *MLDs Synthetic Data Project: An Evaluation*
    ii. Dr. Daniel Bonnery, Investigator with the synthetic data project presented a talk entitled *MLDS Synthetic Data Project: An Evaluation.* This presentation was for the Conference on Current Trends in Survey Statistics in Singapore
6. Multilevel Modeling Conference, Utrecht, Netherlands
    i. Ms. Tessa Johnson, Graduate research assistant with the synthetic data project, presented a symposium presentation entitled *Modeling Student Mobility Using Hierarchical Networks*

Local Presentations for Research and Policy Audiences

1. Dr. Dawnsha Mushonga, presented research on the longitudinal relation between student and school level poverty and long-term outcomes for faculty and graduate students at the Morgan State University Psychometrics Seminar.
2. Dr. Mushonga also gave a poster presentation at the University of Maryland School of Social Work. This presentation was geared toward faculty and students in social work. The

presentation focused on the long-term academic and career outcomes associated with poverty.

3. Dr. Henneberger gave a presentation of work from the poverty study at the Johns Hopkins Bloomberg School of Public Health. The presentation focused on the strengths and challenges associated with using administrative data for research. Dr. Henneberger met with several students, staff, and faculty to discuss more about the MLDS Center research after the presentation.
4. Drs. Rose and Mushonga presented research from the poverty study at the annual Ruth Young Center Research day at the University of Maryland School of Social Work.
5. Dr. Henneberger presented at the University of Maryland Baltimore County Department of Economics and Policy seminar session. The talk was entitled *Student and School Concentrated Poverty: What are the Long-Term Consequences for Academic and Career Outcomes?*
6. Dr. Bess Rose presented research from the poverty study at the Morgan State University Psychometrics Seminar. The talk was entitled *Applying Longitudinal Data Analysis Methods to Examine Poverty as a Predictor of Wage Trajectories.*

F. Publications in Peer Reviewed Journals

Uretsky, M. C., Shipe, S. L., & Henneberger, A. K. (2019). Upstream Predictors of the Need for Developmental Education among First-year Community College Students. *Community College Journal of Research and Practice*, 1-15.

Uretsky, M.C. (2019). High School Completion in Context: Student and School-Level Factors Related to On-Time Graduation. *Teachers College Record.*

Bonnéry, D., Feng, Y., Henneberger, A. K., Johnson, T. L., Lachowicz, M., Rose, B. A., Shaw, T., Stapleton, L.M., Woolley, M.E. & Zheng, Y. (2019). The Promise and Limitations of Synthetic Data as a Strategy to Expand Access to State-Level Multi-Agency Longitudinal Data. *Journal of Research on Educational Effectiveness*, 1-29.

G. Synthetic Data Project (SDP)

The Center continues its work on the development of synthetic data, a project being funded by a grant from the U.S. Department of Education, Institute of Education Science.[7] The Center's project, which is being conducted by the Research Branch, involves evaluating the feasibility of developing synthetic data from the Center's actual data. Synthetic data is essentially a set (or multiple sets) of hypothetical students. The goal is for the synthetic data with hypothetical students to statistically mimic the data with real students. This would allow a researcher to test a research question about real students on the synthetic data without ever having received access to the real data with real students. Because the synthetic data does not represent actual students, there can be greater assurances that providing research access does not compromise student privacy.

[7] The Center was one of several agencies to partner with MSDE in applying for the 2015 Statewide Longitudinal Data Systems Program Grant. In total, MSDE was awarded $6.9 million over four years, $2.6 million of which is for the Center's project.

This past year, the SDP researchers successfully created synthetic data sets and have begun the testing phase of the project. The testing focuses on two issues:

1. Research Utility – a determination of whether a researcher can use the synthetic data to conduct meaningful research and whether the results of that research are consistent with results from the actual data.
2. Disclosure Risk – a determination of whether the synthetic data pose a risk of disclosure of confidential protected information.

The internal testing conducted by the researchers have thus far confirmed that the synthetic data have research utility and do not pose a disclosure risk. At the September meeting of the MLDS Governing Board the researchers requested permission to further test the synthetic data using outside researchers. The researchers are also consulting with the U.S. Census Bureau, which has been using synthetic data for several years and the U.S. Department of Education's Privacy Technical Assistance Center (PTAC), which advises education stakeholders in protecting the privacy of students.

