

WICHE



Western Interstate Commission
for Higher Education

Beyond Borders: Understanding the Development and Mobility of Human Capital in an Age of Data-Driven Accountability

*A Report on WICHE's
Multistate Longitudinal
Data Exchange Pilot Project*

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Western Interstate Commission for Higher Education

The Western Interstate Commission for Higher Education (WICHE) is a public, interstate agency established to promote and facilitate resource sharing, collaboration, and cooperative planning among the Western states and territories and their colleges and universities. Members are:

Alaska	Montana	Utah
Arizona	Nevada	Washington
California	New Mexico	Wyoming
Colorado	North Dakota	U.S. Pacific territories and freely associated states*
Hawai'i	Oregon	
Idaho	South Dakota	

WICHE's broad objectives are to:

- Strengthen educational opportunities for students through expanded access to programs.
- Assist policymakers in dealing with higher education and human resource issues through research and analysis.
- Foster cooperative planning, especially that which targets the sharing of resources.

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The Policy Analysis and Research unit is involved in the research, analysis, and reporting of information on public policy issues of concern in the WICHE states.

*The U.S. Pacific territories and freely associated states includes three U.S. Pacific territories – American Samoa, the Commonwealth of the Northern Mariana Islands, and Guam – and three freely associated states – Marshall Islands, Federated States of Micronesia, and Palau. They join as a single member, with each territory and state electing individually to participate actively in the commission when it sees fit. The Commonwealth of the Northern Mariana Islands (CNMI) is the first of the group to participate.

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Foreword

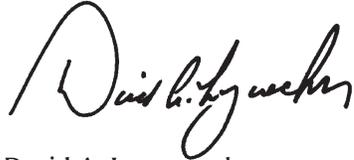
States invest heavily in public higher education to assure that both the states and their citizens enjoy the substantial financial benefits that accrue both individually and collectively from increased levels of education. Not surprisingly, therefore, state policymakers seek to be informed about how well higher education is doing in preparing the state's citizens to fit into the state's workforce. In addition, leaders of the state's institutions of higher education also need and want to know how well their institutions are doing in preparing the skilled workforce to sustain and enhance the economic development of the state.

In recent years many states have begun to develop and mine data systems that can demonstrate how well the state's system of higher education is doing in serving the state's need for filling the needs for a skilled workforce. In today's mobile society, however, these state databases simply don't provide an adequate picture of success in this realm because missing from the analysis are information about those high school and college graduates who migrate from the state, those individuals who come from another state to attend college in their state and whether they stay or return home after graduation, as well as those who come well-educated from other states to meet the state's workforce needs. State level data simply can't capture the information necessary to provide this comprehensive picture of how higher education serves the state's workforce and economic development agenda.

Now, in this recently completed pilot project, the Western Interstate Commission for Higher Education (WICHE) has demonstrated that states can get answers about what happens with the mobility of human capital within, into, out of states. WICHE, with the generous support of the Bill & Melinda Gates Foundation and the unflagging efforts of many state education and labor department leaders, forged a path for bringing together a cooperative exchange of education and earnings data across state agencies and state lines. Known as the Multistate Longitudinal Data Exchange, or MLDE, this cooperative effort has proven that state leaders can step outside their own borders and exchange information on a large scale. As you will read about in this report, it is not always an easy proposition – many entities need to be shepherded, legitimate concerns about data privacy and confidentiality have to be carefully addressed, you need an intricate and well-defined process to sort through and blend many distinct data sources and structures, and you have to stay focused about what you hope to learn from the vast array of information that results.

The results you will read about here and in the companion detailed outcomes report prove the feasibility and value of cross-border information exchange. Students can be found and their identity confirmed even across disconnected data sources and despite life changes that bring name changes, moves, and myriad educational trajectories. Data privacy and security can be maintained. And, state lawmakers can obtain the information they need to understand fully how students in their state make their way through college and into the workforce through their state-supported education systems. This information can provide more nuanced views of the economic payoff for different degrees and insights about how student grant and other student characteristics relate to college completion, among many other topics that are hinted at in this report but are as yet unexplored.

We hope that you will find this report about WICHE's multistate data exchange pilot project to be informative to your own efforts to exploit the vast potential of longitudinal data for better educational policy and practices, and consider the benefit of cooperating with your peers across state lines to expand the scope of voluntary exchange of information to better serve students, institutions, states, and national interests.

A handwritten signature in black ink, appearing to read "David A. Longanecker". The signature is fluid and cursive, with a large initial "D" and "L".

David A. Longanecker
President, Western Interstate Commission for Higher Education

Acknowledgments

A number of individuals were instrumental in launching and supporting WICHE's Multistate Longitudinal Data Exchange project that led to the results we present in this report. First and foremost among them were representatives of each of the participating states' K-12, higher education, and labor agencies. We are indebted to them for their active partnership throughout four years of project development and data extraction, and their contributions to the formulation and review of the results we report here. Our thanks also go to the National Student Clearinghouse staff for its careful handling of these data, preparation of the datasets supplied to WICHE and the states, and their many other invaluable contributions. Additionally, David Longanecker, WICHE's president, and Demarée Michelau, director of policy analysis at WICHE, Hans L'Orange of the State Higher Education Executive Officers (SHEEO), and Peter Ewell and Karen Paulson of the National Center for Higher Education Management Systems (NCHEMS), each of whom contributed invaluable technical advice and logistical support. Special thanks go to Peace Bransberger, senior research analyst at WICHE, whose careful preparation of the analyses of the datasets made this report possible. We thank Jere Mock and Paul Albright for their editorial assistance and Candy Allen for producing the layout and graphics in this report. Finally, WICHE is sincerely thankful to the Bill & Melinda Gates Foundation for its generous support of this important project.

Executive Summary

As educational attainment grows increasingly more essential to individual and societal prosperity and simultaneously more expensive, policymakers' appetite for evidence of the return on the investment in a college education has swelled and they increasingly want to equip prospective college students and their families with concrete information about the likelihood of graduating and obtaining a reasonably well-paying job. They also want to know how their education investments are paying off in the form of skilled workers for the economy. These rising demands have resulted in a number of efforts to measure education and employment outcomes backed by the federal or state governments.

It is against this backdrop that the Western Interstate Commission for Higher Education (WICHE), supported by a grant from the Bill & Melinda Gates Foundation, embarked on a pilot project to develop a Multistate Longitudinal Data Exchange (MLDE). This effort was aimed at building a resource able to track how human capital develops and becomes mobile across a multistate region, and at giving states, for their use in policy and program improvement, access to data that go missing from individual state databases whenever individuals cross state lines. Spanning individual-level data covering K-12 education, postsecondary education, and workforce information systems in four initial states – Hawai'i, Idaho, Oregon, and Washington – the pilot sought to determine whether a MLDE could serve as such a resource and, if so, how it could be built. This report describes how this project progressed, presents analytical results from a combined dataset of students who completed high school and started college in any of the four states, discusses the implications of those results, and offers lessons applicable to ongoing efforts to build and use longitudinal data systems for policy and practice.

More specifically, the pilot project identified the following products:

- An aggregated analysis tracking human capital development and mobility among the participating states,
- The return of identifiable data back to participating states for the specific individual students they served, enhanced with the information made available from the other pilot states through the exchange, and
- An infrastructure, including governance and architecture, necessary to make the exchange of data among states possible and sustainable, as well as to expand or export it to additional states.

To deliver on these, it was necessary to painstakingly shape data-sharing agreements permitting the exchange of data across all these data systems and states, and then to devise and implement a process for reliably and securely exchanging those data. The data-sharing agreements permitted WICHE to receive an anonymized dataset of all students in the combined dataset, while each participating state received enhanced data for the subset of students they supplied in the original cohorts. Befitting the idea that states would exchange data, the enhanced data sent to the states were provided to them in identified form so that they could add that information to analyses of student outcomes.

Another desired outcome of the pilot effort was to determine how much additional information could be obtained by exchanging data across state lines. WICHE's analysis determined that the project did in fact clear up a considerable amount of missing data, especially for employment outcomes. Adding the wage records from just the three other participating states captured employment information

for 22 percent of Idaho's degree earners with a valid Social Security Number, information that would otherwise be unknown to Idaho without the MLDE. The equivalent figures were 17, 14, and 9 percent for Hawai'i, Oregon, and Washington, respectively. WICHE also learned that accounting for subsequent enrollment (such as graduate school) further reduced a state's uncertainty about student outcomes. For example, information about subsequent enrollment shed new light on the educational outcomes of another 17 percent of Idaho's students.

Beyond quantifying the extent to which states can better understand the outcomes of students who cross state lines, the MLDE pilot also provided numerous lessons applicable to data systems development efforts and the growing interest in examining employment outcomes. Such lessons included:

- **A demonstration of the feasibility of the MLDE.** First and foremost, the project was able to build workable data-sharing agreements that satisfied the legal requirements for student confidentiality (as approved by offices of the participating states' attorneys general), successfully exchange individual-level data across states and sectors, and assemble a dataset that could be utilized to address topics related to how human capital is developed and becomes mobile over a multistate region.
- **More sophisticated and comprehensive information about workforce outcomes and swirl spanning the education and labor sectors.** The MLDE enables a much richer perspective on human capital development that better reflects the complex reality of today's college students' experiences than most currently available alternatives provide. If we do not create the capacity for a more comprehensive view, we will never know what we are missing in understanding the ways in which human capital develops, nor how we might envision new and better ways to impart the knowledge and skills needed for success in today's globalized economy.
- **Meeting state workforce needs.** Understanding how well aligned the state educational investments are with local workforce demands and students' employment directions provides a clear advantage to state policymakers who are thinking strategically about how to encourage institutions to be more responsive to local needs. More than that, policymakers should be concerned about how well the state is attracting talent educated elsewhere, not simply how their own state's investments are paying off in the local labor market. The MLDE can provide that information – insights no other source can currently provide. This capability broadens perspective considerably and stimulates discussion of the human capital "balance of trade" among states.
- **Accountability, consumer information, and program improvement.** While the MLDE holds promise for serving all three of these principal goals, our experience to date suggests caution in how employment outcomes information is used for accountability purposes. Despite these limitations, policymakers, agency leaders, and institutional leaders are likely to find the data to be quite valuable in formative assessment and in helping to shape the next series of questions that allow for better policy and program improvement. And what really sets the MLDE apart from most other efforts to combine these data is its unique ability to provide information for program and policy improvement.

- **A vigilant focus on policy relevance helped states in the MLDE conceptualize what data are needed for what purpose.** The Federal Educational Rights and Privacy Act (FERPA) is the principal law protecting the confidentiality of student records, and it includes provisions for individual-level data to be disclosed for certain evaluation and research purposes. States and institutions can achieve curricular improvements or evaluate public policies without knowing anything specific about students' identities. The more challenging question is at what point in the process do the data get stripped of identifying information. So long as the analytical question would benefit materially from having data from multiple sources, then the need for some form of identity resolution is clear and given policymakers' attention to measures of employability, that need extends to matching data across states. Once matchmaking has taken place, the data can be de-identified before they are made available for analysis. Whether individually identifiable data are needed for policy and planning purposes, then, hinges on the nature of the research question being raised; its salience to some potential action by the state or the institution (i.e., the source of the question); the availability of any data to adequately address the question; and the nature of that data, especially whether they already exist in a de-identified format adequate for the planned use.
- **Improved flexibility and rapid response will be crucial to long-term sustainability.** Although the approach to exchanging data taken in the pilot successfully passed legal review and delivered a source of rich data to demonstrate the value of a multistate resource, it was quickly apparent that the process sacrificed some potential flexibility and timeliness. Improving flexibility and timeliness is important if a future version of the MLDE is to optimally deliver on its potential to inform public policymakers and institutional leaders.
- **Effective data use is a challenging, underappreciated task.** Our experience with the MLDE reinforces the lessons states have been learning in this regard. Efforts to clean the data were extensive and required the active assistance of state research staff before any analysis could be performed. It is clear that for states to most effectively use the data available in their State Longitudinal Data Systems (SLDS), they must be conscious of the added demands of using unit-record data, especially if those data are obtained as part of an exchange across state lines. That should not dissuade states from collaborating and, in fact, expanding the MLDE to more states would also help ease the burden of interpretation.
- **Unequal value propositions.** While the MLDE pilot was designed to be a resource to all participating states and sectors, it became apparent that some states and sectors received more of a benefit from the initial exchange of data than others.
- **Other lessons.** The pilot project taught us many other less "global" lessons as well, including the value of the Common Education Data Standard (CEDS) effort in aligning data elements in the MLDE, that states' own SLDS efforts were accelerated by participating in the MLDE, and that we currently lack a consensus about what might be a threshold for tolerating error in identity resolution.

Introduction

As educational attainment grows increasingly more essential to individual and societal prosperity and simultaneously more expensive, policymakers' appetite for evidence of the return on the investment in a college education has swelled. Policymakers also want to know how their education investments are paying off in the form of skilled workers for the economy. This is true whether they are federal policymakers looking at their commitments to grant and loan programs or state policymakers whose attention is aimed at per-student subsidies, institutional appropriations, state financial aid programs, or what portion of educational costs students and families are being asked to contribute through tuition.

These pressures manifest themselves in different ways. One is a renewed focus on accountability measures, particularly in tying funding streams to institutional performance on key indicators of productivity. So school districts, individual schools, colleges, and universities are being asked to track student outcomes to better calculate measures of student success that can be tied to performance reporting or funding models, including the outcomes of students who disappear from their rosters. At the postsecondary level, and driven in part by consistent evidence that the public views a college education as instrumental for improving employment prospects, institutions are expected to show that their graduates are able to find reasonably well-paying jobs.

Moreover, some believe that providing prospective college students with better information about their likely enrollment and employment outcomes would drive students to institutions and academic programs that can show good outcomes and away from those that cannot. In other words, better consumer information would help lead to better decisions, which in turn influence the distribution of public subsidies, lead to improved student success and, ultimately, economic development.

In response to both of these motivations, the federal government has launched a number of attempts to measure education and employment outcomes, including its efforts to create gainful employment regulations that would ensure graduates of vocationally-oriented academic programs are able to pay off their student loans, the (yet undefined) set of measures that would evaluate employment outcomes in President Obama's postsecondary ratings proposal, and the *Student Right to Know Before You Go Act* that has been introduced in Congress.¹ States, meanwhile, are also starting to link data to show recent college graduates' employment outcomes, mostly measured according to median wages.²

Providing this information generally requires longitudinal data that can track individuals over time and wherever they go. Policymakers increasingly recognize how essential capable data systems are to filling this need. This recognition is apparent not only in the presence of longitudinal data systems in the various legislation attached to proposals such as those described above but also in the massive investments the federal government and the states have made over the past eight years to develop such systems. That work has been spearheaded by more than \$630 million in federal grants provided to create and enhance Statewide Longitudinal Data Systems (SLDS).³ Even as these projects mature and deliver useful data capacity to examine student progress and success, they are typically limited by state borders. When individuals leave the state for further education or to find work, state-based SLDSs cannot follow them. These out-migrants are a significant source of missing data and, consequently, create gaps in how well policymakers and

practitioners understand student success. Such gaps have unknown – and potential detrimental – impacts on the policymaking process as well as on the planning and operation of educational institutions. There is a growing need to show that the SLDS data systems can be instrumental in helping to inform public policies and practices,⁴ and that preventable gaps created when individuals move are a barrier to meeting that need.

It is against this backdrop that the Western Interstate Commission for Higher Education (WICHE), supported by a grant from the Bill & Melinda Gates Foundation, embarked on a pilot project to develop a Multistate Longitudinal Data Exchange (MLDE). This effort was aimed at building a resource able to track how human capital develops and becomes mobile across a multi-state region. WICHE worked initially with four states – Hawai'i, Idaho, Oregon, and Washington – to determine whether a MLDE could serve as such a resource and, if so, how it could be built. The project required WICHE, in partnership with the participating states, to clarify the analytical focus of the MLDE, create a process for exchanging sensitive individual data that would be acceptable to the state agencies that owned the data and compliant with federal and state law, develop a governance structure for the MLDE, and estimate the value of the MLDE based on an initial exchange of data. It also required merging data that each state had gathered from K-12 education, postsecondary education, and workforce information systems. This report describes how this project progressed, presents analytical results from a combined dataset of students who completed high school and started college in any of the four states, discusses the implications of those results, and offers lessons applicable to ongoing efforts to build and use longitudinal data systems for policy and practice.

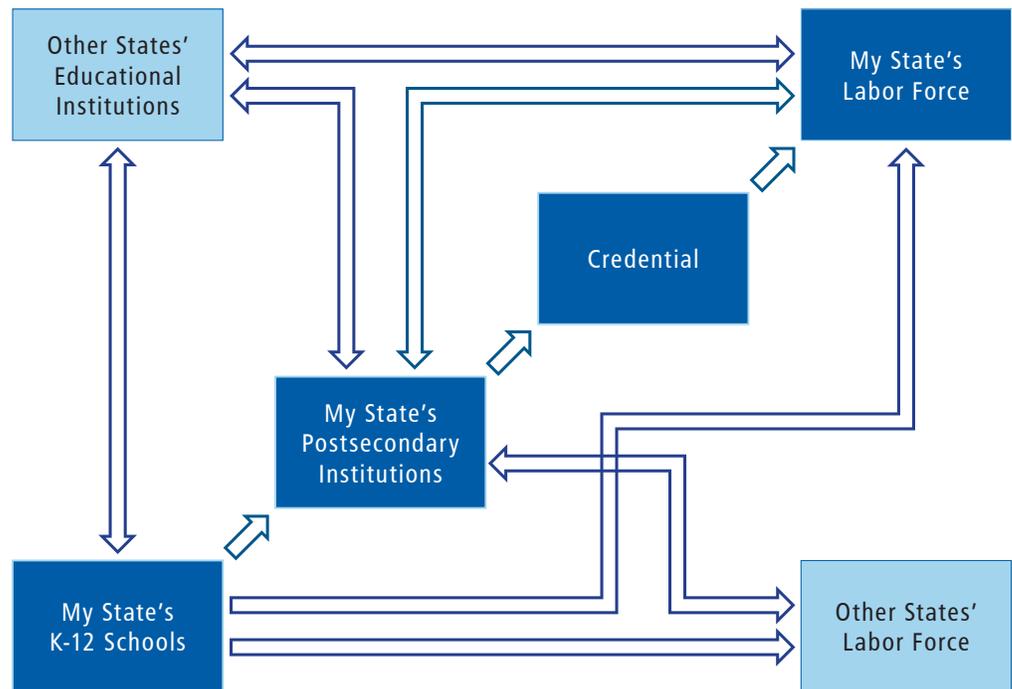
Background

WICHE's work on what was to become the MLDE project had its beginnings in a meeting it hosted with the Data Quality Campaign (DQC) in December, 2008. At the time, the DQC was working with the four regional compacts to advance conversations around SLDS development by helping to organize similar meetings. WICHE's meeting brought together the principal research/data officer from each of three agencies within its member states: the K-12 agency, the state higher education executive officer agency, and the workforce/labor agency. More than most other efforts going on at the time, this meeting expanded the conversation beyond education to include labor market information, and WICHE observed that participants (often representing the same state) were meeting and getting to know one another for the first time.

