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Authors:

Scott Davis (*IMPAQ International*)

Stephen Wandner (*Urban Institute*)

Louis Jacobson (*New Horizons Economic Research*)

Submitted to:

Gloribel Nieves-Cartagena
Contracting Officer's Technical Representative
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210

***Submitted by*:**

Eileen Poe-Yamagata
Project Director
IMPAQ International, LLC
10420 Little Patuxent Parkway
Suite 300
Columbia, MD 21044
www.impaqint.com

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ABSTRACT

American workers interested in enhancing or augmenting their skills often enroll in education and training programs that they expect to help them progress along a career path or find and keep good jobs. To provide individuals with information to help them decide among program alternatives, some states have created websites (termed scorecards) that allow users to browse education and training opportunities and view the labor market outcomes of recent program completers. Because of the challenges states face in producing such systems, the U.S. Department of Labor (DOL) was interested in considering potential alternative approaches, such as having DOL help facilitate the process of creating these systems. This study focused on two questions: (1) Is it feasible to use national databases of employment and earnings data for state education and training program scorecards? (2) How different are employment- and earnings-related outcome measures for education and training programs when based on single-state unemployment insurance (UI) wage records versus data from a national database of earnings? To answer these questions, IMPAQ worked with three states—Missouri, New Jersey, and Ohio—each of which provided us with administrative data on training completers along with UI wage record data. Moreover, the states agreed to allow us to match their data to the National Directory of New Hires (NDNH), a national database of earnings. To understand how the employment- and earnings-related measures typically used in scorecards compare when based on either single-state wage record data or a national database of earnings, analysts calculated a series of outcome measures using both data sources. The key results are: (1) the alternatives are limited in terms of existing databases with national coverage that could be used to support a national approach to scorecards; (2) in states like Missouri and Ohio, scorecard measures based on single-state UI data are not meaningfully different than if they were based on national data; and (3) in states like New Jersey, scorecard measures based on single-state UI data are underestimated due to substantial missing data on trainees who work in other states. Based on the results, IMPAQ provides three recommendations to DOL: (1) work to streamline the process of accessing the NDNH; (2) encourage and/or help foster regional wage record data sharing among groups of states; and (3) identify ways to enable information sharing among states, so states without scorecards may learn from those that have been successful at creating and maintaining them.

Key words: education and training programs, scorecards, employment, earnings, unemployment insurance (UI) wage records, National Directory of New Hires (NDNH)

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EXECUTIVE SUMMARY

American workers interested in enhancing or augmenting their skills often enroll in education and training programs that they expect to help them progress along a career path or find and keep good jobs. For some job seekers, the U.S. public workforce system works with public and private training providers to cover the cost of enrolling in such programs. For others, the cost of enrolling in additional education or training is one of many factors to consider when deciding which program best meets their needs.

To make good decisions about investing in themselves—in the form of additional education or training—American workers need pertinent, reliable information on how the skills developed in a particular program translate into job opportunities and earnings potential. To provide this kind of information to the public, some states have created websites (termed scorecards) that allow users to browse education and training opportunities. These sites may provide information about the organizations offering education and training programs, program cost, and other information. One of the key pieces of information sometimes included in scorecards consists of the labor market outcomes of recent program completers, such as the proportion of recent cohorts employed after finishing the program and their average earnings. In general, states that provide this information rely on earnings data from state unemployment insurance (UI) wage records. Despite the obvious value of this outcome information to prospective trainees, few states to date have successfully developed such systems, for myriad reasons.

Because of the challenges states face in producing such systems, the U.S. Department of Labor (DOL) was interested in considering potential alternative approaches. Recently, policy makers have been interested in understanding how to foster the more widespread development of these types of websites. One such alternative would be for DOL to facilitate the process of creating these systems for those states not able to produce them independently.

To better understand how such an approach might work, whether it is feasible, and its advantages and disadvantages, DOL contracted with IMPAQ International, LLC (IMPAQ) to conduct the *Comparing State and National Approaches to Education and Training Program Scorecards* study. This report describes the study in detail, including the main research questions, the approach, the data collected, the results of the analyses, and recommendations to DOL.

ES.1 Approach

One topic of consideration by DOL that motivated the study was the potential for complementing the state approach to scorecards by developing or supporting a national approach. Two key characteristics define the state approach:

- The status quo of relying on state internal capacity to create and support scorecards.
- For states that provide scorecards, exclusive reliance on their own state's UI wage record data to calculate earnings- and employment-related outcome measures.

The national approach to scorecards is an as yet unspecified approach DOL would use to support states that otherwise would not create their own scorecards—with the ultimate goal of more widespread scorecard implementation.

This study focused on one aspect of the state approach versus national approach discussion. Namely, DOL sought to explore through this study the potential for DOL to work with states to match individual-level data on participants in education and training providers to available national databases of earnings. The idea was that, if DOL could facilitate such matching, the national database(s) could be used in place of single-state UI wage records to calculate the types of outcome measures reported in scorecards. But it was not clear whether doing so was possible, or if so, how it might be done—DOL wanted IMPAQ to make an effort to do so, and see what lessons could be drawn from the experience that would shed light on the feasibility of such a process.

Because the work would involve gaining access to national database(s) of earnings, DOL was also interested in understanding how typical employment- and earnings-related outcome measures reported differed between single-state UI wage records versus a national database of earnings. This issue is important because of the potential for program participants to subsequently find jobs in states other than the state in which they were educated or trained. If this is fairly common, employment- and earnings-related outcome measures based solely on single-state UI wage records risk being downwardly biased—this is because individuals that go on to jobs in other states (and thus do not appear in single-state wage records) are generally counted in a scorecard as not employed.

Key Research Questions. Based on the study objectives, IMPAQ's aim was to answer two key research questions:

1. Is it feasible to use national databases of employment and earnings data for state education and training program scorecards?
2. How different are employment- and earnings-related outcome measures for education and training programs when based on single-state UI wage records versus data from a national database of earnings?
    a. How do any differences vary with the characteristics of trainees and/or training programs?
    b. How do any differences vary for different types of outcome measures, such as those with different follow-up periods?

Approach. The original approach to the study included four key components:

1. Work with three states—Florida, New Jersey, and Ohio—to assemble data on education/training program participation that could be matched to databases of employment and earnings. However, Florida declined to participate in the study, and Missouri ultimately replaced Florida.

2. Work with these states, the Social Security Administration (SSA), and the Department of Health and Human Services (HHS) to match earnings data with participant data. States were to provide UI wage record data. SSA was to provide annual earnings data. HHS was to provide quarterly earnings data from the National Directory of New Hires (NDNH).[1]
3. Analyze the strengths and weaknesses of using different sources of earnings data and different outcome measures (e.g., for different follow-up periods), focusing on how best to provide useful information to individuals seeking to enhance their earnings through postsecondary education and training.
4. Produce a report that details the processes required to obtain earnings data from the different sources, describes the results of the analyses comparing program outcome measures based on different data sources, assesses the feasibility of using national databases for scorecards, and provides recommendations for how DOL can foster the more widespread implementation of scorecards.

Data Sources. The planned approach called for gathering data from multiple data sources, including:

- ***State Participant Data and Wage Record Data***. The intent was to have each of the three states provide data on individuals awarded certificates and degrees from two- and four-year educational institutions in that state, along with state UI wage record data. The state wage record data would enable the construction of both pre- and post-program employment and earnings measures.
- ***SSA Earnings Data***. IMPAQ would work with DOL to obtain SSA earnings data for individuals included in the participating state data files.
- ***NDNH Earnings Data***. IMPAQ would work with DOL to obtain the NDNH data, which includes quarterly wage record data from all states covering a rolling window of eight calendar quarters.

Analysis. Using the earnings data from all available sources, the intent was to analyze whether and how outcome measures for education and training programs varied by data source. In other words, IMPAQ would calculate the same outcome measures for the same population of trainees using each of the sources of employment and earnings data.

Challenges. As the study unfolded, as noted, it became clear that strictly adhering to the original approach was not possible. Over time, IMPAQ worked closely with DOL to consider new developments in the project and how they affected what could be done. Ultimately, although not able to obtain all the data the study originally set out to analyze, IMPAQ was able to collect employment and earnings data from two different sources (state UI wage records and the NDNH). This allowed IMPAQ to answer the key research questions related to understanding how

[1] We also raised with states the potential for accessing national earnings data through the Wage Record Interchange System (WRIS). Early discussions with states made clear that they could not provide data from it for our purposes, so we decided not to pursue WRIS data.

different data sources affect outcome measures. Moreover, lessons learned from the experience speak importantly to some of the challenges in implementing the type of national approach to scorecards that DOL envisioned when the study began.

ES.2 Data

The original approach to the study called for obtaining data from national databases of earnings to accomplish two objectives. First, this would demonstrate the feasibility of accessing such databases for calculating the types of employment- and earnings-related outcome measures typically reported in education and training program scorecards. Second, outcome measures based on data from the national database(s) would be compared to the same measures based on single-state UI wage record data—comparisons that would shed light on the degree to which the figures reported by states relying on their own UI wage records might be biased due to missing data from trainees finding employment outside their home states.

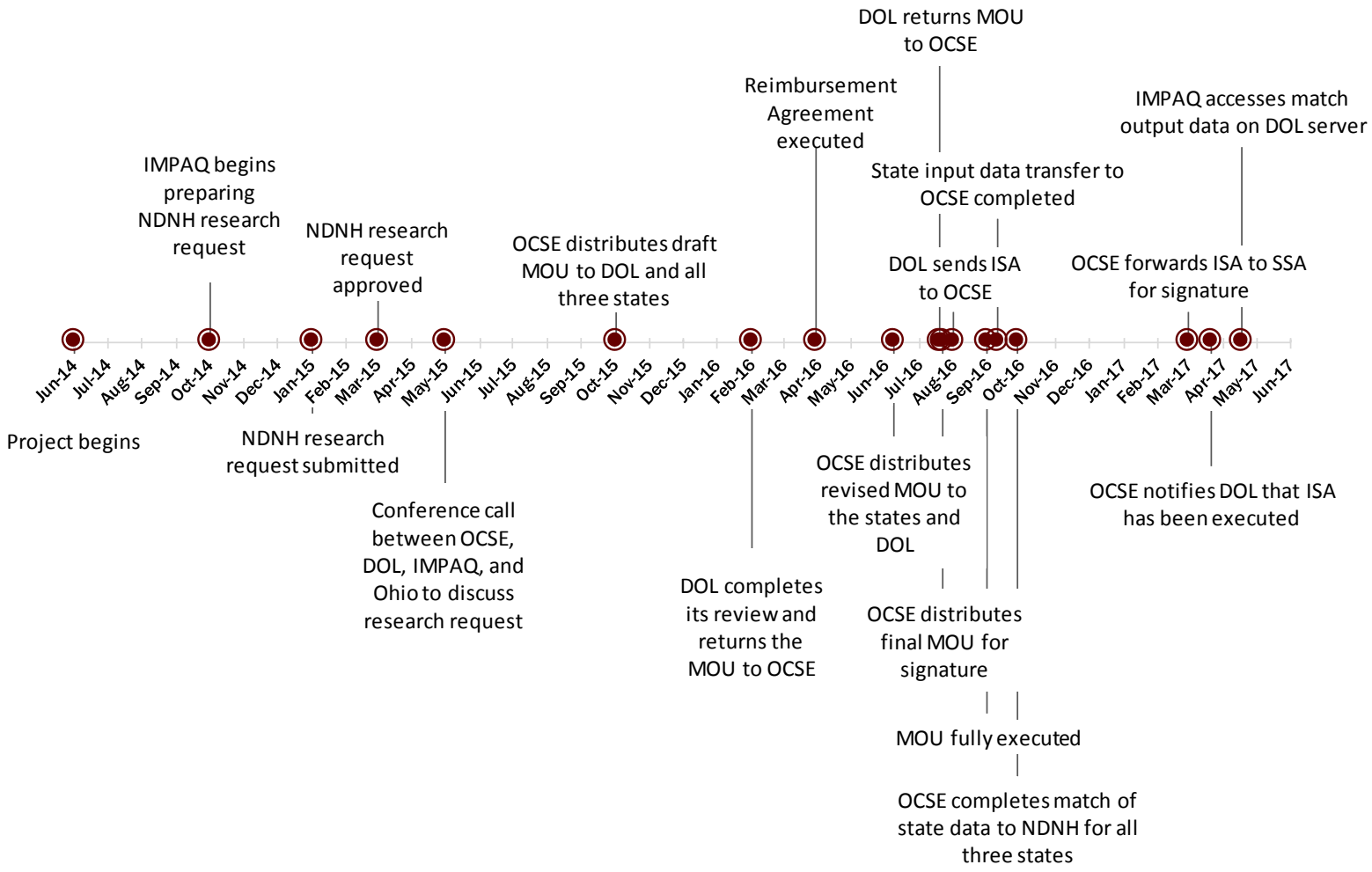
Early in this project, IMPAQ sought approval to access administrative data on earnings from the SSA; this request was eventually denied. As it became clear that the SSA data would not be forthcoming, IMPAQ requested access to the NDNH, which was approved. Although IMPAQ was ultimately able to obtain the NDNH data as planned, the process for making the necessary arrangements was time-consuming, taking over two years from start to finish.

Exhibit ES.1 on the next page shows the timeline of the efforts to obtain the NDNH data.

As the basis for the comparisons, IMPAQ recruited three states—Missouri, New Jersey, and Ohio—to participate in the study. Each state provided administrative data on individuals who had completed a training program through the Workforce Investment Act (WIA) and its successor legislation, the Workforce Innovation and Opportunity Act (WIOA) within the most recent five-year period available in the state's records, along with its UI wage record data. The states also agreed to allow IMPAQ to match their data to the NDNH, and to work with the project team to make all necessary arrangements to do so.

The state data generally show profiles of trainees in Missouri and Ohio that are roughly similar to each other, but somewhat different from the profile of trainees in New Jersey. In Missouri and Ohio, trainees in the data were mostly white, evenly balanced by gender, and in their prime working years; and they tended to have relatively low education. In New Jersey, a smaller proportion was white, there were more women than men, and trainees were generally better educated than in the other two states. Employment rates and quarterly earnings (based on state UI wage records) at one, four, and eight quarters prior to the start of the training episode were also very similar in Missouri and Ohio, which were both different from New Jersey. In general, employment rates in New Jersey were much lower, but quarterly earnings among those employed were higher compared to the other two states.

Exhibit ES.1: Timeline of Gaining Access to the NDNH



Note: ISA stands for Interconnection Security Agreement. See Section A.2 of Appendix A for details regarding the ISA.

By far the most common type of training reported was 'other occupational skills' training, which accounted for between 77 and 94 percent of all training episodes across the three states. The length of training varied across states, though the industry focus of the training showed some similarities, with healthcare being the most common in all three. The New Jersey data on industry was unreported for 70 percent of the training episodes in the data, but among training episodes for which the industry focus was reported, industry representation was similar to the other two states. One key aspect of training expected to affect comparisons between outcomes based on state or national data—whether the training took place near a state border—showed some variation across states, although the data for New Jersey and Ohio were too imprecise for any strong comparison to be made.

For consistency with a separate research study for DOL that produced a suggested template for scorecards, the analysis focused on employment rates and quarterly earnings defined at one, four, eight, and 12 quarters post-completion. Data on the labor market outcomes of trainees at these follow-up periods showed similar patterns across the three states, as did the data on trainee and training characteristics. Outcomes for training completers in Missouri and Ohio were similar across all follow-up periods—about three-quarters of trainees were employed and quarterly earnings (among those employed) averaged about $6,000 to just over $8,000. A much smaller proportion of trainees in New Jersey were employed (12-60 percent depending on the quarter) compared to the other two states, but average quarterly earnings for New Jersey trainees were generally similar to average quarterly earnings for trainees in the other states, except for the longest two follow-up periods (eight and 12 quarters post-completion) when they were lower.

ES.3 Comparing Outcome Measures Based on State and National Data

To understand how the employment- and earnings-related measures typically used in education and training program scorecards compare when based on either single-state wage record data or a national database of earnings, the same measures were calculated using data from three states and matched earnings records from the NDNH. The results of the comparisons of employment rates based on the two data sources are summarized in Exhibit ES.2.

The results of the comparisons of employment rates showed virtually no differences in either Missouri or Ohio. In both states, the employment rate derived from the NDNH data was slightly lower than the corresponding rate derived from state wage record data. In New Jersey, however, employment rates were much higher for all post-completion periods when calculated using NDNH data versus state data.

ES.2: Employment Rates Post-Training Completion, by State and Data Source

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
First quarter following quarter of training completion			
State wage records	75.5	43.9	75.4
NDNH	73.0	64.3	73.0
Difference	*-2.5*	*+20.4*	*-2.4*
Fourth quarter following quarter of training completion			
State wage records	76.1	60.3	76.9
NDNH	75.2	68.2	74.2
Difference	*-0.9*	*+7.9*	*-2.7*
Eighth quarter following quarter of training completion			
State wage records	72.0	18.3	74.7
NDNH	71.9	68.0	70.9
Difference	*-0.1*	*+49.7*	*-3.8*
Twelfth quarter following quarter of training completion			
State wage records	69.7	11.8	71.9
NDNH	70.3	62.1	68.9
Difference	*+0.6*	*+50.3*	*-3.0*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Comparing average quarterly earnings (among those employed) across the three states showed a similar pattern. Exhibit ES.3 summarizes the results.

In both Missouri and Ohio, there was little difference between average earnings calculated from the two data sources for any of the post-completion periods. In Missouri, average post-completion quarterly earnings were 2-4 percent higher when based on the NDNH data. In Ohio, the difference was 2 percent or less. In New Jersey, on the other hand, average quarterly earnings were significantly much higher when derived from the NDNH data. At the fourth quarter post-completion, for example, average quarterly earnings as measured by the NDNH data were 5 percent higher than when measured using state wage record data. At the twelfth quarter post-completion, the difference increased to over 20 percent.

Exhibit ES.3: Quarterly Earnings Post-Training Completion, by State and Data Source

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
First quarter following quarter of training completion			
State wage records	$6,187 (4,551)	$6,190 (7,658)	$5,991 (4,871)
NDNH	$6,360 (4,729)	$6,039 (7,371)	$5,971 (5,238)
Difference			
Absolute	*+173*	*-151*	*-20*
Percent	*+2.8%*	*-2.4%*	*-0.3%*
Fourth quarter following quarter of training completion			
State wage records	$7,139 (4,898)	$7,354 (6,222)	$7,367 (4,926)
NDNH	$7,404 (5,190)	$7,710 (6,783)	$7,427 (4,944)
Difference			
Absolute	*+265*	*+356*	*+60*
Percent	*+3.7%*	*+4.8%*	*+0.8%*
Eighth quarter following quarter of training completion			
State wage records	$7,609 (5,358)	$7,168 (7,895)	$7,814 (4,835)
NDNH	$7,877 (5,593)	$8,237 (7,212)	$7,965 (5,108)
Difference			
Absolute	*+268*	*+1,069*	*+151*
Percent	*+3.5%*	*+14.9%*	*+1.9%*
Twelfth quarter following quarter of training completion			
State wage records	$7,772 (5,223)	$6,879 (5,946)	$8,125 (4,905)
NDNH	$8,057 (5,572)	$8,277 (7,366)	$8,298 (5,210)
Difference			
Absolute	*+285*	*+1,398*	*+173*
Percent	*+3.7%*	*+20.3%*	*+2.1%*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values.

To understand in greater detail how individual earnings compared between the two data sources, IMPAQ examined the proportion of the sample in each state that fell into three mutually exclusive and exhaustive categories: (1) those with higher earnings in the NDNH, (2) those with the same earnings in both data sources, and (3) those with higher earnings in the state wage

record data. In both Missouri and Ohio, the large majority of trainees (over 80 percent) had equivalent earnings in the two data sources. In New Jersey, a much higher proportion of trainees (over half) had higher earnings in the NDNH data than in the state wage record data for the two longest post-completion periods.

Because the NDNH identifies the state that reported each quarterly earnings record for each individual in the database, it was possible to examine how often trainees from each of the three states had earnings records in the NDNH from any other U.S. state. For trainees with some out-of-state earnings reported in the NDNH, the states most commonly represented in the out-of-state earnings records for Missouri and Ohio were states within the same region of the country. This was less true for New Jersey, as distant states (including Florida, California, and Texas) were well-represented.

Lastly, to isolate the statistical relationships between characteristics of trainees, characteristics of the training, and differences in employment- and earnings-related outcomes based on the two data sources, a series of multivariate regression models (by state and post-completion period) was estimated. The two dependent variables in the regressions were: (1) an indicator variable equal to 1 if the individual had higher earnings in the NDNH data than in the state data and zero otherwise, and (2) an indicator variable equal to 1 if the individual had higher earnings in the state data and zero otherwise. More highly educated trainees, those who completed 'other occupational skills' training, and those who trained in two industries—management and transportation—were more likely to have higher earnings based on the NDNH data than when based on single-state wage records. In New Jersey and Ohio, trainees who participated in programs near the border were more likely than others to have higher earnings in the NDNH; in Missouri, the opposite was true.

ES.4 Discussion

At the outset, IMPAQ and DOL believed it might be possible to link individual-level data on participants in education and training programs to multiple national databases of earnings, including both records maintained by SSA and the NDNH. Unfortunately, the study encountered challenges securing both administrative data on trainees as well as national data on their labor market outcomes:

- Neither of the two states originally selected for the study—New Jersey and Ohio—was willing to provide data on individuals who completed programs of study at postsecondary institutions, which IMPAQ had planned to include in the scorecard coverage.
- SSA ultimately determined that it lacked the legal authority to facilitate the kind of matching and analysis envisioned for the project. Similarly, in early conversations with states to recruit them for the study, it became clear that states would not be able to provide WRIS data.

As a result of these challenges, the original plans for the study had to be modified. First, the population of interest was narrowed to trainees who received funding through WIA/WIOA.

Second, the study focus shifted to using the NDNH as the sole national database of earnings with which to compare outcomes based on single-state wage records.

The key results of these efforts fall into two groups: (1) lessons learned about the potential for creating scorecards from national databases of employment and earnings data; and (2) what can be said about how typical outcome measures differ, depending on whether they are based on single-state UI data versus a national database of employment and earnings.

Exhibit ES.4 on the next page summarizes the key results of the study. Each is described in detail in Chapter 5.

Recommendations. The primary objective of this project was to learn whether it would be feasible for DOL to facilitate the more widespread dissemination of education and training program scorecards, by working with states to match individual-level data on trainees to national databases of employment and earnings. A second objective was to understand how typical scorecard outcome measures compare when based either on single-state wage record data or on data from a national database.

This report describes not only the challenges faced as the study progressed but also what we learned—in terms of both whether national databases may be used for the purpose envisioned by DOL, and how outcome measures based on state and national data compare to one another. Under current conditions, it is not feasible for DOL to facilitate state scorecards linked to national data sources. But given the study results that there may be little difference between using single-state data and national data for many states (those more similar to Missouri and Ohio than to New Jersey), it may not be necessary for DOL to make national data available for state scorecards to support their development.[2]

Based on what was learned through this study, IMPAQ offers the following recommendations for DOL to consider as it seeks to support making education and training program scorecards more widely available to the public:

1. **Work with the Office of Child Support Enforcement (OCSE)/HHS to streamline the process of accessing the NDNH.**

2. **Encourage and/or help foster regional wage record data sharing among groups of states. Consider developing regional data centers to facilitate data sharing and support scorecard development.**

3. **Identify ways to enable information sharing among states, so states without scorecards may learn from those that have been successful at creating and maintaining them.**

[2] One important caveat is that this is true only to the degree that the results, which are based on WIA/WIOA training completers, are relevant for broader populations.

Exhibit ES.4: Summary of Key Results

Research Question	Results
1. Is it feasible to use national databases of employment and earnings data for state education and training program scorecards?	▪ State agencies are reluctant to share individual-level postsecondary educational records for research. ▪ It is easier to obtain state participant data from states where an existing infrastructure can support making administrative data available to the public for research. ▪ Working with state agencies to execute data sharing agreements that govern the release of data for research purposes takes time. ▪ Making the legal arrangements necessary to obtain administrative data on employment and earnings maintained by federal agencies is sufficiently time-consuming that it effectively precludes using the data for time-sensitive purposes. ▪ The alternatives are limited in terms of existing databases with national coverage that could be used to support a national approach to scorecards. Under current data sharing rules, neither SSA data nor the NDNH is a viable option for scorecard purposes.
2. How different are employment- and earnings-related outcome measures for education and training programs when based on single-state UI wage records versus data from a national database of earnings? a. How do any differences vary with the characteristics of trainees and/or training programs? b. How do any differences vary for different types of outcome measures, such as those with different follow-up periods?	▪ In states like Missouri and Ohio, scorecard measures based on single-state UI data are not meaningfully different than if they were based on national data. ▪ In states like New Jersey, scorecard measures based on single-state UI data are underestimated due to substantial missing data on trainees who work in other states. ▪ Among trainees with out-of-state earnings, the out-of-state earnings are most likely to come from nearby states within the same region. ▪ Differences in outcome measures based on state versus national data are more common for more highly educated trainees and trainees in particular industries. Other relationships vary across the three states. ▪ Differences in outcome measures based on state versus national data can depend on the length of the follow-up period, becoming more pronounced for longer-term measures.

Concluding Remarks. When this study began, IMPAQ expected to work with up to three states to compare outcome measures based on single-state UI wage record data to federal tax record data on income, from the SSA. One key objective of the study was to document the process of linking the state and federal data and to describe, based on that experience, the feasibility of using national data for scorecards. Work on this project revealed the challenges associated with successfully completing these kinds of data linkages. It became increasingly clear that what IMPAQ sought to do would not be easy, and that linking the data would depend on both federal and state stakeholders supporting the study and interpreting favorably the associated legal necessities. Ultimately, IMPAQ was able to link state data on trainees to a national database of earnings, though the process took much longer than originally anticipated. Once the output data was received, IMPAQ was able to analyze the differences between outcome measures based on state versus national data and to consider the implications of the results for efforts to complement state efforts to develop or enhance education and training program scorecards. The optimistic conclusion is that both the lessons learned about the existing challenges to using national data sources and the results of the quantitative analyses will prove useful to policymakers—as they continue working to provide the public with more and better information to help them make important decisions about their individual human capital investments.

1. INTRODUCTION

American workers interested in enhancing or augmenting their skills often enroll in education and training programs that they expect to help them progress along a career path or find and keep good jobs. For some job seekers, the U.S. public workforce system works with public and private training providers to cover the cost of enrolling in such programs. For others, the cost of enrolling in additional education or training is one of many factors to consider when deciding which program best meets their needs.

To make good decisions about investing in themselves—in the form of additional education or training—American workers need pertinent, reliable information on how the skills developed in a particular program translate into job opportunities and earnings potential. To provide this kind of information to the public, some states have created websites (termed scorecards) that allow users to browse education and training opportunities. These sites may provide information about the organizations offering education and training programs, program cost, and other information. One of the key pieces of information sometimes included in scorecards consists of the labor market outcomes of recent program completers, such as the proportion of recent cohorts employed after finishing the program and their average earnings. In general, states that provide this information rely on earnings data from state unemployment insurance (UI) wage records. Despite the obvious value of this outcome information to prospective trainees, few states to date have successfully developed such systems, for myriad reasons.

Because of the challenges states face in producing such systems, the U.S. Department of Labor (DOL) was interested in considering potential alternative approaches. Recently, policy makers have been interested in understanding how to foster the more widespread development of these types of websites. One such alternative would be for DOL to facilitate the process of creating these systems for those states not able to produce them independently.

To better understand how such an approach might work, whether it is feasible, and its advantages and disadvantages, DOL contracted with IMPAQ International, LLC (IMPAQ) to conduct the *Comparing State and National Approaches to Education and Training Program Scorecards* study. This report describes the study in detail, including the main research questions, the approach, the data collected, the results of the analyses, and recommendations to DOL.

Chapter 2 describes IMPAQ's approach to the study. Chapter 3 presents the data, including a discussion of the data collection experience and an overview of the state data on trainees. Chapter 4 analyzes the differences between employment- and earnings-related outcomes based on state and national data. Chapter 5 concludes the report by discussing key results and presenting recommendations.

2. APPROACH

This chapter describes the study approach. Challenges faced along the way forced modification of the initial approach. What follows describes the original approach and notes some of those obstacles. Later chapters elaborate on the changes made, though the main features of the approach remained consistent with the description in this chapter.

State and National Approaches to Scorecards. One topic of consideration by DOL that motivated the study was the potential for complementing the state approach to scorecards by developing or supporting a national approach. As context for the study, it is useful to clarify what is meant by the two different approaches.

The state approach is in essence the current status quo, whereby states with the capacity and inclination to produce and support scorecards do so, and states that either cannot or do not wish to produce scorecards do not. Under an earlier contract with DOL, IMPAQ analyzed the extent to which scorecards had been developed and implemented in states that had received grants from the first three rounds of DOL's Workforce Data Quality Initiative (WDQI), and identified key factors related to success in developing those scorecards.[3] That study revealed that few WDQI states had developed scorecards at that time. The content and features of state scorecards varied among states that had developed them, but nearly all were similar in one respect: to calculate employment- and earnings-related post-completion outcome measures, they relied exclusively on their own state's Unemployment Insurance (UI) wage record data. Therefore, two key characteristics define the state approach:

- The status quo of relying on state internal capacity to create and support scorecards.
- For states that provide scorecards, exclusive reliance on their own state's UI wage record data to calculate earnings- and employment-related outcome measures.

As an alternative to the state approach, DOL was interested in the potential for a national approach to scorecards. No single, clear definition characterizes what a national approach could or should be, as opposed to the state approach. There are two basic alternatives. One would be for DOL to somehow play a role in creating and maintaining a scorecard for states that cannot or will not create one on their own. For instance, DOL might help to facilitate or carry out the data processing needed to populate a scorecard. Alternatively, DOL might develop and make available to states a standardized template for a scorecard webpage, but leave it up to states to populate the template. Other roles and ways of supporting states are also possible. Given this background, the national approach to scorecards is an as yet unspecified approach DOL would use to support states that otherwise would not create their own scorecards—with the ultimate goal of more widespread scorecard implementation.

[3] See Davis, S., L. Jacobson, and S. Wandner. "Using Workforce Data Quality Initiative Databases to Develop and Improve Consumer Report Card Systems," May 23, 2014. Columbia, MD: IMPAQ International.

This study focused on one aspect of the state approach versus national approach discussion. Namely, DOL sought to explore through this study the potential for DOL to work with states to match individual-level data on participants in education and training providers to available national databases of earnings. The idea was that, if DOL could facilitate such matching, the national database(s) could be used in place of single-state UI wage records to calculate the types of outcome measures reported in scorecards. But it was not clear whether doing so was possible, or if so, how it might be done—DOL wanted IMPAQ to make an effort to do so, and see what lessons could be drawn from the experience that would shed light on the feasibility of such a process.

Because the work would involve gaining access to national database(s) of earnings, DOL was also interested in understanding how typical employment- and earnings-related outcome measures reported differed between single-state UI wage records versus a national database of earnings. This issue is important because of the potential for program participants to subsequently find jobs in states other than the state in which they were educated or trained. If this is fairly common, employment- and earnings-related outcome measures based solely on single-state UI wage records risk being downwardly biased—because individuals that go on to jobs in other states (and thus do not appear in single-state wage records) are generally counted in a scorecard as not employed. Moreover, though state UI wage records cover the large majority of workers in the U.S., some important types of employment are not covered in these systems.[4] Some national databases—such as Internal Revenue Service (IRS) records—do cover these additional types of employment.

Key Research Questions. Based on the study objectives, IMPAQ'S aim was to answer two key research questions:

1. Is it feasible to use national databases of employment and earnings data for state education and training program scorecards?
2. How different are employment- and earnings-related outcome measures for education and training programs when based on single-state UI wage records versus data from a national database of earnings?
    a. How do any differences vary with the characteristics of trainees and/or training programs?
    b. How do any differences vary for different types of outcome measures, such as those with different follow-up periods?

Approach. The original approach to the study included four major components:

[4] For example, state UI wage records do not contain information on earnings for the self-employed, or for those employed by the federal government. For more detail on limitations of the coverage of state UI wage records, see Durham, C. and L. Wheaton, "Investigating Alternative Sources of Quarterly Wage Data: An Overview of the NDNH, LEHD, WRIS, and ADARE," October 18, 2012. Urban Institute.

1. Work with three states—Florida, New Jersey, and Ohio—to assemble data on education/training program participation that could be matched to databases of employment and earnings (the criteria for selecting the states are described in Chapter 3).
2. Work with these states, the Social Security Administration (SSA), and the Department of Health and Human Services (HHS) to match earnings data with participant data. States were to provide UI wage record data. SSA was to provide annual earnings data.[5] HHS was to provide quarterly earnings data from the National Directory of New Hires (NDNH).[6]
3. Analyze the strengths and weaknesses of using different sources of earnings data and different outcome measures (e.g., for different follow-up periods), focusing on how best to provide useful information to individuals seeking to enhance their earnings through postsecondary education and training.
4. Produce a report that details the processes required to obtain earnings data from the different sources, describes the results of the analyses comparing program outcome measures based on different data sources, assesses the feasibility of using national databases for scorecards, and provides recommendations for how DOL can foster the more widespread implementation of scorecards.

Data Sources. The planned approach called gathering data from multiple data sources:

- ***State Participant Data and Wage Record Data***. The intent was to have each of the three states provide data on individuals awarded certificates and degrees from two- and four-year educational institutions in that state. Because the plan was to compare results for different programs of study, some of which would likely have few completers in a single year, the data request would cover a five-year period: 2008–2012. For each person in this population, the state would be asked to provide whatever demographic information was available (e.g., age, race, gender), along with information about type of award (e.g., institution, program of study, program length). Each state would also be asked permission to match the population of program completers to its UI wage record data covering 2004–2013, which would enable the construction of both pre- and post-program employment and earnings measures. As a supplement to single-state UI wage records, states would be asked to obtain multi-state UI wage record data through the Wage Record Interchange System (WRIS).[7]
- ***SSA Earnings Data***. IMPAQ would work with DOL to obtain SSA earnings data for individuals included in the participating state data files. Because SSA was not expected to return individual-level data, the data was first to be organized into a number of cells before providing SSA with the input files. The cells were to be defined based on available characteristics in the data, such as gender and program of study. States would provide

[5] See https://www.ssa.gov/dataexchange/.

[6] See https://www.acf.hhs.gov/css/resource/overview-of-national-directory-of-new-hires.

[7] The WRIS is a system that facilitates the exchange of UI wage record data among states for specific purposes, such as for measuring and reporting on the performance of education and training programs and providers. For more information, see https://doleta.gov/performance/wris.cfm.

input files with Social Security Numbers (SSNs) and cell identifiers directly to SSA. SSA would then match individuals to its earnings data by SSN. Next, SSA would calculate a number of outcome measures for each of the cells identified in the data, provided there was a sufficiently large number of individuals (e.g., greater than 10) in the cell, and would provide the aggregate output to DOL and IMPAQ for analysis.

- ***NDNH Earnings Data***. IMPAQ would work with DOL to obtain the NDNH data. The plan was to work with the three states to have them submit input data files to DOL, which would then submit the data to HHS. HHS would match individuals to NDNH earnings data using SSNs, and then return the matched data to DOL. DOL would host the output data files on its secure servers and provide access to approved IMPAQ researchers.