Section 2. List of all studies performed by the Center

2.1 Research Reports

Poverty

Student and School Concentrated Poverty in Maryland: What are the Long-term High School, College, and Career Outcomes? This report examines the roles of student- and school-level poverty and race/ethnicity on long-term educational and career outcomes.

Grant Aid

The Effects of Need-based Grant Aid on Long-Term College and Workforce Outcome. This report examines Maryland's Howard P. Rawlings Educational Assistance (EA) grant and uses the fact that eligibility for the grant is determined by a definite threshold of financial need as a natural experiment to estimate a causal effect of receiving the EA Grant for bachelor's degree-seeking students.

Career and Technology Education (CTE)

The Effect of High School Career and Technology Education on Postsecondary Enrollment and Early Career Wages. This report estimates the effect of completing a sequence of CTE courses in high school on enrollment in postsecondary education, graduation within five years, and workforce wages in the sixth year.

2.2 Dashboards[8]

The Center added 12 new dashboards to the website this year and updated 18 existing dashboards.

Topic	Added	Updated

[8] MLDS Center Dashboards: https://mldscenter.maryland.gov/Dashboards.html

Dual Enrollment Trends	2	8
Initial college Enrollments		10
Financial Aid	10	

2.3 Dual Enrollment Report

The Maryland Longitudinal Data System Center (MLDSC) is required to report annually on the number of students who are dually enrolled and the courses in which students dually enroll. This report, required under the *College and Career Readiness and College Completion Act of 2013* (see Education Article § 24-703.1, Annotated Code of Maryland), is the sixth MLDS Center Report.

The data for this report comes from the Maryland Longitudinal Data System (MLDS). The MLDS is Maryland's central repository for student education and workforce data. Students were identified in the System as dually enrolled if they were enrolled in both a public high school and a college in Maryland, and had at least one overlapping day of enrollment in both institutions.

A total of 13,504 Maryland public high school students were dually enrolled in the 2017-2018 academic year. This is approximately a 13% increase from the prior year. Maryland community colleges were the most common location for students accessing dual enrollment opportunities. Dually enrolled students more closely reflected the demographics of the Maryland college-going population than the Maryland public high school population. The majority of dually enrolled Maryland public high school students were female, white, and not economically disadvantaged (as measured by non-eligibility for free/reduced price meals), although there were increases in participation amongst economically disadvantaged students, and African American, Hispanic/Latino, and Asian students.

Course information is reported from Maryland public high schools. The MLDS does not currently receive college course information. Students accessed courses in a variety of subject areas. The highest numbers of courses with dual enrollment were in the subjects of English language and literature, and mathematics.

Dual enrollment participation varied widely across the state. This is a reflection of the unique and varied opportunities for dual enrollment in each school system. The data presented in this report identifies trends in dual enrollment that policymakers and other stakeholders can evaluate to understand the impact of CCR-CCA on dual enrollment in Maryland. Supplemental information on dually enrolled Maryland public high school students including Statewide Dual Enrollment Trends and County Dual Enrollment Trends are available on the MLDS Center website[9] as a series of dashboards. The MLDS Center Research Branch completed a report studying the causal impacts of dual enrollment on postsecondary and workforce outcomes. That report, Effects of Dual Enrollment on College and Workforce, is available on the MLDS Center website under Research Reports.

[9] See https://mldscenter.maryland.gov/Dashboards.html - and select *Dual Enrollment Trends*

2.4 Maryland Public School Student Pathways Results

At the request of the staff of the Department of Legislative Service, the Center created an analysis of *Maryland Public School Pathways Results.* The analysis starts with a cohort of 2008 high school exiters and reports on their graduation from high school, college enrollment patterns, and college persistence and graduation patterns at 150% of normal program length. For a 2-year program, 150% of normal program length is 3 years and for a 4-year program, 150% of normal program length is 6 years. An additional report was created this year to provide the same analysis, but at 200% of normal program length. Both analyses can be found on the Center's website.[10]

2.5 Career Preparation Expansion Act

The Career Preparation Expansion Act Report seeks to understand this population (high school graduates, class of 2013) and their workforce outcomes within the context of the other critical factor in the lives of recent high school graduates: postsecondary education. The first five years after high school is traditionally the time when high school graduates engage in college; and that is certainly the case with the cohort analyzed for this report. Notably, 76% of the high school graduates had or continue to have some involvement with college during the first five years after high school. The impact of college on workforce outcomes is of critical importance and highlighted throughout this report.