The notion of connecting data systems across state lines was first advanced at that meeting and, with funds remaining from the original conference grant provided by the Bill & Melinda Gates Foundation, WICHE hosted a second meeting in June, 2009 in Olympia, Washington.⁵ Attended by representatives from Hawai'i, Idaho, Oregon, and Washington, that meeting's purpose was to assess the appetite among those four states for putting together a pilot effort to link their SLDS projects and to begin to anticipate the challenges and opportunities such a collective resource might provide. By the end of the meeting it was clear that the states were interested in pursuing the idea. Encouraged, WICHE began to work with the Gates Foundation to develop a proposal to support an effort to create a pilot project.

Figure 1 illustrates the concept behind the pilot. While most states are focused on building linkages along the diagonal from the lower left to the upper right in their SLDS projects, the vision for the MLDE is to connect SLDS projects to account for movement to and from other states' educational institutions and other states' labor markets. The figure also shows links that skip over steps in our natural tendency to think about the educational pipeline in a linear fashion; for instance, to examine the behaviors of individuals who leave the labor market for more schooling. These pathways clearly exist in reality, even if our current capacity to analyze them is limited. But WICHE's vision for the pilot was to create a resource capable of supporting analytical approaches that incorporate multiple perspectives on the development and mobility of human capital.

Figure 1. Multistate Longitudinal Data Exchange Concept



At the same time, the federal government had announced a new round of competitive funding for SLDS development under the American Recovery and Rehabilitation Act (ARRA). The ARRA competition was different from the three prior competitions in that it required states to internally link data between K-12 and postsecondary education and encouraged states to create pathways into workforce information and work collaboratively across borders.⁶ Since all four states were preparing proposals for an ARRA SLDS grant, WICHE suggested that they include their involvement in the pilot multistate data exchange project in their proposals, conditional upon WICHE receiving supplemental funding from the Gates Foundation to move forward with the pilot. Three of the four states (all but Washington) eventually followed through by including the pilot effort in their SLDS proposals, and two (Oregon and Washington) received funding. WICHE continued to engage the four states to ensure that they remained committed to working on the project while the proposal worked its way through the foundation's grantmaking process. At one point, it was necessary to clarify that the intent of the pilot project was emphatically not to duplicate states' own SLDS efforts by building

a “shadow” SLDS for any of the participating states; rather, WICHE’s goal was to capitalize on states’ SLDS projects, linking them with one another. Upon approval of WICHE’s proposal by the Gates Foundation, the pilot MLDE project began in earnest in June, 2010, and the initial meeting to begin constructing the MLDE was held in Portland, Oregon, in October, 2010.

It is worth placing the launch of the MLDE pilot within an historical timeline of events bearing on the development and use of longitudinal data. As the project got underway, the federal government’s guidance on the application of the Family Educational Rights and Privacy Act (FERPA) was still fairly restrictive. Indeed, based on a subsequent conversation with a member of the Washington State Attorney General’s office, our plans to actually exchange personally identifiable data among the states would be impermissible under the FERPA guidance in effect at that time. Though we were told we would have been able to assemble and use a de-identified dataset, which would have shown much of the value of combining data across states, not being able to give enhanced data back to participating states would have been a serious setback. Changes in the federal government’s guidance on FERPA that went into effect in January, 2012 resolved this problem.⁷ The new guidance permitted the participating states to designate WICHE as an authorized representative for the purposes of assembling the combined data, while also allowing the redisclosure of data across state lines and between state agencies.⁸

Tracking student outcomes in postsecondary education was already a topic of great concern when our pilot project kicked off. Spurred in part by the intense data needs of the movement toward designing outcomes-based performance funding programs, states and the federal government were wrestling with the inadequacies of federal data on graduation rates.⁹ Meanwhile, the National Student Clearinghouse (NSC) was just beginning to systematically mine the rich data it had collected institution-by-institution to produce reports showing the complexities in student enrollment behaviors and patterns of success.¹⁰

As WICHE’s MLDE got underway, there were several extensive efforts to track employment outcomes of college graduates but attempts to do so using student-level longitudinal data were quite limited. These early efforts clearly and unequivocally demonstrated a strong association between higher levels of educational attainment and earnings, but they relied mainly on survey data compiled by the U.S. Census Bureau. The ability to examine short-term returns to college credentials came largely from surveys coordinated by the National Center for Education Statistics. Research on employment outcomes using linked education and workforce data at the individual level was, in mid-2010, still mainly confined to the evaluation of vocational education programs and not widely reported. A small group of states, like Florida and Washington, were held out as exemplars of how to do this work, and there was at least one earlier and preliminary effort to combine such data across states.¹¹ Two simultaneous developments have helped to ramp up interest in more granular evidence of the return on investment in education. First was the rapid growth of the for-profit postsecondary education sector and the concomitant increase in federal grant and loan dollars going to those schools. Concerns among policymakers over how well these institutions were preparing their students for work led to an ongoing set of Congressional hearings, government investigations, and the gainful employment regulations, the last of which requires linked education, income, and debt repayment data for

those institutions. The second event was the Great Recession. With employment at historically low levels, stories of college graduates not being able to find work abounded, and even though they were generally better off in the labor market than those without a college education, the idea that colleges failed to prepare their graduates adequately for jobs gained traction, as did concerns of a “skills mismatch” in the labor market.¹²

This short tour through recent history not only places WICHE’s pilot MLDE in context, it also illustrates just how much activity there has been around data systems and how rapidly evolving it has been. At this juncture, the demand for evidence and the challenges of satisfying that demand remain substantial. Already mentioned is the *Student Right to Know Before You Go Act* currently awaiting a full hearing in Congress. Additionally, as Congress begins to debate reauthorization of the Elementary and Secondary Act and the Higher Education Act, it appears that, once again, a federal unit-record data system may be considered, even if it is unlikely to be permitted. Meanwhile, the federal government is continuing to refine “gainful employment” regulations to penalize certain postsecondary programs whose graduates are unable to earn a reasonable wage and repay their debt.¹³ Individually, states, often working with outside entities, are mining linked education and employment data in order to develop accountability metrics and consumer information.¹⁴ In sum, this is a rapidly evolving priority and one that deserves our attention.

Building the Agreements

WICHE’s efforts during this pilot project were aimed at generating the following products:

- An aggregated analysis tracking human capital development and mobility among the participating states,
- The return of identifiable data back to participating states for the specific individual students they served, enhanced with the information made available from the other pilot states through the exchange, and
- An infrastructure, including governance and architecture, necessary to make the exchange of data among states possible, as well as to expand or export it to additional states.

All three of these products hinged on WICHE’s ability to create a data-sharing agreement among the participating states and their respective state agencies that own those data. WICHE maintained all along that the main goal for the project was to develop the capacity to exchange data among states on a continuing basis, not simply to assemble a dataset to be used for an interesting one-time research project. But it was clear that any long-term, sustainable effort must first be able to show how much participating states stood to gain from the effort required to put the MLDE together. Thus, an initial exchange of data was necessary to determine that value. It was also important because it was not until WICHE and participating states began to forge an agreement to actually share data across state lines that we were able to identify the obstacles and develop solutions to address them.

From the outset, the intent was to capitalize on and not supplant each individual state’s SLDS development effort, so that all the data required for the MLDE could be supplied by each state’s SLDS, relying on agreements already forged internally within the state. In that regard, and in keeping with the spirit of a pilot

effort, WICHE intentionally sought to engage states at different levels of SLDS development, since any effort to expand the MLDE beyond the pilot would have to address states at whatever developmental stage they were to be found. Another essential principle undergirding the MLDE pilot was *state ownership*, which meant that the exchange was intended to be owned collectively by the participating states. During the pilot, WICHE worked to fulfill the objectives outlined in the grant proposal, which itself was put together with substantial input from the states. At every opportunity, states are reminded that the MLDE is being designed and built in a manner that puts major decisions about operations and usage at the discretion of the participating states; ultimately the success or failure of the entire resource will hinge on whether its owners – the states themselves – find value in supporting and using it.

After the first meeting was spent on goal-setting and identifying underlying principles for the pilot, WICHE began working in earnest on a data-sharing agreement. This Memorandum of Agreement (an example is provided in Appendix A¹⁵) would establish key elements of the governance behind the MLDE, set forth the process for combining data, and identify the specific data elements to be exchanged.

A number of issues had to be settled before states were in position to sign their MOA(s).¹⁶ First and foremost, WICHE and the states had to come to agreement about the scope of the pilot project. Building off of previous work and best practice, WICHE discouraged states from considering the MLDE pilot to be an information technology project, in spite of the obvious need to deploy information technology to accomplish it.¹⁷ Rather, WICHE encouraged states to identify a policy question or questions that the MLDE pilot would be uniquely positioned to answer and to build the pilot resource to address those questions. Getting specific on the research questions was difficult, and ultimately the questions that are at the heart of the MOAs are:

1. What are the patterns of postsecondary enrollment and employment of high school graduates from each participating state?
2. What are the patterns of postsecondary enrollment and employment of students in public postsecondary institutions in participating states?
3. By more fully accounting for individual mobility across state lines, to what extent does sharing data among states supplement existing state data resources available for conducting evaluations leading to policy and program improvement?

The first two questions capture the essence of what the MLDE is intended to address and they enable WICHE and the participating states to examine a wide range of more detailed or specific analytical questions of interest to policymakers, institutional leaders, and other stakeholders. In particular, meaningful disaggregated analyses for students from different demographic backgrounds, states of origin, curriculum pathways, and other characteristics of importance are possible under these research questions. But as a pilot effort, in many respects the third question represented the initial focal point of analytical efforts once we had the fully exchanged and integrated data. More than the first two questions, it zeros in on how much information a state gains by collaborating through the MLDE with its neighbors. At the same time, the question is designed to reveal how much information a state is missing when it relies solely on its own data resources,

information that could be vitally important in pointing toward the most promising directions for policy and practice.

The process, or architecture, embedded in the MOAs will be described more fully momentarily, but it bears noting that the MOA also had a clear set of restrictions on how the data could be accessed and used. This section of the MOA drew extensively upon existing data-sharing agreements in participating states and on guidance issued through national resources like the Data Quality Campaign.¹⁸ Clear language establishing that the state agencies contributing data to the MLDE retained ownership over those data, prohibited redisclosure of any data without written approval except as necessary to operate the MLDE, and prevented any entity from using the data to make a decision about any individual whose records were included in the data. WICHE further pledged not to release aggregated findings without first giving participating states an opportunity for review and feedback. This was an essential step for the pilot project that helped to overcome resistance based on uncertainty about what the results from the shared data might show. The MOA also addressed data security issues, another major source of concern at the outset. Such limitations were essential to achieving compliance with existing federal (namely, FERPA and the Privacy Act of 1974 that governs the workforce information) and, where appropriate, state law. In many ways they were equally important to establish the necessary trust that WICHE and other states would have clear guidelines for how the exchanged data could be used. These provisions were carefully scrutinized in the participating states' attorney generals' offices before the state agencies were given clearance to sign the MOAs.

In pursuing these research questions and controlling the usage of the data in these ways, the group was able to limit the number of data elements required to operate the MLDE. These elements can be found listed in the example MOA provided as Appendix A. As is evident, the elements are all fairly basic in terms of what they convey. The MLDE applied to data that would identify an individual well enough to allow matching to occur across state lines and among state agencies operating unconnected data systems and provide: demographic information; enrollment records by term (including whether a student was a recipient of a Pell Grant); awards by term; and employment records by quarter. Even though these elements were relatively straightforward, it was helpful for WICHE to lean on the work that was being done concurrently to develop Common Education Data Standards (CEDS).¹⁹ CEDS data element definitions gave participating states a foundation for the kind of information the MLDE was ideally seeking and provided a convenient way for participating states to quickly reconcile any data elements that were not consistently defined. CEDS also offered a base for the MLDE team to use when considering how to construct and use analytical variables.²⁰

The Process for Exchanging Data

The MOA also laid out an involved process for how the data would be exchanged among the states and combined. The first step was to identify the parameters for the groups of individuals for whom data would be exchanged in order to address the research questions. Ultimately, the working group settled on two cohorts, labeled Cohort A and Cohort B. Cohort A was all the public high school graduates in 2004-05 across all four states and Cohort B was to include all first-time postsecondary students who enrolled at public institutions in any of the four states during the 2005-06 academic year.²¹ A large portion of these two cohorts

overlapped, but defining them separately enabled WICHE to examine outcomes of the K-12 education data system (a key expectation of the pilot project), while also including students from a high school graduating class who either never went to college or who delayed doing so, as well as older students who began postsecondary studies much later.

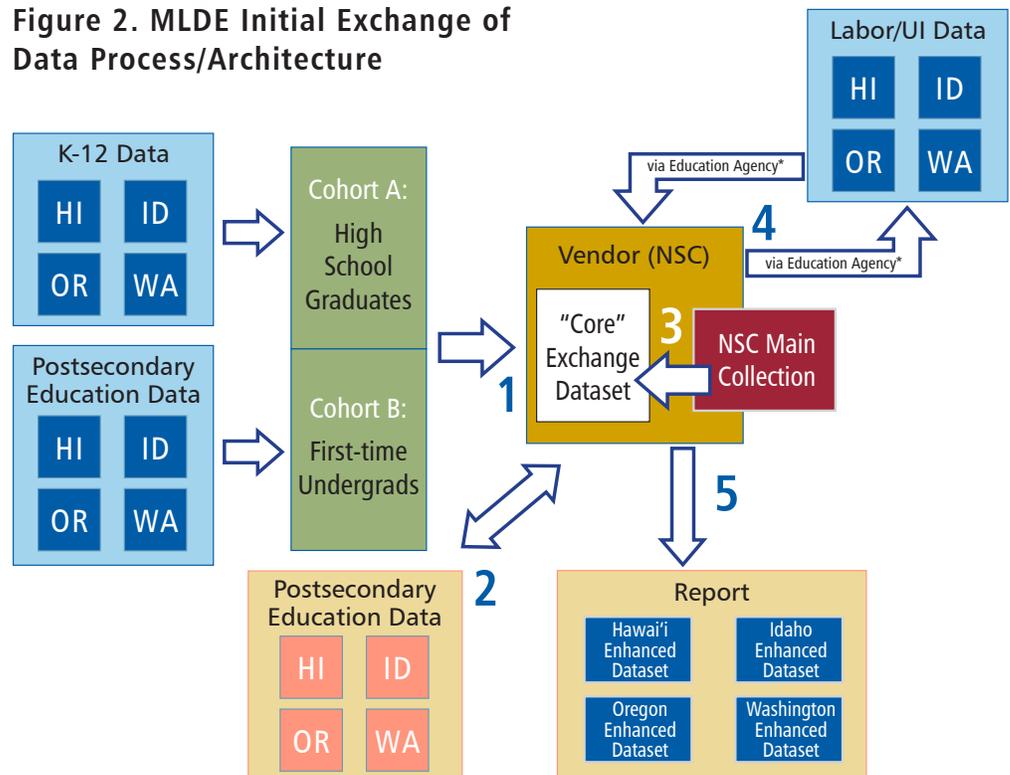
From the beginning, WICHE viewed its role as a facilitator or broker to help states come together and share data with one another, not as the site where the actual merging of individual-level data would occur. Instead, WICHE sought to identify a capable partner to perform the turnkey operation of consolidating the data files flowing in from each of the participating states. Eventually WICHE and the states settled on the National Student Clearinghouse (NSC) as the contractor for the pilot phase. NSC offered particular advantages, including a secure environment for holding, managing, transmitting, and receiving sensitive, individually identifiable data; ample expertise working with and analyzing individual-level education records; and a store of data of its own that the pilot project could capitalize on. The NSC served two related but distinct roles in this effort. First, NSC was the site where the states' data were merged and otherwise managed, and it also supplied the identity resolution process by which individuals were matched across data systems. In this role, NSC dedicated a separate portion of its data center to accommodate this project. The second role NSC played in the MLDE pilot was as a data provider. Here the NSC supplied information about postsecondary enrollment and awards for students from the original two cohorts whose postsecondary pathways took them to private institutions almost anywhere in the country, as well as public institutions not located in one of the four participating states.

Figure 2 illustrates the process through which the MLDE accomplished the initial exchange of data. The first step was for each of the four states to extract the cohorts and include key identifying and demographic information about the students and submit those data to the NSC. After combining the records, which included a first-stage identity resolution, NSC sent the resulting dataset back to the states. Each state then looked for any postsecondary enrollment or awards records for the period between the 2005-06 and the 2010-11 academic years that it had for any of the students in that combined dataset.²² At the same time, each state also looked for any Social Security numbers (SSNs) found attached to those students' records, transmitting all matched data back to the NSC, which accomplished step two. After receiving these datasets, NSC reached into its own main collection for any enrollment and awards records found for the students, including any records at independent institutions nationwide and public institutions outside of the four participating states. NSC also performed a more thorough identity resolution process at this time. It then attached a randomly-generated project identification number (the MLDE ID) solely to use in de-identifying the individual student records for further data collection and eventual analysis.