Analysis. Using the earnings data from all available sources, the intent was to analyze whether and how employment- and earnings-related outcome measures for education and training programs varied by data source. In other words, IMPAQ would calculate the same outcome measures for the same population of trainees using each of the sources of employment and earnings data. Because the data sources cover different types of employment and have other differences, comparing them would show how those differences affect the types of program outcome measures typically reported in scorecards. Moreover, the analysis would clarify whether differences among the outcome measures were related to other factors, such as: (1) trainee characteristics (e.g., gender, age, race); (2) characteristics of the training programs in which they participated (e.g., type of training, length of training; and (3) length of the follow-up period (e.g., one quarter post-completion, four quarters post-completion).

Challenges. As the study unfolded, as noted, it became clear that strictly adhering to the original approach was not possible. Over time, IMPAQ worked closely with DOL to consider new developments in the project and how they affected what could be done. Ultimately, although not able to obtain all the data the study originally set out to analyze, IMPAQ was able to collect employment and earnings data from two different sources (state UI wage records and the NDNH). This allowed IMPAQ to answer the key research questions related to understanding how different data sources affect outcome measures. Moreover, lessons learned from the experience speak importantly to some of the challenges in implementing the type of national approach to scorecards that DOL envisioned when the study began. The next chapter describes the study data in detail, including briefly summarizing IMPAQ's experiences attempting to collect data from different sources and describing the study data ultimately received.

3. DATA

To compare state and national approaches to creating scorecards, IMPAQ sought to gather administrative data from two sources. First, IMPAQ worked to: (1) identify states to participate in the study and (2) obtain individual-level data from those states on training participation and earnings. Second, the study needed to obtain earnings information from national databases, to which individuals from the state data could be matched. As the study unfolded, as noted, a number of challenges forced the revision of data collection and analysis plans. This chapter provides an overview of the data collection process, highlighting the obstacles faced and how the original approach was adjusted in response. The chapter also provides summary information about the data on which the analyses are based.

3.1 Data Collection

Since the data collection process focused on two data sources—national databases of earnings and state administrative data—the discussion addresses each source in turn.

3.1.1 National Databases of Earnings

To compare scorecards based on administrative data from a single state to scorecards based on a database of earnings covering all states, it was necessary to match the individual-level data from states to a database of earnings with national coverage. Since the original request to gain access to SSA earnings data covering all states was ultimately denied, IMPAQ sought and obtained access to the NDNH.[8]

The NDNH. After being denied access to SSA data, DOL identified the NDNH as another source of earnings data that might potentially support scorecards. Following initial discussions, IMPAQ and DOL agreed that the study would request access to the NDNH. What follows is a description of the process of gaining that access.[9]

The NDNH—a database maintained by the Office of Child Support Enforcement (OCSE), as mentioned above—includes quarterly earnings and employment data from all states.[10] These data are provided on a regular basis by state workforce and federal agencies. The database was established to help state child support agencies in their mission to enforce child support obligations on the part of noncustodial parents. This remains its primary purpose. However, certain state and federal agencies and other organizations may apply for access to the NDNH data, provided the data will be used for purposes allowed by law.

[8] Because one of the objectives of the study was to document the process of seeking access to national databases of earnings, Appendix A presents a detailed description of our experiences both requesting SSA data and gaining access to the NDNH.

[9] Much of our description of the NDNH and its purpose is based on the publication *A Guide to the National Directory of New Hires*, available online at http://bit.ly/2s1oRcP.

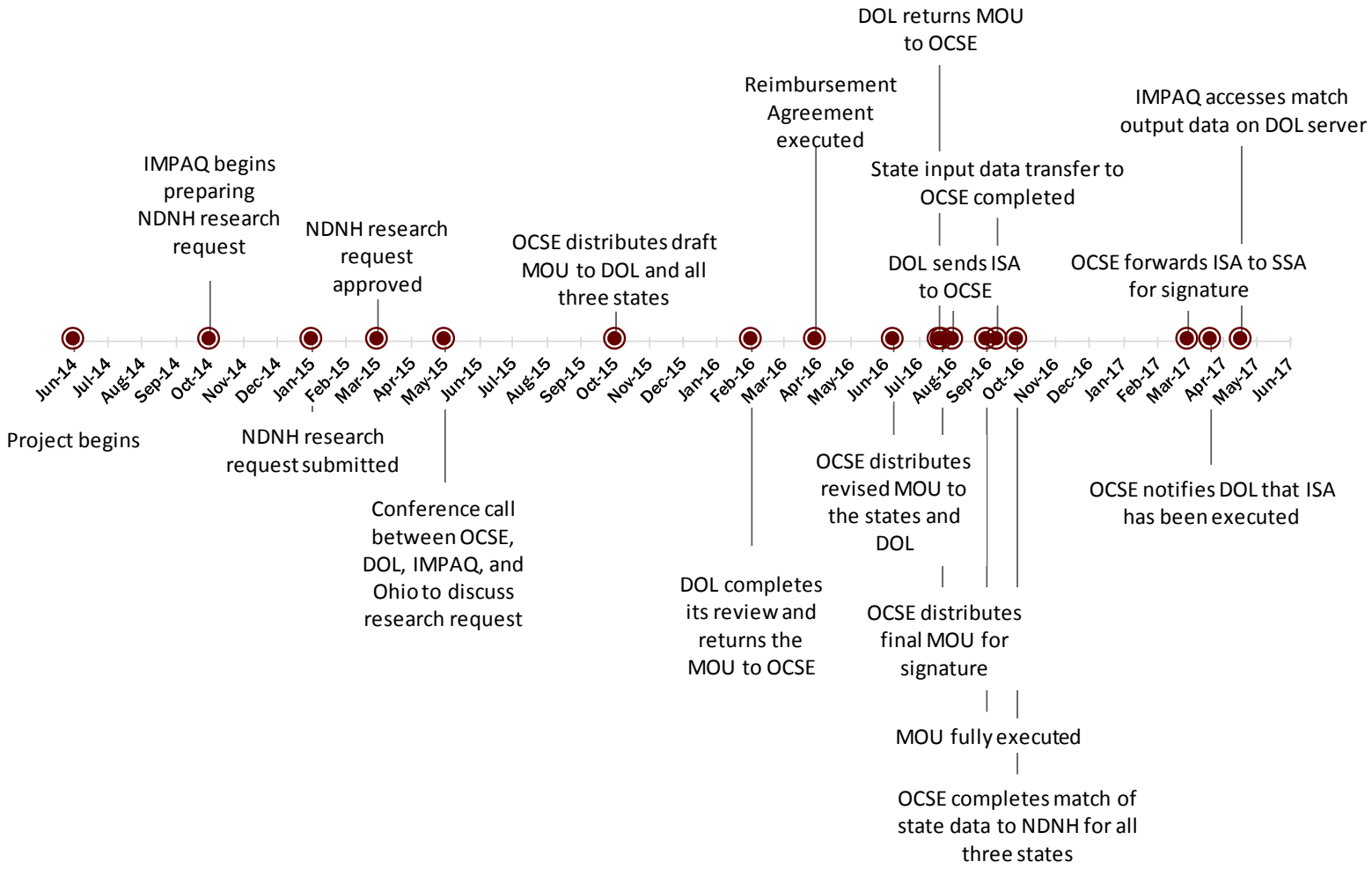
[10] The NDNH also includes data on newly hired employees and on UI claims.

The NDNH presented one main advantage and one limitation concerning its use for this study:

- ***Advantage: national coverage***. The NDNH's coverage of all states enables its use to assess the degree to which the labor market outcome measures commonly reported in state-based scorecards are affected by the absence of interstate earnings and employment data.
- ***Limitation: data not archived***. Reporting agencies periodically provide new data to OCSE for inclusion in the NDNH. As new data are received, the oldest data currently residing in the database are deleted. At any given time, the NDNH includes only eight calendar quarters of earnings and employment information. Because the intent was to compare labor market outcome measures calculated with state data to the same measures calculated with NDNH data, it was necessary to have overlap between the quarters covered by the two data sources. The eight-quarter limit on NDNH coverage would leave relatively few calendar quarters for analysis.

Although IMPAQ was ultimately successful in obtaining earnings data from the NDNH, completing the necessary paperwork and executing the required legal agreements, which took significantly longer than anticipated, represented one of the biggest challenges for the study. Appendix A describes in detail the efforts to obtain the NDNH data, from when the research request was first submitted to when the output data were finally obtained. The timeline in Exhibit 1, which summarizes the key steps, makes clear the length of the process—27 months from the time the research request was submitted to OCSE (January 2015) to when the output data were ultimately accessed (April 2017).

Exhibit 1: Timeline of Gaining Access to the NDNH



Note: ISA stands for Interconnection Security Agreement. See Section A.2 of Appendix A for details regarding the ISA.

3.1.2 State Administrative Data

Comparing state and national approaches to scorecards required state cooperation. The study approach called for the use of state administrative data to calculate common scorecard measures as the basis for comparing similar measures calculated with earnings from a national database. Participating states had to be willing to both provide their administrative data to the research team and allow their administrative data to be matched to the national database.

Early in the study, IMPAQ worked with DOL to identify three states—Florida, New Jersey, and Ohio—for the study. Four major factors informed their selection:

- Established systems that linked workforce and education data
- Relatively large populations, to yield adequate sample sizes
- Information suggesting their potential interest in the study and willingness to participate
- Together providing a good mix of states for understanding the limitations of using only single-state earnings data for scorecards (see further below).

The last point is important. As an example, because New Jersey is relatively small and located near major population centers in other states, it was expected that a large proportion of trainees in that state would find employment in neighboring states. Scorecard measures based only on New Jersey earnings data would not reflect the labor market outcomes of any such trainees. Ohio has some labor markets that cross state borders, but many of its major labor markets are located in the interior of the state. Thus, it was expected that some trainees in Ohio would get jobs outside the state, but not as large a proportion as in New Jersey. Finally, because of Florida's long coastal border, many of its largest labor markets do not border any other state. Therefore, among those three states, it was expected that Florida would have the smallest proportion of trainees going on to jobs outside the state. Such variation in the proportion of trainees who get jobs outside the state was expected to enable the study to shed light on the relative importance of this missing data issue across states.

IMPAQ contacted the three states thus selected, to describe the study and determine whether they were indeed willing to participate. Two—Ohio and New Jersey—agreed to be part of the study; Florida declined to participate. As a replacement for Florida, IMPAQ was able to secure the participation of Missouri. The key reason for selecting Missouri was IMPAQ's established relationship with a researcher in the state, who had substantial experience working with Missouri state administrative data—including data on participation in workforce programs and UI wage record data. Leveraging this relationship, made it possible to make the necessary arrangements for Missouri to be included in the study relatively quickly. Compared to the other two study states, Missouri is most similar to Ohio—featuring both labor markets near its state borders and labor markets in the interior of the state.[11]

[11] See Appendix B for a map of each state showing its major metropolitan areas.

The process of working with each of the three states to carry out this study involved a number of steps:

- Make initial contact to describe the study, what IMPAQ was asking of the state, and the potential benefits to the state of participating in the study.
- Execute Data Sharing Agreements (DSAs) that governed the data to be shared, who would have access to the data, data security requirements, and other issues.
- Work with each state to support its review of a draft Memorandum of Understanding (MOU) among the three states, DOL, and OCSE, which governed access to and use of NDNH data.
- Arrange for each state to transfer the data to IMPAQ and work with them to understand and prepare the data for matching to the NDNH.
- Maintain communication with the states on project status.

Although the general process was the same for all three states, there were myriad differences in what was required before the states would provide the data. One key difference was that in two of the states (Ohio and New Jersey), IMPAQ arranged to receive the raw data so that it could be prepared as needed. In Missouri, IMPAQ instead worked with the IMPAQ-affiliated researcher at MU to have the data transferred to him for preparation.

Data Collection in Ohio. In Ohio, the Center for Human Resources Research (CHRR) at the Ohio State University (OSU) has an established process for researchers to request access to data from the Ohio Longitudinal Data Archive (OLDA).[12] Because there were already established procedures for requesting access to OLDA data, IMPAQ was able to reach an agreement to participate much sooner in Ohio than in the other two states. By January 2015, IMPAQ had executed a formal agreement with the CHRR to provide the necessary data and to allow the data to be matched to the NDNH. Moreover, staff at CHRR were able to provide useful documentation describing the variables available in the data, and were available to answer questions that arose during data processing.

Working with CHRR, IMPAQ ultimately settled on the following multi-step process for obtaining, processing, and delivering the data to OCSE for matching:

1. CHRR would send IMPAQ test data, to include: (1) individual-level data on participants in Workforce Innovation Act (WIA) programs, and (2) individual-level Ohio UI wage record data. In lieu of SSN, the data would include a pseudo-ID for each individual, and CHRR would retain a crosswalk of pseudo-IDs and SSNs.
2. IMPAQ would use the test file to develop computer programs to prepare the sample, clean the data, and prepare all analysis variables.

[12] The OLDA is a system of linked workforce and education data, including data on participation in programs funded by the Workforce Innovation and Opportunity Act (WIOA), UI wage records, and K-12 educational records.

3. Shortly before the anticipated match, CHRR would send IMPAQ the study data. The only difference between the test and the study data would be that the study data would include the most recent data available in the OLDA.
4. IMPAQ would prepare the necessary match input files and send them to CHRR.
5. CHRR would replace the pseudo-IDs in the match input files with SSNs (required for the matching process). Once the legal arrangements were complete, CHRR would forward the match input files to OCSE.

After receiving the initial test data files from CHRR, the research team identified additional variables in the OLDA that were not in the original request but that had the potential to add value to the analyses. IMPAQ subsequently worked with CHRR to request a modification to the research request, which was approved. Shortly thereafter, a revised test data file was provided, which included the additional variables. Lastly, anticipating that the NDNH match would take place in the fourth quarter of 2015, the final study data was received from CHRR in October 2015.

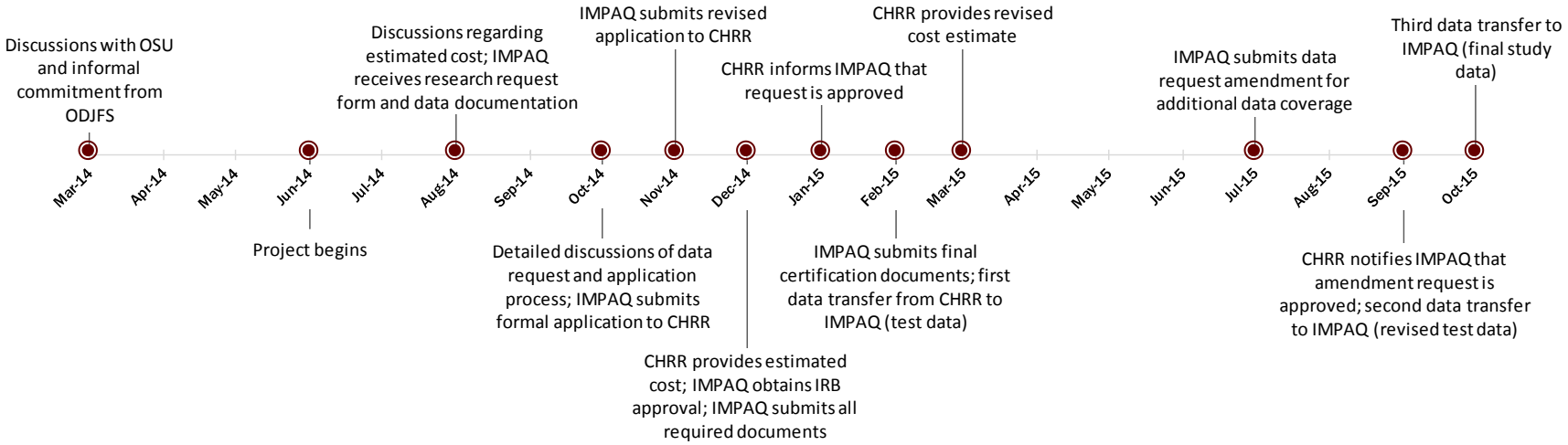
Exhibit 2 on the next page summarizes the key milestones of the data collection process in Ohio.

Data Collection in New Jersey. In New Jersey, IMPAQ worked with staff in the Office of Research & Information in the New Jersey Department of Labor and Workforce Development (NJDLWD) to make all necessary arrangements.[13] Among the three states, the final preparation and execution of a DSA took the longest for New Jersey—with the final DSA executed one year after the state was initially approached. Several reasons help explain why the process was comparatively protracted:

- Initially, IMPAQ requested that the state provide individual-level data on both WIA trainees and graduates of programs operated by institutions of higher education. It took time for NJDLWD staff to investigate the potential for providing higher education data, a request that ultimately was not approved.
- The nature of the data transfer processes involved in the study design were more complex than other studies NJDLWD had supported. The data would be moving from NJDLWD to HHS, then from HHS to DOL, where it would be accessed by IMPAQ. Internally, NJDLWD needed time to review what was proposed to confirm that it was acceptable. Moreover, the proposal was one of many competing priorities requiring attention from NJDLWD's legal and research teams.

[13] In our initial conversations with officials at NJDLWD, we discussed the possibility of having some of the data preparation work done by the John J. Heldrich Center for Workforce Development at Rutgers University. The Heldrich Center has a close relationship with NJDLWD; the Center partnered with NJDLWD on a project funded by DOL's Workforce Data Quality Initiative (WDQI) grant program, and it developed New Jersey's consumer report card system. Ultimately, NJDLWD elected instead to work directly with IMPAQ.

Exhibit 2: Summary of Key Milestones of State Data Collection, Ohio



Note: ODJFS stands for the Ohio Department of Job and Family Services and IRB stands for Institutional Review Board.

IMPAQ and NJDLWD executed a formal DSA outlining New Jersey's participation in the study in August 2015. In preparing the DSA, IMPAQ supplied NJDLWD with a copy of the agreement with Ohio, which NJDLWD was able to use as a model. Generally speaking, the DSA with New Jersey described the same multi-step process for transferring and preparing the data as described above for Ohio. One notable difference is that NJDLWD was willing to provide IMPAQ with SSNs, which helped simplify the process.

Once the formal agreement was in place, the test data files from New Jersey were provided quickly. Upon reviewing the files, IMPAQ identified some minor discrepancies between what had been requested and what had been delivered. The research team worked with the data processing liaison at NJDLWD to explain what was missing, and quickly received updated files with the correct information. As in Ohio, the study data files were received in October 2015, expecting that the NDNH match would occur before the end of the year.

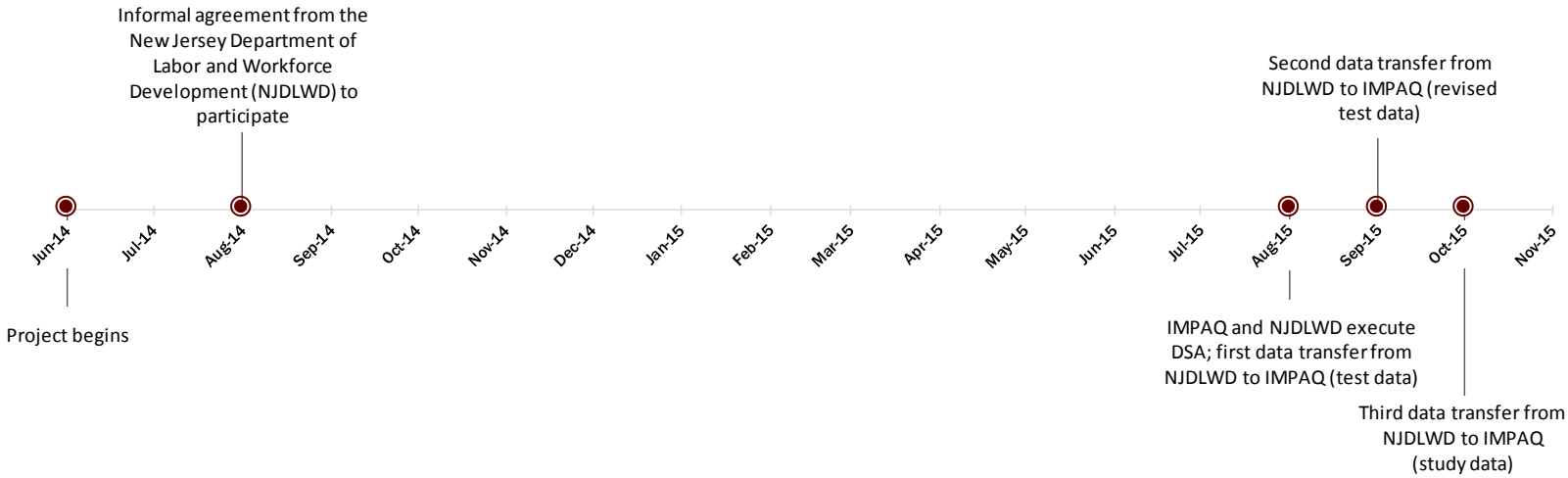
Exhibit 3 on the next page summarizes the key milestones of the data collection process in New Jersey.

Data Collection in Missouri. Of the three study states, the entire process—from securing informal approval to participate to receiving the study data files—moved most quickly in Missouri. This resulted from of the relative lateness of the decision to recruit Missouri for the study (June 2015). In the earliest discussions with officials in the state, IMPAQ made the time pressure clear and explained that inclusion required the state to move quickly, as described further below.

Once it became clear that Florida would not participate in the study, IMPAQ and DOL jointly decided that having only two states was sufficient to achieve the main objectives of the study. However, as the delays reaching a formal agreement with New Jersey became apparent, DOL and IMPAQ agreed that it would be good to identify and recruit a third state—so that, if New Jersey ultimately was unable to participate, the study would still have two states. Missouri was a natural choice for the third state, as noted, due to the presence of the IMPAQ-affiliated researcher at MU.

This researcher's connections with officials in the state enabled him to arrange some initial telephone calls to discuss the project. IMPAQ's main point of contact with the state was in the Division of Workforce Development (DWD), an agency within the Missouri Department of Economic Development (DED). During these initial discussions, it was made clear that, should Missouri be willing to participate, the process would need to move quickly to secure all necessary formal approvals from the state. The contact at DWD indicated that he did not see any reason why Missouri would be unable to participate—though he noted that the data transfers outlined were somewhat complicated, and that DED's general counsel would likely need to review everything. Moreover, because Missouri's UI wage record data were maintained by a separate agency—the Missouri Department of Labor and Industrial Relations (DOLIR)—he indicated that he would need to clear the proposal with that agency, too.

Exhibit 3: Summary of Key Milestones of State Data Collection, New Jersey



Despite the complexity of the proposal and the pressure to move quickly, Missouri was able to make all necessary arrangements to support the study in relatively short order. The first call to discuss the project with Missouri was in August 2015. By December 2015, the pertinent state agencies had executed an agreement among themselves to supply the necessary data.

The data transfer processes and preparation of the match input data followed a different process in Missouri compared to Ohio and New Jersey. In the two other states, as noted, the general process was for the state to send raw data to IMPAQ, receive the match input files after they had been prepared, then send the match input files to OCSE. In Missouri, the IMPAQ-affiliated contact at MU worked with us, DED, and DOLIR to arrange to have all the data sent to him. He then prepared the match input files according to IMPAQ's instructions and sent the match input files to OCSE. Because DED and DOLIR had worked with this person on other studies using the same data, he had past DSAs he could offer to DED and DOLIR as models for preparing a DSA for this study. Moreover, since the individual-level data on WIA participants was housed at MU, all that was needed was permission to access those data and for DOLIR to deliver the UI wage record data. Following this approach, the IMPAQ-affiliated MU contact was able to successfully collaborate with DED and DOLIR to finalize all necessary arrangements for Missouri to participate in the study. He received the study data files in January 2015.

Exhibit 4 on the next page summarizes the key milestones of the data collection process in Missouri.

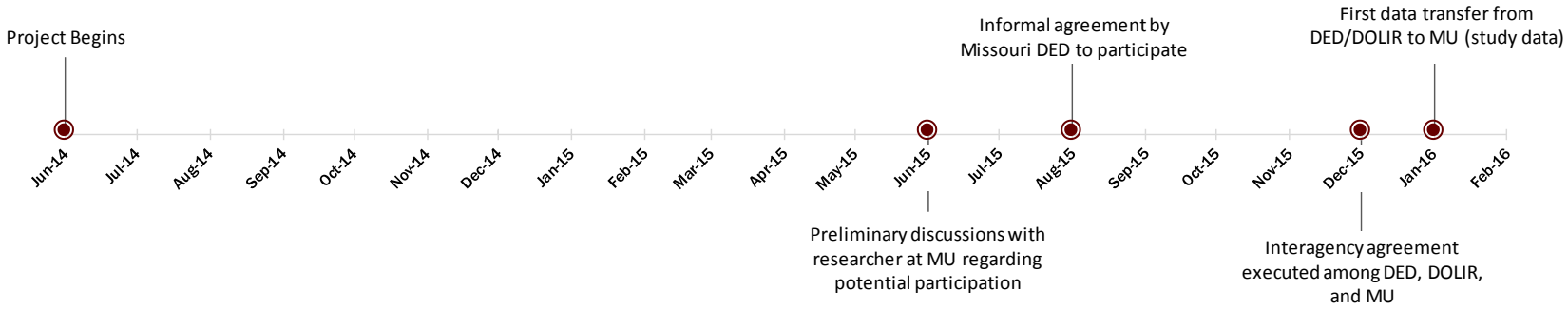
3.2 Data Description

Each of the three states provided individual-level data on people who had received training services under WIA/WIOA. The information received falls into three categories:

1. **Trainee characteristics**: Important information about trainees, such as their gender, age, and educational attainment. These factors are likely to influence the subsequent labor market outcomes for trainees, independent of the training or other services they receive. In IMPAQ's subsequent analyses, controlling for these factors enabled examination of the extent to which any observed differences in outcomes across data sources (i.e., state UI wage records and the NDNH) were associated with trainee characteristics. Other key variables treated as trainee characteristics relate to their labor market experiences before they entered training.

2. **Characteristics of training**: Important information about the training received by trainees. These factors are likely to influence the subsequent labor market outcomes for trainees, independent of the characteristics of the trainees themselves. Controlling for these factors enabled examination of the extent to which any observed differences in earnings and employment outcomes across data sources are associated with the characteristics of the training itself.

Exhibit 4: Summary of Key Milestones of State Data Collection, Missouri

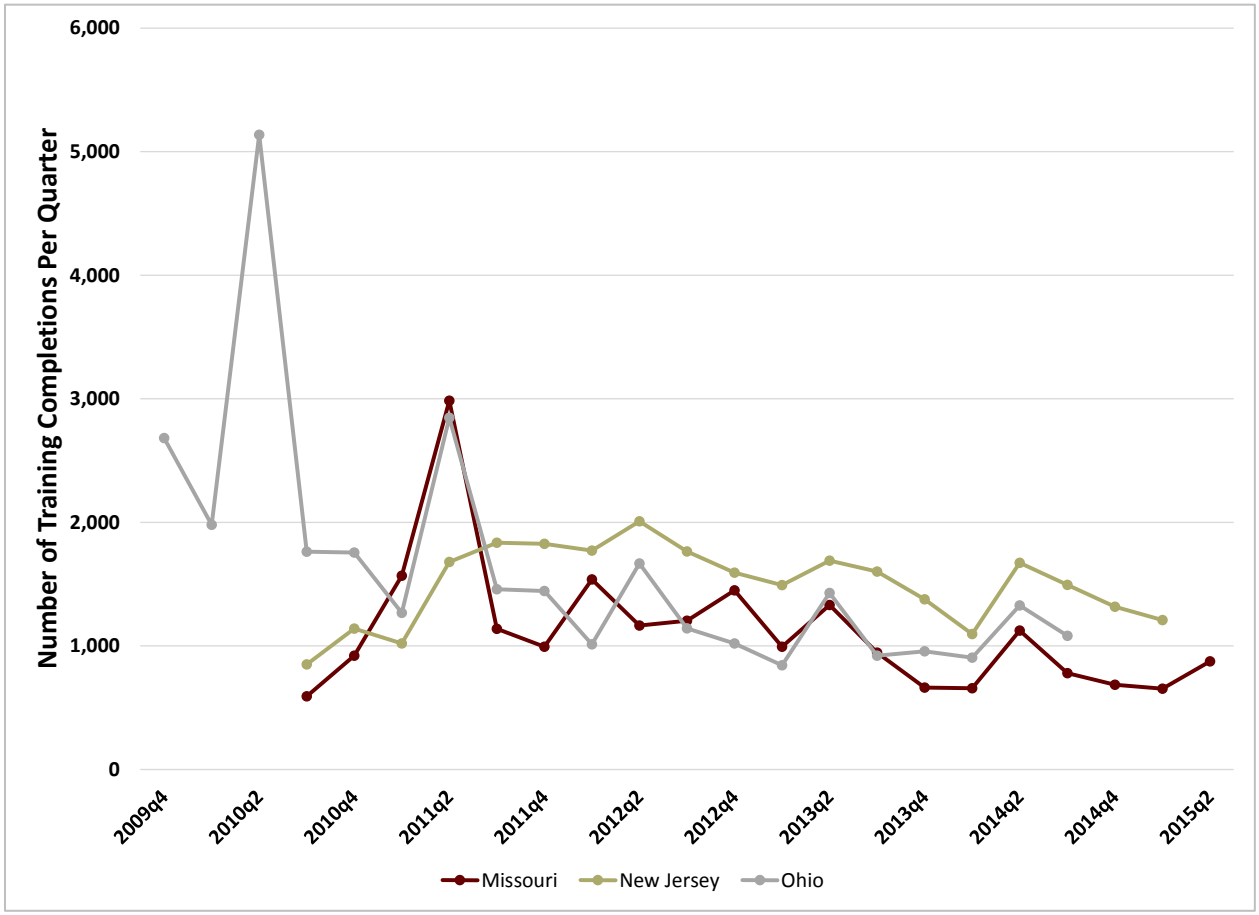


Of particular importance for the analyses were two variables related to location—whether the training took place near a state border and whether it was in an urban area. Knowing whether the training took place near the state border was especially important, as noted, because of the expectation that differences in earnings and employment outcomes measured using single-state UI wage records versus NDNH earnings data would be most pronounced in states where trainees are likely to obtain jobs in neighboring states.

3. **Labor market outcomes**: Important information about earnings- and employment-related outcomes for trainees. These are the outcomes the study wanted to compare, as calculated using single-state UI wage record data versus NDNH earnings data.

The data received from each state covered roughly five years. Exhibit 5 shows the number of training completions per calendar quarter in the sample from each state.

Exhibit 5: Number of Training Completions per Quarter, by State



Source: State administrative data on WIA/WIOA training completers.

The trainee data covered as early as the fourth quarter (Q4) of 2009 and as late as the second quarter (Q2) of 2015, with generally similar trends across the three states for the data coverage

period. The large spikes in Ohio in 2010, and in the other two states in 2011, were due to funds provided by the American Recovery and Reinvestment Act (ARRA) of 2009. Aside from the ARRA-funded peaks, all three states experienced general declines in the number of trainees per quarter since 2012.

Although all three states provided roughly five years of data, the analysis had to be restricted to a subset of the data in each state because, as noted, comparing employment and earnings outcomes based on the two data sources required calendar quarters covered by *both* datasets. Since the NDNH covers eight calendar quarters at any given time, at most the analysis would be based on eight quarters—and only then if the state UI wage records covered the same eight quarters. Due to the delays in obtaining the NDNH data, the quarters covered by the state UI wage records and the NDNH data did not overlap completely for any of the three states.

Exhibit 6 summarizes the analysis samples for the three states.

Exhibit 6: Analysis Samples, by State

	Missouri	New Jersey	Ohio
Last quarter reported in state UI wage record data	Q3 2015	Q2 2015	Q4 2014
First quarter reported in NDNH earnings data	Q3 2014	Q2 2014	Q2 2014
Last quarter reported in NDNH earnings data	Q2 2016	Q1 2016	Q1 2016
Quarters for which state UI wage records and NDNH earnings data overlap	Q3 2014 Q4 2014 Q1 2015 Q2 2015 Q3 2015	Q2 2014 Q3 2014 Q4 2014 Q1 2015 Q2 2015	Q2 2014 Q3 2014 Q4 2014
Sample sizes			
For outcomes 1 quarter post-completion	4,118	6,789	3,315
For outcomes 4 quarters post-completion	4,170	7,434	3,305
For outcomes 8 quarters post-completion	5,926	8,547	3,829
For outcomes 12 quarters post-completion	6,038	9,116	5,739
Total	**16,199**	**25,421**	**18,044**

Source: State administrative data and NDNH data on WIA/WIOA training completers.

The most recent state UI wage record data were for Missouri—which covered through Q3 2015. In contrast, the Ohio UI wage record data covered only through Q4 2014. The NDNH earnings data covered eight quarters, but not the same quarters for all states.[14] For New Jersey and Ohio, the NDNH data covered the eight quarters from Q2 2014 through Q1 2016. For Missouri, the

[14] The NDNH earnings data we received actually covered more than eight quarters, but several of the oldest and the most recent quarters covered by the data included only a small number of records from a small number of states. When we reviewed the frequency with which states were represented in each quarter of the NDNH data, it was clear which eight quarters represented the true coverage period.

NDNH data coverage began and ended one quarter later.[15] For Ohio, the earnings data sources overlap for only three quarters (Q2 2014 through Q4 2014). For both New Jersey and Missouri, they overlap for five quarters.

The last panel of Exhibit 6 shows the sample sizes for each state, both separately for different post-completion follow-up periods and collectively. The reason for separate sample sizes for each post-completion period is that the outcomes for each period are defined only for individuals for whom the period falls within the range of quarters for which the two earnings data sources overlap. For example, in Missouri, the sample we used to analyze outcomes defined at four quarters post-completion is made up of only individuals who completed training in the five-quarter period from Q2 2013 through Q2 2014.

As can be seen, despite limiting the analysis samples to the overlap period between the two sources of earnings data, the sample sizes are still relatively large, ranging from 3,315 for Ohio to 9,116 for New Jersey.

3.2.1 Trainee Characteristics

Exhibit 7 summarizes key trainee demographic characteristics in the three states.

Exhibit 7: Trainee Characteristics, by State

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
Race			
White	73.6	48.1	73.6
Black	22.2	36.7	9.3
Other	1.6	15.2	1.1
Not Reported / Missing	2.7	0.0	16.0
Gender			
Male	47.8	44.1	52.1
Female	52.2	55.7	46.1
Not Reported / Missing	< 0.1	0.2	1.8
Age			
18-24	10.6	16.2	15.0
25-34	27.1	21.6	28.5
35-44	26.2	22.3	24.4
45-54	24.1	25.0	22.2
At least 55	11.9	15.0	10.0

[15] Because OCSE matched the input files for all three states to the NDNH database within a one-week period in September 2016, the reason for this difference is unclear.

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
Educational Attainment			
Less Than a High School Diploma	4.8	8.1	3.6
High School Diploma	42.8	40.3	49.2
GED or Equivalent	12.3	5.0	9.8
Some College	27.2	16.0	19.3
Associate Degree	1.5	8.9	7.1
Bachelor's Degree	7.7	14.0	6.6
More Than Four Years of College	2.4	4.7	1.4
Other	1.3	2.9	2.9

Source: State administrative data on WIA/WIOA training completers.