The report groups the cohort of high school graduates based on whether the high school graduates entered college and received degrees, attempted college but exited without a degree, are still in college, or bypassed college altogether and went straight into the workforce. Not surprisingly, each pathway yields different workforce outcomes. Those high school graduates with no college degree had a median wage in the 20th quarter (five years) after high school ranging from $5,300 to $6,300, which is $1,500 to $2,500 below the estimated living wage in Maryland. Those high school graduates who earned a college degree had median 20th quarter wages that ranged from $7,000 to $14,000, which is $800 below to $6,100 above the living wage.

Several important observations can be gleaned from the wage earnings data. First, there is no immediate return on the investment (both time and money) in college unless a degree is earned. Students who attempted college but did not earn a degree have a lower 20th quarter median wage than those students who directly enter the workforce. And, unlike students who earned a degree, they do not have the financial reward of higher wages to help offset any costs incurred with going to college. Second, the value of any postsecondary degree is significant. While those without a degree are on pace to earn $1 million in their lifetime, those with a degree are on pace to earn $1.5 to $2 million in their lifetime. Finally, while all postsecondary degree earners have improved workforce outcomes over non-degree earners, bachelor's degree earners have a median 20th quarter wage that is approximately $1,400 to $2,500 higher than associate and certificate degree earners, respectively.

[10] See https://mldscenter.maryland.gov/CenterReports.html and select *Maryland Public School Pathways*

The report requirement to provide information on the hours worked cannot be directly addressed with MLDS data since the source of wage data only includes the total wage earned per quarter. One reason that hours worked is important is it helps paint a picture of the high school graduates' level of engagement in the workforce. Another approach to understanding the level of engagement in the workforce is to analyze the number of quarters during the five year period in which the high school graduates are reported as having wages. The results show that 87% of the cohort had at least one wage record during the five year period after high school, with 29% having wages in almost every quarter and 19% having wages in as few as one to five quarters. The range of workforce participation is once again impacted by college going. For example, bachelor's degree recipients have a high rate of irregular wage visibility, which may be explained by the fact that actively pursuing and completing a four year degree leaves little time for work within five years. Further, the pattern and timing of when they are engaged in work corresponds with summer periods when they are less likely to be fully involved in college. However, the workforce participation patterns of certificate and associate degree earners indicates that they are more likely to have continuous or frequent wages during the five year period. This pattern may reflect their shorter time to degree as only one to two years of full-time enrollment are required to complete their degrees, leaving a longer period to be fully engaged in employment after college. Finally, high school graduates with no college attendance make up 37% of those students with no wage records. It is possible that those students left the state for employment or joined the military. However, the no college group also has a range of wages that are less than continuous, indicating that a portion of this group has remained in Maryland. This sporadic employment may be due to under-employment; possibly due to lack of jobs for individuals with no postsecondary credential.

The final requirement of the report is to identify the industry sector in which the high school graduates are employed. Generally, five years after high school, the sector with the largest percentage of high school graduates is *Trade, Transportation, and Utilities*, followed by *Leisure and Hospitality*. Once again, educational attainment has an impact on sector and wage outcomes. *Trade, Transportation, and Utilities* sector was the largest employer of high school graduates for all educational attainment groups, except Bachelor's, with wages ranging from a low of $4,300 for those Still in College and as high as $6,400 for those with No College, which are both below living wage. *Professional and Business Services* was the largest employer of Bachelor's degree earners with a median quarterly wage of $11,700, which is above the living wage.

In addition to the methodologies for analyzing wages introduced in last year's report, this year's report adds additional methodologies for analyzing wages and workforce participation of the graduates. These include: (1) a comparison of the salaries of the graduates to Maryland's minimum wage; (2) an analysis of the percent of graduates employed in a sector as compared to that sector's contribution to the Maryland economy; (3) a comparison of the salaries of graduates in an industry sector to the average quarterly wage of all Marylanders working in that sector; and (4) a comparison of projected growth in industry sectors to the percentage of graduates working in those sectors.