Next, NSC sent a file containing one record for all the individuals in the dataset with two fields, SSN and the MLDE ID, to the agency in each state responsible for managing the Unemployment Insurance (UI) program. Those agencies used the SSN to locate employment records for those individuals spanning the time period between the first quarter of 2004 through the last quarter for which they had data, which in some cases reached the fourth quarter of 2012. After appending those records onto the data file, each state agency stripped the SSNs from the file and

transmitted it back to the NSC. In Hawai'i, Idaho, and Washington, in order to remain compliant with applicable laws covering the confidentiality of employment records, these data files passed through the entity responsible for developing the state SLDS both before moving it on to the employment agency and before the resulting data matched with employment records was transmitted back to NSC.²³ Only in Oregon was the data exchanged directly between the NSC and the Oregon Employment Department. Once in receipt of the employment records, the NSC merged them back with the education records and prepared a de-identified dataset including all students for use by WICHE to prepare aggregated analyses. NSC concurrently created separate files for each of the participating states containing identifiable information, enhanced with the enrollment, awards, and employment data that were made available through the exchange, for transmission to each state. Each state received a customized file including only those students who were included in that state's original cohorts.

Figure 2. MLDE Initial Exchange of Data Process/Architecture



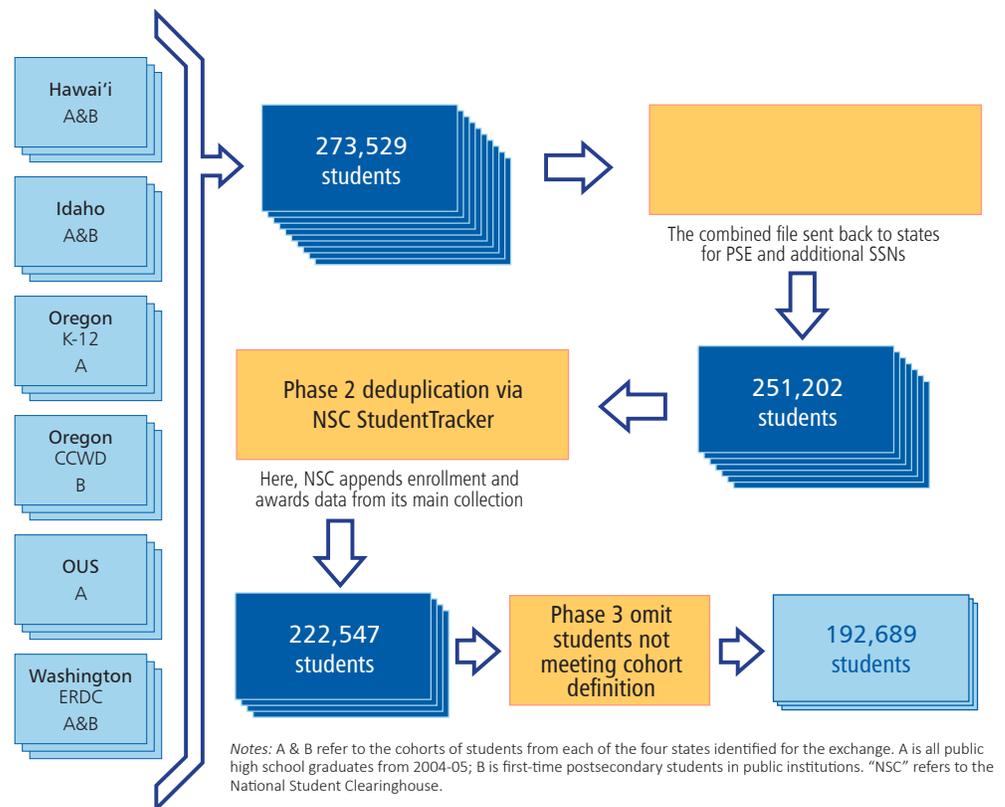
Note: "NSC" refers to the National Student Clearinghouse.

* Except in Oregon, where data went directly to/from the Oregon Employment Department.

At the technical core of the MLDE is an identity resolution process that links the individual records held in different states or data systems for the same person. WICHE relied on the NSC and its long experience and mature systems for reliably linking records in different data systems for the same individuals. Figure 3 depicts both the process and the number of individual records that were unduplicated during the NSC's efforts. The original extraction of data covering two cohorts and across four states yielded 273,529 records. In the interests of compressing the amount of time required to complete all of the steps in the initial exchange, the first attempt to eliminate duplication in those records was relatively rudimentary but still reduced the number of records to 252,267. After obtaining the postsecondary enrollment and awards information from the states, NSC ran the

entire dataset through StudentTracker, its proprietary identity resolution process, which further reduced the number of records to 222,547. While no identity resolution process will perfectly match all individuals, this number reflects the best estimate of the number of unique individuals in the full dataset as assembled from the four states' cohort extraction efforts. Analysis of that group, however, turned up individuals whose enrollment and awards data indicated that they were improperly included in the original cohort because they failed to meet the cohort definition. Excluding these yielded a final, complete dataset containing 192,689 uniquely identified individuals.²⁴ Generally, these last exclusions were made when states identified students in their own records as first-time postsecondary students but who in fact had evidence of having previously attended a postsecondary institution (and not, by and large, as a dually-enrolled student).²⁵

Figure 3. Identity Resolution Process

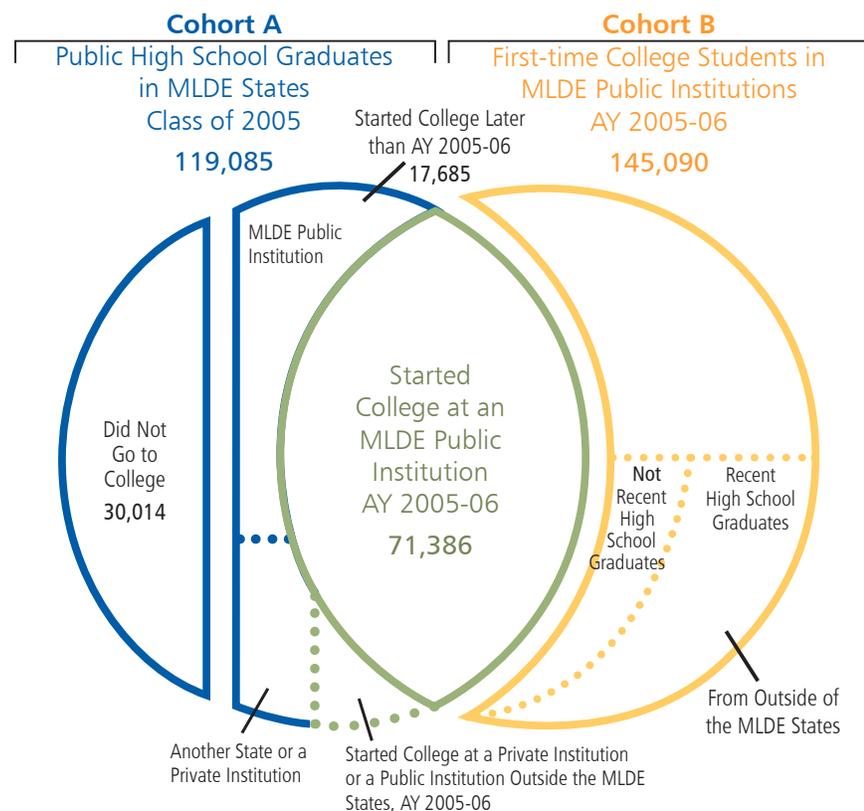


Results

This section provides select findings from the analysis of the combined, de-identified dataset. As a description of the pilot effort, these findings mainly address how much more information on student outcomes was made available through participation in the MLDE. In other words, while the findings necessarily touch on both of the first two research questions embedded in the MOAs, these results more directly address the third question concerning the extent to which the MLDE makes more policy- and practice-relevant information available. More detailed findings on student progression into and through college (as well as additional details concerning the data flow and the identity resolution process) can be found in the companion report, *A Glimpse Beyond State Lines: Student Outcomes from WICHE's Multistate Longitudinal Data Exchange Pilot Project*.²⁶

First, however, a mental map of the MLDE's initial cohorts is important in interpreting the results from the data analysis (Figure 4). It clearly illustrates the two cohorts previously described, and the overlap between them representing students who completed high school in 2005 and went directly to a public postsecondary institution in one of the four participating states. At the same time, it also helps illustrate some of the factors necessary to consider in interpreting the results. As indicated, Cohort B, the first-time postsecondary students, includes a substantial but unknown number of students who enrolled directly after graduating high school, either from another state or from a private secondary school or home school within one of our four states. In the non-overlapping portion of Cohort A, the public high school graduates, are those students who went directly to college elsewhere, those who delayed their entry into postsecondary studies but eventually went to college by 2010-11, and those who had not enrolled in college at all by that date.

Figure 4. Venn Diagram of Cohorts

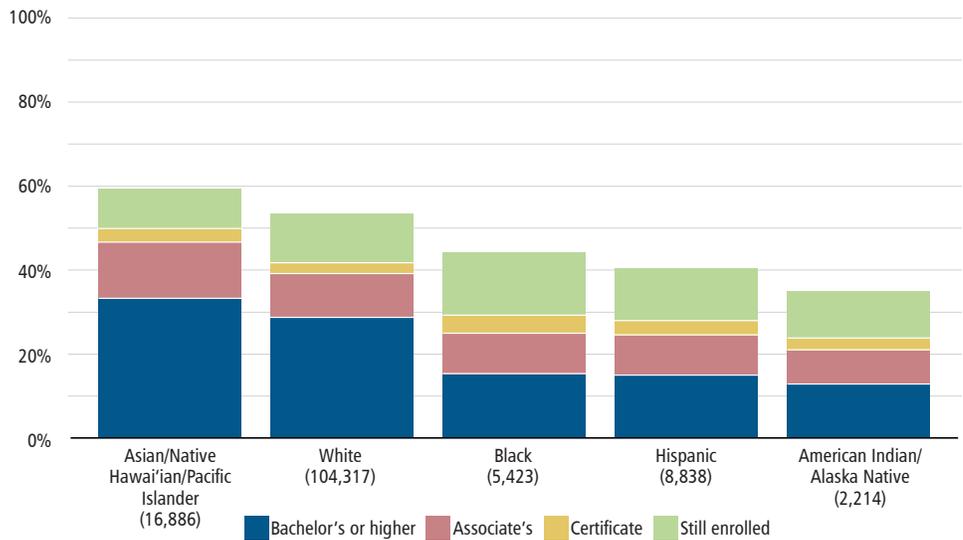


Note: Green dotted segment = the portion of Cohort A who began college at a private institution in an MLDE state or elsewhere in the nation, in academic year 2005-06. Private or homeschooled high school graduates, from an MLDE state or elsewhere, may be among the Cohort B first-time college students.

In analyzing the combined data, WICHE examined student pathways into and through college and into the workforce for these groups separately and together, but this discussion will highlight selected results from the full dataset aimed at demonstrating the unique capabilities of the MLDE to fill information gaps. Some of these capabilities include the MLDE's ability to contribute data elements not commonly available through other sources, such as race/ethnicity and receipt of

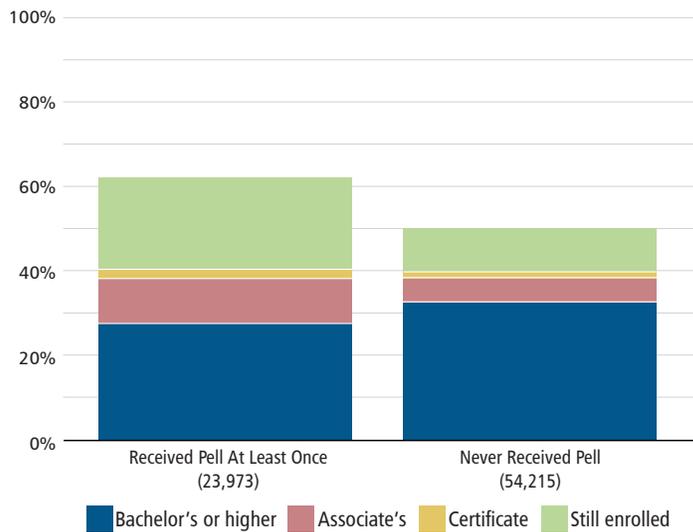
financial aid. For example, looking at completion rates for degrees or certificates, the MLDE data can disaggregate findings for students based on their race/ethnicity (Figure 5), or whether they ever received a Pell Grant during the timeframe studied (Figure 6). The former analysis shows a wide disparity in success rates for students from underrepresented racial/ethnic backgrounds. The latter graph points out similar rates of success for students regardless of whether they ever received a Pell Grant, but that fewer Pell recipients received bachelor’s degrees and more received Associate’s degrees. Both of these results are roughly consistent with findings from

Figure 5. Highest Credential Completed Among All First-Time Postsecondary Students, by Race/Ethnicity



Notes: Highest degree completed during the six years the students were tracked, among the 157,606 students who ever enrolled at least once in a postsecondary institution. Results not displayed for the 5,045 students who enrolled but did not start soon enough to complete a degree and for students whose race/ethnicity were of multiple races (5,600), or not indicated (14,400).

Figure 6. Highest Credential Completed Among All First-Time Postsecondary Students, by Pell Receipt

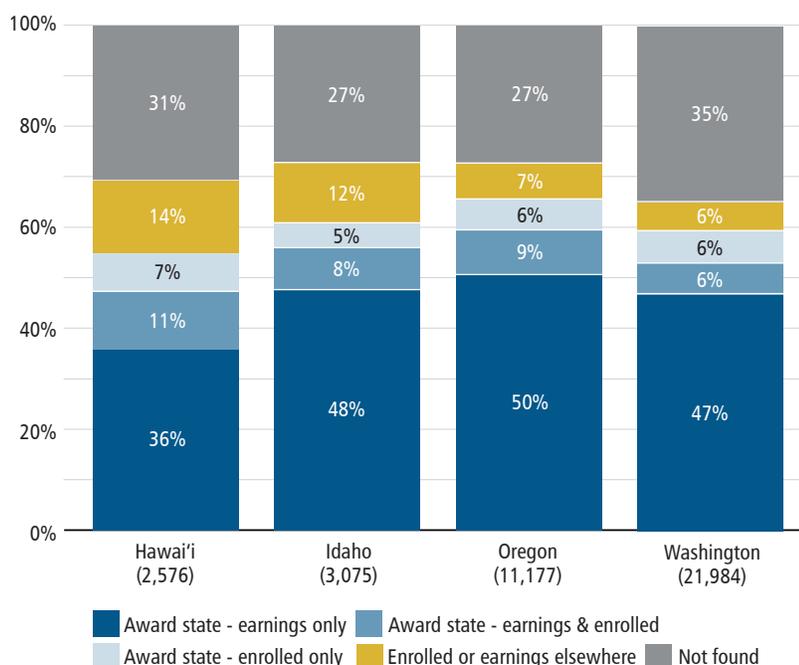


Note: Highest degree completed during the six years the students were tracked, among the 157,606 students who ever enrolled at least once in a postsecondary institution, not including the 5,045 students who enrolled but did not start soon enough to complete a degree, and for whom Pell indicators were available.

the Beginning Postsecondary Students federal longitudinal sample survey.²⁷ But the MLDE is able to further disaggregate these data by state and institution, as well as combine these and other data elements (e.g., Pell receipt and age) to better target policy or practice interventions.

Thus, the MLDE offers participating states considerably more flexibility to investigate student success than is currently available through other data sources. But the value it offers to states swells by the inclusion of employment information. Of particular interest is how much information about students' employment outcomes is made available through the MLDE that wouldn't be known without swapping data among states. This is not a trivial issue, especially since individuals are more likely to have access to appealing employment opportunities as their educational attainment level rises.²⁸ The MLDE was able to capture the mobility, and therefore explain, considerably more of the post-degree outcomes for students who earned an Associate's degree or better, as shown in Figure 7. The information on graduates' employment or subsequent enrollment in other states that was made available through the MLDE ranged from 6 percent in graduates of Washington to 14 percent in Hawai'i. As a proportion of the information about student outcomes that was unavailable to each individual state relying solely on its own data, the

Figure 7. Mobility of Recent Graduates with an Associate's Degree or Higher



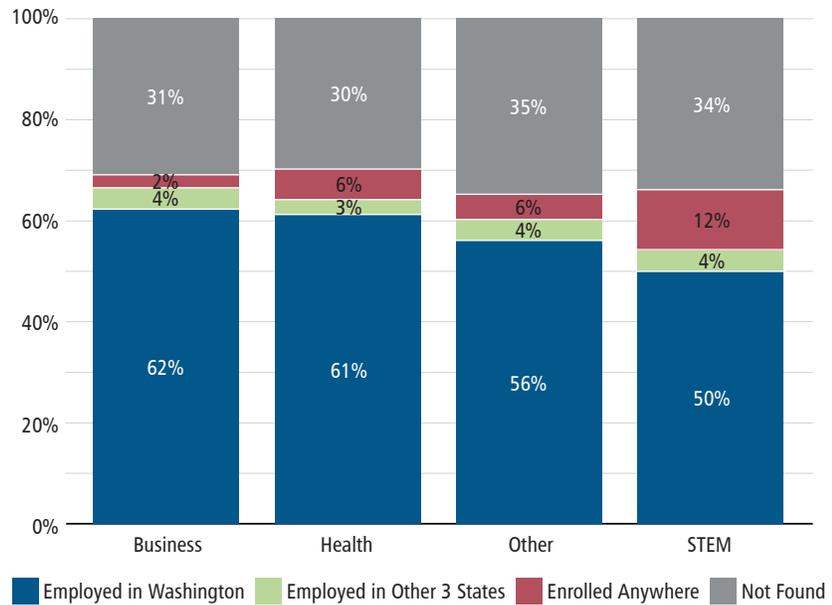
Note: Among students for whom we had a valid SSN, who completed a degree of Associate's or higher by December 31, 2010 from one of the four MLDE states. Earnings are measured approximately 10-12 months after degree. Graduates with degrees from private institutions are included in the state figures where the institution is located.