Notes: Table entries represent percentages. The total within a category may not sum to one due to rounding. Prior to Q2 2013, the Ohio data identified race only as White, Other than White, or Not Reported.

The demographic characteristics of trainees in Missouri and Ohio are quite similar. In both states, nearly three-quarters were white, nearly balanced by gender, and in their prime working years; they also tended to have relatively low levels of education. In Ohio, for instance, a high school diploma was the highest level of education achieved by 49 percent of trainees. In Missouri, that proportion was 43 percent.

Trainees in New Jersey differed from trainees in Missouri and Ohio in several respects. First, a smaller proportion (48 percent) was white and a larger proportion was black (37 percent). Second, women made up a higher proportion of trainees (over 55 percent). Third, trainees in New Jersey were better educated than those in the other two states—14 percent had Bachelor's degrees (versus 7-8 percent), and 5 percent had attended more than four years of college (versus 1-2 percent).

Beyond demographic and other individual characteristics, an important determinant of post-training labor market outcomes are the employment and earnings histories of trainees during the period immediately prior to the start of training. Exhibit 8 shows the employment rates of trainees from each state for one, four, and eight quarters prior to the quarter when training started.[16] Employment in a calendar quarter is defined as having positive earnings in the state UI wage record data for the reference quarter.

[16] For this and all subsequent measures of employment rates, employment is defined as having positive earnings in the corresponding quarter from the relevant data source—in this case, state UI wage records.

Exhibit 8: Employment Rates Prior to Training, Single-State Data, by State

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
Employed in quarter immediately prior to quarter of training start	52.0	21.0	50.7
Employed in fourth quarter prior to quarter of training start	68.6	44.2	63.0
Employed in eighth quarter prior to quarter of training start	72.1	13.7	66.3

Source: State administrative data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Employment is defined as having positive earnings in the state UI wage record data for the corresponding quarter.

In both Ohio and Missouri, trainees were most likely to be employed eight quarters prior to the quarter they started training, and the likelihood of employment decreased leading up to the start of training. For instance, 66 percent of trainees in Ohio were employed in the eighth quarter before they started training, compared to 63 percent the fourth quarter prior to training and only 51 percent in the quarter immediately before starting training. A similar pattern holds in Missouri, with proportions very similar to those in Ohio but slightly higher.

In New Jersey, again the pattern is different. First, compared to the other two states, a much smaller proportion of trainees was employed in any of the reference quarters. In the eighth quarter prior to the start of training, for example, only 14 percent of trainees in New Jersey were employed, compared to over 65 percent in the other two states. Second, the proportion of trainees employed in New Jersey was highest—44 percent—in the fourth quarter prior to training. The rate in that quarter is over double the rate for either the eighth quarter prior or the quarter immediately prior to the start of training.

Exhibit 9 summarizes the earnings of trainees in each state for the first, fourth, and eighth quarters prior to the quarter when training started, for trainees employed in each respective quarter.[17]

In Ohio, the average quarterly earnings for employed trainees decreased steadily—from $7,408 in the eighth quarter prior to the start of training, to $6,624 in the fourth quarter prior, to $4,492 in the quarter immediately prior. A similar pattern holds for both New Jersey and Missouri, though in New Jersey average earnings tended to be much greater than in the other two states.

[17] All dollar amounts throughout the report are normalized to 2015 dollars using annual average values of the Consumer Price Index for all urban consumers, all items (not seasonally adjusted), series id: CUUR0000SA0.

Exhibit 9: Quarterly Earnings Prior to Training, Single-State Data, by State

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
Earnings in quarter immediately prior to quarter of training start	$5,905 (11,662)	$6,198 (19,352)	$4,792 (5,804)
Earnings in fourth quarter prior to quarter of training start	$7,372 (8,498)	$10,597 (103,435)	$6,624 (6,467)
Earnings in eighth quarter prior to quarter of training start	$7,847 (8,226)	$11,081 (164,332)	$7,408 (6,957)

Source: State administrative data on WIA/WIOA training completers.
Notes: Table entries represent averages, with standard deviations in parentheses. All values are in constant 2015 dollars.

3.2.2 Characteristics of Training

Exhibit 10 summarizes key characteristics of the training received by participants in each state.

Exhibit 10: Characteristics of Training, by State

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
Type of Training			
On the Job Training	17.0	2.5	20.6
Skill Upgrading and Retraining	0.1	0.1	0.3
Entrepreneurial Training	< 0.1	< 0.1	< 0.1
Adult Education and Literacy with Training	2.2	2.8	0.4
Customized Training	0.2	0.2	1.1
Other Occupational Skills Training	80.5	93.8	77.6
Length of Training in Days			
Less than 60 Days	18.7	24.8	20.5
At least 60 Days, Less than 90 Days	7.5	15.4	13.9
At Least 90 Days, Less than 180 Days	17.6	30.6	21.9
At Least 180 Days, Less than 1 Year	18.1	21.5	19.7
At Least 1 Year	38.1	7.7	24.0

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
Training O*Net Code			
Computer and Mathematical	6.5	1.3	4.4
Healthcare Practitioners and Technical	17.1	1.7	17.3
Healthcare Support	10.3	5.3	15.4
Installation, Maintenance, and Repair	5.5	0.1	4.8
Management	5.3	2.5	3.2
Office and Administrative Support	11.6	5.9	7.5
Production	10.7	0.6	14.8
Transportation and Material Moving	13.2	5.6	18.8
Other	19.3	6.9	13.8
Not Reported / Missing	0.6	69.4	< 0.1
Receipt of Wagner-Peyser Services			
Yes	99.0	84.3	83.4
No	0.1	15.7	16.6
Not Reported / Missing	1.0	0.0	0.0
Training Located in an Urban Area			
Yes	66.9	100.0	56.9
No	33.1	0.0	43.1
Training Located Near a State Border			
Yes	61.4	66.6	37.0
No	38.6	33.4	63.1

Source: State administrative data on WIA/WIOA training completers.
Notes: Table entries represent percentages. The total within a category may not sum to one due to rounding.

Across all three states, the most common type of training was 'other occupational skills training,' which accounted for between 77 and 94 percent of all training episodes. In Ohio and Missouri, 'on the job training' accounted for nearly all the rest of the episodes. The length of training varied across states. In Ohio, slightly over half of all training lasted less than 180 days. In New Jersey, about 70 percent of all training took less than 180 days. Training took much longer on average in Missouri—with only 44 percent lasting for less than 180 days, and 38 percent lasting at least one year (compared with 8 percent for New Jersey and 24 percent for Ohio).

The industry focus of training in Ohio and Missouri was somewhat similar. Training in healthcare—covering two different O*Net categories—accounted for 33 percent of training episodes in Ohio and 27 percent in Missouri, making healthcare the most common industry represented in the training in both states. In Ohio, the production and transportation and material moving industries together accounted for an additional 34 percent of training. In Missouri, these two industries represented 24 percent of training; the office and administrative support industry accounted for another 17 percent. The numbers for New Jersey do not provide much insight into the industry focus of training, as O*Net codes were unreported for 70 percent of training episodes in that state.

One goal of this study was to understand, not only how the state and national approaches to scorecards compare to one another, but also how the comparison may vary for different types of state geographies. However, the last two characteristics shown in Exhibit 10—whether the training was located in an urban area and whether it was located in an area on a state border—are only reliable for Missouri. In Ohio and New Jersey, both geographic characteristics of the training—whether located in an urban area and whether near a state border—were derived from the workforce investment board (WIB) associated with the training record. In both states, however, WIBs can encompass a number of counties within the state, limiting the precision with which it is possible to identify either urban or border status. The two measures are more precise for Missouri, as they are based on the county of residence for each trainee.

Bearing in mind the limitations of the measure for New Jersey and Ohio, Exhibit 10 shows that the proportion of trainees who received training in an urban area varied substantially across the three states. In Ohio, 60 percent of trainees completed training in an urban area, compared to 60 percent in Missouri and all trainees in New Jersey. There is also some variation in the proportion of training episodes that were located near a state border. In Ohio, only 37 percent of training took place near the state border. By comparison, over 60 percent of training was located near the state border in both New Jersey and Missouri.

3.2.3 Labor Market Outcomes

Existing scorecard systems present a variety of post-completion outcome measures, such as the proportion of completers employed after finishing a program or the average annual earnings of program completers. The specific definitions of labor market outcomes vary—some based on the calendar quarter immediately following program completion, others on the combined labor market experiences over multiple quarters post-completion. To compare outcome measures based on the two sources of earnings data, the analysis focused on the measures included in a recent effort to develop a scorecard template for community college programs.

Exhibit 11 on the next page shows the template produced as part of that DOL-funded research study.

The bottom part of the template displays the labor market outcome measures to be reported for training programs. The left-hand bottom panel displays the post-completion employment rate for trainees, measured as the proportion of students employed within the first year after earning a credential. A bar below the graphic enables users to expand the panel to display longer-term employment rates, measured over two years post-completion.

The right-hand bottom panel displays the median first-year post-completion earnings for trainees. A bar below the graphic, as before, enables users to display the same measure based on two years post-completion.

To compare outcome measures based on single-state wage record data with those based on NDNH earnings data, the analysis focused on labor market outcome measures similar to those

included in the template in Exhibit 11. It examined both employment rates and earnings in each of the first, fourth, eighth, and twelfth calendar quarters immediately following the quarter of training completion.

Exhibit 11: Community College Scorecard Template

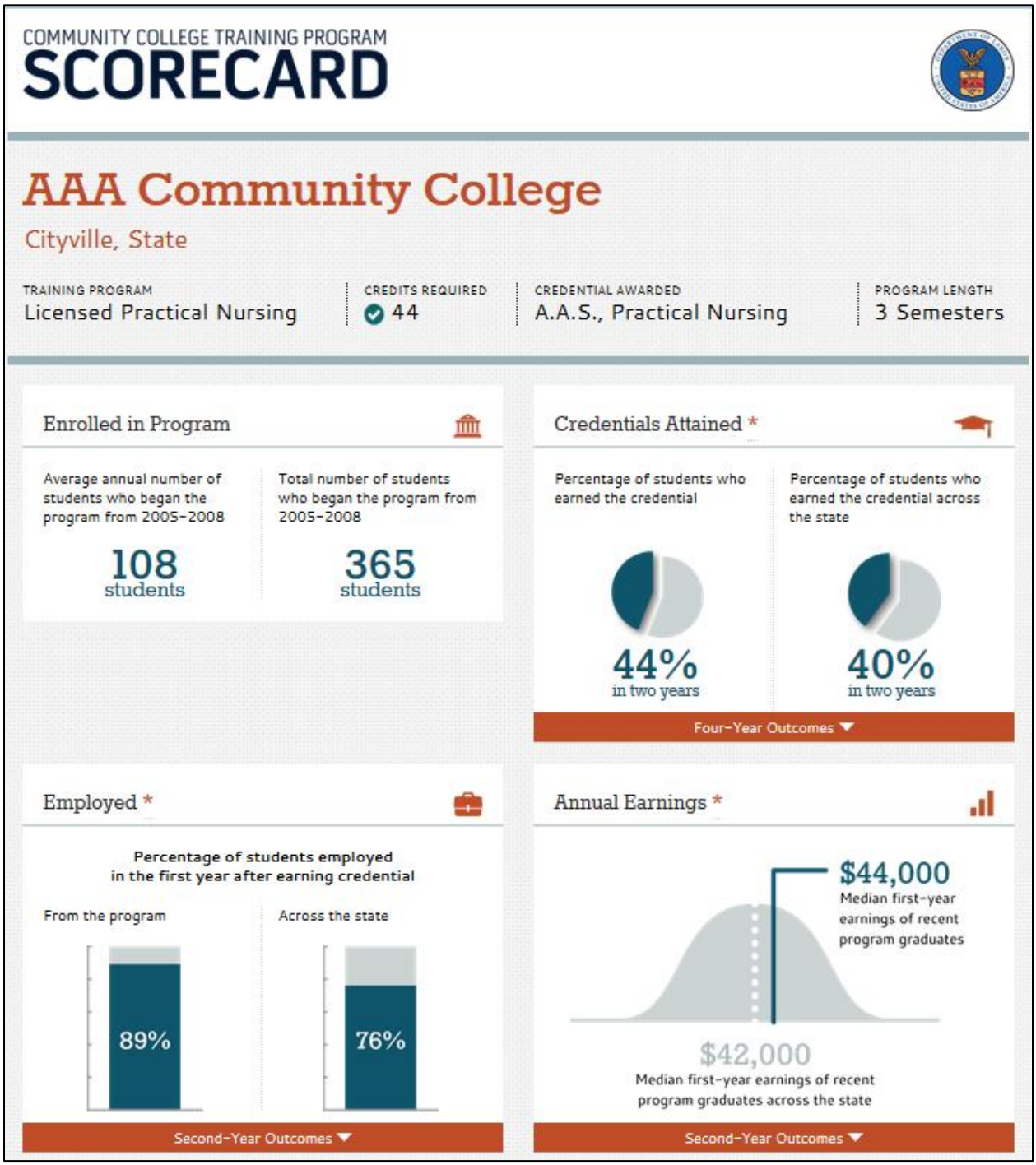


Exhibit 12 summarizes the proportion of trainees employed at each of the follow-up periods. For example, the number in the first row, second column shows that 44 percent of training completers in New Jersey were employed in the first quarter after the quarter of training completion.

Exhibit 12: Employment Rates Post-Training Completion, Single-State Data, by State

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
Employed in quarter immediately following quarter of training completion	75.5	43.9	75.4
Employed in fourth quarter immediately following quarter of training completion	76.1	60.3	76.9
Employed in eighth quarter immediately following quarter of training completion	72.0	18.3	74.7
Employed in twelfth quarter immediately following quarter of training completion	69.7	11.8	71.9

Source: State administrative data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Employment is defined as having positive earnings in the state UI wage record data for the corresponding quarter.

Two patterns are worth noting. First, for all three states, employment rates generally rose a bit and then fell as the time since completion increased. In Ohio, the employment rate started at 75 percent one quarter post-completion, rose to 77 percent in the eighth quarter post-completion, then fell to 72 percent in the twelfth quarter post-completion. Missouri and New Jersey showed a similar pattern. Second, employment rates in Missouri and Ohio were fairly similar; in both states and across all follow-up periods, 70-77 percent of trainees were employed. Employment rates in New Jersey were noticeably lower, ranging from 44 percent in the first quarter post-completion down to just 12 percent in the twelfth quarter post-completion.

Exhibit 13 shows the quarterly earnings of trainees at one, four, eight, and 12 quarters after the quarter of training completion for trainees employed in each respective quarter.[18]

[18] All references here and throughout the report to outcome measures for quarterly earnings are based on the raw earnings data from state UI wage records and the NDNH. The only adjustment made to the earnings values was to convert all dollar amounts to constant 2015 dollars, as noted in footnote 17.

Exhibit 13: Quarterly Earnings Post-Training Completion, Single-State Data, by State

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
Earnings in quarter immediately following quarter of training completion	$6,187 (4,551)	$6,190 (7,658)	$5,991 (4,871)
Earnings in fourth quarter immediately following quarter of training completion	$7,139 (4,898)	$7,354 (6,222)	$7,367 (4,926)
Earnings in eighth quarter immediately following quarter of training completion	$7,609 (5,358)	$7,168 (7,895)	$7,814 (4,835)
Earnings in twelfth quarter immediately following quarter of training completion	$7,772 (5,223)	$6,879 (5,946)	$8,125 (4,905)

Source: State administrative data on WIA/WIOA training completers.
Notes: Table entries represent averages, with standard deviations in parentheses. All values are in constant 2015 dollars.

Average earnings among trainees in Missouri and Ohio steadily increased the longer the follow-up period. In Missouri, average earnings one quarter post-completion were $6,187, rising to $7,772 in the twelfth quarter post-completion. A similar pattern is apparent for Ohio.

New Jersey, once again, shows a different pattern. Average earnings among training completers in New Jersey rose only for the shortest two follow-up periods, then began to fall. Average earnings were highest for New Jersey trainees in the fourth quarter post-completion ($7,354). By the twelfth quarter post-completion, earnings averaged only $6,897. Interestingly, although trainees in New Jersey had similar earnings levels to those in the other two states for the first two post-completion quarters, they averaged uniformly lower average earnings than their counterparts in Missouri and Ohio for the two longest follow-up periods.

3.3 Summary

The original approach to the study called for obtaining data from national databases of earnings, to accomplish two objectives. First, this would demonstrate the feasibility of accessing such databases for calculating the types of employment- and earnings-related outcome measures typically reported in education and training program scorecards. Second, outcome measures based on data from the national database(s) would be compared to the same measures based on single-state UI wage record data—comparisons that would shed light on the degree to which the figures reported by states relying on their own UI wage records might be biased due to missing data from trainees finding employment outside their home states.

Early in this project, IMPAQ sought approval to access administrative data on earnings from the SSA; this request was eventually denied. As it became clear that the SSA data would not be forthcoming, IMPAQ requested access to the NDNH, which was approved. Although IMPAQ was ultimately able to obtain the NDNH data as planned, the process for making the necessary arrangements was time-consuming, taking over two years from start to finish.

As the basis for the comparisons, IMPAQ recruited three states—Missouri, New Jersey, and Ohio—to participate in the study. Each state provided administrative data on individuals who had completed a training program through WIA/WIOA within the most recent five-year period available in the state's records, along with its UI wage record data. The states also agreed to allow us to match their data to the NDNH, and to work with the project team to make all necessary arrangements to do so.

The state data generally show profiles of trainees in Missouri and Ohio that are roughly similar to each other, but somewhat different from the profile of trainees in New Jersey. In Missouri and Ohio, trainees in the data were mostly white, evenly balanced by gender, and in their prime working years; and they tended to have relatively low education. In New Jersey, a smaller proportion was white, there were more women than men, and trainees were generally better educated than in the other two states. Employment rates and quarterly earnings (based on state UI wage records) at one, four, and eight quarters prior to the start of the training episode were also very similar in Missouri and Ohio, which were both different from New Jersey. In general, employment rates in New Jersey were much lower, but quarterly earnings among those employed were higher compared to the other two states.

By far the most common type of training reported was 'other occupational skills' training, which accounted for between 77 and 94 percent of all training episodes across the three states. The length of training varied across states, though the industry focus of the training showed some similarities, with healthcare being the most common in all three. The New Jersey data on industry was unreported for 70 percent of the training episodes in the data, but among training episodes for which the industry focus was reported, industry representation was similar to the other two states. One key aspect of training expected to affect comparisons between outcomes based on state or national data—whether the training took place near a state border—showed some variation across states, although the data for New Jersey and Ohio were too imprecise for any strong comparison to be made.

For consistency with a separate research study for DOL that produced a suggested template for scorecards, the analysis focused on employment rates and quarterly earnings defined at one, four, eight, and 12 quarters post-completion. Data on the labor market outcomes of trainees at these follow-up periods showed similar patterns across the three states, as did the data on trainee and training characteristics. Outcomes for training completers in Missouri and Ohio were similar across all follow-up periods—about three-quarters of trainees were employed and quarterly earnings (among those employed) averaged about $6,000 to just over $8,000. A much smaller proportion of trainees in New Jersey were employed (12-60 percent depending on the quarter) compared to the other two states, but average quarterly earnings for New Jersey trainees were generally similar to average quarterly earnings for trainees in the other states, except for the longest two follow-up periods (eight and 12 quarters post-completion) when they were lower.

4. COMPARING OUTCOME MEASURES BASED ON STATE AND NATIONAL DATA

After collecting individual-level data on WIA/WIOA trainees from the states and matching them to the NDNH, the next step was to compare post-completion outcome measures using single-state UI wage record data to the same measures calculated using NDNH data. Because NDNH data capture the outcomes of trainees who find jobs in states other than the states in which they were trained, comparing the two data sources shows how missing interstate data affects the type of labor market outcome measures typically used in scorecards. This chapter presents the results of analyzing this issue.

4.1 Employment Rates

Exhibit 14 summarizes employment rates for trainees, by state and by earnings data source. The exhibit has four panels, corresponding to employment rates at the first, fourth, eighth, and twelfth calendar quarter post-completion. Each panel shows the employment rate based on both single-state UI wage record data and NDNH earnings data, along with the absolute difference between the two. For example, the third column of the first panel shows that in Ohio, the employment rate the first quarter post-completion was 75 percent when based on Ohio UI wage records, compared with 73 percent when based on NDNH earnings data, a difference of only 2 percentage points.

Exhibit 14: Employment Rates Post-Training Completion, by State and Data Source

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
First quarter following quarter of training completion			
State wage records	75.5	43.9	75.4
NDNH	73.0	64.3	73.0
Difference	*-2.5*	*+20.4*	*-2.4*
Fourth quarter following quarter of training completion			
State wage records	76.1	60.3	76.9
NDNH	75.2	68.2	74.2
Difference	*-0.9*	*+7.9*	*-2.7*
Eighth quarter following quarter of training completion			
State wage records	72.0	18.3	74.7
NDNH	71.9	68.0	70.9
Difference	*-0.1*	*+49.7*	*-3.8*
Twelfth quarter following quarter of training completion			
State wage records	69.7	11.8	71.9
NDNH	70.3	62.1	68.9
Difference	*+0.6*	*+50.3*	*-3.0*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Comparing the employment rates between the two data sources and across states shows the following patterns of note:

- In both Missouri and Ohio, for each follow-up period, a slightly lower proportion of trainees was employed when measured by the NDNH data as compared to the state wage record data. This means that there are individuals in the samples who had zero reported earnings in the NDNH but positive reported earnings in the wage record data from their home state, for the same calendar quarter. Because the NDNH data comprise state wage record data from all states, this result is contrary to expectations, given that the NDNH data cover more earnings sources.[19]
- In both Missouri and Ohio, for each follow-up period, the difference in employment rates between the two data sources was generally small. In Missouri, the largest difference was less than three percentage points (first quarter post-completion). In Ohio, the differences were larger than in Missouri, but still relatively small (2-4 percentage points).
- In New Jersey, in contrast to both Missouri and Ohio, a higher proportion of trainees was employed when measured by the NDNH data compared to the state data, consistent with expectations.
- The differences were also quite large in New Jersey. The lowest reported difference was for the fourth quarter post-completion, when the employment rate based on the NDNH data was 8 percentage points higher than the rate based on the state data. For the other follow-up periods, the difference was even more pronounced. The largest difference was for the longest follow-up period—12 quarters post-completion, when the employment rate based on the NDNH data was 50 percentage points higher (62 percent) than the rate based on state data (12 percent).

These results indicate that, for trainees in small states like New Jersey with substantial cross-border labor markets in which the major employment center is in a neighboring state, employment rates reported in scorecards when the calculation is made using only single-state wage record data are likely to significantly underestimate the proportion of trainees actually employed. On the other hand, for trainees in larger states like Missouri and Ohio with cross-border labor markets centered within the state, the data source does not materially affect reported employment rates.

4.2 Earnings

Exhibit 15 summarizes quarterly earnings by states and by data source, following the same format as Exhibit 14.

[19] One possibility is that states may periodically update their internal archives of wage record data, but that the updates are not subsequently reported to OCSE. This could be true, for example, if some employers are late to report to their state's UI administrative entity. If the state adds the late-reported data to its administrative database but does not send the new information to OCSE, individuals who worked only for late-reporting employers would have earnings records in their state's UI wage records but not in the NDNH.

Exhibit 15: Quarterly Earnings Post-Training Completion, by State and Data Source

	Missouri	New Jersey	Ohio
	N = 16,199	N = 25,421	N = 18,044
First quarter following quarter of training completion			
State wage records	$6,187 (4,551)	$6,190 (7,658)	$5,991 (4,871)
NDNH	$6,360 (4,729)	$6,039 (7,371)	$5,971 (5,238)
Difference			
Absolute	*+$173*	*-$151*	*-$20*
Percent	*+2.8%*	*-2.4%*	*-0.3%*
Fourth quarter following quarter of training completion			
State wage records	$7,139 (4,898)	$7,354 (6,222)	$7,367 (4,926)
NDNH	$7,404 (5,190)	$7,710 (6,783)	$7,427 (4,944)
Difference			
Absolute	*+$265*	*+$356*	*+$60*
Percent	*+3.7%*	*+4.8%*	*+0.8%*
Eighth quarter following quarter of training completion			
State wage records	$7,609 (5,358)	$7,168 (7,895)	$7,814 (4,835)
NDNH	$7,877 (5,593)	$8,237 (7,212)	$7,965 (5,108)
Difference			
Absolute	*+$268*	*+$1,069*	*+$151*
Percent	*+3.5%*	*+14.9%*	*+1.9%*
Twelfth quarter following quarter of training completion			
State wage records	$7,772 (5,223)	$6,879 (5,946)	$8,125 (4,905)
NDNH	$8,057 (5,572)	$8,277 (7,366)	$8,298 (5,210)
Difference			
Absolute	*+$285*	*+$1,398*	*+$173*
Percent	*+3.7%*	*+20.3%*	*+2.1%*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Comparing the earnings data outcome measures across states and data sources reveals the following patterns of note:

- In Missouri, average quarterly earnings among trainees were consistently higher when measured using the NDNH data, though the differences were small. Across all four post-completion periods, average quarterly earnings for trainees in Missouri were 2-4 percent higher when based on the NDNH data.
- In Ohio, average quarterly earnings for trainees were slightly higher when measured using the NDNH for all but the shortest post-completion period. At one quarter post-completion, average earnings among Ohio trainees were slightly lower when measured using the NDNH data compared to the state wage record data.
- In both Missouri and Ohio, the magnitudes of the differences were small. In Missouri, the differences ranged from 2-4 percent. In Ohio, the differences were even smaller.
- In New Jersey, average earnings as measured by the NDNH data were higher in all follow-up periods except first quarter post-completion.
- In New Jersey, the magnitudes of the differences increased with the length of the follow-up period. At one quarter post-completion, the difference was only 2 percent. For the eighth and twelfth quarters post-completion, average earnings as measured using the NDNH were 15 percent and 20 percent higher, respectively, compared to the same measure based on state wage record data.

As Exhibit 15 shows, comparisons of the two data sources for Missouri and Ohio show fairly similar patterns. The differences in Missouri were slightly larger than those in Ohio, but for both states the magnitudes of differences between the data sources were small. In contrast, as was the case with employment rates, the results for New Jersey show that different data sources led to substantial differences in earnings-related outcome measures, although on this measure the differences were in the expected direction. This is especially true for longer-term post-completion periods.

Comparing Individual Quarterly Earnings by Data Source. Beyond comparing average quarterly earnings based on the two data sources, it is possible to use the combined data to understand how often the two data sources were consistent with one another.

One way to do this is to look at the proportion of trainees that fell into each of three categories:

1. Trainees for whom quarterly earnings as represented in the NDNH data were *greater than* their quarterly earnings as represented in the single-state UI wage record data from their states of training.
2. Trainees for whom quarterly earnings as represented in the NDNH data were *equal to* their quarterly earnings as represented in the single-state UI wage record data from their states of training.

3. Trainees for whom their quarterly earnings as represented in the NDNH data were *less than* their quarterly earnings as represented in the single-state UI wage record data from their states of training.

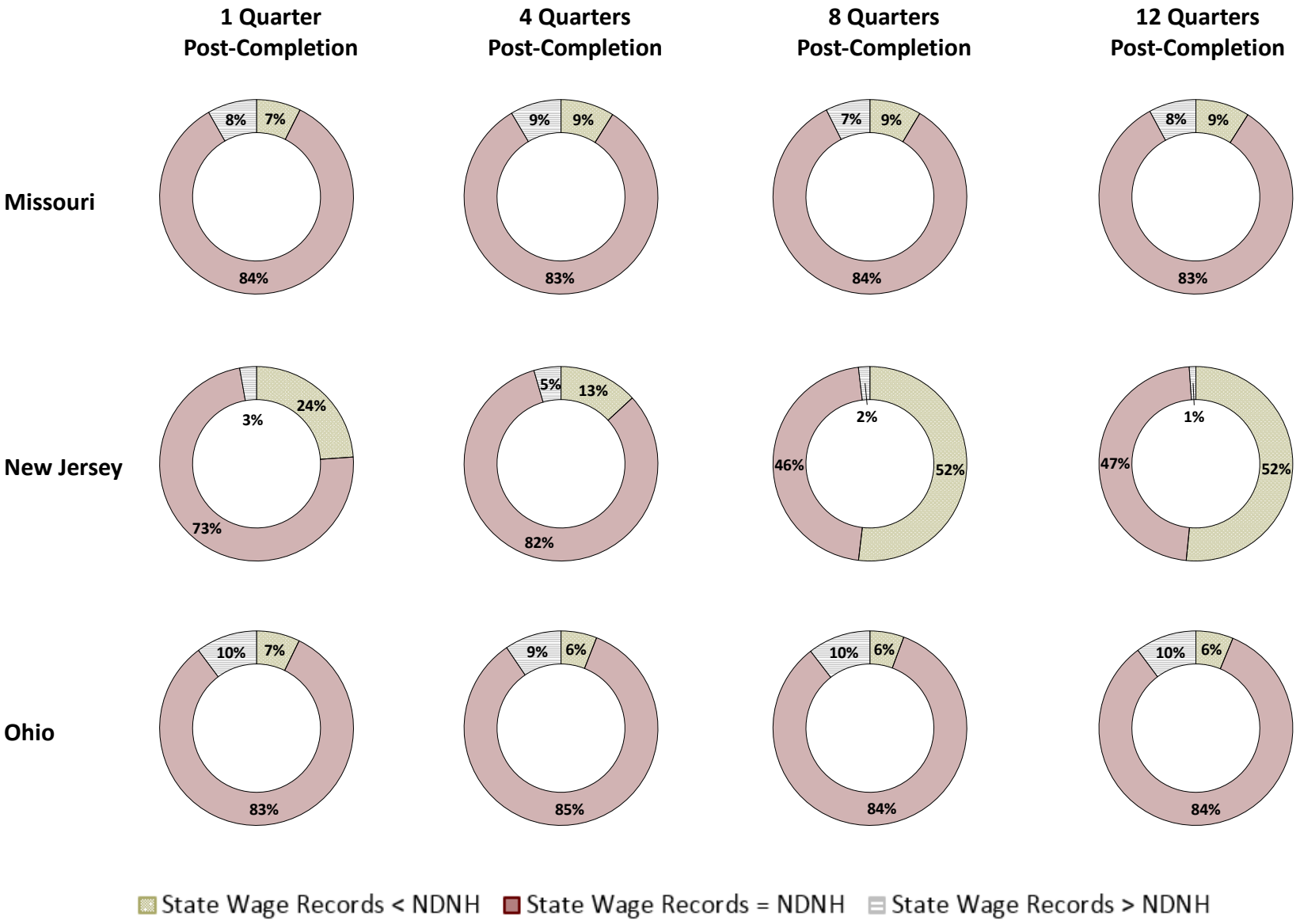
These proportions can reveal substantially more than the overall statistics about how much difference it makes for a state scorecard to rely exclusively on UI wage record data from its associated state.[20] Exhibit 16 summarizes the proportion of trainees in each state that fell into each of the three categories for each of the four follow-up periods. For example, the top left circle indicates that at the first quarter post-completion, 7 percent of trainees in Missouri were in the group 1, 84 percent were in group 2, and 8 percent were in group 3.[21]

Key patterns displayed in Exhibit 16 include:

- Quarterly earnings for trainees in Missouri and Ohio were very similar between the two data sources for all post-completion periods. In Missouri, 83-84 percent of trainees in the sample had roughly equivalent earnings when derived from the two data sources. The proportion was nearly identical in Ohio (83-85 percent).
- Also for Missouri and Ohio, the proportions of trainees in each category were generally consistent across post-completion periods. In Missouri, about 7-9 percent of trainees had higher earnings when calculated using state wage records and a similar proportion had higher earnings when calculated using the NDNH data. The pattern was similar in Ohio, where 6-7 percent of trainees had higher earnings based on state wage records and 10-11 percent had higher earnings based on the NDNH data.
- In New Jersey, the proportion of trainees with roughly equivalent earnings between the two data sources ranged from as low as 46 percent (for the eighth quarter post-completion) to 82 percent (for the fourth quarter post-completion).
- In New Jersey overall, the proportion of trainees with higher earnings in the NDNH data than in the state wage record data was much higher than in the other two states—ranging from 13 percent (for the fourth quarter post-completion) to 52 percent (for both the eighth and twelfth quarters post-completion). These figures are between about 1.5 and 9 times as large as the corresponding proportions for the other two states.
- In New Jersey, the proportion of trainees with higher earnings in the NDNH data than in the state wage record data was highest for longer-term post-completion periods. In both the fourth and eighth quarters post-completion, 52 percent of trainees in New Jersey had higher earnings in the NDNH data than in the state wage record data. This is over double the proportion in the first quarter post-completion (24 percent) and about four times the proportion in the fourth quarter post-completion.

[20] In addition to the comparisons discussed here, Appendix C presents a series of exhibits that describe the joint distribution of earnings in the two data sources by follow-up period and by state.
[21] The total does not sum to 100 percent due to rounding.

Exhibit 16: Comparisons of NDNH to Single-State Earnings, by State and Follow-up Period



To summarize: In Missouri and Ohio, the quarterly earnings of most trainees were essentially the same between the two data sources. Those for whom reported earnings were different between the two data sources were roughly evenly split between those with higher earnings reported in state wage records and those with higher earnings in the NDNH data. The earnings comparisons for New Jersey are very different. A much higher proportion of trainees had higher earnings in the NDNH than in the state data. This is consistent with the patterns of differences in employment rates, reinforcing the importance of labor markets outside the state for trainees in New Jersey.

4.3 Representation of Other States in the Out-of-State Earnings Data

Because the NDNH data identify the state that reported each quarterly earnings record for each individual in the data base, it was possible to examine how often individuals from each of the states in our data had earnings records in the NDNH from every other state in the U.S., excluding their home state. A key objective, as noted, was to understand the relative importance of trainees finding jobs outside their home states. Learning *where* trainees go when they leave their respective home states can help shed light on potential ways to address the issue of out-of-state employment and earnings. If trainees from a given state disperse broadly across the country, accurate measures of post-completion employment and earnings will need to rely on data covering all states. But if trainees tend to work only in nearby states (plausibly living in their home state but working in a nearby state), it may be possible to produce fairly precise measures through regional data sharing agreements among small groups of states.[22]

Exhibits 17-19 map the results for each state for the fourth quarter following training completion.[23] Each map is color-coded by state based on the following proportion:

$$P_s = \frac{N_s}{N_{-S^*}}$$

In the formula, s indexes states, s^* represents the individual's home state, and $-S^*$ represents all states other than the individual's home state. The two terms on the right-hand side of the equation are:

- N_s, which is the number of individuals with NDNH earnings from state s

[22] One example of regional data sharing initiatives that do it precisely this way is the Western Interstate Commission for Higher Education (WICHE), which has established a Multistate Longitudinal Data Exchange (MLDE). It originally supported data sharing among four states—Hawaii, Idaho, Oregon, and Washington—and is currently working to cover 10 or more states. The MLDE has been used to study outcomes for students, including comparing earnings outcomes for students with earnings in the state in which s/he was awarded a degree to those with earnings in another state. See Bransberger, P., "A Glimpse Beyond State Lines: Student Outcomes from WICHE's Multistate Longitudinal Data Exchange Pilot Project," July 2014, Boulder CO: Western Interstate Commission on Higher Education.