Finally, there are two supplemental analyses provided in this year's report. The first is on *Wage Outcomes for High School Graduates with No College Enrollment by High School Program Completion Type*. The analysis finds that of the four high school graduation completion types, those graduates

whose completion fulfilled the requirements for an approved Career and Technology Education Program of Study (CTE) had a higher rate of engagement in the workforce at five years after high school and slightly higher earnings than graduates without CTE.

The second supplemental analysis is on *Student Loans and Wages*. This analysis calculates the estimated amount of loan repayments and whether the graduates' wages are sufficient to make those repayments and meet cost of living requirements. Findings vary by educational attainment groups: the Bachelor's group had median quarterly wages sufficient to cover the basic cost of living, loan repayment costs, and some amount of surplus; the Associate's group had median quarterly wages that were below, but close to what is needed for both cost of living and loan repayment; and the Some College group had a large gap between quarterly wages and cost of living plus loan repayment.

2.6 GED and National External Diploma Program® Outcomes

The Center completed a report on the Educational and Workforce Outcomes for Marylanders Earning a High School Diploma through GED or the National External Diploma Program® (NEDP).

This report is intended to serve as a companion to the Career Preparation Expansion Act (CPEA) Report (see above). The CPEA Report focused on the workforce outcomes of high school graduates five years after graduation. Not included in that population were individuals who earned a high school diploma following successful completion of either the GED® Testing program or the NEDP®. This report explores the workforce outcomes of GED® and NEDP® diploma earners five years after receiving the diploma and includes their wages earned and the industry in which they were employed.

The GED® and NEDP® diploma earners are distinct from the high school graduate population in several important ways. First, there are fewer of them: 5,126 GED® and NEDP® diploma earners versus the 59,510 high school graduates. Second, the age of the GED® and NEDP® diploma earners range between 18 to 65 and older (with 40% over 25). The high school graduates in comparison were generally all routinely 18 years old at graduation. Third, the rate of college going varied greatly: only 29% of GED® and NEDP® diploma earners enrolled in college during the five years after earning their diploma compared to 76% of the high school graduates. Finally, unlike the high school graduates, a significant portion of GED® and NEDP® diploma earners included inmates at Maryland correctional facilities. In fact, between 2016 and 2018, inmates made up approximately 20% of the individuals who earned a high school diploma through the GED® testing program. As discussed in the report, these differences likely impact the rate and type of work engaged in by this population.

Despite these differences, as with the high school graduate population, to understand the wage outcomes of the GED® and NEDP® diploma earners, the report groups them by their educational attainment during the five years after earning the GED® or NEDP® diploma: no college, some college, still in college, and college degree earners. The median quarterly wages for GED® and NEDP® diploma earners five years after earning the diploma varied significantly by educational attainment group. While the median quarterly wage for the population was $6,692, those who earned a college degree had a median quarterly wage that was $2,500 higher. The GED® and NEDP® diploma earners who did not attend college also had a median quarterly wage that was higher than the population - but only $800

higher. Conversely, those who only had some college and those still in college had a median quarterly wage that was roughly $600 less than the entire cohort and over $3,000 less than the college degree earners.

To better understand these wages, the report compares the wages to various wage indicators, such as minimum wage, living wage, and the median wage for all workers. The median wage for all groups exceeded the minimum quarterly wage of $3,608. However, all of the groups, except the college degree group, had a median wage that was less than the living wage of $7,913. All groups, including the college degree earners, had a median quarterly income that was less than the median earnings for all Maryland workers. In addition to reporting on the median wage for each educational attainment group, the report also highlights the number of GED® and NEDP® diploma earners who fell above or below the minimum wage, living wage, and median earnings for all Maryland workers. The fact that 61% of non-college degree earners in the cohort earned a wage that was below the living wage (of which, 19% also earned less than the minimum wage), gives a strong indication of the challenges facing these diploma earners in the workforce. This may be especially significant given the fact that this population is older and not necessarily in the early stages of their career paths.