MLDE filled in 13 percent of the data gap in Washington, 19 percent in Oregon, and 28 percent in both Idaho and Hawai'i.

In addition to breakdowns by student demographic characteristics, policymakers will be interested in the mobility of graduates from particular academic programs. Figure 8 shows where bachelor's degree graduates from colleges and universities in Washington were found to be employed about a year later. These results show that

graduates from STEM (science, technology, engineering, mathematics) programs were less likely to be found working in Washington, as compared to other programs. Given states' interests in spurring STEM education – and Washington has provided supplemental funding for STEM for many years – these findings are potentially provocative and equip policymakers and institutional leaders with questions aimed at further understanding what might account for these differences.

Figure 8. Mobility of Washington's Graduates with a Bachelor's Degree or Higher, by Field of Study

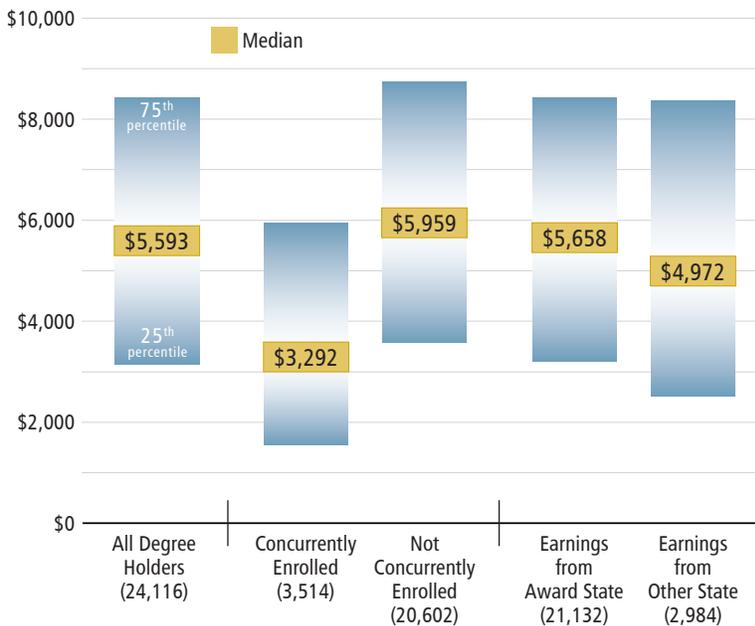


Note: Data are for individuals who completed by December 2010. Employment measured 10-12 months after receipt of award, and subsequent enrollment measured for a term concurrent with the quarter employment was sought.

These analyses are notably different from most of the work to date that has examined the outcomes of recent college graduates, and which has focused largely on the wages they earn. Rather than simply reporting a single measure, it was possible to calculate a series of median wage rates that accounted for whether students were concurrently enrolled when the wages were being earned and whether the students were employed in the same state where they obtained their degree (Figure 9). Each of these measures revealed variation that analysts should account for as longitudinal data systems designed to track students into the workforce mature. Given the accountability focus on employment outcomes, the MLDE also allows states to look at earnings of those who do not earn a degree as well as those who do (Figure 10).²⁹

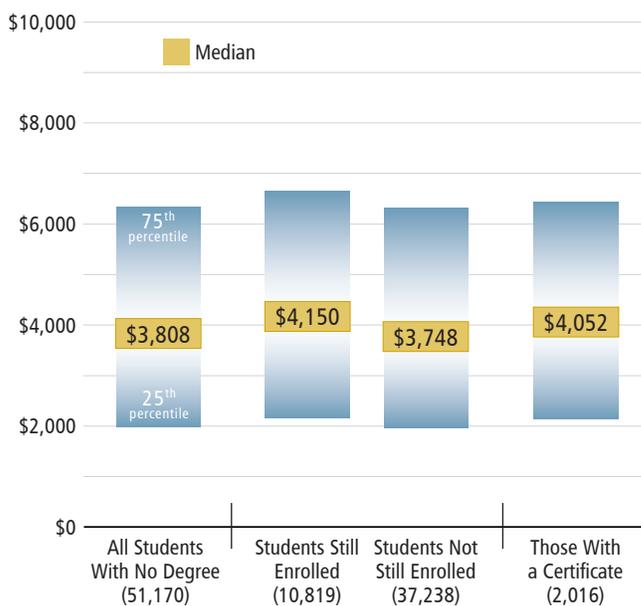
As a pilot project, WICHE's examination of the combined MLDE data has focused on exploring the capabilities of the dataset that add value to what is available through other means. WICHE's analyses have demonstrated that the shared data offer each participating state a wealth of new information that fills important gaps in their own data in two important ways. First and most obviously, the data that come from other states lend much more clarity to analyzing student outcomes, especially with respect to employment. These data make it possible for states to examine how and why they may be losing graduates to their neighbors, as well as

Figure 9. Quarterly Earnings of Degree Earners



Note: Data are for those who earned at least an Associate's degree by December 2010 and for whom a wage record existed. Earnings are measured approximately 10-12 months after degree. "Concurrently Enrolled"/"Not Concurrently Enrolled" applies to whether a graduate had an enrollment record that overlapped the quarter from which the earnings were drawn.

Figure 10. Quarterly Earnings of Postsecondary Students Without a Degree



Note: Students who did not complete a degree by December 2010. "Students Still Enrolled" are those with an enrollment record in Spring 2011. Earnings are measured in the wage quarter after, and not overlapping with, the last enrollment term (Q1 of the following year for Fall term last enrollments and Q3 of the same year for Spring or Summer term last enrollments). "Certificate" encompasses certificate earners who completely stopped out after earning their certificate as well as those found to be enrolled in Spring 2011.

account for educated talent they are attracting from elsewhere. They also permit a calculation of wages that does not simply ignore the earnings of graduates who move on to other states.

Second, the MLDE data make it possible to extend analyses in new and crucial directions since they provide a means for states to use data elements not widely captured in other data sources. Most notably, the MLDE as constructed for the pilot was able to disaggregate student success rates by race/ethnicity and for Pell Grant recipients. And since the data-sharing agreements permitted individually identifiable data to flow back to the states where students were originally identified, states could use their own richer data systems to further examine student outcomes according to their own interests.

Lessons

In the course of the pilot project, WICHE and the participating states have learned a number of useful lessons that apply to the creation and effective use of longitudinal data systems. Furthermore, while WICHE has always maintained that a truly comprehensive data system geared toward informing public policymakers about investing in human capital resource development should be capable of accounting for individual mobility, work on the pilot project has also surfaced a number of virtues the MLDE has that were either unexpected or not fully appreciated at the outset. Naturally, there are some clear challenges as well.

Demonstrating feasibility. First and foremost, the project was able to build workable data-sharing agreements that satisfied the legal requirements for student confidentiality (as approved by offices of the participating states' attorneys general), successfully exchange individual-level data across states and sectors, and assemble a dataset that could be utilized to address policy-relevant topics related to how human capital is developed and becomes mobile over a multistate region. After completing this initial exchange of data, the pilot was used to examine how much the MLDE helped participating states gain a more comprehensive picture of student outcomes in college and in the workforce. As mentioned in the preceding section, that value-added benefit was varied among the states but considerable. Still, the amount of uncertainty the MLDE cleared up for participating states should be viewed in light of the fact that the pilot occurred among four large Western states with vast rural areas and population centers mostly located at great distance from the state borders (and one state is isolated by thousands of miles of open ocean). A similar experiment in the New England states, for example, will almost assuredly generate substantially larger benefits given its relative population density and short distances between cities and towns, where the structure of higher education includes many more private institutions for which pricing is not based on state residency, and where individuals often reside in a different state from where they work.

Additionally, given the richness of the SLDS data from which the MLDE was drawn, the pilot also demonstrated the ability to link key demographic characteristics to student outcomes in new ways. For instance, students' race/ethnicity, age, and Pell receipt were all available characteristics to use in focusing our analyses.

More sophisticated and comprehensive information about workforce outcomes and swirl spanning the education and labor sectors. Virtually all of the attention on workforce outcomes of educational programs has understandably

focused on what happens to graduates. For instance, the current version of the proposed *Student Right to Know Before You Go Act* would require reporting of employment outcomes only for graduates of postsecondary institutions. Similar policy and research initiatives share the same focus.

Concentrating on what happens to graduates in the labor market after the completion of their studies is an obvious starting point for policy- and practice-relevant analysis. But limiting the analysis of combined education and employment data to graduates only provides a narrow view of how individuals participate in education and the labor market. That view reinforces a traditional, linear mindset whereby a student first attends and completes college, then seeks and obtains a job. It is increasingly apparent that such a lockstep pathway is not very common. Individuals often stop out of college for stints in the workforce before returning, they may be simultaneously enrolled and working, and they have many different motivations for seeking education that does not necessarily culminate in a degree or credential. Furthermore, if indicators are to be used for accountability or consumer information purposes, or, from the institution's perspective for marketing, then the way those indicators are calculated may influence the way in which institutions serve students. A data system that purports to pin down what students' employment outcomes are should be capable of assessing not only what happens to graduates in the workforce but of all students, including those that do not complete a degree or credential. This is especially true if part of the reason the combined education-workforce data are being sought by policymakers is to determine how well students who took out loans are able to pay off their resulting debt, since a credential is a major factor in whether or not former students can afford the debt service on their loans. Policymakers must recognize the potential perverse incentives such an accountability scheme presents to institutions: facing potentially high stakes, an institution should not be incentivized to discourage students from achieving their educational goals based on how it perceives their likely outcomes in the labor market.

The need goes beyond that. Data on students' employment during their schooling can complement – or hinder – the attainment of skills and abilities. It is common for individuals to obtain the kind of specialized knowledge available through one or more courses and not simply through a full program of study. How can we examine the outcomes of such behavior if we focus attention solely on graduates? Similarly, information about the relationship of co-op, internships, and apprenticeships to educational and workforce outcomes is difficult to come by. To what extent might such workplace experiences factor into the employment outcomes that we see in graduates' data? Our interest also extends to examining the degree to which individuals swirl in and out of education systems and the workforce. Why do they behave that way and what impact does it have on their ability to be productively employed? Finally, what can we learn about how non-credit enrollment may correspond to employment outcomes, particularly for remedial coursework and customized training programs?

Moreover, the interest in ascertaining employment outcomes through individual-level datasets has, to date, largely ignored individuals who have opted not to extend their education beyond high school. This neglect is partly due to the fact that our ability to link to the UI wage record files requires a Social Security number, but most states prohibit the collection of an SSN at the K-12 level. Thus, we simply

cannot perform the same kind of analyses on individuals who elect not to attend college. However, given how much worse those with a high school diploma or less fare in the workforce based on U.S. Census data, this is a serious blind spot that must be addressed.

It may be that the important policy and practice questions we are most interested in are most easily answered by a dataset that captures the transition between postsecondary education and work. But if we do not create the capacity for a more comprehensive view, then we will never know what we are missing in understanding the ways in which human capital develops, nor how we might envision new and better ways to impart the knowledge and skills needed for success in today's globalized economy.

Meeting state workforce needs. As with students' employment outcomes, policymakers are also rightly concerned with how their educational investments are paying off in meeting the state's workforce needs. For instance, are students finding their way into the state's most critical industries? SLDS activity within a state can begin to provide insights into that issue but only for those individuals who find employment in the state. The MLDE can also allow researchers to find out whether students are leaving the state in large numbers for better opportunities elsewhere. Understanding how well aligned the state educational investments are with local workforce demands and students' employment directions provides a clear advantage to state policymakers who are thinking strategically about encouraging institutions to be more responsive to local needs.

More than that, policymakers should be concerned about how well the state is attracting talent educated elsewhere, not simply how their own state's investments are paying off in the local labor market. The MLDE can provide that information – insights no other source can currently provide. This capability broadens the perspective considerably and stimulates discussions of the human capital “balance of trade” among states. That knowledge promotes more productive and collaborative problem-solving among state leaders within a region. For a host of reasons, it may not be possible or advisable to attempt to tightly couple state educational activities and investments to a snapshot of existing or projected state economic needs. The reasons include the difficulty in accurately projecting employment demand in a future increasingly marked by innovation and change. Moreover, individuals stubbornly resist being pigeon-holed into a state plan. Still, states can take a more regional perspective on how different industries' and employers' needs are being fulfilled and be better informed of their interdependence.

Accountability, consumer information, and program improvement. As touched upon at the outset of this report, longitudinal data linked across systems has three principal uses:

- Accountability, which could mean anything from public disclosures to policies that direct funding on the basis of how well students perform in both the educational and workforce settings. One example of a system taking the latter approach is the Texas Technical College System, which now directs funds to its institutions based on indicators of recent graduates' workforce participation.³⁰
- Consumer information, which refers to the idea that certain outcomes measures available to students prior to their enrollment, will help them

make better choices about which institutions to attend, as well as which academic programs to pursue. Much of the effort to make consumer information more readily available to the public has concentrated on a student's odds of completing a degree based on an institution's graduation rate data. There also has been a substantial push recently to make data available on median wages for recent graduates as well. The idea is that if students had a better sense of what their income is likely to be if they complete a particular program, they will make better choices for themselves.

- Program improvement, which refers to the use of longitudinal data to make adjustments in state or institutional policies or practices that lead to improved student outcomes or program quality. Such impacts could be on the curriculum, support services, financial aid distribution policies, institutional resource allocation policies, and so on.

The MLDE holds promise for serving all three of these principal goals, given enough time to develop and expand it to include more states and private sector institutions. At this stage in the development of longitudinal data systems designed to link education and employment, it is a fair question whether any resource that relies on the UI wage record files is ready to be used for accountability purposes. There remain large amounts of missing data that policymakers should be aware of before they attempt to directly incorporate employment outcomes into strong accountability schemes, such as through a funding formula. Where doing so is likely safest is in places where data on graduates' employment are very nearly complete, such as for local technical colleges. In the case of the MLDE pilot, our findings were rarely conclusive enough to lead directly to clear policy recommendations. However, policymakers, agency leaders, and institutional leaders are likely to find the data to be quite valuable in formative assessment and in helping to shape the next series of questions that allow for better policy and program improvement. And despite the need for caution in linking these data to accountability efforts, it is clear that states participating in the MLDE have more comprehensive information to use for that purpose – and for consumer information – than they would otherwise have on their own.

Yet what really sets the MLDE apart from most other efforts to combine these data is its unique ability to provide information for program and policy improvement. By contrast, the *Student Right to Know Before You Go Act* and a federal unit-record system (should such a project ever overcome the current prohibition) would not offer the same benefits for program improvement because neither option includes a means by which states and educational providers can obtain the personally identifiable information they would need to fully interrogate their own data. This is a significant missing piece for a number of reasons. First, states and institutions will be much more likely to be in “compliance mode” if the only purpose they see in supplying the data is because they are required to do so. They may see it as an unnecessary burden and, if so, a compliance mindset may impact data quality. That might be especially true if the states and institutions were to view the results as useful mainly as a means of marketing themselves to prospective students. Second, if institutions are going to be judged on their performance on indicators constructed from such data, but do not have the means for unpacking that calculation, their ability to improve on those measures will be reduced. Finally,

states and institutions are likely to find ways to use the enhanced information on students who have moved away in combination with other data in their possession to find efficiencies and improve student outcomes and overall performance. That is, supplying the enhanced information back to states and educational providers has the potential to unlock all the other data elements that are not formally among the elements exchanged through the MLDE. For instance, the sheer number of state financial aid programs and the wide variation therein severely limits the utility of any commonly-defined variable for who receives state aid. Similarly, wide variation in the way states and institutions approach remedial education also complicates the development of common definitions for exchanged variables. States and institutions can address these important policy questions by analyzing their own data on financial aid or remediation but equipped with a more complete picture of impacted students' postsecondary and employment outcomes made possible through the MLDE than would otherwise be the case.

This discussion begs the question of whether the MLDE can meet all three public policy purposes adequately enough to fill in for a federal unit-record data system. Conceptually speaking, it is clear that it could contain all the data necessary to do so either directly or indirectly. In reality, whether it would have access to all the data would depend on how much coverage the MLDE would have of the universe of students and their respective employment records. As a pilot of just four states, the MLDE as it currently exists is a long way from having that necessary coverage, but the design principles in place would permit its expansion to other states' public institutions as well as to private institutions. From the outset, the MLDE has been based on voluntary participation by state agencies, particularly those that manage the SLDS effort. By partnering with the National Student Clearinghouse, the MLDE was able to obtain data on the progress of students who attended private colleges and public institutions outside of the four states, but only for the students originally identified as members of one of the pre-defined cohorts. Employment outcomes for those individuals were limited to just those who at some point enrolled at a public postsecondary institution. If the MLDE were to expand to all 50 states, data coverage would be vastly greater but would still lack information for students attending private institutions or employment information for those who never went to college. It is possible that the MLDE could include as many of those institutions as saw fit to participate, either by passing their data through their state's SLDS or through another conduit. But depending as it currently does on voluntary adoption, the MLDE's chances to have sufficient coverage to fully meet some accountability demands – like employment outcomes for students who graduate from for-profit institutions – depends on those institutions either seeing value in their participation, or being subject to some requirement that they participate as a condition for Title IV eligibility.