[23] The data used to produce the maps are provided in Appendix E, along with similar data for the other follow-up periods considered in our analyses.

- N_{-S^*}, which is the total number of individuals with NDNH earnings from any state, *excluding* their home state.

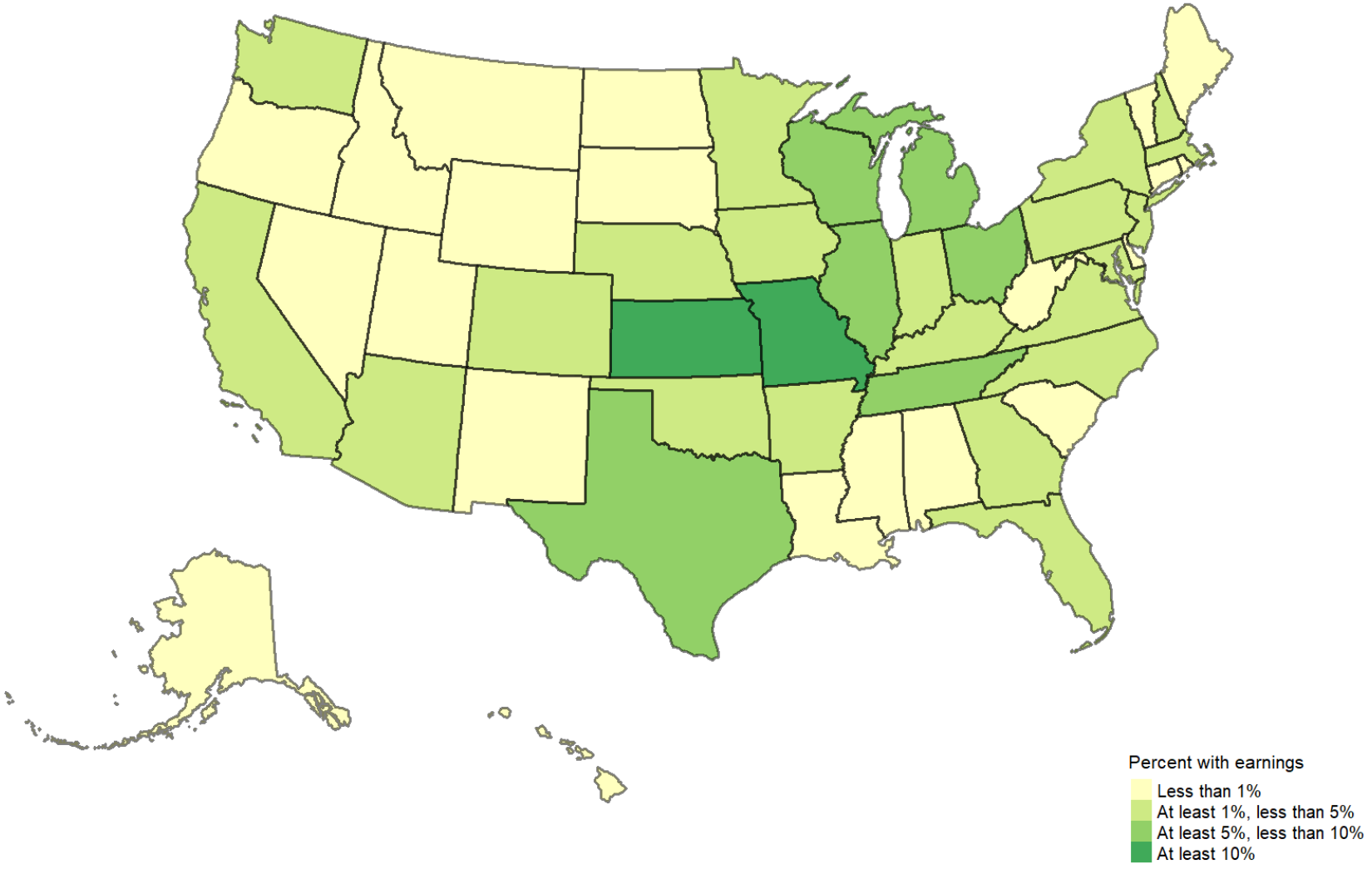
Put another way, the denominator of the proportion is the total population of trainees in the sample with earnings outside their home state (regardless of whether they had earnings in their home state). The numerator is the subset of that population with earnings in state s. The map colors are darker for states with the highest representation among trainees with out-of-state earnings.

As demonstrated in the maps, key takeaways include:

- For trainees in Missouri, the top 10 states in which trainees had out-of-state earnings in the fourth quarter post-completion were Kansas (11 percent), Michigan (9 percent), Illinois (8 percent), Ohio (7 percent), Texas (7 percent), Tennessee (7 percent), Wisconsin (5 percent), Arkansas (5 percent), Oklahoma (4 percent), and New York (4 percent).
- For trainees in New Jersey, the top 10 states in which trainees had out-of-state earnings in the fourth quarter post-completion were New York (17 percent), Pennsylvania (13 percent), Florida (7 percent), California (6 percent), Ohio (6 percent), Texas (6 percent), Georgia (6 percent), Massachusetts (6 percent), Illinois (4 percent), and Arkansas (4 percent).
- For trainees in Ohio, the top 10 states in which trainees had out of state earnings in the fourth quarter post-completion were Michigan (18 percent), Pennsylvania (10 percent), New York (6 percent), Indiana (6 percent), Illinois (5 percent), North Carolina (5 percent), Wisconsin (4 percent), Tennessee (4 percent), Florida (4 percent), and Kentucky (4 percent).

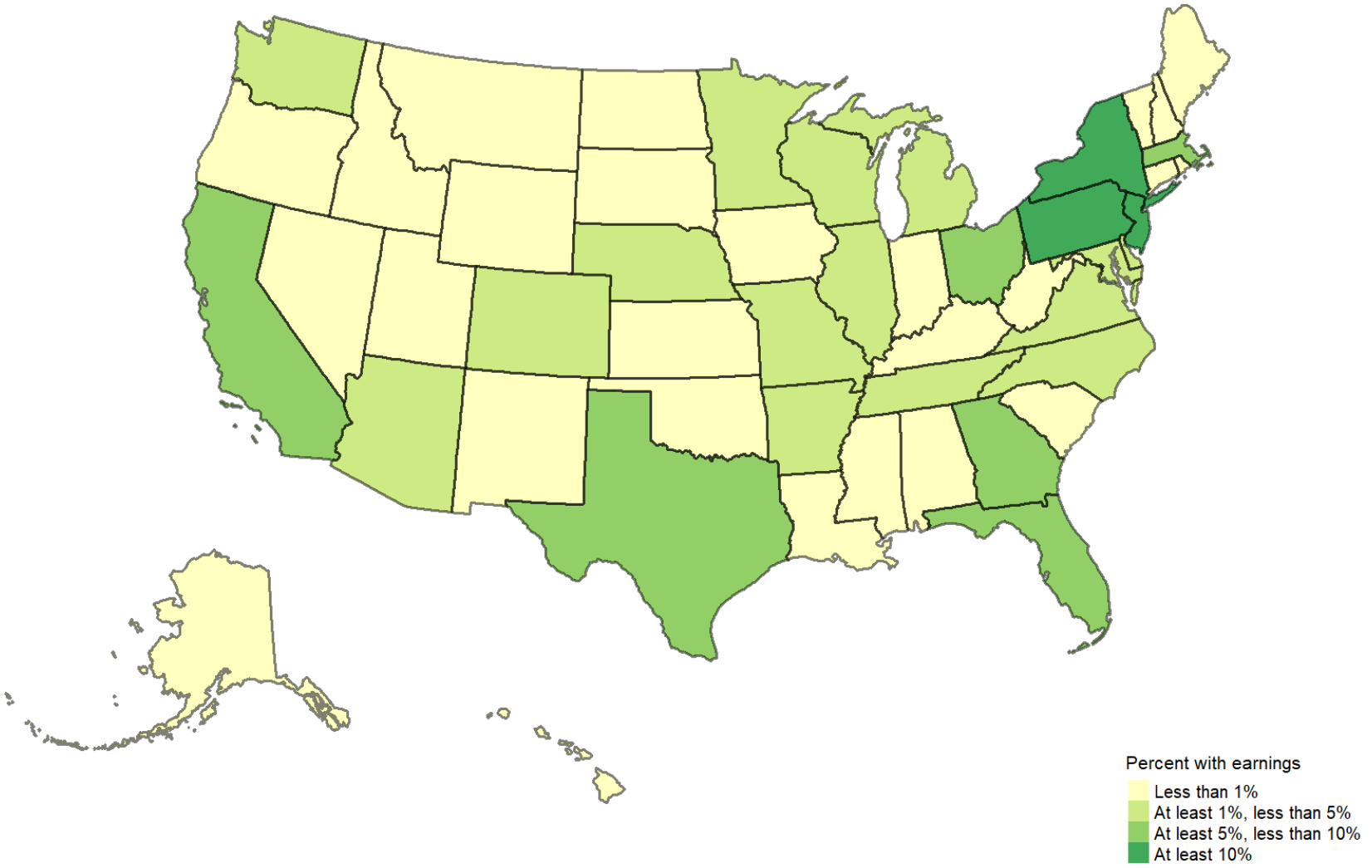
For each state, the data show the importance of nearby labor markets. Many of the states represented most heavily among out-of-state earnings records in the NDNH for Missouri and Ohio are from states within the same region of the country as the home state. This is less true for New Jersey, as more distant states like Florida, California, and Texas are well-represented.

Exhibit 17: Prevalence of Earnings from Other States, Missouri



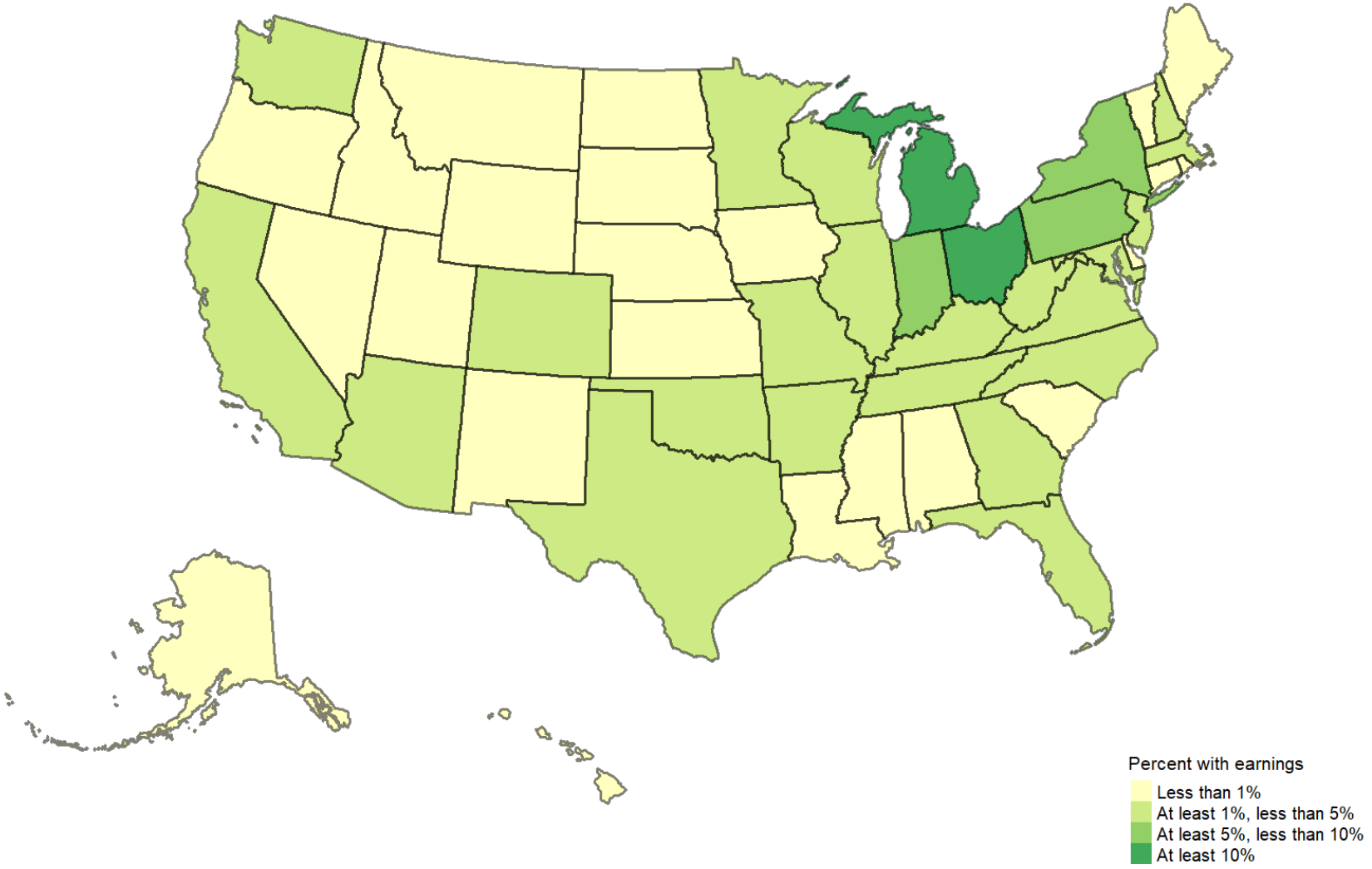
Source: State administrative data and NDNH data on WIA/WIOA training completers.
Note: Percentages indicate the number of Missouri trainees with earnings from each state divided by the total number of Missouri trainees with any out-of-state earnings.

Exhibit 18: Prevalence of Earnings from Other States, New Jersey



Source: State administrative data and NDNH data on WIA/WIOA training completers.
Note: Percentages indicate the number of New Jersey trainees with earnings from each state divided by the total number of New Jersey trainees with any out-of-state earnings.

Exhibit 19: Prevalence of Earnings from Other States, Ohio



Source: State administrative data and NDNH data on WIA/WIOA training completers.
Note: Percentages indicate the number of Ohio trainees with earnings from each state divided by the total number of Ohio trainees with any out-of-state earnings.

4.4 Factors Associated with Differences in Outcome Measures

As discussed in Sections 4.1.1 and 4.1.2, some noteworthy differences exist between employment- and earnings-related outcome measures based on state UI data versus NDNH data. To better understand whether these differences are more likely under particular circumstances, the data were examined for any systematic relationships between the differences in outcome measures and either individual or training characteristics.

Cross-tabulations. First, the outcome measure data were summarized separately for groups defined by key variables of interest: (1) race, (2) educational attainment, (3) length of training, (4) whether the training took place near the state border, and (5) whether the training took place in an urban area.

Eight patterns (see tabulations in Appendix D) are apparent:

Patterns related to employment rates

- In Missouri, the differences between employment rates based on the two data sources were larger in magnitude for non-whites. In the other two states, the differences by race were generally similar.
- In Missouri, differences in employment rates between data sources were highest for trainees with high educational attainment. In the other two states, differences in employment rates by data source were not generally associated with educational attainment.
- There was no clear relationship between the difference in employment rates for the two data sources and training length in either Missouri or New Jersey. In Ohio, the difference was largest for training that lasted at least one year.
- The differences in employment rates between the two data sources were not related to whether the training occurred near a state border for any of the three states.
- In both Missouri and Ohio, differences in employment rates between the two data sources were larger when the training took place outside an urban area for all but the longest post-completion period.
- In Missouri, at the twelfth quarter post-completion, the employment rate derived from NDNH data was slightly higher than the rate derived from state wage record data when training took place in an urban area, but lower when training took place outside an urban area.

Patterns related to earnings

- The differences in *earnings* by data source for all three states were generally larger for whites and for those of other races compared to blacks.

- In Missouri, differences in quarterly earnings between the two data sources were highest (in percentage terms) for less-educated trainees. In New Jersey, the differences in quarterly earnings showed no clear relationship with educational attainment. In Ohio, differences were highest for more highly educated trainees.
- There were no obvious relationships between the difference in quarterly earnings as measured by the two data sources and training length in any of the three states.
- In New Jersey, the difference in quarterly earnings between data sources was higher for trainees who trained near the border, particularly for longer-term post-completion periods. Differences in quarterly earnings between data sources showed no obvious association with whether the training occurred near a border in either Missouri or Ohio.
- In neither Missouri nor Ohio was there any clear relationship between quarterly earnings by data source and whether the training was in an urban area.

The results related to whether training took place near a border are somewhat surprising. The expectation was that, for trainees near state borders, employment- and earnings-related outcomes would be higher when calculated using the NDNH data, since some trainees may get jobs outside their home states. However, receiving training near a border turned out not to be consistently related to any differences in employment rates by data source; and border status was only related to differences in quarterly earnings by data source for New Jersey. One potential explanation is that the border measure is fairly crude in both New Jersey and Ohio. As noted, WIB boundaries were the finest level of geographic detail available for those two states; the border measure in Missouri, based on county of residence, is much more precise.

Ultimately, the results related to border status suggest that, even for trainees most likely to work outside the state, state scorecards that rely on single-state UI wage record data may produce a generally accurate picture of employment- and earnings-related outcomes in states like Missouri and Ohio. However, in states like New Jersey—those for which neighboring states feature large labor markets near the state border—both types of measures are likely to be significant underestimates in the single-state data, though the magnitude of the bias is similar regardless of border status of the training.

Multivariate Regression Models. Cross-tabulations are useful in understanding some of the relationships in the data, but do not isolate the associations between individual factors and differences in the outcomes. To do so, a series of multivariate regression models were estimated, of the form:

$$Y_i = \alpha + \beta X_i + \gamma Z_i + \delta T_i + \lambda P_i + \varepsilon_i \quad [1]$$

where the subscript *i* indexes individuals and the term Y_i represents the outcome of interest. The terms on the right-hand side of the equation are:

- α, a constant term

- X_i, a set of variables that capture individual characteristics (e.g., race, gender, educational attainment)
- Z_i, a set of variables that capture characteristics of training (e.g., type, length, O*Net code)
- T_i, a set of indicator variables for the calendar quarter of training completion
- P_i, a set of variables that capture pre-training earnings in 1, 4, and 8 quarters prior to the start of training
- ε_i, a mean-zero error term

The parameters β, γ, δ, and λ represent the parameters of interest. The estimates of these parameters indicate whether individual explanatory variables in the regression model are associated with the outcome variable, Y_i. Estimates that are statistically significant indicate that the corresponding explanatory variable is associated with the outcome variable, holding all other explanatory variables constant.

Regression models were estimated for eight outcomes of interest—two main outcomes defined at each of the four follow-up periods we analyzed (i.e., one, four, eight, and 12 quarters post-completion). The two main outcomes are:[24]

1. Y_{1i} , an indicator variable equal to 1 if, in the reference follow-up quarter, the individual's earnings as reported in the NDNH data were *greater than* his/her earnings as reported in the single-state UI wage record data.
2. Y_{2i} , an indicator variable equal to 1 if, in the reference follow-up quarter, the individual's earnings as reported in the NDNH data were *less than* his/her earnings as reported in the single-state UI wage record data.

The first regression reveals what factors are associated with the likelihood of having higher earnings in the NDNH data compared to the single-state UI wage record data. The second regression does the same thing regarding what factors are associated with the likelihood of having higher earnings in the single-state UI wage record data. For each model, a positive estimated coefficient indicates that the corresponding explanatory variable is positively associated with the outcome. For example, for a model in which the dependent variable is defined as in Y_{1i} above, defined for the first quarter post-completion, if the estimated coefficient

[24] Because OCSE did not permit us to include continuous earnings measures based on single-state wage records in our input data for the NDNH match, we did not observe in the same data file continuous measures of earnings based on both data sources. Rather, we created categorical earnings variables (for both the pre-training and post-completion earnings variables), with each earnings distribution split into 13 categories: (1) zero, (2) at least zero but less than $500, (3) at least $500 but less than $1,000, (4) at least $1,000 but less than $1,500, (5) at least $1,500 but less than $2,000, (6) at least $2,000 but less than $2,500, (7) at least $2,500 but less than $3,000, (8) at least $3,000 but less than $4,000, (9) at least $4,000 but less than $5,000, (10) at least $5,000 but less than $7,500, (11) at least $7,500 but less than $10,000, (12) at least $10,000 but less than $15,000, and (13) at least $15,000. Therefore, the outcome measures we used for the regression models lack some precision, as they were determined based on whether an individual's earnings fell into the same category when derived from both data sources.

on an indicator variable for being male were positive and statistically significant, that would mean that men were more likely than women to have higher earnings in the NDNH than in the single-state UI wage record data. All regressions were estimated using ordinary least squares (OLS).[25]

Exhibit 20 summarizes the key regression results for the three states at the fourth quarter post-completion for the first dependent variable, the indicator for having higher earnings in the NDNH than in the state wage record data.

Exhibit 20: Regression Results, NDNH Earnings Greater than State Earnings, by State

	Missouri	New Jersey	Ohio
	N = 4,170	N = 7,434	N = 3,305
Race			
White [a]	-	-	-
Black	0.027**	0.004	-0.007
Other	0.073*	-0.010	-0.000
Female	-0.023**	-0.028***	-0.020*
Age			
18-24	0.004	-0.021	-0.004
25-34[a]	-	-	-
35-44	-0.000	-0.010	0.012
45-54	-0.025**	-0.014	0.006
At least 55	-0.005	-0.033**	-0.002
Educational Attainment			
Less Than a High School Diploma	0.008	-0.011	-0.018
High School Diploma [a]	-	-	-
GED or Equivalent	-0.010	-0.025	-0.027*
Some College	0.015	0.031***	-0.004
Associate Degree	0.011	0.015	0.019
Bachelor's Degree	0.043**	0.059***	0.039*
More Than Four Years of College	0.089**	0.053**	0.059
Other	0.019	0.034	-0.032*
Type of Training			
On the Job Training	-0.013	-0.035	-0.045***
Skill Upgrading and Retraining	0.320	0.054	-0.057**
Entrepreneurial Training	-0.103***	-0.128***	[b]
Adult Education and Literacy with Training	-0.067***	-0.054***	-0.083***
Customized Training	-0.103***	-0.102*	-0.103***
Other Occupational Skills Training [a]	-	-	-

[25] We also estimated the regressions using logistic regression, which explicitly accounts for the binary nature of the dependent variables. The results were substantively similar. We report OLS results for ease of interpretation. Full regression results are presented in Appendix F.

	Missouri	New Jersey	Ohio
	N = 4,170	N = 7,434	N = 3,305
Length of Training in Days			
Less than 60 Days [a]	-	-	-
At least 60 Days, Less than 90 Days	-0.031	-0.015	-0.032**
At Least 90 Days, Less than 180 Days	-0.018	-0.022*	-0.034***
At Least 180 Days, Less than 1 Year	-0.012	-0.051***	0.008
At Least 1 Year	-0.036***	-0.061***	-0.009
Training O*Net Code			
Computer and Mathematical	-0.031	0.065	0.003
Healthcare Practitioners and Technical [a]	-	-	-
Healthcare Support	-0.029*	-0.040	0.004
Installation, Maintenance, and Repair	-0.020	0.027	-0.006
Management	0.061**	0.117***	0.030
Office and Administrative Support	-0.019	0.036	-0.001
Production	0.012	0.077	0.023
Transportation and Material Moving	0.071***	0.062**	0.055***
Other	-0.011	0.031	0.007
Not Reported / Missing	-0.123***	0.007	-0.069**
Receipt of Wagner-Peyser Services	[b]	0.013	-0.009
Training Located in an Urban Area	-0.010	[b]	-0.017*
Training Located Near a State Border	-0.024**	0.016*	0.061***

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries are estimated regression coefficients. Asterisks indicate statistical significance at the 10 (*), 5 (**), and 1 (***) percent levels. Standard errors are provided in Appendix F. All regressions also included a constant term and additional explanatory variables that controlled for: (1) earnings in each of the 1st, 4th, and 8th quarters preceding the start of training and (2) the calendar quarter of training completion. [a] This is the reference category (the omitted category against which the estimates for the other categories are measured). [b] This variable (or category) was omitted from the regression due to perfect multicollinearity.

The estimated regression coefficients show the statistical association between each explanatory variable and the likelihood that a trainee had higher earnings in the NDNH data than in the state data in the fourth quarter post-completion, holding all other variables in the regression constant. For example, in the Missouri column, the coefficient on the 45-54 age group indicates that, all else equal, Missouri trainees in that age range were 2.5 percentage points less likely to have higher earnings at the fourth quarter post-completion in the NDNH data than the state data, compared to Missouri trainees in the 25-34 age group (the reference category)—a result that is statistically significant at the 5 percent level.

Exhibit 20 shows the following noteworthy relationships:

- In all three states, women were 2-3 percentage points less likely than men to have higher earnings in the NDNH.
- Compared to trainees with high school diplomas, trainees with higher levels of education were more likely to have higher earnings in the NDNH. In all three states, the effect ranged from 4-6 percentage points for trainees with Bachelor's degrees.
- Training type was strongly associated with the likelihood of having higher NDNH earnings for all three states. Compared to the reference category (other occupational skills training), trainees who completed other types of training were 5-13 percentage points less likely to have higher earnings in the NDNH than in the state wage record data.
- In general, trainees who completed longer-term programs were less likely to have higher earnings in the NDNH. Compared to the trainees who completed programs lasting less than 60 days, trainees in longer programs were between 3-6 percentage points less likely have higher earnings in the NDNH than in the state data.
- In some industries, training completion was related to the likelihood of having higher earnings in the NDNH. In all three states, for example, trainees who participated in programs in the transportation and material moving industry were 6-7 percentage points more likely to have higher earnings in the NDNH than in the state data.
- The importance of being near a border varied by state. In New Jersey and Ohio, the effect was positive—trainees who participated in programs near their state's borders were more likely to have higher earnings in the NDNH than in the state wage record data. The magnitude of the effect was much larger in Ohio (6 percentage points) than in New Jersey (2 percentage points); but Missouri trainees who completed programs near the state border were 2 percentage points less likely to have higher earnings in the NDNH.

Exhibit 21 summarizes the key regression results for the three states at the fourth quarter post-completion for the second dependent variable, having higher earnings in the state wage record data than in the NDNH.

Exhibit 21: Regression Results, State Earnings Greater than NDNH Earnings, by State

	Missouri	New Jersey	Ohio
	N = 4,170	N = 7,434	N = 3,305
Race			
White [a]	-	-	-
Black	-0.016	-0.000	0.002
Other	0.006	-0.006	0.012
Female	-0.010	0.005	-0.042***
Age			
18-24	0.003	0.007	-0.004
25-34 [a]	-	-	-
35-44	0.028**	0.007	0.008
45-54	0.039***	0.009	-0.015
At least 55	0.050***	-0.002	-0.004
Educational Attainment			
Less Than a High School Diploma	-0.001	0.005	-0.034
High School Diploma [a]	-	-	-
GED or Equivalent	-0.007	0.001	-0.015
Some College	-0.001	-0.012*	-0.041***
Associate Degree	0.019	0.008	-0.046**
Bachelor's Degree	0.002	-0.017**	-0.035
More Than Four Years of College	-0.046***	-0.003	0.010
Other	0.042	0.010	0.040
Type of Training			
On the Job Training	0.059***	0.003	0.019
Skill Upgrading and Retraining	-0.122***	-0.006	-0.086***
Entrepreneurial Training	-0.117**	-0.058***	[b]
Adult Education and Literacy with Training	0.088**	0.032	-0.107***
Customized Training	0.095	-0.048	-0.049**
Other Occupational Skills Training [a]	-	-	-
Length of Training in Days			
Less than 60 Days [a]	-	-	-
At least 60 Days, Less than 90 Days	-0.045***	-0.005	-0.016
At Least 90 Days, Less than 180 Days	0.002	0.005	0.011
At Least 180 Days, Less than 1 Year	0.004	-0.014**	0.007
At Least 1 Year	0.085***	0.011	0.023

	Missouri	New Jersey	Ohio
	N = 4,170	N = 7,434	N = 3,305
Training O*Net Code			
Computer and Mathematical	-0.053***	-0.035	-0.073**
Healthcare Practitioners and Technical [a]	-	-	-
Healthcare Support	-0.028	-0.012	-0.029
Installation, Maintenance, and Repair	-0.009	-0.021	-0.013
Management	-0.050**	-0.040	-0.033
Office and Administrative Support	-0.032*	-0.022	-0.047*
Production	-0.041**	-0.063**	-0.100***
Transportation and Material Moving	-0.044**	-0.051**	-0.047*
Other	-0.025	-0.034	-0.041*
Not Reported / Missing	0.232	-0.042	-0.091*
Receipt of Wagner-Peyser Services	[b]	-0.005	0.001
Training Located in an Urban Area	-0.023**	[b]	-0.010
Training Located Near a State Border	0.001	-0.005	0.005

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries are estimated regression coefficients. Asterisks indicate statistical significance at the 10 (*), 5 (**), and 1 (***) percent levels. Standard errors are provided in Appendix F. All regressions also included a constant term and additional explanatory variables that controlled for: (1) earnings in each of the 1st, 4th, and 8th quarters preceding the start of training and (2) the calendar quarter of training completion. [a] This is the reference category (the omitted category against which the estimates for the other categories are measured). [b] This variable (or category) was omitted from the regression due to perfect multicollinearity.

Exhibit 21 highlights some key relationships in in the data, including:

- Trainees with higher educational attainment were less likely to have higher earnings in the state data than in the NDNH data. For example, compared to trainees in Ohio with high school diplomas, trainees in Ohio with some college or an Associate's degree were 4-5 percentage points less likely to have higher earnings in the state data.
- In Missouri and Ohio, the type of training affected the likelihood that a trainee would have higher earnings in the state data than in the NDNH. In Missouri, trainees who participated in either on the job training or adult education programs were more likely to have higher earnings in the state data than the NDNH data, all else equal, than participants in 'other occupational skills' training. In contrast, trainees in skill upgrading or entrepreneurial programs were less likely. In Ohio, participants in all types of training except on the job training were less likely to have higher state earnings than NDNH earnings.
- The industry of training was associated with whether a trainee had higher earnings in the state wage record data compared to the NDNH data. Across all three states, trainees in programs focused on the production industry were 4-10 percentage points less likely to have higher state earnings than NDNH earnings compared to participants in programs for healthcare practitioners. There were fewer statistical associations between industry and the dependent variable in New Jersey than in the other two states.

- Whether the training took place in an urban area was associated with having higher state earnings than NDNH earnings only in Missouri. In that state, trainees who completed programs in urban areas were 2 percentage points less likely than others to have higher state earnings than NDNH earnings.
- Whether the training took place near the state border had no discernible association with the likelihood of having higher state earnings than NDNH earnings for any of the three states.

Collectively, the regression results show that differences in earnings measures between the two data sources showed some associations with characteristics of trainees and of training programs. The primary interest here is in understanding what factors may lead earnings measures based on single-state wage records to underestimate earnings. The regression results indicate that more highly educated trainees, those who received other occupational skills training, and those who received training in two industries—management and transportation—were more likely to have higher earnings in the NDNH than in their home state wage records. In New Jersey and Ohio, trainees who participated in programs near the border were more likely than others to have higher earnings in the NDNH; in Missouri, the opposite was true.

4.5 Summary

To understand how the employment- and earnings-related measures typically used in education and training program scorecards compare when based on either single-state wage record data or a national database of earnings, the same measures were calculated using data from three states and matched earnings records from the NDNH.

The results of the comparisons of employment rates showed virtually no differences in either Missouri or Ohio. In both states, the employment rate derived from the NDNH data was slightly lower than the corresponding rate derived from state wage record data. In New Jersey, however, employment rates were much higher for all post-completion periods when calculated using NDNH data versus state data.

Comparing average quarterly earnings (among those employed) across the three states showed a similar pattern. In both Missouri and Ohio, there was little difference between average earnings calculated from the two data sources for any of the post-completion periods. In Missouri, average post-completion quarterly earnings were 2-4 percent higher when based on the NDNH data. In Ohio, the difference was 2 percent or less. In New Jersey, on the other hand, average quarterly earnings were significantly much higher when derived from the NDNH data. At the fourth quarter post-completion, for example, average quarterly earnings as measured by the NDNH data were 5 percent higher than when measured using state wage record data. At the twelfth quarter post-completion, the difference increased to over 20 percent.

To understand in greater detail how individual earnings compared between the two data sources, IMPAQ examined the proportion of the sample in each state that fell into three mutually

exclusive and exhaustive categories: (1) those with higher earnings in the NDNH, (2) those with the same earnings in both data sources, and (3) those with higher earnings in the state wage record data. In both Missouri and Ohio, the large majority of trainees (over 80 percent) had equivalent earnings in the two data sources. In New Jersey, a much higher proportion of trainees (over half) had higher earnings in the NDNH data than in the state wage record data for the two longest post-completion periods.

Because the NDNH identifies the state that reported each quarterly earnings record for each individual in the database, it was possible to examine how often trainees from each of the three states had earnings records in the NDNH from any other U.S. state. For trainees with some out-of-state earnings reported in the NDNH, the states most commonly represented in the out-of-state earnings records for Missouri and Ohio were states within the same region of the country. This was less true for New Jersey, as distant states (including Florida, California, and Texas) were well-represented.

In addition to documenting how the employment- and earnings-related outcomes of interest compared between the two data sources, IMPAQ examined the extent to which the differences were related to observable characteristics of either trainees or training programs. A series of cross-tabulations disaggregating the differences in the outcome measures according to several characteristics of interest found few clear patterns. The two important results related to whether the training took place near a border. First, there were no differences in employment rates by data source related to border status. Second, quarterly earnings by data source did not different by border status of the training in two states, Missouri and Ohio. In New Jersey, however, the difference in average quarterly earnings was higher among trainees who trained near the border, particularly for the longer-term post-completion periods.

To further isolate the statistical relationships between characteristics of trainees, characteristics of the training, and differences in employment- and earnings-related outcomes based on the two data sources, a series of multivariate regression models (by state and post-completion period) was estimated. The two dependent variables in the regressions were: (1) an indicator variable equal to 1 if the individual had higher earnings in the NDNH data than in the state data and zero otherwise, and (2) an indicator variable equal to 1 if the individual had higher earnings in the state data and zero otherwise. More highly educated trainees, those who completed 'other occupational skills' training, and those who trained in two industries—management and transportation—were more likely to have higher earnings based on the NDNH data than when based on single-state wage records. In New Jersey and Ohio, trainees who participated in programs near the border were more likely than others to have higher earnings in the NDNH; in Missouri, the opposite was true.

5. DISCUSSION

Recent years have seen a number of state and federal efforts to provide the public with information and tools to help them make better decisions. One area of focus among policymakers is how to make education and training program scorecards—easy-to-use websites that provide information to the public about available programs, including summary measures of labor market outcomes for program completers—more widely available. Some states have created scorecards, but many have not.

DOL has been considering how it might support states to encourage or facilitate the production of scorecards in states that do not currently have them. To help address this issue, DOL funded the study reported here to answer two important questions: (1) Is it feasible to use national databases of employment and earnings data for state education and training program scorecards? (2) How different are employment- and earnings-related outcome measures for education and training programs when based on single-state UI wage records versus data from a national database of earnings?