One important trend observed in the CPEA Report is also true with this population: there is no immediate return on the investment (both time and money) in college unless a degree is earned. Students who attempted college but did not earn a degree had a lower median wage at five years than those students who directly entered the workforce. And, unlike students who earned a degree, they do not have the financial reward of higher wages to help offset any costs incurred from going to college. Second, the value of any postsecondary degree is significant; with a median quarterly wage $3,000 higher (or $12,000 annually).

In addition to wages, the report also explores the industry of employment of the NEDP® and GED® diploma earners five years after earning their diploma. Close to half of all of the NEDP and GED diploma earners were employed in either the Trade, Transportation, and Utilities sector or the Education and Health Services sector. Educational attainment impacted both the sector of employment and the amount earned in the sector. For example students who did not enroll in college were most often in the Trade, Transportation and Utilities sector and earned a median quarterly wage of $7,000. The Trade, Transportation, and Utilities sector was also the largest sector for some college and still in college, but the wages were lower by $200 and $2,500 respectively. College degree earners were most often in Education and Health Services sector and earned a median quarterly wage of approximately $9,600. The Goods Producing sector provided the highest quarterly median wages for the no college and still in college groups, while Public Administration sector provided the highest quarterly median ages for the college degree group.

Finally, the report discusses and utilizes new methodologies for analyzing wages, reviews the gaps in the wage data and how those gaps impact the analysis, and discusses the implications of the report and direction for future research.

2.7 Wage Visibility for Full-Time Undergraduate Students

Over 150,000 students were enrolled full-time in Associate's and Bachelor's degree programs in Maryland's colleges in the fall of 2017. This web-report explores how many of these students were employed while pursuing a degree. Working while in college may help students finance their education as well as provide the opportunity to build work experience that will support their career pursuits after college. However, working while in college may have negative consequences for some students, who may struggle to balance competing demands for their time, encounter scheduling conflicts between work and class, or have limited opportunity to attend faculty office hours or receive tutoring support.

The report provides results statewide and by college type. The report also explores the industry sectors in which the students are working.

2.8 Planned Research and Reporting

Each year, the MLDS Center staff develop, with input from stakeholders, a Research and Reporting Plan. The plan, which is reviewed by the Governing Board, is provided below.

Research Branch Priorities

Priority 1: Complete in-depth statistical analyses, able to support causal inferences where appropriate, on the following topics:

1. Studies that support causal inferences about the effects of different pathways from high school into college and the workforce, including examination of the Bridge Plan for Academic Validation (research request by MSDE) and additional focus on dual enrollment and early college initiatives.
2. Studies that further examine and disentangle the role of student and school-level poverty on long-term academic and workforce outcomes.
3. Studies that examine the relationship between characteristics of teacher preparation programs and/or individual teachers (in aggregate) and student outcomes.
4. Studies that examine the relationship between student characteristics and workforce outcomes in critical workforce areas.
5. Studies that explore statistical methods and best practices for incorporating wage data when data are missing not at random (e.g., for federal employees).
6. Studies that examine the causal effect of attending a 4-year college on long-term college and workforce outcomes.
7. Studies that examine the early elementary school predictors of long-term academic and career outcomes.
8. Further development of connections/partnerships and research questions related to the addition of behavioral data and data from the Department of Juvenile Services.
9. Maryland's production of high school and college graduates that meet the needs for Maryland's workforce demands (e.g., STEM; Pre-K teachers; Diverse teacher workforce)

Priority 2: Develop technical documentation to guide staff on the use of the System, data, appropriate methods, and best practices.

Priority 3: Applications for external funding to support priorities 1-2.

Reporting Services Branch Priorities

Priority 1: New Initiatives

1. Study critical workforce areas, including: Nursing, Teaching, and Computer Science
2. Report on earnings for high school and college graduates, including: transfer Associate's degrees, Career Associate's degrees and Bachelor's degrees.

Priority 2: Required Reporting

1. Dual Enrollment Report
2. Annual Report
3. Career Preparation Expansion Act Report
4. Fulfill Requests from Department of Legislative Services; Data Requests; and other stakeholders.