Other limitations should be noted. The MLDE pilot did not capture post-collegiate outcomes for those who were self-employed or had jobs with the military or federal government since the UI wage records do not contain the necessary information. Other data sources contain records for the latter two employment conditions, and tax data can provide some information about self-employment. As a pilot study, the MLDE project was chiefly concerned with accessing and exchanging data owned by participating states, that they could voluntarily make available to one another without involving the federal government. But any work that builds off

of this project should attempt to gain access and exchange the data for individuals falling into the self-employed, military, or federal employment categories.

Finally, there are significant gaps in the UI wage record files that deserve attention. As previously mentioned, very little can be discovered about the employment of individuals who elect not to attend college since K-12 agencies are commonly prohibited from obtaining an SSN. Other gaps exist in what is typically not collected in the UI wage record files, namely hours worked during a quarter and occupation code. Although Oregon and Washington, among our participating states, do collect hours worked over a quarter in their UI wage data, Hawai'i and Idaho, and most others nationally do not. This prevents the calculation of a wage rate since it is impossible to know from a gross wages figure whether that amount is for full-time or part-time employment, or whether it refers to wages earned throughout the quarter or is concentrated in a few weeks at some point during that three-month period. This makes interpreting wage outcomes unnecessarily difficult and complicated. Not having an occupation code makes it difficult to determine whether an individual is working in the field in which they earned their degree. Each of these factors reduces the utility of any effort to combine education and employment data at the state level, and these limitations are not specific to the MLDE project.

A vigilant focus on policy-relevant information. One of the critical first steps that a longitudinal data resource development project must take is to define its goals. For the work to proceed in a way that most effectively addresses public policy questions and concerns, the project must begin with a clear sense of what those questions will be and ensure that the resulting resource is capable of answering them. While it is clear that there are a host of technical details and decisions to make, states and other entities working to develop data systems should keep those policy issues foremost in their vision.

This is not a straightforward or simple concept. There are many salutary uses of longitudinal data that will never be relevant for legislators or other government officials, and some of these can make an important difference in student success. Early warning systems that are able to identify students who are engaging in behavior that risks their academic futures offer institutional staff, faculty, or others a chance to intervene and put that student on a more productive path. Certainly this is valuable information but generally not appropriate or necessary for a legislator. Not appreciating this distinction is one of the ways in which conversations during the development of data systems can easily go awry by confusing the policy-relevant uses of the data system with transactional uses in the practice of teaching and learning. In the MLDE pilot, discussions periodically veered off the path of policy-relevance and into issues touching more on the collection and management of transactional data. Even the project leaders were occasionally guilty of raising these issues without always recognizing it. Having established high-level agreement that the overarching audience for the pilot was policymakers helped to avoid these divergences.

Of course drawing a clear, bright dividing line between data for transactional purposes and data for policy-relevant purposes is a fool's errand, especially since the MLDE pilot – and most longitudinal data systems in the current developmental pipeline – are relying on data sources that exist for transactional reasons, like the UI wage record data that is essential to operate the UI benefits program. But

thinking through the differences between these kinds of data revealed insights related to who needs what data for what purpose, and these insights are applicable for longitudinal data development and address legitimate privacy concerns. Table 1 offers a few illustrative (and admittedly broad) examples of the kind of data needed for various purposes. It also makes clear that this issue is relatively straightforward when it comes to operational data uses: identifiable data are almost uniformly required since the goal is usually to intervene with, or provide information about, a specific individual. These uses also require frequent updates in the data file.

It becomes more challenging with policy or planning-related data uses. In general, de-identified data are sufficient for many of those purposes since there is no intention to address any single individual's situation, and less frequent data collection is possible. So states and institutions can make curricular improvements or evaluate public policies without knowing students' identities.³¹ The question is at what point in the process do the data get stripped of identifying information. So long as the analytical question would benefit materially from having data from multiple sources, then the need for some form of identity resolution is clear. Since individually identifiable data are essential in matching individual records across agencies and states, there appears to be a need for some entity with the capacity and responsibility for performing that matchmaking operation. Given policymakers' attention to measures of employability, there is clearly a need for such a resource to exist to match data across states. But as we see more students crossing state borders, and even institutions becoming less tied to a physical space, states and institutions would benefit from having access to data compiled across state lines even for tasks like strategic or master planning and institutional assessment. Once matchmaking has taken place, for many uses the data can be de-identified before they are made available for analysis. Whether individually identifiable data are needed for policy and planning purposes, then, hinges on the nature of the research question being raised; its salience to some potential action by the state or the institution (i.e., the source of the question); the availability of any data to adequately address the question; and the nature of those data, especially whether they already exist in a de-identified format adequate for the planned use.

Improved flexibility and rapid response will be crucial to long-term sustainability. In creating the pilot's data-sharing agreements, WICHE and the participating states went to great pains to describe the specific steps necessary to assemble the combined dataset. These steps included the specification of two cohorts to be extracted and together amounted to the creation of a data warehouse where all the records with all the elements were to be temporarily housed. These decisions were made so that the entire data-sharing process would be as clear and transparent as possible in order to obtain the necessary legal approvals to move forward. This was essential because of the uncharted waters we were in with respect to cross-state data-sharing and due to the fact that we were seeking these approvals as the federal government was making changes to FERPA regulations. Although this approach successfully passed legal review and delivered a source of rich data to demonstrate the value of a multistate resource, it was quickly apparent that the process sacrificed some potential flexibility and timeliness. Improving flexibility and timeliness is important if a future version of the MLDE is to optimally deliver on its potential to inform public policymakers and institutional leaders.

Table 1. Data Use Type Examples

Data Use Type	Example Goal	Example Question(s) to be Answered	Data Needs	Individual Identifiability and Match Needs
Operational	Establish and use early warning indicators to intervene with students not on track to graduate	What patterns of attendance and observable study habits predict academic success?	Micro data on attendance, time on task, etc.	Identifiable (in order to intervene with individuals) Not necessary to match data across institutions
	Ensure legal and equitable distribution of financial aid	Are students eligible to receive federal Stafford loan funds?	Loan eligibility and usage	Identifiable Matched with prior and concurrent institutions
	Verification of degree conferral	Has the candidate received the degree being claimed?	Awards data obtained from prior institution	Identifiable
Policy/ Planning at the institution level	Curriculum improvement	How have students receiving remedial coursework proceeded academically? To what extent are students completing their general education requirements and subsequently succeeding academically?	Data on enrollment, including courses, and awards for students from initial and all subsequent institutions	Identifiable data for students served by specific programs
	Curriculum alignment with workforce needs	How have former students and graduates from various academic programs succeeded in the workforce?	Linked education and employment records, preferably across state lines and including subsequent enrollments	Identifiable data for students served by specific programs
Policy/ Planning at the state level	College and career readiness	How well are recent high school graduates performing in postsecondary education and the workforce?	Linked education records and employment records, preferably across state lines	De-identified once students records are matched
	Assessment of academic programs' connection to labor markets	What is the rate at which students are able to find employment upon graduating? To what extent do state policies support the right mix of academic programs to meet the state or regional labor market demands?	Linked education and employment records, preferably across state lines and including subsequent enrollments	De-identified once students' records are matched

A major consideration in selecting the initial cohorts was that all three major sectors – K-12, postsecondary, and workforce – would need to contribute data so that we could demonstrate that data could be exchanged and be useful to all sectors. This had subsequent effects on how much information was useful once the dataset was assembled because some students from the high school graduates cohort failed to enroll in college at all, delayed entry, or failed to complete their postsecondary program, thus reducing the number of individuals for whom our analysis of employment outcomes could be performed. For example, when trying to report on how well graduates with an associate’s degree or better are faring in the workforce, our original dataset of 192,689 individuals is reduced to 59,405 who actually wound up with a degree. That is still a considerable number of individuals, but further disaggregation – by state, institution, degree type, Classification of Instructional Programs (CIP) field, and combinations thereof – quickly degrades the number of individuals for whom the analysis applies. Furthermore, interpreting the resulting employment data is made more difficult because of the possible bias created by relying on a cohort defined five or six years earlier when many of the individuals were not in college. And in looking at the question of how mobile the degree completers are when searching for and finding employment after graduation, one also has to consider that the motivations to relocate may not be the same for the individuals in the high school cohort as they are for the individuals in the first-time postsecondary cohort, the latter of which include non-residents from outside participating states and adult learners not coming to college directly from high school.

WICHE focused attention on the mobility of degree completers because it has a high degree of policy relevance. What this example illustrates, however, is that each policy question is best answered with a research design that fits it well. In this case, a research design would have identified a cohort of all degree completers within a given academic year and then looked for their employment outcomes. Yet once data were exchanged for a static cohort definition, there was no opportunity to match the analysis most appropriately with the policy question at hand. Thus, the ability to match cohorts to particular analytical questions is a key element of enhanced flexibility that would make the MLDE considerably more useful.

With respect to timeliness, the process of assembling the dataset required a considerable amount of time and proceeded in a linear, almost lockstep, manner over about nine months as data flowed back and forth to each entity as new information was added. Again, although this provided the transparency necessary to obtain legal approval, it is too ponderous to be of maximum use to state policymakers or the state agencies that are expected to provide rapid answers, perhaps during a legislative session.

Do these limitations mean that the MLDE is not capable of being the resource policymakers need? The answer is an emphatic no, but the lesson is that these are real problems that deserve a real solution. To that end, WICHE and its partner states believe that a federated model can provide the flexibility and timeliness required to broaden the MLDE’s utility in policymaking and practice improvement. A likely model would revolve around a central hub where the only data stored are in a crosswalk table of identifying information matched across states and their respective SLDSs. Participating states would retain all the other data – on enrollments, awards, institutions and schools, employment records, and possibly

even demographic characteristics not necessary for identity resolution – and would submit a request for a specific set of variables for a specific group of individuals. The central hub, through the crosswalk table, would identify the state(s) where the requested data exist and retrieve those data for the requesting state. Participating states would agree in advance on what elements would be available to exchange, as well as common definitions for those elements. This model requires further development and testing, but it builds off of an existing resource already in use to exchange sensitive individual-level data among states, known as the Wage Record Interchange System (WRIS).³² State labor agencies can use WRIS to locate individuals' employment information in wage records in other states (so long as they have a valid SSN that can be matched) to evaluate workforce investment programs. The underlying agreements severely restrict access to the data that may be exchanged. A more recent expansion of WRIS, known as WRIS 2, permits the exchange of UI wage records to evaluate education and training programs through the preparation of aggregate reports by a properly designated agency. Promising though WRIS 2 is, it still does not go as far in data-sharing among states across the education and labor domains as the MLDE pilot has successfully achieved. Nevertheless, this model for federating cross-state data and facilitating their exchange may be worth adapting to enhance the sustainability and utility of a MLDE-like resource.

Effective data use is a challenging, underappreciated task. The track record for student-level longitudinal data use in state higher education policy is not extensive at this point. Part of the reason is that most longitudinal data exist only in federal sample surveys, which are not representative for individual states or institutions, and are therefore limited in their ability to give specific direction on many state policy issues. But even as more states' SLDS development efforts reach sufficient maturity to produce results, states are finding that the effort is extensive to produce policy- and practice-relevant findings. Postsecondary institutions have generally not had to concern themselves with resolving student identities to provide accountability reporting, but at the core of any SLDS is an identity resolution engine that properly matches individual students across different sectors and institutions. In the course of our data analysis on the MLDE, we found evidence of how widespread this problem is when 20 percent of the individuals states reported in Cohort B were actually not first-time students as the institutions had reported to the state.³³ The identity resolution step is a significant commitment of time and energy, and to the extent that identity resolution does not perfectly match individuals, it complicates interpretation and analysis of results. This becomes especially challenging when staff encounters data inconsistencies arising out of separate identity resolution processes. As an example, data supplied by the National Student Clearinghouse do not always agree with what the state has in its own files for students who are enrolled at multiple institutions in that state. Furthermore, state research staff are tasked with aligning variable definitions across disparate institutions and school districts, accounting for what appear to be exceptional data, and in many cases making sense of new kinds of information about which they have had little prior experience (e.g., the UI wage record files). Our experience with the MLDE reinforces the lessons states have been learning in this regard. Efforts to clean the data were extensive and required the active assistance of state research staff before any analysis could be performed. This required us to make sure, again with the help of state partners, that we were going

to be able to generate substantially similar findings that each state would be able to generate with its own subset of the full dataset, to avoid preparing analyses that were inconsistent with one another.

Data interpretation challenges intensified when we began analyzing the employment data. Without an SSN, no employment data could be obtained and, unfortunately, missing SSNs were widespread in the MLDE, just as they are in most states' own data. Furthermore, the incidence of missing SSNs was greater for Cohort A than for Cohort B since the likelihood of having an SSN depended principally on whether a student ever attended a public postsecondary institution in one of our states. But many in our cohort of high school graduates either never attended college or went to an institution that did not supply data to an SLDS in the MLDE. Other nontrivial issues that are common to states' analyses of employment data, as well as the MLDE effort, are how to measure employment and when. For instance, in evaluating employment outcomes for graduates, should we attempt to look for employment immediately following the conferral of a degree? Or should we give graduates time to find work and, if so, how much time? And what should be done about the fact that the academic calendar does not align well with the economic quarters reported on through the UI wage record files?

A second set of challenges was more specific to the MLDE. When assessing outcomes post-enrollment or post-award, how should we treat students who were found to be employed during the same quarter in two states? There was also the issue of an imbalance of information: we had data from the NSC on nearly all degrees awarded, as well as any subsequent enrollment following graduation anywhere in the nation, but we only had employment data on students who went on to work in one or more of four states. That imbalance confuses any analyses of “net migration.”

Further development of the MLDE must address how to create avenues for authorized researchers to gain access to merged, de-identified data. That step will quickly permit more widespread use of the data with the potential to improve policies and practices. Building those avenues will require a clear and transparent process by which proposed research is approved by the state partners to: 1) protect the confidentiality of the data, 2) ensure that the research is being conducted by legitimate methods and in pursuit of clear analytical goals, and 3) maintain the necessary high-degree of trust among state partners in the MLDE.

Finally, it was apparent that participants were applying differing thresholds for what constituted “good enough,” both in reviewing the findings and in making sure the identity resolution process worked sufficiently well. In sum, after spending 18 months trying to sort through these myriad issues, and others, it is clear that for states to most effectively use the data available in their SLDSs, they must be conscious of the added demands of using unit-record data, especially if those data are obtained as part of an exchange across state lines. That should not dissuade states from collaborating and, in fact, expanding the MLDE to more states would also help ease the burden of interpretation. To the extent possible, the MLDE effort can also build reporting templates and share relevant code that would streamline a participating state's ability to rapidly and accurately produce results.

Unequal value propositions. While the MLDE pilot was designed to be a resource to all participating states and sectors, it became apparent that some states and sectors received more of a benefit from the initial exchange of data than others. Given that the only major metropolitan area astride a state border in the four

participating states is Portland, Oregon/Vancouver, Washington, it was a mild surprise that the MLDE revealed a greater share of employment outcomes data for Idaho and Hawai'i than it did for Washington and Oregon. That may partly be due to the fact that Oregon and Washington are both much larger, and therefore any proportion for them is going to be relatively smaller. Or it might be that the MLDE uncovered patterns in migration among recent college graduates in the Pacific Northwest that were heretofore unknown.

Another imbalance arose among the various agencies within a state. In part because of the way the initial cohorts were defined, and in part because of legal restrictions, the state agencies overseeing the postsecondary education sectors received considerably more value in terms of enhanced data than did the K-12 and labor agencies. Insufficient data history prevented us from reaching deeper into secondary education to capture mobility of students while still in high school. Plus, as previously mentioned, no labor data are available for individuals for whom no SSN was available, and K-12 agencies are almost uniformly prohibited from collecting that information. Thus, the information available to K-12 agencies only applied to their high school graduates who went on to college. That information was rich, and the MLDE offers great potential for providing K-12 agencies with much more robust information about college-going, college readiness, and postsecondary success among students who matriculate somewhere other than at an in-state public institution. But it did not fully address key concerns about outcomes for students who drop out of their records during high school, or what the short-term labor market outcomes are for students who elect not to attend college.

Being very conscious of FERPA, the MLDE's data-sharing agreement prohibited the labor agencies from receiving any individually-identifiable information at all. In fact, the most they were able to do was contribute the UI wage data, help troubleshoot the data-sharing process, and offer exceptional advice on how to use and interpret results. In that regard, the representatives who participated from that sector deserve special credit for staying engaged and contributing their time and energy without the prospect of accessing the enhanced data, even if the opportunity to network and collaboratively engage with partners in the education agencies across multiple states with a policy issue of growing significance was a notable side benefit. But the vision for the MLDE provides hope for more benefit for the labor agencies. For instance, they might have great interest in examining a cohort of incumbent workers for how they are accessing formal education structures and the extent to which such decisions subsequently pay off in the labor market. Taking a similar look at workers displaced by the economic cycle or the shuttering of a major employer would offer great insights into whether, how, and where those individuals were able to get back on their feet.

Finally, there also was an imbalance of benefits within the postsecondary community, or at least the benefits were not always perceived to be equal. The imbalance stems from the relative likelihood of students attending different postsecondary education sectors to be place-bound. For instance, if students who graduate from community colleges are more likely to find employment locally than are students who complete degrees at a state flagship institution, then the MLDE is more likely to provide much needed information to the flagship institution. If state agencies are organized by sector as Oregon's have been throughout the project

(Oregon's community colleges were coordinated by the Department of Community Colleges and Workforce Development (CCWD) and its public four-year institutions were governed by the Oregon University System (OUS)³⁴) then the additional data that OUS stands to obtain from the MLDE is more substantial than what the CCWD will receive, and correspondingly more essential.

Any future effort to expand the MLDE to other states and sectors will undoubtedly experience a similar imbalance of benefits, although the extent to which that is true will depend on the capabilities of the resource. This is important to recognize from the standpoint of sustaining the MLDE in an ongoing way, especially if states or state agencies are asked to contribute operating funds. The most stable funding solution will moderate states' and agencies' natural tendency to try to balance what they perceive to be the benefits of the expenditures necessary for the ongoing health of the resource. But it also will be apparent that the design of the MLDE and its activities will need to acknowledge and respect those differences.