At the outset, IMPAQ and DOL believed it might be possible to link individual-level data on participants in education and training programs to multiple national databases of earnings, including both records maintained by SSA and the NDNH. Unfortunately, the study encountered challenges securing both administrative data on trainees as well as national data on their labor market outcomes:

- Neither of the two states originally selected for the study—New Jersey and Ohio—was willing to provide data on individuals who completed programs of study at postsecondary institutions, which IMPAQ had planned to include in the scorecard coverage.
- SSA ultimately determined that it lacked the legal authority to facilitate the kind of matching and analysis envisioned for the project. Similarly, in early conversations with states to recruit them for the study, it became clear that states would not be able to provide WRIS data.

As a result of these challenges, the original plans for the study had to be modified. First, the population of interest was narrowed to trainees who received funding through WIA/WIOA. Second, the study focus shifted to using the NDNH as the sole national database of earnings with which to compare outcomes based on single-state wage records.

The key results of these efforts fall into two groups: (1) lessons learned about the potential for creating scorecards from national databases of employment and earnings data; and (2) what can be said about how typical outcome measures differ, depending on whether they are based on single-state UI data versus a national database of employment and earnings.

Exhibit 22 summarizes the key results from the study, organized by the projects' two research questions. This is followed by a more detailed discussion of the results.

Exhibit 22: Summary of Key Results

Research Question	Results
1. Is it feasible to use national databases of employment and earnings data for state education and training program scorecards?	▪ State agencies are reluctant to share individual-level postsecondary educational records for research. ▪ It is easier to obtain state participant data from states where an existing infrastructure can support making administrative data available to the public for research. ▪ Working with state agencies to execute data sharing agreements that govern the release of data for research purposes takes time. ▪ Making the legal arrangements necessary to obtain administrative data on employment and earnings maintained by federal agencies is sufficiently time-consuming that it effectively precludes using the data for time-sensitive purposes. ▪ The alternatives are limited in terms of existing databases with national coverage that could be used to support a national approach to scorecards. Under current data sharing rules, neither SSA data nor the NDNH is a viable option for scorecard purposes.
2. How different are employment- and earnings-related outcome measures for education and training programs when based on single-state UI wage records versus data from a national database of earnings? a. How do any differences vary with the characteristics of trainees and/or training programs? b. How do any differences vary for different types of outcome measures, such as those with different follow-up periods?	▪ In states like Missouri and Ohio, scorecard measures based on single-state UI data are not meaningfully different than if they were based on national data. ▪ In states like New Jersey, scorecard measures based on single-state UI data are underestimated due to substantial missing data on trainees who work in other states. ▪ Among trainees with out-of-state earnings, the out-of-state earnings are most likely to come from nearby states within the same region. ▪ Differences in outcome measures based on state versus national data are more common for more highly educated trainees and trainees in particular industries. Other relationships vary across the three states. ▪ Differences in outcome measures based on state versus national data can depend on the length of the follow-up period, becoming more pronounced for longer-term measures.

Lessons Learned Regarding the Use of National Databases for Scorecards. The experience collecting data for this study highlighted a number of challenges to using national databases of employment and earnings data to support education and training program scorecards:

1. **State agencies are reluctant to share individual-level postsecondary educational records for research.**

   At the outset, the intent was to obtain from participating states data on individuals who completed education and training programs at institutions of higher education, covering as many institutions as possible, including two- and four-year colleges and universities, community colleges, and technical schools. Unfortunately, as IMPAQ recruited states for the project and discussed with them what data they could provide, neither New Jersey nor Ohio decided to provide such data, forcing the study to focus instead on WIA/WIOA training completers.[26]

   It is not uncommon for state higher education agencies to set high standards for the release of student records. A number of both federal and state laws govern various aspects of higher education data, such as how they must be protected and what are acceptable uses for them.[27] To comply with the complex legal requirements that pertain to these data, states tend to err on the side of denying access. Despite IMPAQ's best efforts to explain the potential value of the study, and to reassure states that proper security measures would be in place to protect the data, neither of the two states originally approached was willing to provide the needed access.[28]

2. **It is easier to obtain state participant data from states where an existing infrastructure can support making administrative data available to the public for research.**

   IMPAQ's experience recruiting states to participate in the study and working with them to collect the data demonstrated that the process is easier in states that have taken steps to support making these kinds of data available to the public.

   In Ohio, the Center for Human Resources Research (CHRR) has an established process for requesting access to data from the Ohio Longitudinal Data Archive (OLDA).[29] Working

[26] Since Missouri was recruited after we had reached this conclusion with both New Jersey and Ohio, we did not ask Missouri for data on completers from institutions of higher education. This was so that: (1) we could move forward as quickly as possible with Missouri and (2) the population to be analyzed was the same across the three participating states.

[27] For a detailed discussion of information security and privacy issues related to higher education data, see Grama, J.L., "Understanding Information Security and Privacy in Postsecondary Education Data Systems," May 2016. Washington, DC: Institute for Higher Education Policy.

[28] Recently, legislation has been introduced in both houses of Congress that, if enacted into law, would address many of the existing obstacles to sharing postsecondary education records. The bill is called the College Transparency Act (See S. 1121: https://www.congress.gov/bill/115th-congress/senate-bill/1121/all-info and H.R. 2434: https://www.congress.gov/bill/115th-congress/house-bill/2434/all-info).

[29] See https://chrr.osu.edu/projects/ohio-longitudinal-data-archive.

through that process in coordination with CHRR staff helped us secure a commitment from Ohio to provide the data, obtain formal approval from CHRR, and receive the initial study data files with no significant problems or delays. In both New Jersey and Missouri, the process for reaching an agreement on whether the state would participate, defining what data the state would provide, and making the other necessary arrangements was more ad-hoc and driven by this specific project. In those two states, the research team periodically had to rely on state staff to figure out the right way to move things forward and then follow through. Our success in working with New Jersey and Missouri was due in large measure to the willingness of staff in those states to help IMPAQ navigate their internal, informal processes, and to dedicate some of their own time to help accomplish what the study set out to do.

Not every state has developed the kind of standard processes for reviewing requests for administrative data, determining whether to approve them, and making administrative data available to the public that Ohio has.[30] However, states like Ohio clearly demonstrate that this is possible.

3. **Working with state agencies to execute data sharing agreements that govern the release of data for research purposes takes time.**

In two of the states—New Jersey and Ohio—IMPAQ developed and executed a DSA between IMPAQ and the state that was separate from and preceded the MOU involving DOL and OCSE. These DSAs allowed for the transfer of the study data files well in advance of the execution of the MOU—enabling the data to be reviewed, any questions to be clarified, and the data to be prepared for eventual transfer to OCSE. In each state, it took 10-12 months from the time IMPAQ first received an informal agreement to participate in the study to the time the DSA was executed. Most of that time was devoted to initial discussions with each state to describe the research objectives and data needs, let IMPAQ's contacts in each state talk to other staff internally about the feasibility the data request, and making adjustments as what would be possible and what would not became clear. Once the details of the data exchange had been worked out, the process moved more quickly, though it still took time. In Ohio, for example, it took four months from the time the initial research request was submitted until the DSA was complete and the first data files were received.

In Missouri, IMPAQ did not receive the input data files—instead, they were provided to a researcher at MU who is affiliated with IMPAQ. Although there was no DSA with Missouri,

[30] A recent report highlighting the variation in internal research capacity across states found that, among state workforce agencies between 2011 and 2015, the median number of research and evaluation products produced with outside contractors or partners was only two. In two case studies (of Ohio and Washington), the report also documents methods states have used to improve data infrastructure to facilitate sharing data for research purposes. See Chocolaad, Y., and S. Wandner. "Evidence-Building Capacity in State Workforce Agencies: Insights from a National Scan and Two State Site Visits," February 2017. Washington, DC: National Association of State Workforce Agencies.

the state agencies involved in the project (DED and DOLIR) executed a similar agreement among themselves and MU. Like the DSAs with New Jersey and Ohio, the Missouri DSA specified the terms and conditions of the data transfer and allowed the MU researcher to receive the data files and prepare the input data prior to execution of the MOU with DOL and OCSE. The Missouri DSA was put in place more quickly than the DSA with either New Jersey or Ohio—only four months from the first informal commitment to participate in the study until the DSA was executed. The speed was due to intervention by the MU researcher affiliated with IMPAQ as well as by the timing of when Missouri joined the study. IMPAQ advised representatives in the state that if the data were not provided to MU quickly, Missouri would miss the anticipated deadline for submitting the input files to OCSE. Moreover, IMPAQ relied heavily on the established relationship between the IMPAQ-affiliated researcher and officials at the relevant state agencies. The state was likely willing to move forward quickly because they had worked closely with him in the past, including on projects making use of similar state administrative data.

4. **Making the legal arrangements necessary to obtain administrative data on employment and earnings maintained by federal agencies is sufficiently time-consuming that it effectively precludes using the data for time-sensitive purposes.**

A key objective of this study was to assess the feasibility of using national databases of employment and earnings data to produce education and training program scorecards. IMPAQ's efforts to gain access to two such databases—SSA data and the NDNH data—made clear that satisfying the current legal requirements for accessing the data is no small task. In the case of the SSA, IMPAQ was unable to obtain even aggregate outcome data, despite initial indications to the contrary. In the case of the NDNH, IMPAQ was ultimately able to work with DOL, OCSE, and the states to successfully complete the data match originally envisioned, but the process took much longer than expected, being subject to repeated delays.

The most time-consuming aspect of accessing the NDNH data was the process of developing, negotiating, finalizing, and executing the MOU among the three states, DOL, and OCSE. The research request was approved by OCSE in March 2015, yet the MOU was not fully executed until August 2016. Because of the complex nature of what the study proposed to do, it is unclear whether the necessary legal arrangements might proceed more quickly in the future—either for efforts like this (which could leverage the documents from this work as a starting point) or for more straightforward efforts. What is clear is that unless the process is streamlined, any plan to link state administrative data to data from the NDNH must allow for a long delay associated with making the necessary legal arrangements.

5. **The alternatives are limited in terms of existing databases with national coverage that could be used to support a national approach to scorecards. Under current data sharing rules, neither SSA data nor the NDNH is a viable option for scorecard purposes.**

For this project, IMPAQ attempted to link state administrative data on WIA/WIOA trainees to several sources of data on employment and earnings that would provide national coverage. These included the interstate Wage Record Interchange System (WRIS), tax record data accessible through the SSA, and the NDNH. Of these, data were successfully collected from only one—the NDNH.

The WRIS was quickly abandoned when early discussions with states made clear that they could not provide data from it. Based on this experience, under current rules, WRIS is not a viable option for a national approach to scorecards, because of limitations on the allowed uses of the data.

Likewise, based on IMPAQ's experience seeking earnings data through the SSA, matching state data to tax records via the SSA is currently not a viable option, although a separate effort by ED may suggest otherwise. During this study, the U.S. Department of Education (ED) made public a website that allows the public to review summary data on postsecondary institutions in the U.S., including outcomes for students, called College Scorecard.[31] A White House press release at the time explained that the purpose of the website was, in part, to provide data on outcomes—such as post-completion earnings—to students to aid in their college choices.[32] The website provides summary outcome measures related to earnings: both average and median earnings and the share of students' earnings over $25,000. Moreover, the earnings outcome measures are identified as derived from tax records.[33] Neither the documentation website nor the full data documentation report available on it provides specifics about the source of the earnings data, beyond saying that the data are from de-identified tax records. A report from the Executive Office of the President posted on the College Scorecard website provides more detail, explaining that earnings measures are based on tax records from the Department of the Treasury and include all wages and deferred compensation reported on all W-2 forms plus all self-employment earnings from Schedule SE.[34] The fact that aggregate tax record data were allowed to be matched to student data for ED's College Scorecard demonstrates that it is possible to link individual data to the tax record data for the purposes of calculating the types of aggregate earnings outcomes included in that scorecard.

[31] See https://collegescorecard.ed.gov/.

[32] See "Fact Sheet: Empowering Students to Choose the College that is Right for Them," September 12, 2015, Washington DC: The White House, Office of the Press Secretary.

[33] See https://collegescorecard.ed.gov/data/documentation/.

[34] See "Using Federal Data to Measure and Improve the Performance of U.S. Institutions of Higher Education," January 2017, Washington, DC: Executive Office of the President.

It remains unclear why IMPAQ was unable to gain access to SSA earnings data whereas ED was able to access the same data (i.e., tax record data) for the College Scorecard.[35]

Though IMPAQ was successful in arranging for and completing a link between state administrative data and NDNH earnings data, the amount of time and resources it took to do so invites skepticism that the NDNH is a viable data source for use in a national approach to scorecards. Moreover, if DOL were interested in facilitating state matches to NDNH data for the purpose of creating scorecards, the department would have to demonstrate to OCSE how that use satisfies OCSE's legal requirements for release of the data. It is uncertain how OCSE would judge DOL's justification or if that judgment would remain consistent over time.

Lessons Learned Regarding the Use of State versus National Data to Calculate Outcomes. Using both single-state UI wage records from each of the three states along with the NDNH (which covers all states) employment- and earnings-related outcome measures like those typically included in existing state scorecards were compared. That analysis led to a number of conclusions about how the outcome measures vary by data source and about how those variations differ by state, characteristics of trainees, and characteristics of training programs. The most important of these conclusions are:

1. **In states like Missouri and Ohio, scorecard measures based on single-state UI data are not meaningfully different than if they were based on national data.**

   The trainees in the samples from Missouri and Ohio were very similar to each other in terms of their demographic characteristics, the types of training they received, and their employment and earnings histories prior to beginning training. Moreover, the two states are similar to one another in that both have some major labor markets that cross state borders but are centered within the state. Because the two states and their respective samples of trainees are so similar, it is perhaps unsurprising that comparing employment- and earnings-related outcomes based on state wage records and the NDNH yield similar results.

   In both states, there were virtually no differences in either employment rates or average earnings when calculated using the two data sources. Differences in employment rates were less than 4 percentage points for both states across all follow-up periods considered. Likewise, average quarterly earnings were no more than 4 percent higher when based on the NDNH data than when based on the state wage record data.

[35] SSA's earnings data are contained in its Master Earnings File (MEF), which derives its data from W-2 forms and other tax records. See Olsen, A., and R. Hudson, "Social Security Administration's Master Earnings File: Background Information." *Social Security Bulletin* 69 (3), 2009.

2. **In states like New Jersey, scorecard measures based on single-state UI data are underestimated due to missing data on trainees who work in other states.**

   The trainees in the sample from New Jersey were different in many regards from the samples of trainees in the other two states. Furthermore, New Jersey itself is very different from Missouri and Ohio. It is much smaller and there are major metropolitan areas near its borders, such as New York City and Philadelphia. In contrast to the border labor markets in Missouri and Ohio, in which the centers of the metropolitan areas were generally *within* the state, the centers of the border labor markets in New Jersey were generally *outside* the state. Given these collective differences, the expectation was to observe different results for New Jersey than for the other states.

   The results show that for New Jersey, significant substantive differences are apparent between labor market outcomes based on single-state wage record data versus NDNH data covering all states. When based on the NDNH data, employment rates were between 8 and 50 percentage points higher, and average quarterly earnings between 2 percent lower and 20 percent higher, than when based on the state data.

3. **Among trainees with out-of-state earnings, the out-of-state earnings are most likely to come from nearby states within the same region.**

   Because the NDNH identifies the state associated with each quarterly earnings record in the database, the data made it possible to examine the prevalence of earnings from each state in the U.S. among trainees who had any out-of-state earnings. Understanding how likely trainees with out-of-state earnings are to have earnings from neighboring states or distant states can shed light on whether regional data or national data on employment- and earnings-related outcomes offer the most effective way to increase the accuracy of these measures in scorecards.

   Among the three states in the study, for trainees with any out-of-state earnings those earnings were most often from nearby states. In both Missouri and Ohio, four of the 10 states with the greatest representation among out-of-state earnings records were states that shared a border with Missouri or Ohio. This was mostly true for New Jersey as well—New York and Pennsylvania were the two most common states from which trainees had out-of-state earnings—though it was also relatively common for trainees in New Jersey to have such earnings from far more distant states (California, Florida, and Texas).

4. **Differences in outcome measures based on state versus national data are more common for more highly educated trainees and trainees in particular industries. Other relationships vary across the three states.**

   Beyond simply comparing outcome measures by data source, the analysis explored whether the differences by data source were associated with characteristics of trainees or of the training programs in which they participated. Cross-tabulations revealed that more highly educated trainees were more likely to have higher earnings in the NDNH than

in the state wage record data. They also showed that few other factors were associated with differences in earnings between the two data sources.

Regression analyses of the likelihood that a trainee would have higher earnings in the NDNH than in the state data indicated a small number of important factors—the trainees most likely to fall into this category were trainees with higher educational attainment, those who received training in the management or transportation industries, and (for Ohio and New Jersey) those who participated in training programs near the state border.

5. **Differences in outcome measures based on state versus national data can depend on the length of the follow-up period, becoming more pronounced for longer-term measures.**

   For New Jersey, the differences between employment rates by data source, and between average quarterly earnings by data source, were smaller for shorter follow-up periods than for longer ones. For instance, at the fourth quarter post-completion, the employment rate as measured by the NDNH data was only 8 percentage points higher than the employment rate as measured by state wage record data. The difference grew to 50 percentage points at the eighth and twelfth quarters post-completion.

   A similar pattern held for quarterly earnings. At the fourth quarter post-completion, average earnings as measured by NDNH data were only 5 percent higher than average earnings as measured by the state wage record data. At the eighth quarter post-completion, the difference increased to 15 percent; by the twelfth quarter, the difference was 20 percent.

   The results for New Jersey suggest that, to the degree that employment- and earnings-related outcome measures based on single-state wage records are underestimates because they omit data on trainees that work out of state, the bias is especially problematic for longer-term follow-up periods.

Recommendations. The primary objective of this project was to learn whether it would be feasible for DOL to facilitate the more widespread dissemination of education and training program scorecards, by working with states to match individual-level data on trainees to national databases of employment and earnings. A second objective was to understand how typical scorecard outcome measures compare when based either on single-state wage record data or on data from a national database.

This report describes not only the challenges faced as the study progressed but also what was learned—in terms of both whether national databases may be used for the purpose envisioned by DOL, and how outcome measures based on state and national data compare to one another. Under current conditions, it is not feasible for DOL to facilitate state scorecards linked to national data sources. But given the study results that there may be little difference between using single-state data and national data for many states (those more similar to Missouri and Ohio than to

New Jersey), it may not be necessary for DOL to make national data available for state scorecards to support their development.[36]

Based on what was learned through this study, IMPAQ offers the following recommendations for DOL to consider as it seeks to support making education and training program scorecards more widely available to the public:

1. **Work with OCSE/HHS to streamline the process of accessing the NDNH.**

   IMPAQ's experience demonstrated that, although it is possible to match trainee data from states to data from the NDNH, the process takes so much time and effort that it is not a realistic alternative for increasing the availability of state scorecards. DOL may be able to work with OCSE to streamline the process, to make it quicker and easier to make the arrangements necessary to access and use the NDNH data. If this could be done, perhaps it may enable DOL to facilitate state matches to the NDNH for the scorecard reporting purposes.

2. **Encourage and/or help foster regional wage record data sharing among groups of states. Consider developing regional data centers to facilitate data sharing and support scorecard development.**

   Single-state wage record data and databases with national coverage represent opposite ends of a spectrum in terms of data sources for use in calculating labor market outcomes reported in scorecards. Another alternative is for regional groups of states to establish their own data sharing agreements to allow the group to share their respective wage records. Some such regional efforts already exist, as exemplified by the Washington Interstate Commission on Higher Education (WICHE). Because earnings from other states are typically from nearby states, regional data sharing arrangements would likely capture most of the information missing from single-state data alone.

   If DOL can support development of regional data sharing arrangements, it may achieve two ends. First, it may help improve the quality of existing scorecards by providing participating states with more comprehensive outcomes data. Second, it may help states without scorecards to develop them, through creating stronger links among states that lack strong internal capacity to produce scorecards and neighbor states that may possess that capacity.

   A regional approach could be facilitated and expanded through the creation of regional data centers. Such a data center could facilitate data sharing within a region and might also either prepare scorecards for states in the region that do not have their own or otherwise assist with the development of scorecards. Moreover, such data centers might

[36] One important caveat is that this is true only to the degree that our results, which are based on WIA/WIOA training completers, are relevant for broader populations.

also provide a single gateway for researchers and others interested in using the data for research purposes to apply for permission to do so.

3. **Identify ways to enable information sharing among states, so states without scorecards may learn from those that have been successful at creating and maintaining them.**

   As IMPAQ observed in the study preceding this one—which, in part, assessed the prevalence of scorecards among states that had received Workforce Data Quality Initiative (WDQI) grants—some states have been willing and able to develop and maintain education and training program scorecards, but many have not. Since that study, there has been some evidence that more states have been working to develop scorecards. The most recent report on an annual survey of states regarding their status in sharing workforce data and in creating scorecards (among other things) found that 23 states had created scorecards for students and workers, 17 were working toward that goal, and only 11 had made minimal progress to do so.[37] To support this progress and increase scorecard availability, DOL could look for ways to support information sharing among states. This could allow states interested in creating scorecards to leverage what other states have done without starting from scratch.

   The newest WDQI grants (to be awarded in July) may offer an opportunity in this regard.[38] If some of the newest grantees expect to use their grants to develop or improve education and training program scorecards, DOL might support peer-learning among those states and others.

Concluding Remarks. When this study began, IMPAQ expected to work with up to three states to compare outcome measures based on single-state UI wage record data to federal tax record data on income, from the SSA. One key objective of the study was to document the process of linking the state and federal data and to describe, based on that experience, the feasibility of using national data for scorecards. Work on this project revealed the challenges associated with successfully completing these kinds of data linkages. It became increasingly clear that what IMPAQ sought to do would not be easy, and that linking the data would depend on both federal and state stakeholders supporting the study and interpreting favorably the associated legal necessities. Ultimately, IMPAQ was able to link state data on trainees to a national database of earnings, though the process took much longer than originally anticipated. Once the output data was received, IMPAQ was able to analyze the differences between outcome measures based on state versus national data and to consider the implications of the results for efforts to complement state efforts to develop or enhance education and training program scorecards. The optimistic conclusion is that both the lessons learned about the existing challenges to using

[37] See "Mastering the Blueprint 2016: State Progress on Workforce Data," November 2016. Washington, DC: Workforce Data Quality Campaign. Available online at http://bit.ly/2htdEN4.

[38] See the WDQI Round 6 Funding Opportunity Announcement (FOA) at https://www.doleta.gov/grants/pdf/FOA-ETA-17-01.pdf. Page 2 of the FOA identifies one of the objectives of the grant as to allow state workforce agencies to "provide user-friendly information to help customers select the education and training programs that best suit their needs."

national data sources and the results of the quantitative analyses will prove useful to policymakers—as they continue working to provide the public with more and better information to help them make important decisions about their individual human capital investments.

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APPENDIX A. SSA AND NDNH DATA COLLECTION EFFORTS

One of the main objectives of this study was to access national databases of earnings—to learn about their potential for use as a source of information on labor market outcome data for use in education and training program scorecards. In this Appendix, we detail our experience attempting to obtain data from both the SSA and the NDNH.

A.1 Requesting SSA Data

At the outset of the study, one national database we expected to include was earnings data maintained by SSA. Our understanding was that the agency maintains an archive of individual tax return data on the universe of American taxpayers and that it was possible for SSA to provide an extract of the database to us, provided certain precautions were taken to protect data security. In fact, one motivation for this research study was the apparent potential for accessing SSA data. As part of an earlier study, we had preliminary conversations with representatives at SSA's Office of Data Exchange (ODX),[39] and explained what we proposed to do. Our plan at the time involved two steps.

First, we planned to provide to SSA individual-level data on students (at the time, our focus was on obtaining a sample of students in postsecondary education programs) from a number of states. Importantly, we planned to create a number of groups, each of which would correspond to a particular combination of individual characteristics (e.g., all males ages 18-24 with no high school diploma). When constructing the groups, we would take care to ensure that no group contained fewer than five individuals. We expected to include as part of the input data sent to SSA a variable that would identify the group to which each individual belonged.

Second, SSA would match individuals in the input data to its archive of earnings data. After this, SSA would use the earnings data to calculate aggregate labor market outcome measures, such as employment rates and average earnings. These measures were to be calculated *for each group* in the data, and the results delivered to us for analysis. Because the measures would therefore not represent individual-level information, we felt that SSA would agree to collaborate with us.

The reason for grouping the input data was twofold. First, it would prevent any potential for re-identification of individuals in the output data SSA was to send to us. Because the results would represent aggregate figures for groups of five or more, there was no risk that the output data could be used to identify a single person and his/her earnings information. Second, splitting the data into groups would allow us to analyze how differences between measures based on single-state UI data versus the SSA tax record data varied with characteristics of individuals or the programs in which they participated. For example, using the structure of the groups, we could compare aggregate earnings for two groups of trainees that differed only with respect to a single characteristic, such as gender. The comparison would thus tell us something about whether

[39] For a description of ODX and its responsibilities, see https://www.ssa.gov/dataexchange/.

differences across outcome measures are associated with gender, with other factors held constant.

When we explained what we proposed to do, as described above, our contact at ODX indicated that she understood what we intended to do. Moreover, she told us that the study was feasible and that SSA would be able to work with us to provide the aggregated results. Our contact further noted that what we proposed to do sounded very similar to an ongoing project involving researchers working with the U.S. Department of Education (ED). She indicated that the other project had executed an agreement with SSA, and that modeling our request after the ED agreement might expedite approval for our work. After learning of the ED project, we asked our SSA contact to: (1) provide us with a copy of the ED agreement to review, (2) tell us the approximate cost associated with obtaining the data for the ED project, and (3) speak to others at SSA about the potential for us to receive individual-level rather than aggregate data. She responded affirmatively to our requests. In addition to discussing our proposed study with us, she provided us with a copy of a data request form we would need to submit when we were prepared to move forward.

The current study began in June 2014. In July 2014, we contacted the same person at SSA and asked about the status of the three requests we had made earlier. By September 2014, our messages had not been returned. At that time, the U.S. Department of Labor (DOL) initiated contact with the person at SSA we had been trying to reach, to help us get a response. A different SSA representative replied to DOL's message within a week. Shortly thereafter, DOL was provided with a copy of the same data request form we had received earlier.

We worked with DOL to prepare the data request form as expeditiously as possible. This involved identifying appropriate legislative authority for the release of tax record data to support the project. DOL delivered the completed form to SSA in October 2014.

In January 2015, DOL received a message from an SSA representative indicating that the Office of General Counsel at SSA had reviewed the data request and had concluded that SSA was unable to enter provide the data. Citing Internal Revenue Code 26 U.S.C. § 6103, the message indicated that SSA is prohibited from using and releasing earnings data in any form—including individual-level or aggregate data, though SSA offered to review any alternate legal authority DOL could supply that might support the data release.

Shortly after being informed of SSA's decision, we discussed with DOL whether there was any merit in continuing our attempt to obtain tax record data from SSA. Because of the tremendous value of the SSA data to the study as originally designed, DOL continued discussions with SSA in February and March 2015, including an in-person meeting. DOL drafted a revised version of the data request form, in consultation with DOL's Office of the Solicitor, and resubmitted it to SSA in April 2015. In May 2015, DOL had not received a decision from SSA regarding the revised data request. By August 2015, we had begun working under the assumption that SSA data would not be available for the study.

A.2 Collecting NDNH Data

Beginning in October 2014, we worked in collaboration with DOL to prepare a research request form for submission to the Office Child Support Enforcement (OCSE), U.S. Department of Health and Human Services (HHS). Finalizing the form took time, as it requires the applicant to clearly identify both the legal justification for the data release and how the proposed study will support the mission of OCSE. DOL submitted the research request in January 2015. DOL was then notified in March 2015 that the research request had been approved, and that OCSE would follow up to arrange a conference call to discuss how the project would move forward.

Executing the MOU. After the research request was approved, we and DOL supplied additional information to OCSE regarding the request (e.g., our expected sample size, frequency of the match). In May 2015, OCSE arranged for a conference call between OCSE, DOL, IMPAQ, and the state of Ohio. At that time, Ohio was the only state that had committed to participate in the study. At our request, a representative from New Jersey joined the call, as it already anticipated that it would ultimately participate in the project. On the call, we gave a high-level explanation to OCSE of how we understood the data transfer process would work, described the expected timing of when we would submit the input data files to be matched to the NDNH, and answered OSCE questions—helping identify some issues related to the data transfer that were subsequently resolved.[40] As New Jersey and eventually Missouri joined the study, we worked with DOL and OCSE to ensure that all parties understood how the NDNH match process would work, what the responsibilities of each party were, and the project timeline. The match was then planned for December 2015.

Before OCSE will match individual-level input data to the NDNH and deliver the output data, the agency requires that the organization sponsoring the match execute two legal documents: an MOU, and a Reimbursement Agreement (RA). The RA describes the cost of the NDNH match and identifies the terms of payment. The only parties to the RA are OCSE and the sponsoring organization. The MOU is more comprehensive; it describes all of the terms of the proposed match, including:

- Purpose of the research
- Number of records to be matched, analysis variables to be included in the input data files, and NDNH data elements to be included in the matched output data
- Data security requirements governing the transfer of the input data to OCSE, transfer of matched output data to the receiving organization, storage of the output data, access to the output data, data destruction, and other requirements
- How long the output data may be stored
- Conditions governing the reporting of research results based on NDNH data

[40] For example, in response to a discussion about transferring the output data to DOL via a CD-ROM, Ohio noted that state law in Ohio expressly prohibits writing OLDA data to physical media.

For this study, the MOU was considerably more complex than MOUs for other research studies. In general, when the NDNH has been accessed to support DOL research, it has been for impact evaluation studies for which the NDNH is used to gather follow-up data on the labor market outcomes of program participants. In these cases, the parties to the MOU are relatively straightforward, as are the data transfer processes. For this study, however, we proposed to have three different states send input data to OCSE. Moreover, we intended for the matched output data not to be returned to the states but delivered to DOL, where our researchers would access them for analysis. Successfully executing the MOU for this study, therefore, involved successfully preparing an agreement that would govern the NDNH match for this project among three states, DOL, and OCSE.[41]

On October 2, 2015, OCSE circulated a draft of MOU to all three states and to DOL for review and comment. OCSE asked each party to reply with any comments, changes, or edits to the draft. Because we had been working with the three states, IMPAQ worked with all three to explain what needed to be done, and to answer questions from the states as they arose. The MOU review process and its outcome was different in each state:

- In Ohio, CHRR returned a marked-up copy of the MOU to OCSE on October 9. The document had been reviewed by both the OSU general counsel and a representative of the Ohio Department of Job and Family Services (ODJFS). Ohio indicated to us that this would represent the first time individual-level OLDA data, including personally identifiable information, would be shared with a federal agency for research purposes. One change Ohio requested to the MOU was an addendum, applicable only to Ohio, that addressed specific data security concerns.
- New Jersey replied to OCSE on October 23 that it had completed its review of the MOU and had no comments, edits, or requested changes.
- Missouri replied to OCSE on October 23 that the state agencies involved had completed their reviews of the MOU. Missouri requested a series of minor changes, many of which were simply to identify the appropriate agencies or individuals referenced in, or expected to sign, the MOU.

The state-level MOU review process was thus complete by the end of October 2015, with all states having returned their requested changes to OCSE. The review process at DOL took longer. Because of the further delay, it became clear that the match would not occur in December 2015 as originally planned. Although this implied that the window of overlap between the state data and the NDNH data would get progressively smaller as time went by, we and DOL agreed that the delay did not jeopardize our ability to complete the study. DOL ultimately completed its review of the MOU and delivered a marked-up version to OCSE in February 2016.

After receiving feedback from all three states and DOL, OCSE began to review the requested changes and to finalize the MOU. An OCSE representative indicated that OCSE expected to

[41] IMPAQ itself was not formally a party to the MOU. Rather, as a DOL contractor, selected members of IMPAQ's research staff were identified as authorized users of the output data.

circulate the final draft no later than May 15, 2016. In the meantime, representatives of the office at OCSE that oversees the technology infrastructure and processes related to data transfers contacted both the three states and DOL to begin the process of establishing and testing data transfer connections.

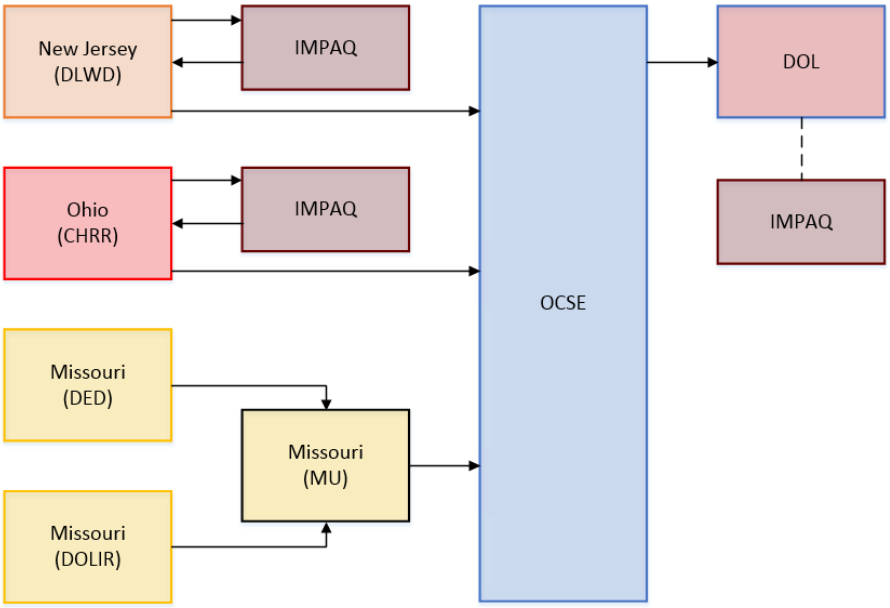
The revised MOU was distributed to states and DOL on June 8, 2016. At that time, OCSE requested that DOL coordinate with the states to review the document once more. As with the first review, IMPAQ acted as the primary liaison to the three states, to assist them with the final review. In Ohio, the final review was expected to be somewhat more substantive than in the other two states, since the Ohio-specific addendum that had been proposed was rejected by OCSE.[42] Ohio indicated to us that because the proposed addendum was not accepted, the MOU would have to be reviewed again by OSU's general counsel. In addition to the reviews by the states, DOL also reviewed the revised MOU, accepting changes proposed by OCSE and supplying information to address OCSE questions. All three states confirmed acceptance of the revised MOU by the end of June. DOL returned the MOU to OCSE on July 1, indicating that the document was ready for OCSE's final review and signature. On July 18, OCSE returned a newly revised version of the MOU to DOL and asked that DOL review the changes and coordinate reviews by the states. The MOU was virtually unchanged, and all states quickly confirmed acceptance. DOL returned the MOU to OCSE on July 20.

OCSE distributed the final copy of the MOU to DOL for signature by DOL and the states on July 22. IMPAQ then worked with all three states to gather the necessary signatures from representatives in each state and to compile them for DOL. DOL sent all required signatures to OCSE on August 23. OCSE countersigned the MOU on August 30 and delivered the final, executed MOU to DOL on August 31, 2016—roughly 19 months after our NDNH research request had been approved.