Priority 3: Other Output

1. New / Expansions
    a. Teachers - Regulatory Reporting
    b. Nursing - Maryland Health Services Cost Review Commission
    c. Dual Enrollment - College Graduation and Course-taking patterns
    d. Computer Science for All
    e. Five Year Outcomes
        - Career Preparation Expansion Act
        - GED/NEDP
        - College Degrees to Careers
2. Revisions to existing dashboards
        - Initial Postsecondary Enrollments - In-State vs. Out-of-State Enrollments
        - Initial Postsecondary Enrollments - Types of Institutions

Section 3. Data Determined to be Unnecessary

Data elements identified for removal in the System are presented to the Governing Board for approval. The following data elements have been approved for removal from the data inventory in the 2019 calendar year:

1. *Postsecondary: DIS-MAPCS Match Flag*

    The Maryland Higher Education Commission (MHEC) previously collected a flag that indicates whether or not the Maryland Approved Program Completer System (MAPCS) data are associated with Degree Information System (DIS) data that were reported for the same student from the same institution for the aligned collection year (e.g. DIS 2018 and MAPCS 2018). This flag is no longer collected by MHEC and was therefore removed.

2. *Postsecondary: Reverse Transfer Flag*

The Maryland Higher Education Commission (MHEC) collects a flag (reverse transfer) that indicates when a community college awards a degree to a student who previously attended a four-year institution. The Maryland Center was informed by MHEC that conflicting definitions have been operationalized for the Reverse Transfer Flag data element in the Degree Information System (DIS) data collection. The MLDS Center has decided to remove this data element from the data inventory as data from other collections can be used to identify reverse transfer students.

Section 4. Proposed or Planned Expansion of Data

4.1 Data Inventory

Md. Ed. Art. §24-701(f) defines the permissible types of student and workforce data that the MLDS may collect. Data that falls under that definition and are determined to be necessary to carry out the mission of the Center are presented to the Governing Board for approval to be included in the inventory. The Data Inventory represents the complete list of data that the MLDS Center collects.

The development of the Data Inventory is a collaborative process between DoL, MSDE and MHEC, and the MLDS Data Advisory Group. The MLDS Data Advisory Group annually reviews the Data Inventory and identifies what data elements to propose for inclusion or remove from the System. All data must be relevant to answering one of the questions in the Research Agenda or generally identified as necessary for evaluating federal or State supported education programs. Data elements identified for inclusion in the *Data Inventory* are presented to the Governing Board for approval. Once approved, the requirements are developed with the agency and included in the data collection calendar.

The MLDS Data Inventory is available online through the MLDS Center website.[11]

4.2 Additions to the Data Inventory

Apprenticeship

Data on apprenticeship programs administered by the Department of Labor were approved for inclusion in the MLDS Data Inventory.

1. First Name
2. Last Name
3. Middle Name
4. Social Security Number
5. Birthdate
6. Address Line 1
7. City
8. Zip Code
9. Gender
24. Employer
25. Employer Address
26. Employer City
27. Employer Zip code
28. Apprenticeship Start Date
29. Apprenticeship End Date
30. Apprenticeship Status
31. Education Level
32. Industry

[11] https://mldscenter.maryland.gov/DataInventory.html

10. Hispanic or Latino Ethnicity
11. American Indian or Alaska Native
12. Asian
13. Black or African American
14. Native Hawaiian or Other Pacific Islander
15. White
16. Demographic Race Two or More Races
17. Apprentice ID
18. Apprentice Type
19. Occupation
20. Sponsor Number
21. Sponsor Address
22. Sponsor City
23. Sponsor Zip code
33. Related Training Instruction Provider
34. Related Training Instruction Provider Address
35. Related Training Instruction Provider City
36. Related Training Instruction Provider ZIP
37. Program Length
38. Required Instructional Hours
39. Starting Wage
40. Ending Wage
41. Hourly Wage
42. Minimum Wage
43. Minimum Education Level
44. Exit Reason

Student Discipline

In 2019 the General Assembly passed House Bill 704 (see Chapter, 688, 2019 Laws of Maryland), which removed the restriction against the Center including student discipline data. Accordingly, the MLDS Governing Board approved the following discipline data elements for inclusion in the Data Inventory:

1. 504 Indicator
2. Disability Code
3. Offense Code
4. Date of Offense
5. Disposition Code
6. Length of Removal
7. Physical Injury
8. Type of Educational Services