Other lessons. The pilot project taught us many other less "global" lessons as well. Among them were:

- The MLDE benefited from work on the Common Education Data Standards (CEDS) effort that was underway concurrently. Our initial efforts to develop common variable definitions were helped along by using the CEDS elements as a starting point from which we could diverge as needed to meet states needs.
- Participating in the pilot had an unintended positive influence in accelerating SLDS development work within states. As is commonly the case, the nine meetings of the working group gave participants an enviable opportunity to exchange ideas about how to solve problems related to data governance, political issues, and other matters that had bogged down internal work. State participants also reported that having to meet the MLDE timeline provided a valuable external impetus to assemble and deliver data. Finally, one participating state reported that it capitalized on having to dig into historical data by using those data not simply for the MLDE but also as the basis for some reporting to illustrate the benefits of their SLDS effort to other internal stakeholder groups.
- Identity resolution is at the core of SLDS and our MLDE. The process for making sure that each person's records are accurately matched is imperfect and, even though the basic steps involved seem to be reasonably well established, each of the partnering entities takes its own approach. A subtle but important part of the challenges in the MLDE pilot is that this resulted in variation in the thresholds for confidence in the results when there appeared to be mismatches in the data, and gaining consensus on what was "good enough" was difficult. Our suspicion is that this may be partly due to the still-embryonic nature of combining and analyzing these linked data. With policy attention to the results rising along with uncertainty about how policymakers might react to results, the need for confidence is rising.

Conclusion

WICHE's pilot MLDE demonstrated that it is possible to link multiple states' SLDS activities in a way that results in a comprehensive body of information that captures the development of human capital and how, once developed, it moves around a multistate region. At a time when policymakers' attention to the return on educational investments – especially as measured by labor market outcomes – has never been higher, the pilot represents a significant step forward in the capability of longitudinal data systems to inform policy and practice. State policymakers as well as educational leaders need information that is reliable and complete in order to craft effective public policies and educational practices. Willingly relying on data that stops at state borders means that decisions based on such evidence are riddled with preventable gaps. Today's hyper-competitive global economic environment, not to mention the rapidly rising prices charged to college students (and the even-higher costs of failing to achieve a postsecondary degree), is not a place to be making critical decisions based on incomplete data. States, where educational policies are decisive in promoting – or retarding – educational attainment, could greatly benefit from a resource that helps them better understand how their policies are helping keep their citizens and the nation as a whole economically competitive. WICHE's MLDE is a way toward meeting that growing need for information.

As an alternative to federal solutions, WICHE's MLDE has clear advantages tied to its ability to make data available to states, namely, to exchange data the states own that is relevant for public policy and institutional practice. The pilot effort showed that exchanging data – even among a select few states with relatively isolated populations – provides a considerable amount of new information about educational and employment outcomes. It provided a path to unlocking the full potential of state and federal SLDS investments by giving states a way to not ignore the outcomes related to those who moved away for further economic or educational opportunities. In so doing, it offers policymakers and planners a resource on which to rely for crucial information about how well state and institutional investments are aligned with state labor needs, and to what extent they are relying on the educational investments and contributing to the economic health of neighboring states as well. The MLDE further provides a means by which states can more carefully target interventions on underrepresented or low-income populations, those whose college readiness is uncertain, and others by unlocking more analytical power that would otherwise be idle in their own substantial data systems.

All these advantages are not without tradeoffs, however. The pilot project revealed some challenges that are important to address if the MLDE is to expand to meet its full potential. Among them are a means to make the resource more flexible and timely to address pressing problems for state and institutional policy and practice. A particular challenge arises out of the voluntary nature of the MLDE: until most, if not all states and private educational providers participate, the MLDE will be limited in its ability to fully deliver the information policymakers crave for accountability and consumer information purposes. Nevertheless, the MLDE serves a unique and crucial role in current data systems architecture in uncovering information states and institutions will find valuable to do policy and program improvement. In time, if enough states and institutions see the benefits, the MLDE

is a tool that can be used for all three major goals of policymakers: accountability, consumer information, and evidence for use in policy and program improvement. Efforts to make longitudinal information relevant for effective policymaking at the state level remain, if no longer in their infancy, then certainly at the toddler stage. This is especially true of the embryonic efforts to combine education and employment data at the individual level. WICHE's pilot MLDE began with a vision for how the nation and each state can more completely examine human capital in a climate that ignores it, and its distribution, increasingly at their own economic peril. The results from the pilot were promising in that, for four states, it proved that such a resource could be built and that it could deliver useful information. Many lessons about the pilot's design and capabilities were learned along the way, but the need for such a resource is all the clearer for the effort WICHE, its partners, and the four pilot states made.

Endnotes

¹ Information about proposed gainful employment regulations can be found at <<http://www2.ed.gov/policy/highered/reg/hearulemaking/2012/gainfulemployment.html>>. Information about President Obama's proposed rankings can be found at <<http://www.whitehouse.gov/the-press-office/2013/08/22/fact-sheet-president-s-plan-make-college-more-affordable-better-bargain->>. The *Student Right to Know Before You Go Act* (S. 915) can be reviewed at <<http://thomas.loc.gov/cgi-bin/query/z?c113:S.915:>>.

² Several states' efforts to combine data across the postsecondary education and workforce sectors, and how the results are publicly displayed can be viewed at www.collegemeasures.org.

³ <<http://nces.ed.gov/programs/SLDS/>>.

⁴ Stevens & Zhang (2014).

⁵ The National Center for Higher Education Management Systems (NCHEMS) had previously done some pioneering work on linking student unit record systems from multiple states to understand the effect of interstate mobility on student completion rates. NCHEMS's effort ultimately relied on data from Kentucky, Ohio, Tennessee, and West Virginia. While WICHE's MLDE pilot took this first effort a step further by linking in K-12 and workforce data, many of the lessons learned during the earlier NCHEMS project were directly applicable and especially helpful to the MLDE project. A report on NCHEMS's project is available at <<http://www.nchems.org/c2sp/documents/ResultsofMulti-StateDataExchange.pdf>>.

⁶ NCES SLDS RFA, <https://nces.ed.gov/programs/slds/pdf/2009_ARRA_RFA.pdf>. Prior RFAs made linking K-12 and postsecondary education data (and workforce data) optional, and were silent about collaborating with other states.

⁷ On another FERPA front, at the outset of WICHE's pilot, the federal government had not yet created the Privacy Technical Assistance Center (PTAC). PTAC is now a principal resource for members of the education community to get rapid guidance about data privacy issues related to FERPA, a need that grew in part out of growing SLDS activity and reporting requirements being set into place by the federal government that could not be met without changes in FERPA.

⁸ EducationCounsel, LLC. 2011. U.S. Department of Education Final FERPA Regulations: Advisory and Overview. Retrieved December 5, 2011 from <http://www.dataqualitycampaign.org/files/1475_2011%20Final%20FERPA%20Regulations_Advisory%20and%20Overview%20FINAL.pdf>; U.S. Government Printing Office. 2011. Federal Register, 76(232), 75604-75660.

⁹ Committee on Measures of Student Success.

¹⁰ The first "Signature Report" from the NSC's Research Center was released in mid-2011 <<http://nscresearchcenter.org/signaturereport1/>>.

¹¹ The Administrative Data Research and Evaluation alliance (ADARE) was the multistate effort. Information can be found at <<http://www.ubalt.edu/jfi/adare/index.cfm>>.

¹² Carnevale, Smith, and Strohl (2013); Vedder, R. (2012, April 9). Why college isn't for everyone. *BusinessWeek*. Retrieved from <<http://www.businessweek.com/articles/2012-04-09/why-college-isnt-for-everyone>>.

¹³ <<https://www2.ed.gov/policy/highered/reg/hearulemaking/2012/gainfulemployment.html>>.

¹⁴ Collegemeasures.org may be the most prominent example of states making linked education and workforce data available for public display. Accountability or performance funding schemes that incorporate measures of workforce participation or earnings are not common at this point. One system that has started to award funds based on employment outcomes is the Texas State Technical College System (see Kelderman, 2013, for more information).

¹⁵ Each signatory state agency required its own version of the MOA, but in the main they are alike. All are available upon request from WICHE.

¹⁶ It required only a single signed MOA with the state agency tasked with assembling the SLDS in three of the participating states – Hawai'i, Idaho, and Washington. In Oregon, however, WICHE needed to execute MOAs with four different state agencies individually: the Department of Education, the Department of Community College and Workforce Development, the Oregon University System, and the Oregon Employment Department. Thus, the pilot MLDE relied upon seven MOAs altogether.

¹⁷ Prescott and Ewell; NCHEMS and C2SP.

¹⁸ EducationCounsel, 2011; Education Research and Data Center has posted a sample data-sharing agreement at <<http://www.erd.cwa.gov/data/docs/dataouttemplate.pdf>>.

¹⁹ Information about this ongoing initiative is available at <<https://ceds.ed.gov/>>.

²⁰ A brief case use on WICHE's MLDE to describe the project's reliance on CEDS can be found at <<https://ceds.ed.gov/pdf/ceds-in-the-field-wiche.pdf>>.

²¹ See also Bransberger, Peace, "A Glimpse Beyond State Lines: Student Outcomes from WICHE's Multistate Longitudinal Data Exchange Pilot Project", WICHE: Boulder, Colorado, 2014, Appendix A: Technical Details.

²² The NSC supplied enrollment data that predated summer 2005 where matches were found.

²³ Special processing was required to capture employment information available in Hawai'i, due to a state statute interpreted as restricting the state's Department of Labor and Industrial Relations from making UI wage record data available directly to other states. It was, however, permissible for the University of Hawai'i (UH) to serve as a go-between for those data to flow among participating states. Thus, the solution for the NSC, after assembling the complete data file, to transmit any records that included employment data from Hawai'i back to the UH for forwarding on to the other participating states. The files that went to UH only covered individuals for whom employment information was provided by Hawai'i, identified by the randomly generated MLDE project ID field, and instructions about which state or states UH should be passing each individual record along. Once in receipt of this last bit of data from UH, the other three states were able to populate Hawai'i employment information by linking it using the MLDE project ID.

²⁴ It is perhaps worth a reminder here that each of the states' customized datasets are a subset of this complete dataset, and further that because individuals were routinely found in multiple states' data over the time period studied, the sum of all the states' customized datasets exceeded this total number of uniquely identified individuals.

²⁵ That is, these individuals wound up improperly identified as belonging to a cohort because they were extracted into Cohort B yet had evidence of prior postsecondary enrollment once the match with other states and NSC data was linked. In most cases, the four states' SLDSs relied on a flag populated at the local campus level for whether a student should be considered "first-time." This result should make states and institutions cautious about how accurate their "first-time" data are. It suggests federal statistics on institutional performance may also be skewed because so much of the data in IPEDS relies on this data element, i.e., federal graduation rates.

²⁶ Bransberger (2014) .

²⁷ For a nationally representative sample of first-time college students in 2003-04, BPS yields the following statistics for completion by 2009 (based on author's calculations):

	Attained bachelor's degree	Attained associate's degree	Attained certificate	Still enrolled	No degree, not enrolled
Received Pell at least once	22.7	10.2	13.7	17.3	36.1
Never received Pell	37.2	8.5	5.7	13.1	35.5

²⁸ Molloy, Raven, Christopher L. Smith, and Abigail Wozniak (2011); Wozniak, Abigail (2010)

²⁹ Many certificate programs pay off handsomely in the labor market and employment projections suggest many more of them are needed (Carnevale, Smith, & Strohl, 2013; Carnevale, Rose, & Hanson, 2012). We include certificates in this graph since it is unclear how to distinguish certificates with value from those from others, because there were so many fewer of them awarded in our data, and because our completions data for certificates earned were less detailed than for degrees earned.

³⁰ Kelderman, Eric (2013)

³¹ Ewell & L'Orange (2009); Prescott & Ewell (2009)

³² More information about WRIS is available at <<http://www.doleta.gov/performance/wris.cfm>>.

³³ Bransberger (2014).

³⁴ Oregon embarked on an extensive realignment of its postsecondary governance structures during the timeframe the pilot project was active. Resulting changes have broken apart OUS in favor of more autonomous institutions coordinated centrally by a new body, the Higher Education Coordinating Commission.

Appendix.

Memorandum of Agreement Between WICHE and the Washington Education Research and Data Center (ERDC)

The following pages show the data-sharing agreement WICHE executed with the Washington Education Research and Data Center (ERDC). This agreement is representative of, and in most important respects, identical to all the other data-sharing agreements through which the pilot project exchanged data. Copies of the other data-sharing agreements with the following state agencies are available upon request.

The University of Hawai'i System

Idaho Office of the State Board of Education

Oregon Department of Community Colleges and Workforce Development

Oregon Department of Education

Oregon Employment Department

Oregon University System

MEMORANDUM OF AGREEMENT

This Agreement is made between the Education Research and Data Center of the Washington State Office of Financial Management (ERDC) and the Western Interstate Commission for Higher Education (WICHE), pursuant to relevant statutes and regulatory authority. WICHE is a 501(c)(3) regional educational nonprofit organization created by the Western Regional Education Compact, adopted in 1953 by Western states. Washington is a member of WICHE. WICHE's mission is to promote access to high quality postsecondary education for residents of the West.

Background and Purpose

Under a grant from the Bill and Melinda Gates Foundation, WICHE is coordinating a project to develop a pilot regional data exchange among four states: Washington, Oregon, Hawaii, and Idaho. The purpose of the data exchange is to explore the feasibility and usefulness of such a data exchange to build a better understanding of the way educated individuals are produced and flow through a region for policymaking and practice improvement purposes. The parties to this agreement recognize that there is a public policy interest in exchanging data among agencies to support policy making, planning, and program implementation. Specifically, the parties acknowledge that linked information about individuals' educational preparation and employment is lost when individuals cross state borders, which renders an incomplete picture of how well states are preparing or attracting the talent necessary for their own current and future workforce needs. To help address those gaps in information, this project tests the feasibility of sharing data among sectors and states to examine patterns of interstate mobility in education and into the workforce.

This agreement sets out the terms and conditions under which the ERDC will disclose confidential data on students captured within its data system to the data exchange project. These data will be matched with corresponding data from other state agencies within Washington and those in Oregon, Idaho, and Hawaii to produce aggregate statistics of human capital development and mobility in order to evaluate the effectiveness of its education and training programs. As part of this agreement, ERDC has contracted with WICHE, and designates WICHE as its authorized representative, to assemble data on public K-12 enrollments and graduates, postsecondary enrollments and graduates, and Unemployment Insurance (UI) wage records in accordance with the terms set forth in this document. In the event WICHE uses subcontractors under this agreement, ERDC acknowledges that the Family Educational Rights and Privacy Act (FERPA) may require ERDC to similarly designate such WICHE subcontractor as an authorized representative of the ERDC (Attachment D). WICHE shall not provide ERDC student data to any subcontractors unless and until ERDC has designated that subcontractor as an authorized representative of ERDC.

Scope

This agreement establishes a pilot data-sharing relationship among several states and WICHE in order to:

- coordinate with state agencies in Washington, Oregon, Hawaii, and Idaho to compile longitudinally linked education and workforce data;
- provide an enhanced data file to ERDC that contains additional information obtained through the exchange process on only the individuals originally supplied to the exchange by ERDC, in order to support ERDC's efforts to conduct evaluation, as allowed under FERPA;
- examine, from a regional perspective, the mobility of students across state borders and among educational providers and their educational preparation for success in the workforce, in order to conduct evaluation of educational programs, as allowed under FERPA.

The specific research questions to be addressed through this agreement are:

- What are the patterns of postsecondary enrollment and employment of high school graduates from each participating state?
- What are the patterns of postsecondary enrollment and employment of students and former students in public postsecondary institutions in participating states?
- By more fully accounting for individual mobility across state lines, to what extent does sharing data among states supplement existing state data resources available for conducting evaluations leading to policy and program improvements?

Data exchanged under this agreement shall be used solely for the purpose expressed above and no other. Any research products produced under this agreement shall be available for inspection by designated representatives of each participating state agency before being made public.

Justification and Authority

In accordance with the Federal Family Educational Rights and Privacy Act (FERPA), and in particular 34 CFR 99.31(a)(3)(iv) and 99.35, ERDC is a state educational authority that for the limited purposes of this Agreement, designates WICHE as its authorized representative for the purpose of assembling data to conduct evaluations of publicly-funded education and training programs. Procedures used in this agreement will be governed by FERPA, the Privacy Act of 1974, and all applicable state laws.

Description of the Data

The data elements to be exchanged under this agreement (the "Data") are housed within state or institutional data systems and pertain to individual students' educational records and to information about individuals' employment captured by state Unemployment Insurance systems. These Data include personally identifiable information, including student names, personal identifiers such as student numbers and social security numbers, any combination of information that together would make it possible to easily identify individuals. The specific data elements to be included in this data exchange are listed in Attachments A and B.