As reflected in the MOU, the process of matching the state data to the NDNH data involved working with all three states, DOL, and OCSE. Exhibit 23 diagrams the relationships between the organizations involved in the different data transfers required for the study. For New Jersey and Ohio, the diagram shows the transfer of raw data to IMPAQ, the transfer of the prepared study files from IMPAQ back to the state, and the transfer of the study data from the state to OCSE. For Missouri, two state agencies provided the raw data to a researcher at the University of Missouri (MU), who then prepared the study files and arranged for their transfer to OCSE. Thus, each of the three states were to provide the input data files to OCSE. After matching the input data to the NDNH, OCSE would then transfer the matched output data files to DOL. DOL would host the output data on a secure server, to which DOL would provide access by two authorized IMPAQ researchers, as indicated by the dashed line.

[42] OCSE indicated that, in its view, the language in Ohio's proposed addendum was redundant, since the issues raised were covered by security language elsewhere in the MOU.

Exhibit 23: Data Transfer Relationships



After execution of the MOU, the only required tasks yet to be completed before IMPAQ could access the output data were: (1) for an Interconnection Security Agreement (ISA) to be executed between DOL and OCSE, and (2) for DOL to provide the two IMPAQ researchers with user names and passwords for logging into the DOL server. The ISA—which required signatures from representatives of DOL, OCSE, and SSA—specified the requirements of the transfer of the matched NDNH output data from OCSE to DOL.[43] Until the ISA was executed, OCSE could not transfer any data for the study to DOL. OCSE sent the ISA to DOL for final clearance in August 2016.

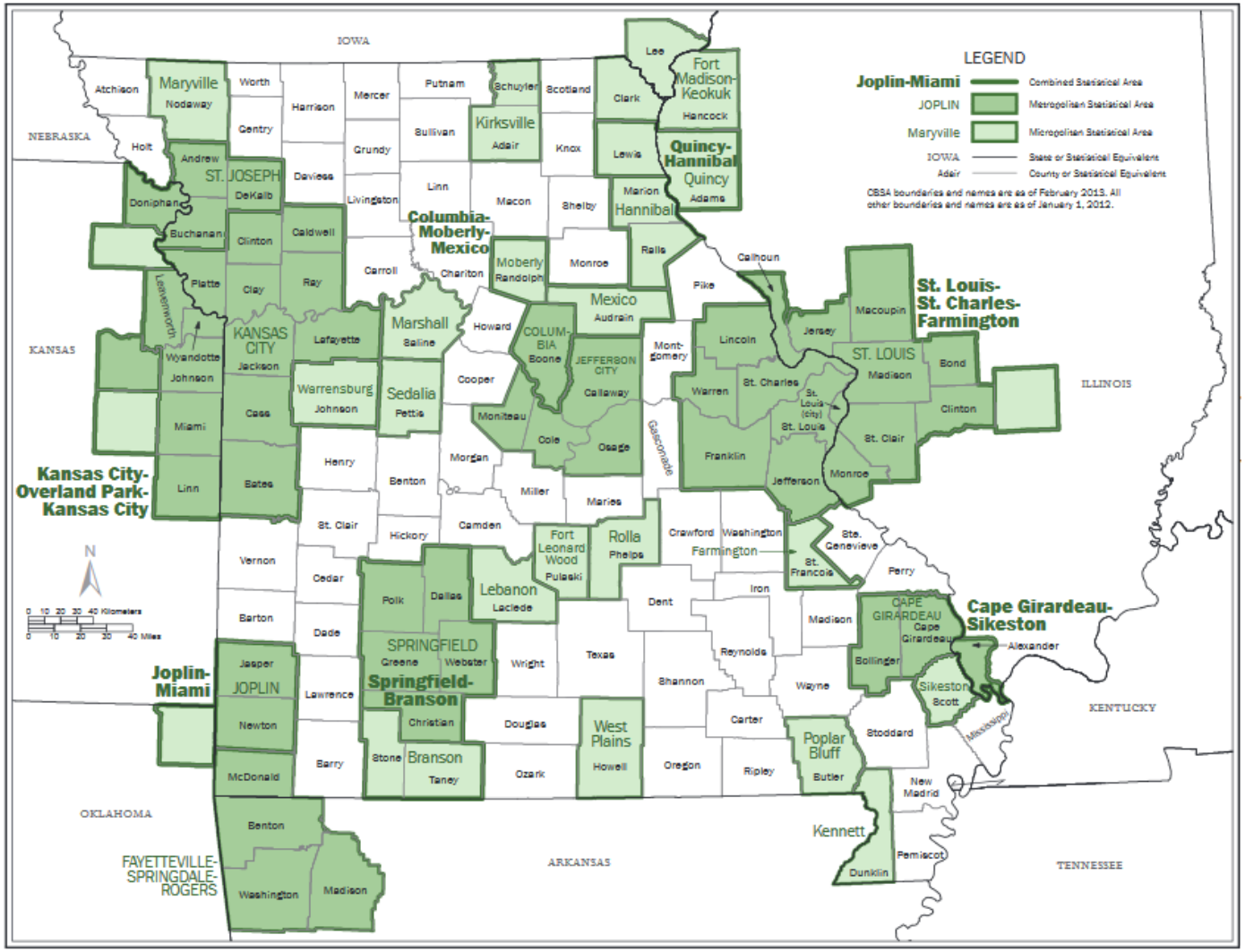
Transferring the Data. Shortly after the MOU was executed, IMPAQ worked with the states and OCSE to facilitate the transfer of the input data files. All of these were transferred to OCSE by September 9, 2016. Within a week, though the ISA had not yet been executed, IMPAQ asked OCSE if it would be possible for OCSE to perform the NDNH match and then hold the output data until the ISA was executed. Because OCSE regularly deletes the oldest earnings records in the NDNH database, IMPAQ preferred this approach, since it would preserve the maximum amount of overlap between the coverage of the state earnings data and the NDNH data. OCSE approved the request, and each of the state input files was processed shortly thereafter—Missouri's on September 20, New Jersey's on September 21, and Ohio's on September 27.[44] At that point, the output data were held by OCSE pending successful execution of the ISA.

[43] SSA is a party to the agreement because the legal authority for the disclosure of NDNH data for research purposes comes from subsection 453(j)(5) of the Social Security Act.

[44] Ohio's input files were first processed on September 22 and processed again on September 26. Both of these first two attempts resulted in errors that were successfully corrected by OCSE.

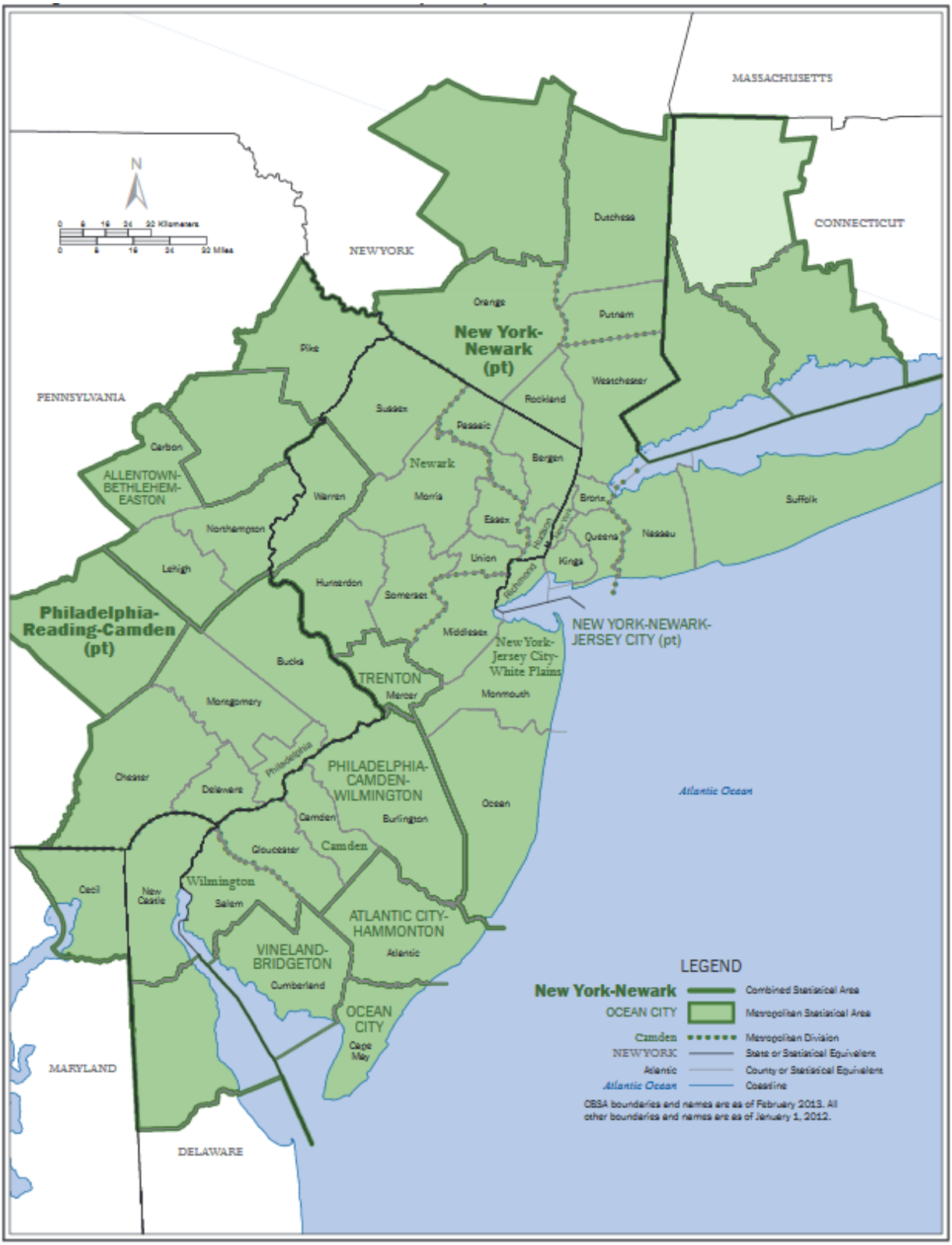
The final ISA was forwarded to SSA for final signatures by OCSE on February 28, 2017. On March 21, DOL was notified by OCSE that the ISA had been executed (its effective date was March 13, 2017, when signatures were completed by SSA representatives). Shortly thereafter, DOL and OCSE began discussions to make the necessary arrangements to transfer the output data to DOL. Finally, on April 18, IMPAQ received credentials for logging into the DOL server. The next day, IMPAQ confirmed that the credentials worked and that we could access the data.

Exhibit 24: Map of Missouri



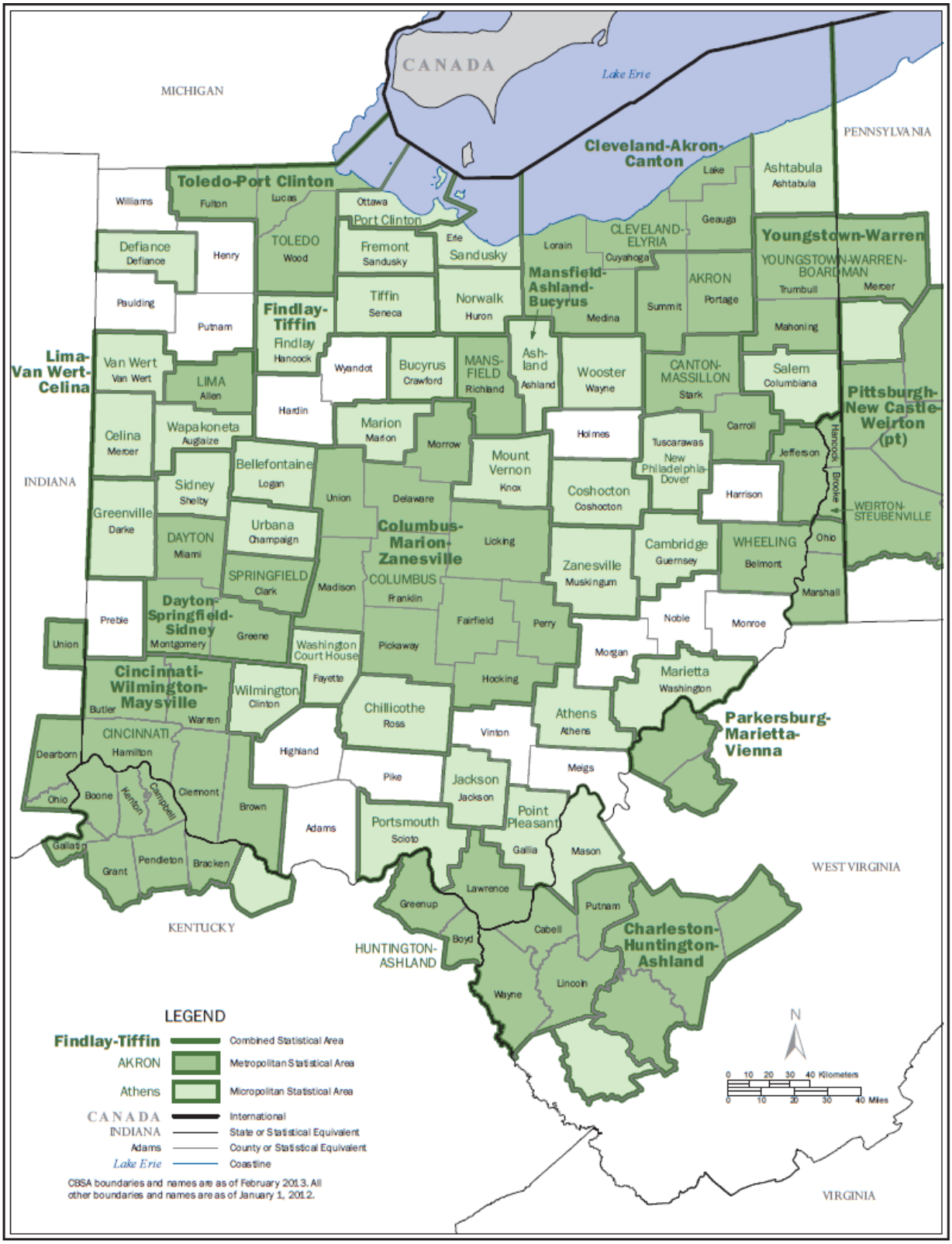
Source: https://www2.census.gov/geo/maps/metroarea/stcbsa_pg/Feb2013/cbsa2013_MO.pdf

Exhibit 25: Map of New Jersey



Source: https://www2.census.gov/geo/maps/metroarea/stcbsa_pg/Feb2013/cbsa2013_NJ.pdf

Exhibit 26: Map of Ohio



Source: https://www2.census.gov/geo/maps/metroarea/stcbsa_pg/Feb2013/cbsa2013_OH.pdf

APPENDIX C. JOINT EARNINGS DISTRIBUTIONS, BY FOLLOW-UP PERIOD AND STATE

Exhibit 27: Joint Earnings Distribution, 1 Quarter Post-Completion, Missouri

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	80.5	5.5	4.7	4.1	2.7	1.5	1.1	100.0
	Greater than zero, less than $2,500	7.5	88.4	2.1	0.9	0.6	0.6	0.0	100.0
	At least $2,500, less than $5,000	11.3	1.7	84.8	1.7	0.5	0.0	0.0	100.0
	At least $5,000, less than $7,500	9.4	0.4	0.5	88.2	0.5	1.0	0.0	100.0
	At least $7,500, less than $10,000	8.3	0.4	0.0	0.0	89.2	1.2	0.8	100.0
	At least $10,000, less than $15,000	7.1	0.6	0.0	0.0	0.3	89.5	2.5	100.0
	At least $15,000	5.6	0.0	0.0	0.0	0.0	0.8	93.7	100.0
Total		25.2	19.8	16.2	17.5	10.7	7.4	3.2	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 28: Joint Earnings Distribution, 4 Quarters Post-Completion, Missouri

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	72.5	4.9	3.9	3.7	6.5	5.2	3.2	100.0
	Greater than zero, less than $2,500	8.1	85.9	2.6	1.3	0.9	0.9	0.4	100.0
	At least $2,500, less than $5,000	12.1	1.9	82.1	2.3	0.5	1.0	0.2	100.0
	At least $5,000, less than $7,500	11.0	0.6	0.6	86.1	0.9	0.5	0.4	100.0
	At least $7,500, less than $10,000	8.7	0.5	0.0	0.4	87.4	1.6	1.4	100.0
	At least $10,000, less than $15,000	8.9	1.0	0.0	0.0	0.0	88.8	1.2	100.0
	At least $15,000	7.0	0.0	0.5	0.0	0.0	0.5	91.9	100.0
Total		24.8	11.4	13.5	18.9	13.7	12.3	5.3	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 29: Joint Earnings Distribution, 8 Quarters Post-Completion, Missouri

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	76.3	2.7	4.3	4.8	3.9	4.6	3.4	100.0
	Greater than zero, less than $2,500	9.5	84.1	1.7	1.7	1.6	0.9	0.5	100.0
	At least $2,500, less than $5,000	10.6	0.5	86.1	1.4	1.0	0.4	0.0	100.0
	At least $5,000, less than $7,500	5.7	0.8	0.4	90.6	1.2	1.0	0.4	100.0
	At least $7,500, less than $10,000	10.6	0.3	0.0	0.3	87.6	0.5	0.8	100.0
	At least $10,000, less than $15,000	8.0	0.1	0.0	0.4	0.1	90.2	1.1	100.0
	At least $15,000	9.2	0.0	0.0	0.6	0.0	0.6	89.5	100.0
Total		27.8	9.3	13.0	17.6	13.2	13.0	6.1	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 30: Joint Earnings Distribution, 12 Quarters Post-Completion, Missouri

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	74.5	3.4	4.3	4.4	4.4	5.2	3.7	100.0
	Greater than zero, less than $2,500	10.7	84.8	1.8	1.2	0.4	0.6	0.6	100.0
	At least $2,500, less than $5,000	11.3	1.4	85.2	1.2	0.4	0.1	0.4	100.0
	At least $5,000, less than $7,500	12.2	0.5	0.3	85.8	0.4	0.7	0.1	100.0
	At least $7,500, less than $10,000	9.6	0.1	0.3	0.5	88.3	0.9	0.2	100.0
	At least $10,000, less than $15,000	8.2	0.3	0.0	0.1	0.4	90.2	0.8	100.0
	At least $15,000	7.4	0.0	0.0	0.0	0.0	0.0	92.6	100.0
Total		29.7	8.4	12.0	16.4	14.2	13.1	6.1	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 31: Joint Earnings Distribution, 1 Quarter Post-Completion, New Jersey

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	59.5	14.9	9.6	7.2	3.2	2.9	2.8	100.0
	Greater than zero, less than $2,500	5.1	91.1	1.4	1.0	0.4	0.5	0.4	100.0
	At least $2,500, less than $5,000	5.9	1.0	91.2	1.3	0.1	0.5	0.0	100.0
	At least $5,000, less than $7,500	4.8	1.0	0.2	92.3	0.7	0.7	0.3	100.0
	At least $7,500, less than $10,000	6.1	1.1	0.0	0.3	90.9	1.4	0.3	100.0
	At least $10,000, less than $15,000	3.9	0.3	0.0	0.0	0.0	95.4	0.3	100.0
	At least $15,000	5.1	0.0	1.1	0.0	0.6	1.1	92.1	100.0
Total		35.7	18.9	16.1	12.3	6.8	6.2	4.1	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 32: Joint Earnings Distribution, 4 Quarters Post-Completion, New Jersey

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	70.1	6.2	5.4	5.3	3.9	4.0	5.1	100.0
	Greater than zero, less than $2,500	6.7	89.0	1.4	0.7	1.0	0.4	0.8	100.0
	At least $2,500, less than $5,000	6.5	1.0	90.9	0.5	0.5	0.3	0.2	100.0
	At least $5,000, less than $7,500	6.3	0.0	0.6	91.1	0.9	0.9	0.2	100.0
	At least $7,500, less than $10,000	6.8	0.6	0.3	0.1	91.6	0.3	0.4	100.0
	At least $10,000, less than $15,000	7.2	0.5	0.6	0.3	0.0	90.6	0.8	100.0
	At least $15,000	5.7	0.3	0.0	0.0	0.0	0.0	94.0	100.0
Total		31.8	12.6	13.8	14.4	10.8	9.4	7.1	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 33: Joint Earnings Distribution, 8 Quarters Post-Completion, New Jersey

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	37.0	9.9	10.6	12.1	10.2	12.4	7.7	100.0
	Greater than zero, less than $2,500	12.4	84.7	0.9	1.2	0.3	0.6	0.0	100.0
	At least $2,500, less than $5,000	7.0	0.9	89.5	1.7	0.3	0.6	0.0	100.0
	At least $5,000, less than $7,500	8.7	0.6	0.6	88.4	0.6	0.3	0.6	100.0
	At least $7,500, less than $10,000	11.8	0.9	0.0	0.0	86.4	0.9	0.0	100.0
	At least $10,000, less than $15,000	8.5	0.5	0.0	0.5	0.9	89.2	0.5	100.0
	At least $15,000	4.7	0.8	0.0	0.0	0.0	0.0	94.5	100.0
Total		32.0	11.7	12.3	13.3	10.6	12.4	7.8	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 34: Joint Earnings Distribution, 12 Quarters Post-Completion, New Jersey

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	41.9	8.4	10.4	11.5	9.9	10.9	6.9	100.0
	Greater than zero, less than $2,500	8.2	85.3	0.8	2.9	2.0	0.8	0.0	100.0
	At least $2,500, less than $5,000	9.6	0.4	88.6	0.9	0.0	0.0	0.4	100.0
	At least $5,000, less than $7,500	6.7	0.4	1.7	88.7	2.5	0.0	0.0	100.0
	At least $7,500, less than $10,000	8.3	0.0	0.7	0.0	89.0	1.4	0.7	100.0
	At least $10,000, less than $15,000	4.6	0.8	0.0	0.0	0.0	93.1	1.5	100.0
	At least $15,000	12.9	0.0	0.0	0.0	0.0	1.1	86.0	100.0
Total		37.9	9.8	11.5	12.5	10.3	11.0	7.0	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories..

Exhibit 35: Joint Earnings Distribution, 1 Quarter Post-Completion, Ohio

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	81.2	3.4	4.2	5.0	3.2	2.1	0.9	100.0
	Greater than zero, less than $2,500	8.6	84.9	4.0	1.2	0.7	0.7	0.0	100.0
	At least $2,500, less than $5,000	8.6	4.5	84.9	0.8	0.7	0.3	0.2	100.0
	At least $5,000, less than $7,500	9.2	2.2	2.0	84.7	1.1	0.4	0.5	100.0
	At least $7,500, less than $10,000	8.8	1.6	0.5	2.1	85.5	1.3	0.3	100.0
	At least $10,000, less than $15,000	11.3	0.7	0.3	1.4	1.0	83.2	2.1	100.0
	At least $15,000	17.0	1.1	1.1	0.0	1.1	3.4	76.1	100.0
Total		27.0	17.2	17.4	16.2	11.3	8.3	2.6	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 36: Joint Earnings Distribution, 4 Quarters Post-Completion, Ohio

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	81.1	2.4	3.7	3.5	4.2	3.4	1.7	100.0
	Greater than zero, less than $2,500	9.4	84.1	1.8	2.1	1.3	1.0	0.3	100.0
	At least $2,500, less than $5,000	10.0	2.9	84.6	1.4	0.0	1.1	0.0	100.0
	At least $5,000, less than $7,500	10.9	1.9	1.5	85.2	0.3	0.2	0.0	100.0
	At least $7,500, less than $10,000	8.5	1.4	0.8	1.0	87.7	0.6	0.0	100.0
	At least $10,000, less than $15,000	7.7	0.6	0.4	0.4	0.2	89.7	0.9	100.0
	At least $15,000	7.1	0.0	0.6	0.6	0.0	0.6	91.0	100.0
Total		25.8	11.3	12.8	16.7	14.6	13.9	4.8	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 37: Joint Earnings Distribution, 8 Quarters Post-Completion, Ohio

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	82.2	0.8	2.9	3.2	3.5	4.8	2.6	100.0
	Greater than zero, less than $2,500	13.4	81.8	0.9	0.9	1.5	1.2	0.3	100.0
	At least $2,500, less than $5,000	9.9	2.2	86.0	0.4	0.4	0.6	0.4	100.0
	At least $5,000, less than $7,500	10.4	0.9	1.7	85.6	0.5	0.5	0.5	100.0
	At least $7,500, less than $10,000	10.7	1.0	0.0	1.9	85.9	0.5	0.0	100.0
	At least $10,000, less than $15,000	12.0	1.0	0.3	1.2	0.8	83.8	0.8	100.0
	At least $15,000	10.2	0.5	0.5	0.5	0.5	0.0	87.7	100.0
Total		29.1	8.2	12.3	16.2	14.5	14.5	5.2	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 38: Joint Earnings Distribution, 12 Quarters Post-Completion, Ohio

		NDNH							Total
		Zero	Greater than zero, less than $2,500	At least $2,500, less than $5,000	At least $5,000, less than $7,500	At least $7,500, less than $10,000	At least $10,000, less than $15,000	At least $15,000	
State Wage Records	Zero	81.3	2.2	2.7	2.6	2.6	5.6	3.0	100.0
	Greater than zero, less than $2,500	15.1	81.4	1.4	0.2	0.6	1.0	0.2	100.0
	At least $2,500, less than $5,000	11.2	3.8	83.6	0.6	0.3	0.2	0.3	100.0
	At least $5,000, less than $7,500	12.1	1.7	1.6	83.6	0.3	0.6	0.1	100.0
	At least $7,500, less than $10,000	9.4	0.5	0.4	0.8	88.0	0.7	0.2	100.0
	At least $10,000, less than $15,000	11.9	0.7	0.6	0.2	0.4	85.1	1.1	100.0
	At least $15,000	10.0	0.6	0.0	0.3	0.3	0.0	88.9	100.0
Total		31.1	8.5	10.5	14.0	14.0	15.4	6.6	100.0

Source: State administrative data on WIA/WIOA training completers.
Note: Table entries represent column percentages, showing how the trainees in a given earnings category in the state data are distributed among NDNH earnings categories.

Exhibit 39: Employment Rates by State, Data Source, and Race

	Missouri			New Jersey			Ohio		
	White	Black	Other	White	Black	Other	White	Black	Other
First quarter following quarter of training completion									
State wage records	75.8	75.4	64.2	41.6	46.5	45.0	75.3	75.3	74.1
NDNH	72.5	76.1	56.8	64.0	65.6	62.3	72.9	72.8	68.5
Difference	*-3.3*	*+0.7*	*-7.4*	*+22.4*	*+19.1*	*+17.3*	*-2.4*	*-2.5*	*-5.6*
Fourth quarter following quarter of training completion									
State wage records	76.7	76.2	60.5	60.7	60.1	59.0	77.2	76.5	78.6
NDNH	74.4	79.6	65.1	69.0	67.6	66.9	74.4	74.4	75.5
Difference	*-2.3*	*+3.4*	*+4.6*	*+8.3*	*+7.5*	*+7.9*	*-2.8*	*-2.1*	*-3.1*
Eighth quarter following quarter of training completion									
State wage records	72.6	70.3	75.6	18.5	18.7	16.4	75.6	-	-
NDNH	71.8	72.1	75.6	68.9	66.2	69.9	71.4	-	-
Difference	*-0.8*	*+1.8*	*0.0*	*+50.4*	*+47.5*	*+53.5*	*-4.2*	-	-
Twelfth quarter following quarter of training completion									
State wage records	71.2	65.6	61.7	10.3	14.0	11.3	72.7	-	-
NDNH	70.9	68.6	70.4	63.2	60.2	63.5	69.3	-	-
Difference	*-0.3*	*+3.0*	*+8.7*	*+52.9*	*+46.2*	*+52.2*	*-3.4*	-	-

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Exhibit 40: Quarterly Earnings by State, Data Source, and Race

	Missouri			New Jersey			Ohio		
	White	Black	Other	White	Black	Other	White	Black	Other
First quarter following quarter of training completion									
State wage records	$6,279 (4,714)	$5,804 (3,933)	$6,832 (5,135)	$6,826 (6,002)	$4,793 (4,328)	$7,619 (14,270)	$6,411 (5,212)	$4,921 (3,768)	$6,196 (4,790)
NDNH	$6,500 (4,923)	$5,854 (4,030)	$6,602 (5,192)	$6,563 (6,482)	$4,809 (4,683)	$7,292 (12,687)	$6,384 (5,712)	$4,949 (3,723)	$5,896 (5,288)
Difference	*+$221*	*+$50*	*-$230*	*-$263*	*+$16*	*-$327*	*-$27*	*+$28*	*-$300*
Fourth quarter following quarter of training completion									
State wage records	$7,197 (4,732)	$7,015 (5,525)	$7,151 (5,271)	$8,199 (6,695)	$5,723 (4,719)	$8,277 (6,835)	$7,773 (5,067)	$6,174 (4,348)	$7,142 (4,819)
NDNH	$7,484 (5,064)	$7,169 (5,581)	$7,527 (5,480)	$8,521 (7,121)	$6,017 (5,276)	$8,841 (7,831)	$7,854 (5,022)	$6,183 (4,567)	$7,143 (4,896)
Difference	*+$287*	*+$154*	*+$376*	*+$322*	*+$294*	*+$564*	*+$81*	*+$9*	*+$1*
Eighth quarter following quarter of training completion									
State wage records	$7,746 (5,309)	$7,094 (5,478)	$8,629 (5,741)	$8,367 (9,781)	$5,483 (4,767)	$7,573 (6,306)	$8,133 (4,929)		
NDNH	8,054 (5,599)	7,276 (5,558)	9,050 (5,745)	9,327 (8,145)	6,406 (5,127)	9,097 (7,402)	8,243 (5,184)	-	-
Difference	*+$308*	*+$182*	*+$421*	*+$960*	*+$923*	*+$1,524*	*+$110*		
Twelfth quarter following quarter of training completion									
State wage records	$7,926 (5,176)	$7,101 (5,310)	$8,174 (5,395)	$8,001 (6,568)	$5,641 (4,571)	$7,526 (7,108)	$8,490 (4,937)		
NDNH	$8,214 (5,539)	$7,343 (5,597)	$10,055 (6,060)	$9,396 (8,316)	$6,543 (5,158)	$8,924 (7,889)	$8,655 (5,138)	-	-
Difference	*+$288*	*+$242*	*+$1,881*	*+$1,395*	*+$902*	*+$1,398*	*+$165*		

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Exhibit 41: Employment Rates by Data Source and Educational Attainment, Missouri

	Less than a High School Diploma	High School Diploma	GED or Equivalent	Some College	Associate Degree	Bachelor's Degree	More than Four Years of College	Other
First quarter following quarter of training completion								
State wage records	70.1	76.4	72.4	77.1	68.1	76.2	72.3	84.4
NDNH	63.8	74.7	72.6	71.7	68.1	73.8	75.2	78.4
Difference	*-6.3*	*-1.7*	*+0.2*	*-5.4*	*0.0*	*-2.4*	*+2.9*	*-6.0*
Fourth quarter following quarter of training completion								
State wage records	70.8	78.3	73.0	77.3	74.3	75.2	56.5	77.4
NDNH	67.8	76.5	73.9	75.3	73.3	77.6	69.4	71.7
Difference	*-3.0*	*-1.8*	*+0.9*	*-2.0*	*-1.0*	*+2.4*	*+12.9*	*-5.7*
Eighth quarter following quarter of training completion								
State wage records	54.1	73.8	66.4	73.3	81.0	76.8	70.7	76.0
NDNH	58.6	73.2	66.4	72.4	76.2	79.2	76.4	68.0
Difference	*+4.5*	*-0.6*	*+0.0*	*-0.9*	*-4.8*	*+2.4*	*+5.7*	*-8.0*
Twelfth quarter following quarter of training completion								
State wage records	62.5	70.3	63.9	72.7	64.7	70.4	66.9	61.3
NDNH	61.7	70.3	64.5	72.9	58.8	75.9	74.6	53.2
Difference	*-0.8*	*+0.0*	*+0.6*	*+0.2*	*-5.9*	*+5.5*	*+7.7*	*-8.1*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Note: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Exhibit 42: Quarterly Earnings by Data Source and Educational Attainment, Missouri

	Less than a High School Diploma	High School Diploma	GED or Equivalent	Some College	Associate Degree	Bachelor's Degree	More than Four Years of College	Other
First quarter following quarter of training completion								
State wage records	$4,863 (3,265)	$5,941 (4,105)	$5,128 (4,010)	$6,320 (4,182)	$5,996 (5,394)	$8,010 (5,903)	$10,701 (8,033)	$6,118 (3,751)
NDNH	$5,254 (3,599)	$6,082 (4,250)	$5,305 (4,134)	$6,510 (4,366)	$6,036 (5,639)	$8,020 (5,766)	$11,096 (8,120)	$6,584 (5,269)
Difference	*+$391*	*+$141*	*+$177*	*+$190*	*+$40*	*+$10*	*+$395*	*+$466*
Fourth quarter following quarter of training completion								
State wage records	$5,463 (3,278)	$6,851 (4,421)	$5,854 (3,683)	$7,343 (4,503)	$6,825 (4,685)	$9,942 (7,390)	$12,288 (8,825)	$6,479 (3,629)
NDNH	$5,809 (3,753)	$7,049 (4,688)	$6,011 (3,829)	$7,646 (4,922)	$6,815 (4,554)	$9,888 (7,442)	$12,988 (8,372)	$8,076 (5,263)
Difference	*+$346*	*+$198*	*+$157*	*+$303*	*-$10*	*-$54*	*+$700*	*+$1,597*
Eighth quarter following quarter of training completion								
State wage records	$5,388 (3,500)	$7,392 (5,085)	$6,731 (4,227)	$7,540 (4,768)	$6,381 (4,879)	$10,324 (7,437)	$13,026 (10,340)	$5,664 (3,421)
NDNH	$6,060 (4,135)	$7,571 (5,240)	$6,879 (4,316)	$7,717 (4,913)	$6,882 (4,808)	$10,763 (7,193)	$14,676 (11,242)	$8,119 (10,174)
Difference	*+$672*	*+$179*	*+$148*	*+$177*	*+$501*	*+$439*	*+$1,650*	*+$2,455*
Twelfth quarter following quarter of training completion								
State wage records	$5,594 (3,426)	$7,024 (4,171)	$6,632 (4,185)	$8,285 (5,019)	$8,922 (4,121)	$10,821 (7,352)	$15,191 (11,593)	$7,087 (3,685)
NDNH	$6,001 (4,264)	$7,294 (4,637)	$6,536 (4,285)	$8,611 (5,728)	$9,161 (4,264)	$11,181 (7,495)	$15,108 (11,684)	$7,632 (3,645)
Difference	*+$407*	*+$270*	*-$96*	*+$326*	*+$239*	*+$360*	*-$83*	*+$545*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Exhibit 43: Employment Rates by Data Source and Educational Attainment, New Jersey