PK12: Gifted and Talented

The Maryland State Department of Education is adding a Gifted and Talented Student Indicator to the End of Year Attendance data collection in order to comply with accountability requirements. Beginning with the 2020-2021 academic year, the following data element will be provided from MSDE:

1. Gifted and Talented Student Indicator

Adult Education

LACES (Literacy, Adult, and Community Education System) captures Adult Education data that is required for reporting to the Federal government pursuant to the Adult Education and Family Literacy Services (AEFLS) grant. The following data elements were approved for inclusion:

1. First Name
2. Last Name
3. Middle Name
4. Social Security Number (SSN)
5. Birth Date
6. Student ID
7. Home Address
8. Home City
9. Home Zip Code
10. Home County
56. Class End Date
57. Class Program
58. Instructor Type
59. Instructor Name
60. Min Required Days
61. Max Required Days
62. Days
63. Times
64. Weekly Time
65. Location

11. Gender
12. Hispanic/Latino Ethnicity
13. American Indian/Alaskan Native
14. Asian
15. Black or African American
16. Native Hawaiian or Other Pacific Islander
17. White
18. Program Type
19. Intake Date
20. Date Left
21. Employment Status Upon Entry
22. Highest Education Level Completed on Entry
23. Highest Ed. Level Completed on Entry Location
24. Current Level
25. Entry Level
26. Overall Status
27. Assessed Date
28. Instrument
29. Form
30. Level
31. Subtest
32. Scaled Score
33. Scaled Gain
34. SPL/GLE
35. SPL/GLE Gain
36. Raw Score
37. Assessed Level
38. Assessed Status in Subject Area
39. ESL Student
40. Scaled Gain in Subject
41. Current FY Instructional Hours
42. Instructional Hours Since Last Assessment in Subject Area
43. Instructional Hours Between Pre and Post in Subject Area
44. Enrollment Type
45. Match/Enroll Date
46. Instructional Start Date
47. Instructional End Date
48. Enrollment
49. Max Enroll
50. Class ID
51. Term
52. Course Number
53. Class/Group/Workshop Title/Name
54. Class Status
54. Class Start Date
66. Class Instructional Area
67. Class Language of Instruction
68. Class Completion
69. Age
70. Birthplace
71. City of Birth
72. Born Outside of US
73. Country of Birth
74. Immigrant
75. US Citizen
76. F1 Visa
77. Country of Citizenship
78. Barrier - Homeless
79. Barrier - Public Assistance
80. Barrier - Dislocated Worker
81. Barrier - Displaced Homemaker
82. Barrier - Migrant Worker
83. Barrier - Single Parent or Guardian
84. Barrier - At Risk
85. Barrier - Abuse
86. Barrier - Correctional
87. Barrier - Institutional
88. Parents' Highest Education Completed
89. Military Service Experience
90. Family Income Range
91. Number of Dependents
92. Minor with Adult Status
93. Lifetime Hours
94. Hours Type
95. Hours Present
96. Hours Absent
97. Late
98. Cohort
99. Goal Status
100. Goal
101. Exempt from Assessment
102. Type
103. Date Earned
104. Name of Diploma/Credential
105. Description/Number
106. Person's Name on Diploma/Credential
107. Completed Requirements
108. By Exam Only
109. Diploma Record Creation Date

PK12: Data Matching

House Bill 1206 - Data Matching was passed in the 2019 legislative session and requires county boards of education to convert student home addresses into a U.S. Census Bureau tract or block number and then provide that information to MSDE. MSDE will in turn provide these data to the MLDS Center. The proposed data elements for inclusion are listed below.

1. Student Census Tract
2. Student Census Block
3. School Census Tract
4. School Census Block

Postsecondary: Classification of Instructional Programs Code

The Maryland Higher Education Commission (MHEC) is adding a Classification of Instructional Program (CIP) code field to the Maryland Approved Program Completer System (MAPCS) data collection to capture the instructional program area of the student. The code reported is the one associated with the National Higher Education General Information Survey code in the MHEC Academic Program Inventory. The following data element is being added to the 2019 MAPCS collection:

1. CIP Code

Section 5. Recommendations to the Governing Board