Process for Exchanging Data

Operational procedures to carry out the pilot exchange of Data are as follows:

1. WICHE will supply specifications for a dataset to be prepared by ERDC to include identifying information and individual demographic characteristics for two cohorts of students (Attachment A).
2. ERDC will produce a data file with the requested data elements meeting the criteria for inclusion and provide it to WICHE. The other participating states/state agencies will deliver similar data files to WICHE.
3. WICHE will merge the Data from all participating states/state agencies, creating a merged cohort file.
4. WICHE will assign a randomly generated "Exchange ID" to each unique individual in the merged cohort file.
5. Next, WICHE will send this cohort file to the participating states/state agencies, along with specifications for additional data elements on student enrollments and awards at public educational institutions (Attachment B).
6. ERDC will append the requested data elements to the cohort file for only those students in the cohort file and send the resulting data file back to WICHE.
7. WICHE will match the Data to the data files submitted by the other states and to the contents of the National Student Clearinghouse, creating a "core exchange dataset."
8. WICHE will seek to obtain workforce information to append to the core exchange dataset according to the following procedure:
 - a. WICHE will send a data file containing only the individual Social Security Numbers (SSNs) and Exchange IDs of all the merged education records to each of the participating state's labor agencies.
 - b. Each state labor agency will then append workforce information outlined in Attachment C from their UI wage record collection for those SSNs in the supplied data file.
 - c. Each state labor agency will strip out the SSNs, but not the Exchange IDs, and return the resulting data file to WICHE.
 - d. Using the Exchange IDs, WICHE will append the workforce information obtained from each state labor agency to the records containing data on individual students in the core exchange dataset.
 - e. For each participating state education agency, WICHE will return the records containing data on only the individual students they originally supplied to the Exchange. These records will be enhanced with any information that was obtained through the process of linking in the exchange. Redisclosure of enhanced personally identifiable information back to the originating state agency is allowable under FERPA regulations.
 - f. ERDC will have an opportunity to review and validate their matched data and will convey concerns and questions to WICHE within 30 days.
 - g. WICHE will strip all identifying information other than the Exchange ID from the core exchange dataset and use the resulting dataset to calculate statistics on student enrollment, graduation, and workforce participation using a template reporting format developed in partnership with participating state agencies. Cells with fewer than 10 cases will not be reported.

- h. WICHE shall maintain the data file in a secure environment until the conclusion of the project. WICHE shall destroy it within six months of the termination of the project and provide written assurances to ERDC that it has done so. ERDC will also destroy any of the enhanced data it received through the exchange process within six months of the termination of the project and provide written assurances to all participants in the exchange that it has done so, except as required under existing contractual commitments. Destruction of the data means that all files and directories containing personally identifiable information shall be permanently deleted and any hard copies of such data will be shredded.

Limitation on access and use

WICHE agrees to the following limitations on the use of the information provided by ERDC:

1. ERDC retains ownership of data supplied directly or by virtue of agreements with other Washington state agencies (see Attachment H).
2. WICHE shall not use, access, or redisclose ERDC student data provided under this Agreement for any purpose other than those purposes authorized by this Agreement.
3. The information provided by ERDC will not be duplicated or redisclosed at the individual level without the written authority of the ERDC, except as part of the essential process of matching the data as provided in this Agreement.
4. Access to the data within WICHE or its subcontractors will be restricted only to those persons with legitimate interests in performing the essential functions under this Agreement.
5. WICHE will require that any subcontractor with access to the Data sign an agreement preventing the disclosure of the data except as provided in this Agreement, prior to gaining access to the Data. WICHE shall supply copies of this nondisclosure agreement to participating state agencies.
6. WICHE will not duplicate or redisclose the crosswalk table without the written authority of ERDC, except as provided in this Agreement. All stipulations of this Agreement will apply to any duplication of records or files.
7. WICHE agrees that these Data shall not be used to make a decision about the rights, benefits, or privileges of any individual identified in the course of the research, but will be used strictly for the purpose of analysis and evaluation. WICHE further agrees that any product will be in the form of aggregate statistical data without personal identifiers, except that WICHE may supply state educational agencies with enhanced information obtained through the exchange on only the individual students each agency originally supplied for matching in the exchange. Here and elsewhere, aggregate data means data in aggregations consisting of at least 10 cases, where no single case accounts for more than 80 percent of the data item.
8. WICHE is authorized to redisclose ERDC student data to the educational agencies named in Attachment F for the limited purpose of evaluating federal or state-supported education programs. Any ERDC student data redisclosed in accordance with this section shall only be redisclosed pursuant to a written agreement which provides that the data may only be used for the purpose described in this Agreement, may not be redisclosed without the express written

consent of ERDC, and must be destroyed when no longer needed for the purpose described above.

9. WICHE is authorized to redisclose ERDC student data to each state labor agency named in Attachment F only after ERDC has notified WICHE that it has entered into an agreement with the relevant state labor agency appointing it as an authorized representative of ERDC for the purposes outlined in this Agreement (Attachment G).
10. ERDC will not redisclose data to any entity that is not a party to this Agreement including institutions, schools, school districts, or other state agencies. Any reports prepared by ERDC using the matched data will present aggregate data only.
11. WICHE agrees that the aggregated findings shall not be published without formal approval of ERDC. Such approval shall not be unreasonably withheld by ERDC.
12. All parties will strictly comply with all applicable laws and regulations regarding the privacy and use of the individually identifiable data used within this project, including (but not limited to) FERPA and any applicable state law. ERDC will provide guidance to the parties on matters of the laws of its state regarding data use. Where published guidance on regulatory compliance is unclear, the parties will seek clarification to the extent reasonably available and will attempt to mutually agree to their position on such questions; no party will be responsible to indemnify the others for actions taken to effectuate such mutually agreed interpretations.

Physical safeguards

WICHE agrees to the following minimum safeguards for the information provided by the ERDC as follows:

1. Access to the ERDC student data will be restricted to only those authorized personnel who need it to perform their official duties pursuant to this Agreement, and all parties will maintain a list of authorized personnel.
2. The information will be stored in a manner that is safe from access by unauthorized persons. No data shall be transferred to or stored on laptop computers or portable storage devices such as USB keys and external hard drives.
3. WICHE will require its matchmaking contractor to comply with all aspects of this agreement and with all applicable state and federal statutes and regulations related to the privacy and security of individual educational and workforce records.
4. WICHE shall take necessary precautions to ensure that only authorized personnel are given access to the data.
5. WICHE shall instruct all personnel with access to the information regarding the confidential nature of the information, the requirements of this Agreement, and other relevant state and federal laws respecting unauthorized disclosure.

Transmission and storage of data

Transmission and storage of all data pertaining to individual's educational records will adhere to generally-accepted best practice standards related to information security, including, but not limited to,

commercially available and widespread precautionary measures, such as firewall implementation, virus scanning, security access control software, logical encryption of data as it leaves the data boundary, secure tunnels, and limitation of physical access to confidential information. Upon the reasonable request of ERDC, WICHE and its subcontractor(s) will disclose and review said policies, procedures, and practices with ERDC. Specifically, all transmission of data pertaining to individuals' records shall be transmitted through Secure FTP File Transfer Protocol. Files received by WICHE and its subcontractor(s) will be securely stored using FIPS 140-2 validated AES encryption, the U.S. Federal encryption standard.

Notice of nondisclosure

WICHE agrees that all its authorized personnel, including information technology staff, network administrators, and approved subcontractors, who will have access to the information provided by ERDC will sign a Notice of Nondisclosure (Attachment E).

In the event any Party hereto is subject to a data release incident or data breach whereby such information is released to unauthorized parties, such Party will immediately notify the other Parties. Such notification shall be given in accordance with applicable state and federal law. As between WICHE and the State Parties, WICHE will be responsible for all costs associated with providing such notice to the extent such a release incident or data breach occurs through its database; it is understood and agrees that among the other parties ultimate liability would be determined on the basis the source of the release.

In the event ERDC is required to disclose any data provided hereunder (specifically including, but not limited to, information which could potentially identify individuals or specific postsecondary institutions) pursuant to any applicable statute, law, rule or regulation of any governmental authority or pursuant to any order of any court of competent jurisdiction, ERDC must provide the other parties prompt notice of such request for disclosure and reasonably cooperate with the other parties' efforts to obtain a protective order. The parties further agree that any exclusion effected pursuant to this provision is authorized only to the minimum extent necessary to allow ERDC to comply with a legal rule or order compelling the disclosure of information and shall not constitute a general waiver of the obligations of confidentiality under this Agreement.

Amendments and alterations

With mutual consent, WICHE and ERDC may amend this Agreement at any time, provided that the amendment is in writing and signed by authorized staff.

Nothing in this Agreement will alter, terminate, or amend any other existing agreements in operation between the parties to this Agreement and any other entities.

Duration

In keeping with the pilot status of this project, this Agreement will remain in effect through the completion of this Gates-funded pilot project. At the end of that period, this Agreement may be extended if all parties agree.

Audit rights

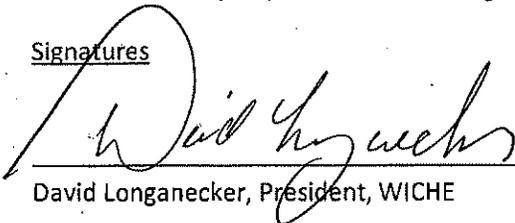
Consistent with 20 CFR 603, ERDC shall have the right to conduct on-site inspections to review and audit WICHE and its subcontractor(s), to the extent required by law, in order to ensure compliance with the nondisclosure aspects of this Agreement.

Termination

This Agreement may be terminated by either party with 30 calendar days' written notice to the other party. Upon termination, WICHE agrees to cease work, destroy all data generated to date, and provide written assurances to ERDC that it has done so.

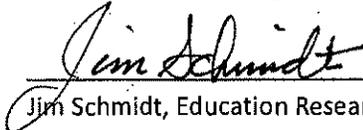
All confidentiality requirements in this Agreement survive termination of this Agreement.

Signatures



David Longanecker, President, WICHE

5/17/2012
Date



Jim Schmidt, Education Research and Data Center

16 MAY 2012
Date

ATTACHMENT A. SPECIFICATION OF ORIGINAL COHORTS

The first step in the data exchange process is to specify the cohorts of individuals for whom data will be collected from each participating states' data systems. For this initial process, two cohorts are identified. Inclusion criteria for Cohort A, high school graduates, are as follows:

- Graduated from a public high school in Washington during the 2004-05 academic year (including trailing summer 2005).
- High school graduates are defined as consistent with the definition Washington uses for its submission to the Common Core of Data, generally only those with regular diplomas or GEDs.
- Students who are dually enrolled in postsecondary institutions should be included only if they received a high school award as defined above during the 2004-05 academic year.

Inclusion criteria for Cohort B, first-time postsecondary students, are as follows:

- Students who are identified as first-time postsecondary enrollees as undergraduates during the 2005-06 academic year (including leading summer 2005).
- Undergraduate students only.
- Exclude students who are earning dual credit if they are identified as current high school students.
- Include students enrolled in credit-bearing and remedial/developmental courses.

To prepare the cohort file, ERDC will provide all of the following data stored in their respective data systems for individuals meeting the criteria for inclusion in one of the two cohorts specified above. This file will have one unique record for each individual.

Data element	Comments
Social Security Number	
State/sector student ID	
First name	
Middle name	
Last name/Surname	
Generation code/Suffix	E.g., III, Jr.
Birth Date	
Sex	
Race/ethnicity	
ACT/CEEB code of high school	For Cohort A to be used for matching
Date of high school diploma	For Cohort A to be used for matching
Institutional IPEDS UnitId	For Cohort B to be used for matching
Institutional OPE ID	For Cohort B to be used for matching
Date of first postsecondary enrollment	For Cohort B to be used for matching

ERDC will submit all relevant information for each of the data elements indicated above for the purposes of matching records among multiple states. Specifically, the data exchange process will use

this personally identifiable information to match records across multiple databases in multiple states according to the process set forth in the "Process for Exchanging Data" section of the Agreement. In addition to providing additional fields for matchmaking purposes, these demographic data are necessary for disaggregation in the analysis to examine the extent to which the development and mobility of human capital varies by student background characteristics. These data are essential in being able to examine the extent to which students from different racial/ethnic backgrounds remain in their native states during and after their postsecondary education, for example. For the purposes of that disaggregation, wherever data in the cohort files are not consistent, e.g., ERDC's data system identifies a single student as being both female and male, ERDC will be responsible for designating the most appropriate information to be used in all analyses generated by the Exchange.

ATTACHMENT B. SPECIFICATION OF ELEMENTS FOR ENROLLMENT AND AWARDS FILES

Having received the merged cohort file from WICHE, ERDC will generate two data files, one on enrollments and one on awards. Both will include data only on individuals included in the merged cohort file. The resulting enrollment file will have one record per person per institution per term for summer 2005 through summer 2011. The resulting awards file will have one record per individual for all awards conferred. Each file is specified below. All data elements listed correspond to and employ the same data element definitions as, the Common Education Data Standards release 2.0.

Enrollment File

Data element	Comments
Exchange ID	Provided originally by WICHE in merged cohort file
Institutional IPEDS UnitID	
Academic Term Start Date	Not in CEDS 2.0
Academic Term End Date	Not in CEDS 2.0
CIP Code for First Program or First Major (6-digit) during designated term	
Instructional Activity Hours Type	
Instructional Activity Hours Attempted	
Instructional Activity Hours Completed	
Total Cumulative Credits Earned at start of term	Not in CEDS 2.0
Student Level	Undergraduate or graduate
Pell Recipient	Yes/No
Degree-seeking Status	Yes/No

Awards File

Data element	Comments
High School Graduation Date	Used as criteria in Cohort A identification, but potentially useful for Cohort B and therefore necessary for inclusion
High School Diploma Type (CEEB code)	Regular or GED For identifying high schools
Academic Award Level	
Institutional IPEDS UnitID	For the institution that conferred the award
Academic Award Date	For postsecondary awards
CIP for Academic Award (6-digit)	

Working with representatives of the participating states/state agencies, WICHE will develop any common derivations that may be necessary for analyses addressing the research questions, e.g., attendance status.

**ATTACHMENT C. SPECIFICATION OF WORKFORCE INFORMATION TO BE
SUPPLIED BY STATE LABOR MARKET INFORMATION AGENCY**

Upon receipt of a list of Social Security Numbers from WICHE, each state's labor market information agency will append the following data from the state's Unemployment Insurance wage record system and return the resulting file to WICHE. Data for all quarters from 2004Q1 through the most currently available quarter should be provided.

Data element	Comments
Employment status	By quarter
Wages	By quarter
Hours worked	By quarter
NAICS code	North American Industry Classification System (NAICS)
Exchange Employer ID	Generated by the Washington Employment Security Department

**ATTACHMENT D. ACKNOWLEDGEMENT BY THE EDUCATION RESEARCH AND
DATA CENTER OF THE WASHINGTON STATE OFFICE OF FINANCIAL
MANAGEMENT THAT THE WESTERN INTERSTATE COMMISSION FOR HIGHER
EDUCATION WILL CONTRACT WITH THE NATIONAL STUDENT CLEARINGHOUSE
TO ASSEMBLE AND HOLD DATA**

In accordance with the Federal Family Educational Rights and Privacy Act (FERPA), and in particular 34 CFR 99.31(a)(3)(iv) and 99.35, the Education Research and Data Center of the Washington State Office of Financial Management (ERDC) is a state educational authority that, for the limited purposes of this agreement, designates the Western Interstate Commission for Higher Education (WICHE) as its authorized representative for the purpose of assembling data to conduct evaluations of publicly-funded education and training programs. ERDC acknowledges that WICHE will contract with the National Student Clearinghouse (the "Clearinghouse") to complete this work. Procedures used in this work will be governed by FERPA, the Privacy Act of 1974, and all applicable state laws. The Clearinghouse will conduct all activities under the instruction of WICHE and in conformance with the MEMORANDUM OF AGREEMENT between the ERDC and WICHE dated as of May 2012 (the "Agreement"). The Clearinghouse agrees that it will fully comply with all restrictions, requirements and controls on the use of data to which WICHE is subject under the terms of the Agreement, and specifically warrants that it will adhere to the policies and procedures, consistent with FERPA and other Federal and State laws, contained in the Agreement to protect personally identifiable information (PII) from education records from further disclosure or unauthorized use.

ERDC will provide the Clearinghouse with the following data stored in their respective data systems for individuals meeting the criteria for inclusion in each of the two cohorts being studied.

Cohort File

Data element	Comments
Social Security Number	
State/sector student ID	Needed to help WICHE reconstitute the data
First name	
Middle name	
Last name/Surname	
Generation code/Suffix	E.g., III, Jr.
Birth Date	
ACT/CEEB code of high school	For Cohort A to be used for matching
Date of high school diploma	For Cohort A to be used for matching
Institutional IPEDS UnitId	For Cohort B to be used for matching
Institutional OPE ID	For Cohort B to be used for matching
Date of first postsecondary enrollment	For Cohort B to be used for matching

Enrollment File

Data element	Comments
Exchange ID	Provided originally by WICHE in merged cohort file
Institutional IPEDS UnitID	
Academic Term Start Date	Not in CEDS 2.0
Academic Term End Date	Not in CEDS 2.0
CIP Code for First Program or First Major (6-digit) during designated term	
Instructional Activity Hours Type	
Instructional Activity Hours Attempted	
Instructional Activity Hours Completed	
Total Cumulative Credits Earned at start of term	Not in CEDS 2.0
Student Level	Undergraduate or graduate
Pell Recipient	Yes/No
Degree-seeking Status	Yes/No

Awards File

Data element	Comments
High School Graduation Date	Used as criteria in Cohort A identification, but potentially useful for Cohort B and therefore necessary for inclusion
High School Diploma Type (CEEB code)	Regular or GED For identifying high schools
Academic Award Level	
Institutional IPEDS UnitID	For the institution that conferred the award
Academic Award Date	For postsecondary awards
CIP for Academic Award (6-digit)	

Employment File

Data element	Comments
Employment status	By quarter
Wages	By quarter
Hours worked	By quarter
NAICS code	North American Industry Classification System (NAICS)
Exchange Employer ID	Generated by Oregon Employment Department

ERDC will submit all relevant information for each of the data elements indicated above for the purposes of matching state educational records with Clearinghouse records.

As described in the Agreement, the Clearinghouse shall maintain the data file in a secure environment until the conclusion of the project. The Clearinghouse shall destroy PII within six months of the termination of the project and provide written assurances to ERDC that it has done so. ERDC will also destroy any of the enhanced data it received through the exchange process within six months of the

termination of the project and provide written assurances to all participants in the exchange that it has done so, except as required under existing contractual commitments.