	Less than a High School Diploma	High School Diploma	GED or Equivalent	Some College	Associate Degree	Bachelor's Degree	More than Four Years of College	Other
First quarter following quarter of training completion								
State wage records	39.9	46.8	48.6	44.9	43.7	39.0	33.3	45.6
NDNH	56.5	66.4	68.3	70.2	63.3	58.8	53.5	67.0
Difference	*+16.6*	*+19.6*	*+19.7*	*+25.3*	*+19.6*	*+19.8*	*+20.2*	*+21.4*
Fourth quarter following quarter of training completion								
State wage records	48.8	63.9	63.4	61.5	63.7	55.0	51.8	63.0
NDNH	54.3	69.7	71.2	70.3	69.8	68.0	65.5	70.9
Difference	*+5.5*	*+5.8*	*+7.8*	*+8.8*	*+6.1*	*+13.0*	*+13.7*	*+7.9*
Eighth quarter following quarter of training completion								
State wage records	10.5	17.1	18.9	19.9	22.2	18.9	20.3	29.0
NDNH	55.8	69.1	63.2	71.6	70.4	69.8	66.0	67.1
Difference	*+45.3*	*+52.0*	*+44.3*	*+51.7*	*+48.2*	*+50.9*	*+45.7*	*+38.1*
Twelfth quarter following quarter of training completion								
State wage records	6.3	10.9	11.8	14.1	12.8	12.7	12.7	21.9
NDNH	53.1	63.5	59.5	62.9	63.6	62.7	59.2	66.5
Difference	*+46.8*	*+52.6*	*+47.7*	*+48.8*	*+50.8*	*+50.0*	*+46.5*	*+44.6*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Exhibit 44: Quarterly Earnings by Data Source and Educational Attainment, New Jersey

	Less than a High School Diploma	High School Diploma	GED or Equivalent	Some College	Associate Degree	Bachelor's Degree	More than Four Years of College	Other
First quarter following quarter of training completion								
State wage records	$3,804 (3,434)	$5,122 (3,948)	$5,376 (4,078)	$5,679 (4,604)	$6,548 (4,995)	$8,622 (7,540)	$15,178 (26,987)	$6,053 (4,868)
NDNH	$3,608 (3,588)	$4,864 (3,858)	$5,164 (4,205)	$5,549 (4,737)	$6,362 (5,902)	$8,453 (8,379)	$14,870 (22,461)	$5,810 (4,909)
Difference	*-$196*	*-$258*	*-$212*	*-$130*	*-$186*	*-$169*	*-$308*	*-$243*
Fourth quarter following quarter of training completion								
State wage records	$4,437 (3,546)	$6,300 (4,402)	$5,877 (4,242)	$6,909 (5,278)	$7,550 (5,429)	$10,079 (8,293)	$16,191 (11,446)	$7,219 (5,424)
NDNH	$4,362 (3,690)	$6,425 (4,642)	$5,848 (4,297)	$6,991 (5,090)	$7,887 (5,945)	$10,763 (8,942)	$17,578 (12,333)	$7,173 (5,395)
Difference	*-$75*	*+$125*	*-$29*	*+$82*	*+$337*	*+$684*	*+$1,387*	*-$46*
Eighth quarter following quarter of training completion								
State wage records	$4,585 (3,586)	$6,107 (4,786)	$4,987 (3,601)	$6,988 (4,592)	$6,657 (4,791)	$9,324 (8,467)	$18,761 (25,443)	$5,834 (4,260)
NDNH	$5,079 (4,436)	$6,999 (4,921)	$6,465 (4,604)	$7,938 (5,190)	$8,256 (5,752)	$11,737 (9,175)	$18,742 (18,025)	$8,247 (5,409)
Difference	*+$494*	*+$892*	*+$1,478*	*+$950*	*+$1,599*	*+$2,413*	*-$19*	*+$2,413*
Twelfth quarter following quarter of training completion								
State wage records	$5,363 (3,963)	$5,872 (4,795)	$4,820 (3,683)	$7,013 (4,988)	$7,375 (5,484)	$8,729 (7,009)	$12,618 (11,729)	$5,823 (5,578)
NDNH	$5,160 (3,925)	$6,985 (4,779)	$6,873 (4,893)	$8,177 (5,360)	$8,856 (6,160)	$11,055 (8,310)	$18,722 (20,112)	$7,970 (5,592)
Difference	*-$203*	*+$1,113*	*+$2,053*	*+$1,164*	*+$1,481*	*+$2,326*	*+$6,104*	*+$2,147*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Exhibit 45: Employment Rates by Data Source and Educational Attainment, Ohio

	Less than a High School Diploma	High School Diploma	GED or Equivalent	Some College	Associate Degree	Bachelor's Degree	More than Four Years of College	Other
First quarter following quarter of training completion								
State wage records	68.7	76.7	74.1	73.9	78.1	70.1	69.6	83.3
NDNH	61.8	73.8	70.1	74.4	75.8	69.0	71.4	77.8
Difference	*-6.9*	*-2.9*	*-4.0*	*+0.5*	*-2.3*	*-1.1*	*+1.8*	*-5.5*
Fourth quarter following quarter of training completion								
State wage records	68.3	78.9	75.3	76.9	69.1	75.4	75.9	82.8
NDNH	67.6	75.2	72.9	74.8	70.5	76.3	74.1	71.0
Difference	*-0.7*	*-3.7*	*-2.4*	*-2.1*	*+1.4*	*+0.9*	*-1.8*	*-11.8*
Eighth quarter following quarter of training completion								
State wage records	63.2	76.8	69.0	74.2	76.6	74.5	66.7	73.4
NDNH	57.6	73.7	63.1	70.7	72.1	68.7	62.5	72.7
Difference	*-5.6*	*-3.1*	*-5.9*	*-3.5*	*-4.5*	*-5.8*	*-4.2*	*-0.7*
Twelfth quarter following quarter of training completion								
State wage records	69.7	73.5	68.4	71.9	72.3	66.0	73.1	72.9
NDNH	66.5	69.4	64.4	68.3	71.5	70.4	67.9	70.8
Difference	*-3.2*	*-4.1*	*-4.0*	*-3.6*	*-0.8*	*+4.4*	*-5.2*	*-2.1*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Exhibit 46: Quarterly Earnings by Data Source and Educational Attainment, Ohio

	Less than a High School Diploma	High School Diploma	GED or Equivalent	Some College	Associate Degree	Bachelor's Degree	More than Four Years of College	Other
First quarter following quarter of training completion								
State wage records	$5,397 (4,561)	$5,915 (4,327)	$4,824 (3,623)	$6,023 (6,358)	$6,399 (4,002)	$8,093 (6,155)	$8,928 (6,416)	$5,637 (4,126)
NDNH	$5,485 (5,038)	$5,916 (5,571)	$4,994 (3,720)	$6,023 (5,205)	$6,016 (4,044)	$7,697 (5,897)	$9,281 (5,891)	$5,388 (3,815)
Difference	*+$88*	*+$1*	*+170*	*$0*	*-$383*	*-$396*	*+$353*	*-$249*
Fourth quarter following quarter of training completion								
State wage records	$5,881 (3,996)	$7,081 (4,328)	$6,421 (3,960)	$7,865 (6,262)	$7,471 (4,377)	$9,932 (5,915)	$10,090 (6,086)	$7,159 (4,639)
NDNH	$5,934 (4,030)	$7,173 (4,472)	$6,122 (3,905)	$7,864 (5,704)	$7,399 (4,290)	$10,168 (6,502)	$11,035 (6,523)	$7,316 (4,663)
Difference	*+$53*	*+$92*	*-$299*	*-$1*	*-$72*	*+$236*	*+$945*	*+$157*
Eighth quarter following quarter of training completion								
State wage records	$6,598 (5,029)	$7,489 (4,715)	$6,728 (3,858)	$8,132 (4,900)	$8,798 (5,017)	$9,596 (5,270)	$11,038 (5,874)	$8,152 (5,061)
NDNH	$6,938 (5,406)	$7,683 (4,990)	$6,794 (3,894)	$8,184 (4,951)	$8,674 (5,257)	$10,285 (6,268)	$11,197 (6,836)	$7,931 (5,333)
Difference	*+$340*	*+$194*	*+$66*	*+$52*	*-$124*	*+$689*	*+$159*	*-$221*
Twelfth quarter following quarter of training completion								
State wage records	$5,969 (4,893)	$7,927 (4,778)	$6,896 (4,172)	$8,400 (4,810)	$8,818 (5,161)	$10,287 (5,190)	$10,774 (6,817)	$7,492 (4,733)
NDNH	$5,925 (4,833)	$8,004 (5,003)	$7,041 (4,145)	$8,600 (5,281)	$9,130 (5,529)	$10,560 (5,802)	$11,308 (6,980))	$7,964 (4,965)
Difference	*-$44*	*+$77*	*+$145*	*+$200*	*+$312*	*+$273*	*+$534*	*+$472*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Exhibit 47: Employment Rates by Data Source and Length of Training, Missouri

	Less than 60 Days	At Least 60 Days, Less than 90 Days	At least 90 Days, Less than 180 Days	At least 180 Days, Less than 1 Year	At least 1 Year
First quarter following quarter of training completion					
State wage records	71.1	79.1	81.0	76.9	71.8
NDNH	75.3	79.7	79.9	71.1	62.4
Difference	*+4.2*	*+0.6*	*-1.1*	*-5.8*	*-9.4*
Fourth quarter following quarter of training completion					
State wage records	72.2	74.7	79.0	75.8	77.5
NDNH	78.4	78.4	78.8	76.8	68.8
Difference	*+6.2*	*+3.7*	*-0.2*	*+1.0*	*-8.7*
Eighth quarter following quarter of training completion					
State wage records	67.2	73.3	74.4	75.0	71.3
NDNH	72.5	76.6	76.9	75.0	66.7
Difference	*+5.3*	*+3.3*	*+2.5*	*0.0*	*-4.6*
Twelfth quarter following quarter of training completion					
State wage records	64.4	70.7	72.6	72.4	69.4
NDNH	69.6	74.4	74.0	75.4	67.1
Difference	*+5.2*	*+3.7*	*+1.4*	*+3.0*	*-2.3*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Exhibit 48: Quarterly Earnings by Data Source and Length of Training, Missouri

	Less than 60 Days	At Least 60 Days, Less than 90 Days	At least 90 Days, Less than 180 Days	At least 180 Days, Less than 1 Year	At least 1 Year
First quarter following quarter of training completion					
State wage records	$5,328 (4,405)	$5,946 (4,114)	$6,343 (4,156)	$6,753 (4,810)	$6,527 (4,960)
NDNH	$5,648 (4,860)	$6,006 (4,141)	$6,451 (4,357)	$6,836 (4,881)	$6,894 (5,078)
Difference	*+$320*	*+$60*	*+$108*	*+$83*	*+$367*
Fourth quarter following quarter of training completion					
State wage records	$6,371 (4,386)	$6,924 (4,942)	$7,208 (5,053)	$7,723 (5,108)	$7,291 (4,907)
NDNH	$6,781 (4,771)	$7,007 (4,761)	$7,487 (5,285)	$7,928 (5,613)	$7,596 (5,219)
Difference	*+$410*	*+$83*	*+$279*	*+$205*	*+$305*
Eighth quarter following quarter of training completion					
State wage records	$6,993 (4,755)	$7,805 (5,729)	$7,989 (6,321)	$7,468 (4,789)	$7,715 (5,232)
NDNH	$7,226 (4,855)	$8,044 (5,705)	$8,289 (6,085)	$7,808 (5,605)	$7,973 (5,594)
Difference	*+$233*	*+$239*	*+$300*	*+$340*	*+$258*
Twelfth quarter following quarter of training completion					
State wage records	$6,693 (4,551)	$7,039 (4,597)	$6,662 (4,404)	$8,397 (5,719)	$8,225 (5,369)
NDNH	$6,852 (4,743)	$7,170 (4,828)	$7,149 (5,121)	$8,666 (5,975)	$8,564 (5,747)
Difference	*+$159*	*+$131*	*+$487*	*+$269*	*+$339*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Exhibit 49: Employment Rates by Data Source and Length of Training, New Jersey

	Less than 60 Days	At Least 60 Days, Less than 90 Days	At least 90 Days, Less than 180 Days	At least 180 Days, Less than 1 Year	At least 1 Year
First quarter following quarter of training completion					
State wage records	42.0	44.7	44.2	45.3	44.2
NDNH	67.3	67.0	61.8	62.3	62.9
Difference	*+25.3*	*+22.3*	*+17.6*	*+17.0*	*+18.7*
Fourth quarter following quarter of training completion					
State wage records	60.1	61.1	59.5	60.9	60.2
NDNH	70.6	71.5	66.7	66.8	63.7
Difference	*+10.5*	*+10.4*	*+7.2*	*+5.9*	*+3.5*
Eighth quarter following quarter of training completion					
State wage records	20.3	19.8	19.3	16.1	13.4
NDNH	69.7	70.4	68.0	67.5	62.6
Difference	*+49.4*	*+50.6*	*+48.7*	*+51.4*	*+49.2*
Twelfth quarter following quarter of training completion					
State wage records	13.8	11.6	11.7	11.1	9.3
NDNH	64.4	64.5	61.2	59.7	61.4
Difference	*+50.6*	*+52.9*	*+49.5*	*+48.6*	*+52.1*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Exhibit 50: Quarterly Earnings by Data Source and Length of Training, New Jersey

	Less than 60 Days	At Least 60 Days, Less than 90 Days	At least 90 Days, Less than 180 Days	At least 180 Days, Less than 1 Year	At least 1 Year
First quarter following quarter of training completion					
State wage records	$6,241 (11,362)	$6,381 (5,704)	$6,685 (6,367)	$5,309 (4,671)	$5,108 (4,763)
NDNH	$6,010 (9,920)	$6,301 (6,034)	$6,674 (6,715)	$4,903 (4,518)	$5,116 (5,180)
Difference	*-$231*	*-$80*	*-$11*	*-$406*	*+$8*
Fourth quarter following quarter of training completion					
State wage records	$8,120 (7,605)	$7,923 (6,525)	$7,664 (5,055)	$6,103 (4,430)	$6,192 (5,003)
NDNH	$8,586 (8,293)	$8,100 (6,624)	$8,226 (6,688)	$6,056 (4,806)	$6,617 (5,604)
Difference	*+$466*	*+$177*	*+$562*	*-$47*	*+$425*
Eighth quarter following quarter of training completion					
State wage records	$7,430 (11,738)	$7,557 (5,663)	$7,911 (7,037)	$5,872 (4,459)	$5,837 (5,315)
NDNH	$8,956 (9,527)	$8,891 (6,588)	$8,741 (6,954)	$7,021 (5,239)	$6,728 (5,528)
Difference	*+$1,526*	*+$1,334*	*+$830*	*+$1,149*	*+$891*
Twelfth quarter following quarter of training completion					
State wage records	$7,351 (7,497)	$6,866 (4,746)	$7,144 (5,539)	$5,577 (4,361)	$8,265 (6,967)
NDNH	$9,149 (10,236)	$8,550 (6,852)	$8,486 (6,504)	$7,119 (5,098)	$7,558 (5,618)
Difference	*+$1,798*	*+$1,684*	*+$1,342*	*+$1,542*	*-$707*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Exhibit 51: Employment Rates by Data Source and Length of Training, Ohio

	Less than 60 Days	At Least 60 Days, Less than 90 Days	At least 90 Days, Less than 180 Days	At least 180 Days, Less than 1 Year	At least 1 Year
First quarter following quarter of training completion					
State wage records	75.5	75.5	77.3	75.7	69.6
NDNH	73.7	72.3	75.2	74.1	64.6
Difference	*-1.8*	*-3.2*	*-2.1*	*-1.6*	*-5.0*
Fourth quarter following quarter of training completion					
State wage records	73.7	78.1	80.0	79.4	72.6
NDNH	72.2	77.9	75.7	77.3	67.4
Difference	*-1.5*	*-0.2*	*-4.3*	*-2.1*	*-5.2*
Eighth quarter following quarter of training completion					
State wage records	72.7	73.2	76.4	76.3	74.5
NDNH	71.9	72.3	73.3	72.8	66.7
Difference	*-0.8*	*-0.9*	*-3.1*	*-3.5*	*-7.8*
Twelfth quarter following quarter of training completion					
State wage records	66.6	72.1	72.9	71.6	74.1
NDNH	67.1	70.9	70.0	70.5	67.6
Difference	*+0.5*	*-1.2*	*-2.9*	*-1.1*	*-6.5*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Exhibit 52: Quarterly Earnings by Data Source and Length of Training, Ohio

	Less than 60 Days	At Least 60 Days, Less than 90 Days	At least 90 Days, Less than 180 Days	At least 180 Days, Less than 1 Year	At least 1 Year
First quarter following quarter of training completion					
State wage records	$5,586 (4,179)	$5,783 (4,878)	$6,655 (6,044)	$5,809 (3,889)	$5,964 (4,408)
NDNH	$5,323 (4,037)	$5,946 (5,046)	$6,719 (7,032)	$5,865 (4,001)	$5,838 (4,302)
Difference	*-$263*	*+$163*	*+$64*	*+$56*	*-$126*
Fourth quarter following quarter of training completion					
State wage records	$6,359 (4,538)	$7,814 (4,852)	$8,245 (4,848)	$6,610 (3,929)	$7,845 (6,297)
NDNH	$6,462 (4,926)	$7,929 (5,044)	$8,316 (4,953)	$6,662 (4,047)	$7,781 (5,565)
Difference	*+$103*	*+$115*	*+$71*	*+$52*	*-$64*
Eighth quarter following quarter of training completion					
State wage records	$6,359 (4,358)	$7,814 (4,852)	$8,245 (4,848)	$6,610 (3,929)	$7,845 (6,297)
NDNH	$7,236 (5,261)	$8,445 (5,829)	$8,363 (5,534)	$7,563 (4,265)	$8,149 (4,612)
Difference	*+$877*	*+$631*	*+$118*	*+$953*	*+$304*
Twelfth quarter following quarter of training completion					
State wage records	$7,101 (5,170)	$7,819 (5,165)	$8,159 (5,241)	$7,249 (3,775)	$8,368 (4,613)
NDNH	$7,028 (5,044)	$7,671 (5,084)	$8,336 (5,307)	$8,070 (4,804)	$9,178 (5,378)
Difference	*-$73*	*-$148*	*+$177*	*+$821*	*+$810*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Exhibit 53: Employment Rates by State, Data Source, and Border Status

	Missouri		New Jersey		Ohio	
	Near a Border	Not Near a Border	Near a Border	Not Near a Border	Near a Border	Not Near a Border
First quarter following quarter of training completion						
State wage records	75.6	75.2	42.7	46.4	72.1	77.9
NDNH	74.4	70.8	63.3	66.6	72.3	73.4
Difference	*-1.2*	*-4.4*	*+20.6*	*+20.2*	*+0.2*	*-4.5*
Fourth quarter following quarter of training completion						
State wage records	77.0	74.8	59.1	62.8	74.4	78.7
NDNH	76.3	73.6	67.9	68.8	74.5	74.0
Difference	*-0.7*	*-1.2*	*+8.8*	*+6.0*	*+0.1*	*-4.7*
Eighth quarter following quarter of training completion						
State wage records	72.8	70.5	18.6	17.5	76.0	72.0
NDNH	72.9	70.1	68.4	67.3	71.1	70.6
Difference	*+0.1*	*-0.4*	*+49.8*	*+49.8*	*-4.9*	*-1.4*
Twelfth quarter following quarter of training completion						
State wage records	69.4	70.2	11.8	11.9	69.0	73.4
NDNH	70.8	69.4	63.3	60.2	65.2	70.8
Difference	*+1.4*	*-0.8*	*+51.5*	*+48.3*	*-3.8*	*-2.6*

Source: State administrative data and NDNH data on WIA/WIOA training completers.
Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values.

Exhibit 54: Quarterly Earnings by State, Data Source, and Border Status

	Missouri		New Jersey		Ohio	
	Near a Border	Not Near a Border	Near a Border	Not Near a Border	Near a Border	Not Near a Border
First quarter following quarter of training completion						
State wage records	$6,501 (4,937)	$5,704 (3,835)	$6,579 (8,746)	$5,371 (4,494)	$6,186 (4,710)	$5,857 (4,977)
NDNH	$6,643 (5,061)	$5,903 (4,100)	$6,414 (8,312)	$5,224 (4,625)	$6,266 (6,116)	$5,754 (4,474)
Difference	*+$142*	*+$199*	*-$165*	*-$147*	*+$80*	*-$103*
Fourth quarter following quarter of training completion						
State wage records	$7,469 (5,427)	$7,609 (5,358)	$7,728 (6,577)	$6,570 (5,320)	$8,220 (5,574)	$6,802 (4,357)
NDNH	$7,670 (5,536)	$7,018 (4,617)	$8,153 (7,290)	$6,737 (5,383)	$8,214 (5,363)	$6,871 (4,545)
Difference	*+$201*	*-$591*	*+$425*	*+$167*	*-$6*	*+$69*
Eighth quarter following quarter of training completion						
State wage records	$7,921 (5,806)	$7,071 (4,430)	$7,543 (8,815)	$6,376 (5,389)	$7,903 (5,172)	$7,771 (4,664)
NDNH	$8,131 (5,997)	$7,437 (4,780)	$8,771 (7,844)	$7,162 (5,577)	$8,056 (5,460)	$7,918 (4,921)
Difference	*+$210*	*+$366*	*+$1,228*	*+$786*	*+$153*	*+$147*
Twelfth quarter following quarter of training completion						
State wage records	$8,066 (5,711)	$7,322 (4,335)	$7,281 (6,527)	$6,214 (4,763)	$8,263 (4,993)	$8,058 (4,861)
NDNH	$8,333 (5,921)	$7,623 (4,942)	$8,898 (8,198)	$7,189 (5,450)	$8,540 (5,316)	$8,183 (5,156)
Difference	*+$267*	*+$301*	*+$1,617*	*+$975*	*+$277*	*+$125*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. Differences are calculated by subtracting state values from NDNH values. All values are in constant 2015 dollars.

Exhibit 55: Employment Rates by State, Data Source, and Urban Status

	Missouri		Ohio	
	In an Urban Area	Not in an Urban Area	In an Urban Area	Not in an Urban Area
First quarter following quarter of training completion				
State wage records	76.2	74.1	73.3	78.8
NDNH	74.9	69.6	72.0	74.5
Difference	*-1.3*	*-4.5*	*-1.3*	*-4.3*
Fourth quarter following quarter of training completion				
State wage records	76.5	75.3	76.1	78.2
NDNH	76.4	72.9	74.3	74.2
Difference	*-0.1*	*-2.4*	*-1.8*	*-4.0*
Eighth quarter following quarter of training completion				
State wage records	72.1	71.5	73.2	76.4
NDNH	72.5	70.4	71.3	70.5
Difference	*+0.4*	*-1.1*	*-1.9*	*-5.9*
Twelfth quarter following quarter of training completion				
State wage records	67.9	73.3	70.3	74.0
NDNH	69.9	71.1	66.8	71.5
Difference	*+2.0*	*-2.2*	*-3.5*	*-2.5*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent percentages. Differences are calculated by subtracting state values from NDNH values. New Jersey data is excluded because all observations in the state were coded as near a state border.

Exhibit 56: Quarterly Earnings by State, Data Source, and Urban Status

	Missouri		Ohio	
	In an Urban Area	Not in an Urban Area	In an Urban Area	Not in an Urban Area
First quarter following quarter of training completion				
State wage records	$6,591 (4,994)	$5,457 (3,501)	$6,050 (4,474)	$5,902 (5,423)
NDNH	$6,663 (5,139)	$5,785 (3,770)	$6,082 (5,506)	$5,794 (4,780)
Difference	*+$72*	*+$328*	*+$32*	*-$108*
Fourth quarter following quarter of training completion				
State wage records	$7,612 (5,414)	$6,230 (3,537)	$7,932 (5,280)	$6,576 (4,261)
NDNH	$7,786 (5,566)	$6,646 (4,249)	$7,953 (5,190)	$6,668 (4,459)
Difference	*+$174*	*+$416*	*+$21*	*+$92*
Eighth quarter following quarter of training completion				
State wage records	$7,948 (5,830)	$6,820 (3,936)	$8,036 (4,984)	$7,559 (4,648)
NDNH	$8,197 (6,058)	$7,116 (4,192)	$8,256 (5,318)	$7,611 (4,820)
Difference	*+$249*	*+$296*	*+$220*	*+$52*
Twelfth quarter following quarter of training completion				
State wage records	$8,414 (5,685)	$7,080 (4,146)	$8,206 (4,933)	$8,028 (4,870)
NDNH	$8,489 (6,053)	$7,207 (4,351)	$8,379 (5,178)	$8,203 (5,248)
Difference	*+$75*	*+$127*	*+$173*	*+$175*

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries represent averages, with standard deviations in parentheses. New Jersey data is excluded because all observations in the state were coded as near a state border.

APPENDIX E. DATA FOR MAPS OF OUT-OF-STATE EARNINGS BY STATE

Exhibit 57: Data for Prevalence of Earnings in Other States, Missouri

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Alabama	0.0054533	0.0043750	0.0068681	0.0105414
Alaska	0.0006817	0.0006250	0.0000000	0.0004792
Arizona	0.0170416	0.0137500	0.0105311	0.0134164
Arkansas	0.0456714	0.0481250	0.0467033	0.0579780
California	0.0490798	0.0375000	0.0407509	0.0507906
Colorado	0.0327198	0.0356250	0.0384615	0.0349784
Connecticut	0.0074983	0.0056250	0.0059524	0.0067082
Delaware	0.0006817	0.0012500	0.0013736	0.0014375
District of Columbia	0.0013633	0.0006250	0.0018315	0.0019166
Florida	0.0299932	0.0231250	0.0412088	0.0383325
Georgia	0.0218132	0.0318750	0.0260989	0.0306660
Hawaii	0.0000000	0.0006250	0.0004579	0.0004792
Idaho	0.0013633	0.0031250	0.0004579	0.0023958
Illinois	0.1029312	0.0781250	0.0815018	0.1006229
Indiana	0.0177232	0.0137500	0.0169414	0.0158122
Iowa	0.0259032	0.0262500	0.0178571	0.0225204
Kansas	0.0858896	0.1081250	0.1080586	0.1025395
Kentucky	0.0252215	0.0125000	0.0178571	0.0162913
Louisiana	0.0040900	0.0062500	0.0059524	0.0062290
Maine	0.0000000	0.0006250	0.0004579	0.0004792
Maryland	0.0163599	0.0200000	0.0260989	0.0244370
Massachusetts	0.0156783	0.0143750	0.0114469	0.0153330
Michigan	0.0606680	0.0925000	0.0920330	0.0503115
Minnesota	0.0429448	0.0381250	0.0402930	0.0464782
Mississippi	0.0034083	0.0037500	0.0032051	0.0038333
Missouri	0.2862986	0.1875000	0.1913919	0.1657882
Montana	0.0000000	0.0012500	0.0027473	0.0038333
Nebraska	0.0224949	0.0162500	0.0128205	0.0129372
Nevada	0.0006817	0.0012500	0.0036630	0.0009583
New Hampshire	0.0190866	0.0231250	0.0141941	0.0134164
New Jersey	0.0129516	0.0168750	0.0215201	0.0134164
New Mexico	0.0000000	0.0000000	0.0004579	0.0000000
New York	0.0293115	0.0387500	0.0338828	0.0416866
North Carolina	0.0306748	0.0325000	0.0251832	0.0234787
North Dakota	0.0027267	0.0012500	0.0036630	0.0038333
Ohio	0.0906612	0.0743750	0.0631868	0.0474365
Oklahoma	0.0449898	0.0437500	0.0302198	0.0407283

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Oregon	0.0020450	0.0037500	0.0054945	0.0038333
Pennsylvania	0.0245399	0.0356250	0.0251832	0.0297077
Rhode Island	0.0027267	0.0025000	0.0013736	0.0043124
South Carolina	0.0074983	0.0031250	0.0073260	0.0057499
South Dakota	0.0040900	0.0018750	0.0013736	0.0009583
Tennessee	0.0756646	0.0668750	0.0631868	0.0675611
Texas	0.0531697	0.0675000	0.0773810	0.0642070
Utah	0.0054533	0.0037500	0.0050366	0.0067082
Vermont	0.0000000	0.0000000	0.0000000	0.0009583
Virginia	0.0143149	0.0187500	0.0201465	0.0201246
Washington	0.0197682	0.0131250	0.0114469	0.0091040
West Virginia	0.0013633	0.0025000	0.0027473	0.0038333
Wisconsin	0.0681663	0.0537500	0.0457875	0.0344993
Wyoming	0.0006817	0.0006250	0.0009158	0.0004792

Source: NDNH data.

Note: Table entries represent the number of individuals with NDNH earnings data outside Missouri for the corresponding state and follow-up period, divided by the total number of individuals with NDNH earnings data from any state other than Missouri for the corresponding follow-up period.

Exhibit 58: Data for Prevalence of Earnings in Other States, New Jersey

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Alabama	0.0029600	0.0022153	0.0037092	0.0027668
Alaska	0.0004933	0.0004431	0.0007418	0.0011858
Arizona	0.0138135	0.0128489	0.0107567	0.0090909
Arkansas	0.0281204	0.0345591	0.0352374	0.0252964
California	0.0661075	0.0607000	0.0556380	0.0588933
Colorado	0.0133202	0.0146212	0.0137240	0.0126482
Connecticut	0.0113468	0.0093044	0.0133531	0.0086957
Delaware	0.0300937	0.0155073	0.0155786	0.0181818
District of Columbia	0.0019734	0.0035445	0.0018546	0.0031621
Florida	0.0592008	0.0664599	0.0656528	0.0723320
Georgia	0.0562407	0.0549402	0.0574926	0.0557312
Hawaii	0.0000000	0.0000000	0.0003709	0.0000000
Idaho	0.0034534	0.0022153	0.0029674	0.0039526
Illinois	0.0281204	0.0385467	0.0296736	0.0347826
Indiana	0.0128268	0.0097475	0.0051929	0.0075099
Iowa	0.0078934	0.0026584	0.0037092	0.0023715
Kansas	0.0088801	0.0062029	0.0048220	0.0059289
Kentucky	0.0078934	0.0066460	0.0048220	0.0039526
Louisiana	0.0000000	0.0000000	0.0018546	0.0011858
Maine	0.0039467	0.0044307	0.0055638	0.0047431
Maryland	0.0305871	0.0310146	0.0296736	0.0371542
Massachusetts	0.0414406	0.0544971	0.0430267	0.0486166
Michigan	0.0217070	0.0234825	0.0189169	0.0130435
Minnesota	0.0177602	0.0279132	0.0281899	0.0260870
Mississippi	0.0004933	0.0008861	0.0011128	0.0000000
Missouri	0.0439073	0.0336730	0.0315282	0.0296443
Montana	0.0019734	0.0013292	0.0011128	0.0007905
Nebraska	0.0330538	0.0124058	0.0066766	0.0063241
Nevada	0.0138135	0.0062029	0.0081602	0.0122530
New Hampshire	0.0064134	0.0053168	0.0063056	0.0051383
New Jersey	0.2511100	0.2077980	0.1832344	0.1731225
New Mexico	0.0000000	0.0004431	0.0003709	0.0007905
New York	0.1484953	0.1643775	0.1754451	0.1660079
North Carolina	0.0276270	0.0296854	0.0293027	0.0296443
North Dakota	0.0000000	0.0000000	0.0011128	0.0007905
Ohio	0.0547607	0.0598139	0.0619436	0.0573123
Oklahoma	0.0128268	0.0088613	0.0033383	0.0102767
Oregon	0.0014800	0.0026584	0.0044510	0.0043478

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Pennsylvania	0.1159349	0.1280461	0.1498516	0.1573123
Rhode Island	0.0113468	0.0075321	0.0051929	0.0063241
South Carolina	0.0019734	0.0026584	0.0044510	0.0047431
South Dakota	0.0004933	0.0000000	0.0000000	0.0003953
Tennessee	0.0532807	0.0270270	0.0226261	0.0229249
Texas	0.0384805	0.0589278	0.0504451	0.0525692
Utah	0.0034534	0.0048737	0.0048220	0.0047431
Vermont	0.0009867	0.0008861	0.0018546	0.0023715
Virginia	0.0305871	0.0332300	0.0318991	0.0335968
Washington	0.0276270	0.0208241	0.0204006	0.0177866
West Virginia	0.0004933	0.0022153	0.0003709	0.0000000
Wisconsin	0.0335471	0.0221533	0.0200297	0.0189723
Wyoming	0.0000000	0.0000000	0.0003709	0.0003953

Source: NDNH data.

Note: Table entries represent the number of individuals with NDNH earnings data outside New Jersey for the corresponding state and follow-up period, divided by the total number of individuals with NDNH earnings data from any state other than New Jersey for the corresponding follow-up period.

Exhibit 59: Data for Prevalence of Earnings in Other States, Ohio

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Alabama	0.0069791	0.0056711	0.0045208	0.0049352
Alaska	0.0000000	0.0018904	0.0000000	0.0018507
Arizona	0.0119641	0.0141777	0.0126582	0.0117212
Arkansas	0.0338983	0.0302457	0.0307414	0.0197409
California	0.0309073	0.0264650	0.0370705	0.0499692
Colorado	0.0189432	0.0217391	0.0641953	0.0296114
Connecticut	0.0019940	0.0047259	0.0081374	0.0104874
Delaware	0.0000000	0.0000000	0.0009042	0.0037014
District of Columbia	0.0009970	0.0018904	0.0018083	0.0037014
Florida	0.0319043	0.0378072	0.0524412	0.0536706
Georgia	0.0329013	0.0330813	0.0388788	0.0357804
Hawaii	0.0000000	0.0000000	0.0000000	0.0006169
Idaho	0.0009970	0.0009452	0.0018083	0.0030845
Illinois	0.0468594	0.0472590	0.0433996	0.0487353
Indiana	0.0418744	0.0576560	0.0470163	0.0382480
Iowa	0.0089731	0.0047259	0.0063291	0.0030845
Kansas	0.0159521	0.0075614	0.0081374	0.0098705
Kentucky	0.0797607	0.0378072	0.0479204	0.0413325
Louisiana	0.0000000	0.0037807	0.0018083	0.0030845
Maine	0.0000000	0.0000000	0.0009042	0.0006169
Maryland	0.0219342	0.0226843	0.0153707	0.0191240
Massachusetts	0.0169492	0.0217391	0.0207957	0.0203578
Michigan	0.0558325	0.1833648	0.0705244	0.1024059
Minnesota	0.0219342	0.0236295	0.0171790	0.0228254
Mississippi	0.0049850	0.0037807	0.0000000	0.0012338
Missouri	0.0269192	0.0236295	0.0298373	0.0296114
Montana	0.0000000	0.0009452	0.0000000	0.0006169
Nebraska	0.0259222	0.0094518	0.0207957	0.0129550
Nevada	0.0009970	0.0018904	0.0072333	0.0049352
New Hampshire	0.0109671	0.0207940	0.0054250	0.0086366
New Jersey	0.0219342	0.0217391	0.0235081	0.0222085
New Mexico	0.0019940	0.0009452	0.0009042	0.0024676
New York	0.0618146	0.0642722	0.0768535	0.0690932
North Carolina	0.0817547	0.0453686	0.0298373	0.0296114
North Dakota	0.0069791	0.0047259	0.0072333	0.0055521
Ohio	0.2721834	0.1814745	0.1808318	0.1850709
Oklahoma	0.0289133	0.0255198	0.0126582	0.0154226
Oregon	0.0039880	0.0018904	0.0063291	0.0037014

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Pennsylvania	0.0837488	0.0954631	0.1283906	0.1147440
Rhode Island	0.0029910	0.0037807	0.0018083	0.0061690
South Carolina	0.0009970	0.0028355	0.0072333	0.0074028
South Dakota	0.0039880	0.0018904	0.0018083	0.0006169
Tennessee	0.0797607	0.0387524	0.0605787	0.0524368
Texas	0.0408774	0.0359168	0.0551537	0.0475015
Utah	0.0059821	0.0028355	0.0081374	0.0098705
Vermont	0.0000000	0.0009452	0.0000000	0.0012338
Virginia	0.0139581	0.0198488	0.0207957	0.0222085
Washington	0.0209372	0.0170132	0.0117541	0.0141888
West Virginia	0.0149551	0.0217391	0.0099458	0.0148057
Wisconsin	0.0817547	0.0406427	0.0433996	0.0425663
Wyoming	0.0029910	0.0000000	0.0000000	0.0000000

Source: NDNH data.

Note: Table entries represent the number of individuals with NDNH earnings data outside Ohio for the corresponding state and follow-up period, divided by the total number of individuals with NDNH earnings data from any state other than Ohio for the corresponding follow-up period.

APPENDIX F. FULL REGRESSION RESULTS

Exhibit 60: Regression Results, NDNH Greater than Single-State, Missouri

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Race				
White [a]	-	-	-	-
Black	-0.007 [0.011]	0.027** [0.013]	0.022** [0.01]	0.015 [0.01]
Other	-0.033 [0.021]	0.073 [0.04]	0.008 [0.032]	0.106** [0.044]
Female	-0.037*** [0.011]	-0.023** [0.011]	-0.023** [0.009]	-0.012 [0.01]
Age				
18-24	-0.015 [0.014]	0.004 [0.017]	0.026* [0.016]	0.036** [0.017]
25-34 [a]	-	-	-	-
35-44	-0.033*** [0.012]	0.000 [0.013]	-0.014 [0.01]	-0.011 [0.01]
45-54	-0.012 [0.012]	-0.025** [0.012]	-0.028*** [0.01]	-0.019* [0.011]
At least 55	-0.038*** [0.014]	-0.005 [0.016]	-0.021 [0.013]	-0.017 [0.013]
Educational Attainment				
Less Than a High School Diploma	-0.017 [0.018]	0.008 [0.022]	0.026 [0.021]	0.006 [0.021]
High School Diploma [a]	-	-	-	-
GED or Equivalent	-0.002 [0.014]	-0.010 [0.014]	-0.009 [0.011]	-0.013 [0.011]
Some College	0.001 [0.011]	0.015 [0.011]	0.019** [0.009]	0.004 [0.009]
Associate Degree	0.026 [0.021]	0.011 [0.029]	-0.020 [0.048]	-0.079*** [0.017]
Bachelor's Degree	0.012 [0.016]	0.043** [0.02]	0.021 [0.016]	0.020 [0.017]
More Than Four Years of College	0.015 [0.029]	0.089** [0.037]	0.030 [0.03]	0.027 [0.03]
Other	-0.048** [0.019]	0.019 [0.043]	0.068 [0.069]	0.011 [0.036]
Quarter of Training Completion	✓	✓	✓	✓
Pre-training Earnings				
1 Quarter Prior to Training Start	✓	✓	✓	✓
4 Quarters Prior to Training Start	✓	✓	✓	✓
8 Quarters Prior to Training Start	✓	✓	✓	✓

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Type of Training				
On the Job Training	-0.033*** [0.011]	-0.013 [0.013]	-0.001 [0.012]	-0.03** [0.014]
Skill Upgrading and Retraining	0.985*** [0.028]	0.32 [0.288]	0.143 [0.211]	-0.067*** [0.018]
Entrepreneurial Training	-0.021 [0.031]	-0.103*** [0.039]	-0.148*** [0.026]	0.873*** [0.036]
Adult Education and Literacy with Training	0.014 [0.033]	-0.067*** [0.021]	-0.045** [0.02]	-0.052*** [0.019]
Customized Training	-0.165*** [0.046]	-0.103*** [0.037]	0.076 [0.082]	-0.019 [0.065]
Other Occupational Skills Training [a]	-	-	-	-
Length of Training in Days				
Less than 60 Days [a]	-	-	-	-
At least 60 Days, Less than 90 Days	-0.029 [0.015]	-0.031 [0.019]	0.004 [0.017]	0.001 [0.02]
At Least 90 Days, Less than 180 Days	-0.008 [0.014]	-0.018 [0.015]	0.010 [0.013]	0.005 [0.015]
At Least 180 Days, Less than 1 Year	-0.018 [0.014]	-0.012 [0.016]	0.006 [0.014]	0.002 [0.014]
At Least 1 Year	-0.035*** [0.014]	-0.036*** [0.014]	-0.007 [0.012]	0.000 [0.012]
Training O*Net Code				
Computer and Mathematical	-0.019 [0.018]	-0.031 [0.02]	-0.003 [0.017]	0.001 [0.019]
Healthcare Practitioners and Technical [a]	-	-	-	-
Healthcare Support	-0.028** [0.014]	-0.029 [0.016]	-0.015 [0.014]	0.009 [0.015]
Installation, Maintenance, and Repair	-0.003 [0.021]	-0.02 [0.021]	-0.017 [0.019]	-0.001 [0.019]
Management	0.046 [0.026]	0.061** [0.028]	0.049** [0.022]	0.004 [0.017]
Office and Administrative Support	0.008 [0.015]	-0.019 [0.015]	-0.02* [0.012]	0.000 [0.013]
Production	-0.005 [0.017]	0.012 [0.018]	0.006 [0.017]	0.004 [0.016]
Transportation and Material Moving	0.097*** [0.021]	0.071*** [0.022]	0.047*** [0.018]	0.064*** [0.019]
Other	-0.002 [0.014]	-0.011 [0.015]	0.003 [0.013]	0.014 [0.012]
Not Reported / Missing	-0.047** [0.022]	-0.123*** [0.022]	-0.001 [0.042]	0.017 [0.037]
Receipt of Wagner-Peyser Services [b]	-	-	-	-
Training Located in an Urban Area	-0.026** [0.01]	-0.01 [0.011]	0.002 [0.011]	0.009 [0.01]
Training Located Near a State Border	-0.001 [0.01]	-0.024** [0.011]	-0.036*** [0.01]	-0.026** [0.01]

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Constant	0.161*** [0.023]	0.172*** [0.024]	0.147*** [0.021]	0.110*** [0.021]
Number of observations	4,118	4,170	5,926	6,038
R-squared	0.072	0.060	0.031	0.030

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries are estimated regression coefficients with standard errors in brackets. Each regression model was estimated using OLS. Asterisks indicate statistical significance at the 10 (*), 5 (**), and 1 (***) percent levels. Estimated coefficients for the indicator variables for (1) calendar quarter of training completion and (2) the set of categorical pre-training earnings variables are omitted. [a] This is the reference category (the omitted category against which the estimates for the other categories are measured). [b] This variable (or category) was omitted from the regression due to perfect multicollinearity.

Exhibit 61: Regression Results, Single-State Greater than NDNH, Missouri

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Race				
White [a]	-	-	-	-
Black	0.006 [0.01]	-0.016 [0.01]	0.002 [0.009]	0.008 [0.009]
Other	0.038 [0.035]	0.006 [0.031]	0.012 [0.029]	-0.018 [0.026]
Female	0.001 [0.011]	-0.010 [0.011]	0.007 [0.008]	0.006 [0.009]
Age				
18-24	-0.001 [0.014]	0.003 [0.014]	-0.014 [0.011]	0.004 [0.013]
25-34 [a]	-	-	-	-
35-44	0.019 [0.012]	0.028** [0.012]	0.018 [0.01]	0.013 [0.01]
45-54	0.028** [0.013]	0.039*** [0.013]	0.010 [0.01]	0.006 [0.01]
At least 55	0.006 [0.015]	0.05*** [0.016]	0.008 [0.012]	-0.012 [0.012]
Educational Attainment				
Less Than a High School Diploma	0.022 [0.023]	-0.001 [0.022]	-0.052*** [0.017]	-0.036 [0.023]
High School Diploma [a]	-	-	-	-
GED or Equivalent	-0.007 [0.014]	-0.007 [0.014]	-0.016 [0.01]	-0.019 [0.011]
Some College	0.003 [0.012]	-0.001 [0.012]	0.005 [0.009]	-0.017** [0.008]
Associate Degree	-0.005 [0.021]	0.019 [0.03]	-0.003 [0.06]	-0.021 [0.061]
Bachelor's Degree	0.001 [0.017]	0.002 [0.017]	-0.017 [0.013]	-0.035*** [0.012]
More Than Four Years of College	-0.033 [0.023]	-0.046*** [0.018]	-0.047*** [0.017]	-0.047*** [0.015]
Other	0.008 [0.027]	0.042 [0.045]	0.049 [0.074]	0.032 [0.045]
Quarter of Training Completion	✓	✓	✓	✓
Pre-training Earnings				
1 Quarter Prior to Training Start	✓	✓	✓	✓
4 Quarters Prior to Training Start	✓	✓	✓	✓
8 Quarters Prior to Training Start	✓	✓	✓	✓

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Type of Training				
On the Job Training	0.061*** [0.012]	0.06*** [0.013]	0.020 [0.012]	-0.009 [0.013]
Skill Upgrading and Retraining	-0.16*** [0.033]	-0.122*** [0.046]	-0.08*** [0.027]	-0.028* [0.016]
Entrepreneurial Training	-0.218*** [0.042]	-0.117** [0.05]	-0.027 [0.022]	0.014 [0.023]
Adult Education and Literacy with Training	-0.027 [0.034]	0.088** [0.044]	0.11*** [0.035]	0.096*** [0.032]
Customized Training	-0.064 [0.051]	0.095 [0.182]	0.030 [0.053]	0.108 [0.096]
Other Occupational Skills Training [a]	-	-	-	-
Length of Training in Days				
Less than 60 Days [a]	-	-	-	-
At least 60 Days, Less than 90 Days	-0.035*** [0.012]	-0.045*** [0.015]	-0.012 [0.012]	-0.005 [0.014]
At Least 90 Days, Less than 180 Days	-0.008 [0.012]	0.002 [0.014]	0.005 [0.01]	0.011 [0.012]
At Least 180 Days, Less than 1 Year	0.044*** [0.016]	0.004 [0.015]	0.024** [0.012]	0.004 [0.011]
At Least 1 Year	0.092*** [0.016]	0.085*** [0.015]	0.061*** [0.011]	0.053*** [0.011]
Training O*Net Code				
Computer and Mathematical	-0.025 [0.021]	-0.053*** [0.02]	-0.025 [0.016]	-0.005 [0.017]
Healthcare Practitioners and Technical [a]	-	-	-	-
Healthcare Support	-0.002 [0.017]	-0.028 [0.018]	-0.018 [0.014]	-0.007 [0.014]
Installation, Maintenance, and Repair	-0.005 [0.025]	-0.009 [0.026]	0.007 [0.022]	-0.006 [0.019]
Management	0.004 [0.028]	-0.05** [0.023]	-0.027 [0.019]	-0.041*** [0.015]
Office and Administrative Support	-0.036 [0.018]	-0.032 [0.019]	-0.025* [0.014]	-0.002 [0.014]
Production	-0.014 [0.02]	-0.041** [0.02]	-0.011 [0.017]	0.038** [0.019]
Transportation and Material Moving	-0.02 [0.019]	-0.044** [0.02]	-0.023 [0.015]	-0.016 [0.015]
Other	0.005 [0.018]	-0.025 [0.017]	-0.027** [0.013]	-0.008 [0.013]
Not Reported / Missing	-0.136*** [0.034]	0.232 [0.184]	-0.062 [0.037]	-0.069*** [0.026]

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Receipt of Wagner-Peyser Services [b]	-	-	-	-
Training Located in an Urban Area	-0.028*** [0.01]	-0.023** [0.011]	-0.013 [0.009]	-0.016* [0.009]
Training Located Near a State Border	-0.013 [0.01]	0.001 [0.01]	-0.014 [0.008]	-0.02*** [0.008]
Constant	0.036 [0.023]	0.057** [0.023]	0.067*** [0.018]	0.063*** [0.018]
Number of observations	4,118	4,170	5,926	6,038
R-squared	0.050	0.053	0.032	0.035

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries are estimated regression coefficients with standard errors in brackets. Each regression model was estimated using OLS. Asterisks indicate statistical significance at the 10 (*), 5 (**), and 1 (***) percent levels. Estimated coefficients for the indicator variables for (1) calendar quarter of training completion and (2) the set of categorical pre-training earnings variables are omitted. [a] This is the reference category (the omitted category against which the estimates for the other categories are measured). [b] This variable (or category) was omitted from the regression due to perfect multicollinearity.

Exhibit 62: Regression Results, NDNH Greater than Single-State, New Jersey

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Race				
White [a]	-	-	-	-
Black	-0.023* [0.012]	0.004 [0.009]	-0.024* [0.013]	-0.069*** [0.012]
Other	-0.032** [0.015]	-0.010 [0.011]	0.030 [0.016]	-0.014 [0.016]
Female	-0.05*** [0.011]	-0.028*** [0.009]	-0.018 [0.012]	0.002 [0.011]
Age				
18-24	-0.007 [0.018]	-0.021 [0.014]	-0.007 [0.019]	-0.027 [0.017]
25-34 [a]	-	-	-	-
35-44	-0.013 [0.016]	-0.010 [0.012]	-0.025 [0.016]	-0.042*** [0.016]
45-54	-0.038** [0.016]	-0.014 [0.012]	-0.054*** [0.016]	-0.069*** [0.016]
At least 55	-0.048*** [0.017]	-0.033** [0.014]	-0.156*** [0.019]	-0.144*** [0.018]
Educational Attainment				
Less Than a High School Diploma	-0.033 [0.02]	-0.011 [0.014]	-0.051** [0.021]	-0.038 [0.020]
High School Diploma [a]	-	-	-	-
GED or Equivalent	-0.013 [0.024]	0.025 [0.018]	-0.056** [0.025]	-0.044 [0.025]
Some College	0.050*** [0.016]	0.031*** [0.012]	-0.008 [0.016]	-0.038** [0.015]
Associate Degree	-0.002 [0.02]	0.015 [0.014]	-0.029 [0.019]	-0.027 [0.019]
Bachelor's Degree	-0.001 [0.016]	0.059*** [0.013]	-0.007 [0.018]	-0.026 [0.017]
More Than Four Years of College	0.007 [0.024]	0.053** [0.022]	-0.059** [0.03]	-0.05* [0.028]
Other	0.026 [0.031]	0.034 [0.023]	-0.117*** [0.032]	-0.054 [0.033]
Quarter of Training Completion	✓	✓	✓	✓
Pre-training Earnings				
1 Quarter Prior to Training Start	✓	✓	✓	✓
4 Quarters Prior to Training Start	✓	✓	✓	✓
8 Quarters Prior to Training Start	✓	✓	✓	✓

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Type of Training				
On the Job Training	-0.079*** [0.026]	-0.035 [0.022]	0.158*** [0.035]	-0.043 [0.036]
Skill Upgrading and Retraining	0.016 [0.100]	0.054 [0.084]	-0.100 [0.063]	-0.084 [0.050]
Entrepreneurial Training	-0.209*** [0.022]	-0.128*** [0.022]	0.110 [0.37]	0.271 [0.234]
Adult Education and Literacy with Training	-0.032 [0.048]	-0.054*** [0.018]	-0.119*** [0.03]	-0.073*** [0.026]
Customized Training	-0.050 [0.093]	-0.102 [0.056]	-0.105 [0.137]	0.152 [0.133]
Other Occupational Skills Training [a]	-	-	-	-
Length of Training in Days				
Less than 60 Days [a]	-	-	-	-
At least 60 Days, Less than 90 Days	-0.029 [0.017]	-0.015 [0.014]	0.007 [0.018]	0.012 [0.017]
At Least 90 Days, Less than 180 Days	-0.072*** [0.014]	-0.022 [0.012]	0.009 [0.015]	-0.008 [0.015]
At Least 180 Days, Less than 1 Year	-0.063*** [0.016]	-0.051*** [0.012]	0.032* [0.016]	-0.012 [0.015]
At Least 1 Year	-0.058** [0.027]	-0.061*** [0.015]	0.024 [0.021]	0.008 [0.022]
Training O*Net Code				
Computer and Mathematical	0.059 [0.081]	0.065 [0.050]	-0.033 [0.054]	-0.018 [0.061]
Healthcare Practitioners and Technical [a]	-	-	-	-
Healthcare Support	-0.041 [0.049]	-0.040 [0.028]	-0.022 [0.043]	-0.045 [0.046]
Installation, Maintenance, and Repair	-0.046 [0.074]	0.027 [0.048]	-0.099 [0.065]	-0.096 [0.069]
Management	0.071 [0.055]	0.117*** [0.039]	-0.145*** [0.051]	-0.070 [0.055]
Office and Administrative Support	0.046 [0.049]	0.036 [0.03]	-0.103** [0.043]	-0.072 [0.045]
Production	0.081 [0.091]	0.077 [0.059]	-0.043 [0.07]	-0.060 [0.079]
Transportation and Material Moving	0.039 [0.049]	0.062** [0.032]	-0.042 [0.044]	-0.056 [0.048]
Other	0.004 [0.048]	0.031 [0.029]	-0.118*** [0.043]	-0.057 [0.045]
Not Reported / Missing	-0.082 [0.043]	0.007 [0.026]	-0.19*** [0.038]	-0.133*** [0.04]

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Receipt of Wagner-Peyser Services	0.114*** [0.016]	0.013 [0.013]	-0.026 [0.016]	-0.004 [0.014]
Training Located in an Urban Area [b]	-	-	-	-
Training Located Near a State Border	-0.023 [0.012]	0.016 [0.009]	-0.021 [0.012]	0.018 [0.011]
Constant	0.300*** [0.049]	0.126*** [0.032]	0.727*** [0.047]	0.611*** [0.048]
Number of observations	6,789	7,434	8,547	9,116
R-squared	0.047	0.036	0.049	0.042

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries are estimated regression coefficients with standard errors in brackets. Each regression model was estimated using OLS. Asterisks indicate statistical significance at the 10 (*), 5 (**), and 1 (***) percent levels. Estimated coefficients for the indicator variables for (1) calendar quarter of training completion and (2) the set of categorical pre-training earnings variables are omitted. [a] This is the reference category (the omitted category against which the estimates for the other categories are measured). [b] This variable (or category) was omitted from the regression due to perfect multicollinearity.

Exhibit 63: Regression Results, Single-State Greater than NDNH, New Jersey

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Race				
White [a]	-	-	-	-
Black	-0.002 [0.005]	0.000 [0.006]	-0.002 [0.004]	0.007*** [0.003]
Other	0.004 [0.006]	-0.006 [0.007]	-0.010*** [0.004]	0.000 [0.003]
Female	0.006 [0.004]	0.005 [0.005]	0.007** [0.003]	0.005** [0.002]
Age				
18-24	0.014 [0.008]	0.007 [0.008]	0.011** [0.005]	0.005 [0.004]
25-34 [a]	-	-	-	-
35-44	0.001 [0.006]	0.007 [0.007]	0.007 [0.004]	0.005 [0.003]
45-54	-0.002 [0.006]	0.009 [0.007]	0.001 [0.004]	0.002 [0.003]
At least 55	-0.003 [0.007]	-0.002 [0.008]	0.013** [0.006]	0.004 [0.004]
Educational Attainment				
Less Than a High School Diploma	-0.010 [0.008]	0.005 [0.01]	-0.001 [0.005]	-0.007** [0.003]
High School Diploma [a]	-	-	-	-
GED or Equivalent	-0.008 [0.009]	0.001 [0.012]	0.004 [0.007]	0.007 [0.006]
Some College	-0.010 [0.006]	-0.012* [0.007]	0.003 [0.004]	0.001 [0.003]
Associate Degree	-0.005 [0.008]	0.008 [0.01]	0.009 [0.006]	0.004 [0.004]
Bachelor's Degree	-0.013** [0.006]	-0.017** [0.007]	0.005 [0.005]	0.001 [0.004]
More Than Four Years of College	-0.001 [0.010]	-0.003 [0.013]	0.000 [0.008]	0.005 [0.007]
Other	0.001 [0.013]	0.010 [0.016]	0.004 [0.009]	0.009 [0.009]
Quarter of Training Completion	✓	✓	✓	✓
Pre-training Earnings				
1 Quarter Prior to Training Start	✓	✓	✓	✓
4 Quarters Prior to Training Start	✓	✓	✓	✓
8 Quarters Prior to Training Start	✓	✓	✓	✓

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Type of Training				
On the Job Training	0.028 [0.018]	0.003 [0.014]	-0.003 [0.009]	0.005 [0.009]
Skill Upgrading and Retraining	-0.018*** [0.005]	-0.006 [0.042]	-0.014*** [0.003]	0.001 [0.011]
Entrepreneurial Training	-0.030*** [0.009]	-0.058*** [0.015]	-0.01 [0.008]	-0.027*** [0.01]
Adult Education and Literacy with Training	-0.030*** [0.005]	0.032 [0.025]	0.024** [0.012]	0.006 [0.006]
Customized Training	-0.037*** [0.010]	-0.048*** [0.011]	-0.028*** [0.006]	-0.011** [0.005]
Other Occupational Skills Training	-	-	-	-
Length of Training in Days				
Less than 60 Days [a]	-	-	-	-
At least 60 Days, Less than 90 Days	-0.002 [0.006]	-0.005 [0.008]	-0.006 [0.005]	-0.007** [0.004]
At Least 90 Days, Less than 180 Days	0.007 [0.005]	0.005 [0.007]	0.000 [0.005]	-0.003 [0.003]
At Least 180 Days, Less than 1 Year	0.001 [0.006]	-0.014** [0.007]	-0.012*** [0.004]	-0.005 [0.003]
At Least 1 Year	-0.002 [0.01]	-0.011 [0.01]	-0.01** [0.005]	-0.008* [0.005]
Training O*Net Code				
Computer and Mathematical	0.005 [0.036]	-0.035 [0.032]	-0.023 [0.016]	0.011 [0.009]
Healthcare Practitioners and Technical [a]	-	-	-	-
Healthcare Support	0.015 [0.023]	-0.012 [0.026]	-0.006 [0.016]	0.008* [0.005]
Installation, Maintenance, and Repair	-0.023 [0.027]	-0.021 [0.036]	-0.004 [0.022]	0.005* [0.003]
Management	-0.021 [0.021]	-0.040 [0.027]	-0.016 [0.017]	0.014 [0.01]
Office and Administrative Support	-0.017 [0.021]	-0.022 [0.026]	0.005 [0.017]	0.019*** [0.006]
Production	0.041 [0.052]	-0.063** [0.03]	-0.026* [0.015]	0.002 [0.003]
Transportation and Material Moving	-0.006 [0.021]	-0.051** [0.025]	-0.012 [0.016]	0.006 [0.004]
Other	0.001 [0.021]	-0.034 [0.024]	-0.013 [0.015]	0.007* [0.004]
Not Reported / Missing	-0.017 [0.019]	-0.042 [0.023]	-0.015 [0.015]	0.013*** [0.002]

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Receipt of Wagner-Peyser Services	-0.015* [0.008]	-0.005 [0.009]	0.005 [0.004]	0.003 [0.003]
Training Located in an Urban Area [b]	-	-	-	-
Training Located Near a State Border	-0.006 [0.005]	-0.005 [0.006]	0.003 [0.003]	0.000 [0.003]
Constant	0.049** [0.021]	0.084*** [0.027]	0.021 [0.016]	-0.014** [0.006]
Number of observations	6,789	7,434	8,547	9,116
R-squared	0.018	0.015	0.017	0.011

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries are estimated regression coefficients with standard errors in brackets. Each regression model was estimated using OLS. Asterisks indicate statistical significance at the 10 (*), 5 (**), and 1 (***) percent levels. Estimated coefficients for the indicator variables for (1) calendar quarter of training completion and (2) the set of categorical pre-training earnings variables are omitted. [a] This is the reference category (the omitted category against which the estimates for the other categories are measured). [b] This variable (or category) was omitted from the regression due to perfect multicollinearity.

Exhibit 64: Regression Results, NDNH Greater than Single-State, Ohio

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Race				
White [a]	-	-	-	-
Black	-0.001 [0.011]	-0.007 [0.010]	[b]	[b]
Other	0.053 [0.032]	0.000 [0.025]	-0.001 [0.009]	0.005 [0.008]
Female	-0.014 [0.013]	-0.02* [0.012]	-0.007 [0.011]	0.008 [0.008]
Age				
18-24	0.001 [0.012]	-0.004 [0.012]	0.014 [0.013]	0.003 [0.012]
25-34 [a]	-	-	-	-
35-44	0.010 [0.013]	0.012 [0.012]	0.010 [0.010]	0.001 [0.009]
45-54	0.016 [0.014]	0.006 [0.013]	0.007 [0.011]	-0.001 [0.009]
At least 55	0.006 [0.018]	-0.002 [0.016]	0.000 [0.013]	-0.010 [0.011]
Educational Attainment				
Less Than a High School Diploma	-0.002 [0.023]	-0.018 [0.021]	-0.014 [0.021]	-0.032** [0.014]
High School Diploma [a]	-	-	-	-
GED or Equivalent	-0.029** [0.014]	-0.027** [0.013]	-0.016 [0.013]	-0.011 [0.011]
Some College	0.024* [0.013]	-0.004 [0.011]	0.005 [0.011]	0.009 [0.009]
Associate Degree	0.039* [0.021]	0.019 [0.019]	0.015 [0.016]	0.021 [0.013]
Bachelor's Degree	0.034 [0.022]	0.039* [0.021]	0.007 [0.017]	0.038** [0.016]
More Than Four Years of College	0.085* [0.047]	0.059 [0.042]	-0.028 [0.019]	-0.036* [0.02]
Other	-0.005 [0.02]	-0.032* [0.017]	0.000 [0.02]	0.022 [0.022]
Quarter of Training Completion	✓	✓	✓	✓
Pre-training Earnings				
1 Quarter Prior to Training Start	✓	✓	✓	✓
4 Quarters Prior to Training Start	✓	✓	✓	✓
8 Quarters Prior to Training Start	✓	✓	✓	✓

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Type of Training				
On the Job Training	-0.043*** [0.011]	-0.045*** [0.011]	-0.007 [0.011]	-0.023** [0.012]
Skill Upgrading and Retraining	-0.001 [0.077]	-0.057** [0.025]	-0.040** [0.019]	-0.045*** [0.011]
Entrepreneurial Training	[b]	[b]	[b]	-0.096*** [0.02]
Adult Education and Literacy with Training	-0.077*** [0.020]	-0.083*** [0.019]	-0.087*** [0.013]	-0.012 [0.053]
Customized Training	-0.014 [0.073]	-0.103*** [0.016]	0.215* [0.123]	-0.030 [0.035]
Other Occupational Skills Training [a]	-	-	-	-
Length of Training in Days				
Less than 60 Days [a]	-	-	-	-
At least 60 Days, Less than 90 Days	0.015 [0.015]	-0.032** [0.014]	0.007 [0.014]	-0.006 [0.015]
At Least 90 Days, Less than 180 Days	0.011 [0.013]	-0.034*** [0.013]	-0.010 [0.013]	-0.018 [0.012]
At Least 180 Days, Less than 1 Year	0.021 [0.015]	0.008 [0.015]	0.003 [0.014]	-0.010 [0.012]
At Least 1 Year	0.013 [0.017]	-0.009 [0.017]	0.002 [0.014]	-0.018 [0.013]
Training O*Net Code				
Computer and Mathematical	0.05* [0.028]	0.003 [0.03]	-0.007 [0.022]	0.019 [0.017]
Healthcare Practitioners and Technical [a]	-	-	-	-
Healthcare Support	0.011 [0.016]	0.004 [0.016]	-0.033** [0.014]	-0.015 [0.010]
Installation, Maintenance, and Repair	0.017 [0.025]	-0.006 [0.023]	0.012 [0.023]	0.019 [0.016]
Management	0.029 [0.033]	0.030 [0.031]	0.021 [0.026]	0.035* [0.02]
Office and Administrative Support	0.015 [0.017]	-0.001 [0.016]	-0.029* [0.015]	0.008 [0.014]
Production	0.042** [0.02]	0.023 [0.018]	-0.015 [0.017]	0.015 [0.014]
Transportation and Material Moving	0.11*** [0.021]	0.055*** [0.02]	0.021 [0.019]	0.051*** [0.017]
Other	0.001 [0.016]	0.007 [0.018]	-0.028** [0.014]	0.007 [0.011]
Not Reported / Missing	[b]	-0.069** [0.027]	[b]	[b]

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Receipt of Wagner-Peyser Services	-0.011 [0.011]	-0.009 [0.012]	-0.003 [0.012]	-0.023** [0.012]
Training Located in an Urban Area	0.006 [0.012]	-0.017* [0.009]	-0.006 [0.009]	0.006 [0.007]
Training Located Near a State Border	0.017 [0.012]	0.061*** [0.01]	0.041*** [0.010]	0.038*** [0.008]
Constant	0.009 [0.026]	0.072*** [0.024]	0.052** [0.022]	0.052*** [0.020]
Number of observations	3,315	3,305	3,829	5,739
R-squared	0.067	0.068	0.040	0.037

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries are estimated regression coefficients with standard errors in brackets. Each regression model was estimated using OLS. Asterisks indicate statistical significance at the 10 (*), 5 (**), and 1 (***) percent levels. Estimated coefficients for the indicator variables for (1) calendar quarter of training completion and (2) the set of categorical pre-training earnings variables are omitted. [a] This is the reference category (the omitted category against which the estimates for the other categories are measured). [b] This variable (or category) was omitted from the regression due to perfect multicollinearity.

Exhibit 65: Regression Results, Single-State Greater than NDNH, Ohio

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Race				
White [a]	-	-	-	-
Black	0.011 [0.013]	0.002 [0.013]	[b]	[b]
Other	0.084** [0.036]	0.012 [0.032]	-0.006 [0.011]	0.002 [0.010]
Female	0.012 [0.014]	-0.042*** [0.014]	-0.013 [0.014]	0.011 [0.010]
Age				
18-24	-0.012 [0.016]	-0.004 [0.016]	0.006 [0.018]	0.024 [0.016]
25-34 [a]	-	-	-	-
35-44	-0.013 [0.015]	0.008 [0.015]	-0.016 [0.014]	0.006 [0.011]
45-54	-0.010 [0.017]	-0.015 [0.015]	-0.009 [0.015]	-0.006 [0.011]
At least 55	-0.034* [0.019]	-0.004 [0.020]	-0.037** [0.018]	-0.001 [0.015]
Educational Attainment				
Less Than a High School Diploma	-0.017 [0.027]	-0.034 [0.023]	0.021 [0.029]	-0.023 [0.021]
High School Diploma [a]	-	-	-	-
GED or Equivalent	-0.019 [0.017]	-0.015 [0.018]	0.025 [0.018]	-0.006 [0.014]
Some College	-0.020 [0.014]	-0.041*** [0.014]	0.001 [0.013]	0.000 [0.011]
Associate Degree	-0.002 [0.024]	-0.046** [0.02]	0.039* [0.022]	-0.019 [0.015]
Bachelor's Degree	-0.004 [0.025]	-0.035 [0.022]	0.032 [0.023]	-0.039*** [0.014]
More Than Four Years of College	-0.054 [0.038]	0.010 [0.044]	0.009 [0.040]	-0.009 [0.034]
Other	-0.026 [0.029]	0.040 [0.038]	-0.017 [0.024]	0.004 [0.026]
Quarter of Training Completion	✓	✓	✓	✓
Pre-training Earnings				
1 Quarter Prior to Training Start	✓	✓	✓	✓
4 Quarters Prior to Training Start	✓	✓	✓	✓
8 Quarters Prior to Training Start	✓	✓	✓	✓

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Type of Training				
On the Job Training	0.06*** [0.017]	0.019 [0.016]	0.010 [0.015]	0.039** [0.015]
Skill Upgrading and Retraining	-0.004 [0.074]	-0.086*** [0.032]	0.005 [0.097]	-0.012 [0.046]
Entrepreneurial Training	[b]	[b]	[b]	-0.09*** [0.025]
Adult Education and Literacy with Training	0.005 [0.091]	-0.107*** [0.021]	-0.094*** [0.015]	-0.117*** [0.014]
Customized Training	-0.013 [0.078]	-0.049** [0.023]	-0.100*** [0.021]	0.003 [0.055]
Other Occupational Skills Training [a]	-	-	-	-
Length of Training in Days				
Less than 60 Days [a]	-	-	-	-
At least 60 Days, Less than 90 Days	0.004 [0.016]	-0.016 [0.017]	0.004 [0.016]	-0.002 [0.016]
At Least 90 Days, Less than 180 Days	0.001 [0.015]	0.011 [0.017]	0.003 [0.015]	-0.008 [0.014]
At Least 180 Days, Less than 1 Year	-0.015 [0.016]	0.007 [0.018]	0.014 [0.018]	-0.020 [0.014]
At Least 1 Year	0.037 [0.023]	0.023 [0.021]	0.069*** [0.018]	0.007* [0.015]
Training O*Net Code				
Computer and Mathematical	0.004 [0.028]	-0.073** [0.034]	0.005 [0.035]	-0.028 [0.020]
Healthcare Practitioners and Technical [a]	-	-	-	-
Healthcare Support	0.037 [0.024]	-0.029 [0.022]	0.010 [0.02]	-0.015 [0.015]
Installation, Maintenance, and Repair	0.031 [0.036]	-0.013 [0.039]	-0.061** [0.025]	-0.044** [0.02]
Management	0.135*** [0.049]	-0.033 [0.040]	-0.022 [0.031]	-0.032 [0.021]
Office and Administrative Support	-0.061*** [0.021]	-0.047* [0.025]	0.016 [0.025]	-0.051*** [0.018]
Production	-0.08*** [0.026]	-0.100*** [0.025]	0.017 [0.024]	-0.026 [0.019]
Transportation and Material Moving	0.028 [0.023]	-0.047* [0.024]	-0.016 [0.022]	-0.037** [0.018]
Other	-0.056*** [0.021]	-0.041* [0.024]	0.001 [0.020]	-0.029** [0.015]
Not Reported / Missing	[b]	-0.091* [0.049]	[b]	[b]

	Follow-up Period			
	1 Quarter	4 Quarters	8 Quarters	12 Quarters
Receipt of Wagner-Peyser Services	0.013 [0.013]	0.001 [0.014]	-0.006 [0.015]	-0.010 [0.014]
Training Located in an Urban Area	0.017 [0.014]	-0.01 [0.013]	-0.031*** [0.012]	0.016* [0.01]
Training Located Near a State Border	-0.026* [0.014]	0.005 [0.013]	0.027** [0.012]	0.034*** [0.011]
Constant	0.069** [0.03]	0.147*** [0.031]	0.085*** [0.03]	0.089*** [0.024]
Number of observations	3,315	3,305	3,829	5,739
R-squared	0.044	0.033	0.031	0.028

Source: State administrative data and NDNH data on WIA/WIOA training completers.

Notes: Table entries are estimated regression coefficients with standard errors in brackets. Each regression model was estimated using OLS. Asterisks indicate statistical significance at the 10 (*), 5 (**), and 1 (***) percent levels. Estimated coefficients for the indicator variables for (1) calendar quarter of training completion and (2) the set of categorical pre-training earnings variables are omitted. [a] This is the reference category (the omitted category against which the estimates for the other categories are measured). [b] This variable (or category) was omitted from the regression due to perfect multicollinearity.