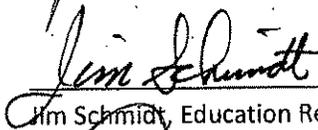
Nothing in this agreement will alter, terminate, or amend any other existing agreements between or among the parties.

Consistent with 20 CFR 603, ERDC shall have the right to conduct on-site inspections to review and audit the Clearinghouse, to the extent required by law, in order to ensure compliance with the nondisclosure aspects of this Agreement.

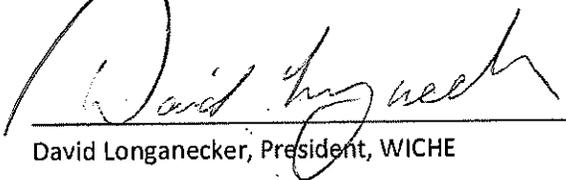
SIGNATURES



Rick Torres, President, National Student Clearinghouse



Jim Schmidt, Education Research and Data Center



David Longanecker, President, WICHE

ATTACHMENT E. NOTICE OF NONDISCLOSURE

STATEMENT OF CONFIDENTIALITY AND NONDISCLOSURE

between the

**EDUCATION RESEARCH AND DATA CENTER, WASHINGTON STATE OFFICE OF FINANCIAL
MANAGEMENT**

and the

WESTERN INTERSTATE COMMISSION FOR HIGHER EDUCATION (WICHE)

Before you are allowed access to the information in the data, you are required to sign the following statement:

As an employee of WICHE, I have access to information provided by the Education Research and Data Center of the Washington State Office of Financial Management (ERDC). This information is confidential, and I understand that I am responsible for maintaining this confidentiality. I understand that the information may be used solely for the purposes of work under the MEMORANDUM OF AGREEMENT between the ERDC and WICHE dated as of May 2012.

- I have been informed and understand that all information related to this Agreement is confidential and may not be disclosed to unauthorized persons. I agree not to divulge, transfer, sell, or otherwise make known to unauthorized persons any information contained in this system.
- I also understand that I am not to access or use this information for my own personal information but only to the extent necessary and for the purpose of performing my assigned duties as an employee of XXXX under this Agreement. I understand that a breach of this confidentiality will be grounds for disciplinary action which may also include termination of my employment and other legal action.
- I agree to abide by all federal and state laws and regulations regarding confidentiality and disclosure of the information related to this Agreement.

Employee

I have read and understand the above Notice of Nondisclosure of Information

Supervisor

The employee has been informed of their obligations including any limitations, use or publishing of confidential data

Signature _____

Printed Name _____

Organization _____

Job Title _____

E-mail address _____

Date _____

ATTACHMENT F. AGENCIES THAT WILL RECEIVE PERSONALLY IDENTIFIABLE INFORMATION UNDER THIS AGREEMENT

Upon signing a MEMORANDUM OF AGREEMENT with WICHE that contains the same procedures and safeguards for sharing data in the Data Exchange outlined in this Agreement, the state educational agencies listed below will be entitled to receive the enhanced data obtained through the Exchange.

WICHE may provide personally identifiable ERDC student data as provided in the Agreement to the state labor agencies listed below once ERDC notifies WICHE that ERDC has entered an agreement appointing the relevant state labor agency as an authorized representative of ERDC for the purposes of the Agreement.

State	State Agencies
Hawaii	Hawaii Department of Education University of Hawaii System Hawaii Department of Labor and Industrial Relations
Idaho	Idaho Office of the State Board of Education Idaho Department of Education Idaho Department of Labor
Oregon	Oregon Department of Education Oregon Department of Community Colleges and Workforce Development Oregon University System Oregon Employment Department
Washington	Education and Research Data Center, Washington State Office of Financial Management Washington Employment Security Department Washington Office of the Superintendent of Public Instruction Washington Higher Education Coordinating Board Washington State Board for Community and Technical Colleges

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APR 03 2012
WICHO PUBLISHING

**ATTACHMENT G. AGREEMENT BETWEEN THE EDUCATION RESEARCH AND DATA
CENTER AND EMPLOYMENT SECURITY DEPARTMENT**

In accordance with the Federal Family Educational Rights and Privacy Act (FERPA), and in particular 34 CFR 99.31(a)(3)(iv) and 99.35, the Education Research and Data Center (ERDC) is a state educational authority that, for the limited purposes of this agreement, designates the [State Labor Agency] (the "Agency") as its authorized representative for the purpose of assisting the Western Interstate Commission for Higher Education (WICHE) in assembling data to conduct evaluations of publicly-funded education and training programs. Procedures used in this work will be governed by FERPA, the Privacy Act of 1974, and all applicable state laws.

The Agency will conduct all activities under the instruction of WICHE and in conformance with the MEMORANDUM OF AGREEMENT between the ERDC and WICHE dated as of March 2012 (the "Agreement"). The Agency agrees that it will fully comply with all restrictions, requirements and controls on the use of data to which WICHE is subject under the terms of the Agreement, and specifically warrants that it will adhere to the policies and procedures, consistent with FERPA and other Federal and State laws, contained in the Agreement to protect personally identifiable information (PII) from education records from further disclosure or unauthorized use.

As described in the Agreement, WICHE may provide the Agency with ERDC student data, including student personally identifiable information (PII), only for the purposes outlined in the Agreement. The Agency shall not use, access, or redisclose ERDC student data provided pursuant to the Agreement for any purpose other than those purposes authorized by the Agreement, and the Agency shall destroy such ERDC student data when it is no longer needed for the purpose of the Agreement and shall provide written assurances to ERDC that it has done so. ERDC shall destroy any of the enhanced data it received through the exchange process within six months of the termination of the project and provide written assurances to all participants in the exchange that it has done so, except as required under existing contractual commitments.

Nothing in this agreement will alter, terminate, or amend any other existing agreements between or among the parties.

EDUCATION RESEARCH AND DATA CENTER

EMPLOYMENT SECURITY DEPARTMENT

By: Jim SchmittBy: Randi WarickName: Jim SchmittName: Randi WarickTitle: Director, ERDCTitle: Assistant CommissionerDate: 16 MAY 2012Date: 3/30/12

ATTACHMENT G.1
Permission to enter into the WICHE MOA
Office of Superintendent of Public Instruction

Purpose:

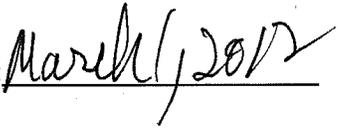
The purpose of this document is to grant permission to the Education Research and Data Center (ERDC) to enter into a Memorandum of Agreement (K1015) with the Western Interstate Commission for Higher Education (WICHE) in order to pilot compiling longitudinally-linked education and employment data with Oregon, Hawaii and Idaho. The MOA (unsigned copy attached) will designate WICHE as an authorized representative of the ERDC for the specific purpose of matching Washington data provided by ERDC with corresponding data from Oregon, Idaho, and Hawaii. The data resulting from this match will pilot providing the Washington state educational authorities with a more complete picture of whether Washington students are being employed in the fields in which they were trained by Washington educational institutions. Evaluating education programs based only on in-state employment provides an incomplete picture and does not recognize the human capital flow between states. Better information on the link between education/training and employment will assist the State in education program evaluation and determining program offerings.

Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: _____



Date: _____



Randy Dorn
Superintendent of Public Instruction

ATTACHMENT G.1
Permission to enter into the WICHE MOA
State Board of Community and Technical Colleges

RECEIVED
MAR 14 2012
OPM FORECASTING

Purpose:

The purpose of this document is to grant permission to the Education Research and Data Center (ERDC) to enter into a Memorandum of Agreement (K1015) with the Western Interstate Commission for Higher Education (WICHE) in order to pilot compiling longitudinally-linked education and employment data with Oregon, Hawaii and Idaho. The MOA (unsigned copy attached) will designate WICHE as an authorized representative of the ERDC for the specific purpose of matching Washington data provided by ERDC with corresponding data from Oregon, Idaho, and Hawaii. The data resulting from this match will pilot providing the Washington state educational authorities with a more complete picture of whether Washington students are being employed in the fields in which they were trained by Washington educational institutions. Evaluating education programs based only on in-state employment provides an incomplete picture and does not recognize the human capital flow between states. Better information on the link between education/training and employment will assist the State in education program evaluation and determining program offerings.

Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: David Prince

Date: March 13, 2012

David Prince
Director of Research

ATTACHMENT G.X

**PERMISSION TO ENTER INTO THE WICHE MEMORANDUM OF AGREEMENT
HIGHER EDUCATION COORDINATING BOARD**

RECEIVED
MAR 30 2012
OFM FORECASTING

Purpose:

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Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: 
Don Bennett, Executive Director

Date: 3-29-2012

ATTACHMENT G.1
Permission to enter into the WICHE MOA
The Evergreen State College

Purpose:

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Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: Andrea Coker Anderson

Date: 3/29/12

Andrea Coker-Anderson
Registrar

ATTACHMENT G.1
Permission to enter into the WICHE MOA
Central Washington University

Purpose:

The purpose of this document is to grant permission to the Education Research and Data Center (ERDC) to enter into a Memorandum of Agreement (K1015) with the Western Interstate Commission for Higher Education (WICHE) in order to pilot compiling longitudinally-linked education and employment data with Oregon, Hawaii and Idaho. The MOA (unsigned copy attached) will designate WICHE as an authorized representative of the ERDC for the specific purpose of matching Washington data provided by ERDC with corresponding data from Oregon, Idaho, and Hawaii. The data resulting from this match will pilot providing the Washington state educational authorities with a more complete picture of whether Washington students are being employed in the fields in which they were trained by Washington educational institutions. Evaluating education programs based only on in-state employment provides an incomplete picture and does not recognize the human capital flow between states. Better information on the link between education/training and employment will assist the State in education program evaluation and determining program offerings.

Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: Tracy Terrell

Tracy Terrell
Registrar

Date: 3/2/12

JP
3/1/12

Signature: John Swiney

John Swiney
Associate Vice President, Enrollment Management

Date: 3-2-12

ATTACHMENT G.1
Permission to enter into the WICHE MOA
Washington State University

Purpose:

The purpose of this document is to grant permission to the Education Research and Data Center (ERDC) to enter into a Memorandum of Agreement (K1015) with the Western Interstate Commission for Higher Education (WICHE) in order to pilot compiling longitudinally-linked education and employment data with Oregon, Hawaii and Idaho. The MOA (unsigned copy attached) will designate WICHE as an authorized representative of the ERDC for the specific purpose of matching Washington data provided by ERDC with corresponding data from Oregon, Idaho, and Hawaii. The data resulting from this match will pilot providing the Washington state educational authorities with a more complete picture of whether Washington students are being employed in the fields in which they were trained by Washington educational institutions. Evaluating education programs based only on in-state employment provides an incomplete picture and does not recognize the human capital flow between states. Better information on the link between education/training and employment will assist the State in education program evaluation and determining program offerings.

Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: Julia Pomerenk

Date: 4-11-12

Julia Pomerenk
Registrar

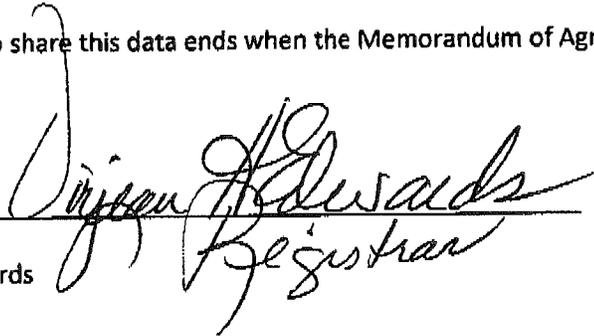
ATTACHMENT G.1
Permission to enter into the WICHE MOA
University of Washington

Purpose:

The purpose of this document is to grant permission to the Education Research and Data Center (ERDC) to enter into a Memorandum of Agreement (K1015) with the Western Interstate Commission for Higher Education (WICHE) in order to pilot compiling longitudinally-linked education and employment data with Oregon, Hawaii and Idaho. The MOA (unsigned copy attached) will designate WICHE as an authorized representative of the ERDC for the specific purpose of matching Washington data provided by ERDC with corresponding data from Oregon, Idaho, and Hawaii. The data resulting from this match will pilot providing the Washington state educational authorities with a more complete picture of whether Washington students are being employed in the fields in which they were trained by Washington educational institutions. Evaluating education programs based only on in-state employment provides an incomplete picture and does not recognize the human capital flow between states. Better information on the link between education/training and employment will assist the State in education program evaluation and determining program offerings.

Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: _____



Virjean Edwards
Registrar

Date: _____

4-27-12

Virjean Edwards
Registrar

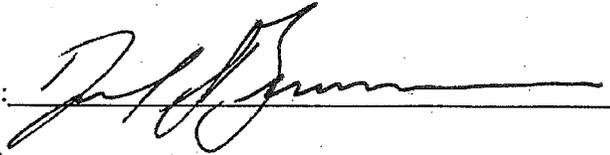
ATTACHMENT G.1
Permission to enter into the WICHE MOA
Western Washington University

Purpose:

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Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: _____



David S. Brunnemer
Registrar

Date: _____

27 April 2012

ATTACHMENT G.1
Permission to enter into the WICHE MOA
Eastern Washington University

Purpose:

The purpose of this document is to grant permission to the Education Research and Data Center (ERDC) to enter into a Memorandum of Agreement (K1015) with the Western Interstate Commission for Higher Education (WICHE) in order to pilot compiling longitudinally-linked education and employment data with Oregon, Hawaii and Idaho. The MOA (unsigned copy attached) will designate WICHE as an authorized representative of the ERDC for the specific purpose of matching Washington data provided by ERDC with corresponding data from Oregon, Idaho, and Hawaii. The data resulting from this match will pilot providing the Washington state educational authorities with a more complete picture of whether Washington students are being employed in the fields in which they were trained by Washington educational institutions. Evaluating education programs based only on in-state employment provides an incomplete picture and does not recognize the human capital flow between states. Better information on the link between education/training and employment will assist the State in education program evaluation and determining program offerings.

Permission to share this data ends when the Memorandum of Agreement for this pilot project ends.

Signature: _____



Date: _____

5/15/12

Erin Morgan
Registrar

ATTACHMENT G.1
Permission to enter into the WICHE MOA
Employment Security Department

Purpose:

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Signature: Randi Warick

Date: 3-2-12

Randi Warick
Assistant Commissioner
Budget, Performance and Research Division

References

- Bransberber, Peace. "A Glimpse Beyond State Lines: Student Outcomes from WICHE's Multistate Longitudinal Data Exchange Pilot Project." (Boulder, CO.: Western Interstate Commission for Higher Education, 2014).
- Carnevale, Anthony P., Rose, Stephen J., and Hanson, Andrew R. (2012). *Certificates: Gateway to Gainful Employment and College Degrees*. (Washington, D.C.: Georgetown University Center on Education and the Workforce). Retrieved from <<https://georgetown.app.box.com/s/w6bzsdovxvqcywwoog6yl>>.
- Carnevale, Anthony P., Smith, Nicole, and Strohl, Jeff (2013). *Recovery: Job Growth and Education Requirements Through 2020*. (Washington, D.C.: Georgetown University Center on Education and the Workforce). Retrieved from <<https://georgetown.app.box.com/s/tll0zkxt0puz45hu21g6>>.
- Committee on Measures of Student Success.
- EducationCounsel, LLC. *U.S. Department of Education Final FERPA Regulations: Advisory and Overview* (Washington, D.C.: Data Quality Campaign, December 2, 2011).
- EducationCounsel, LLC. (2011). *U.S. Department of Education Final FERPA Regulations: Advisory and Overview*. Retrieved December 5, 2011 from <http://www.dataqualitycampaign.org/files/1475_2011%20Final%20FERPA%20Regulations_Advisory%20and%20Overview%20FINAL.pdf>; U.S. Government Printing Office. 2011. Federal Register, 76(232), 75604-75660.
- Ewell, Peter and L'Orange, Hans P. (2009). *The Ideal State Postsecondary Data System: 15 Essential Characteristics and Required Functionality*. Retrieved from State Higher Education Executive Officers Association website: <http://www.sheeo.org/sites/default/files/publications/ideal_data_system.pdf>.
- Kelderman, Eric. "Texas' Technical Colleges are Banking on Student Earnings." *The Chronicle of Higher Education* (September 9, 2013), Accessed February 20, 2014 from <<http://chronicle.com/article/In-Texas-Technical-Colleges/141467/>>.
- Molloy, Raven, Christopher L. Smith, and Abigail Wozniak (2011). "Internal Migration in the United States." *Journal of Economic Perspectives* 25(3), 173-196.
- National Center for Higher Education Management Systems and Center for State Policy on Student Progression. *Tracking Postsecondary Students Across State Lines: Results of a Pilot Multi-State Data Exchange Initiative* (Boulder, CO: NCHEMS, 2008).
- Prescott, Brian T. and Ewell, Peter. *A Framework for a Multi-State Human Capital Development Data System* (Boulder, CO: Western Interstate Commission for Higher Education, 2009), Accessed July 7, 2010 from <<http://www.wiche.edu/info/publications/FrameworkForAMultistateHumanCapitalDevelopmentDataSystem.pdf>>.
- S.915. *Student Right to Know Before You Go Act*. 113th Congress. Accessed March 19, 2014 from <<http://thomas.loc.gov/cgi-bin/query/z?c113:S.915:>>.
- Stevens, David and Zhang, Ting (2014). *Toward a Business Case for Sustained Investment in State Longitudinal Integrated Data Systems*. (Baltimore, MD: Jacob France Institute). Retrieved from <<http://www.jacob-france-institute.org/wp-content/uploads/JFI-WDQI-Year-Three-Research-Report1.pdf>>.
- Vedder, Richard (2012, April 9). Why college isn't for everyone. *BusinessWeek*. Retrieved from <<http://www.businessweek.com/articles/2012-04-09/why-college-isnt-for-everyone>>.
- Wozniak, Abigail (2010). "Are College Graduates More Responsive to Distant Labor Market Opportunities?" *Journal of Human Resources* 45(4), 944-970.

