



# Better Data for Better Policy

## Lessons Learned from across the Coleridge Initiative's Partnerships

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**The Coleridge Initiative is a nonprofit organization that collaborates with federal, state, and local government agencies to build capacity to improve research and policy. They do this by providing a platform to securely link confidential microdata within and across states and agencies and by training agency staff. The Coleridge Initiative's platform is its Administrative Data Research Facility (ADRF),<sup>1</sup> a secure FedRAMP-certified, cloud-based platform for administrative data analytics. State and federal partners are trained to use the ADRF through Applied Data Analytics (ADA) training, a modular, project-based training program that allows agency staff to work hands on with their own data.<sup>2</sup>**

From its creation in 2017 the Coleridge Initiative has engaged postsecondary, workforce, and other state agencies in 40 states and 10 federal agencies. It has delivered almost 30 ADA trainings to over 800 participants representing 250 different agencies in local, state, and federal government. This engagement has resulted in hosting data on the ADRF from 15 different states and over 40 state agencies, as well as 6 federal agencies and a variety of city and county governments. Many of the state partners are active participants in two regional data collaboratives focused on the Midwest and the South.

This is the third of three briefs on the experiences of the Coleridge Initiative and its state partners. Two prior briefs provide case studies of Ohio and Tennessee's partnership with the Coleridge Initiative. The goal of the briefs is to document the experiences of the Coleridge Initiative, draw lessons from the experiences of state partners that can improve the work of the Coleridge Initiative in the future, and apply broader lessons for data sharing, linking, and evidence-based policy.

Every Coleridge Initiative partnership evolves differently, so current partners' experiences provide a wealth of models and lessons for the expansion of the Coleridge Initiative's activities into new states and agencies. This brief reviews the Coleridge Initiative's draws on interviews with staff employed with state partners and ADA training completers to document the Coleridge Initiative's work and to help potential new partners understand how ADA training, the ADRF, and data linking for evidence-based policymaking can support policy and improve the connection between education and workforce. The Coleridge Initiative is informed by, and complements a series of, prior state data quality initiatives, longitudinal data initiatives, and cross-state data initiatives. Many of the state longitudinal data systems on the ADRF were developed as a part of these earlier efforts. What distinguishes the Coleridge Initiative's work through its ADA training, the ADRF, and regional collaboratives is that the initiative provides a platform that enables states to link their longitudinal data with other states and agencies. States can then make that linked data accessible to approved analysts, policymakers, and researchers. The Coleridge Initiative builds workforce capacity through training which, in turn, builds a community of practice.

Julia Lane, the cofounder of the Coleridge Initiative, observes that "our current approach and the current budget realities mean that we cannot produce all the statistics needed to meet today's expectations for informing increasingly complex public decisions" (Lane 2020b, 3). She concludes that as a country we need a new system that "democratizes" data to support better evidence-based policy and practice to serve public needs. In this new system, the organizational structure of public data, the "composition and skill of the government workforce," and "ties to community and local demand need to be institutionalized and made stronger" (Lane 2020b, 9). Democratizing data in this sense is essential for creating value for the public by creating new products, tools, and research. This brief describes how the Coleridge Initiative democratizes data and creates data in this sense in at least three ways:

- **Democratizing data through the ADRF platform** provides a safe environment for processing, linking, and analyzing data to create value. The ADRF is progress toward Lane's (2020b, 9) goal of reforming the "organizational structure" of public data. The ADRF has both technical and procedural strengths that complement existing state longitudinal data systems.
- **Democratizing data through the ADA training program** provides federal and state agency staff and other data stewards and users with the capacity to use data on the ADRF platform to create value. ADA training provides participants with an opportunity to create value through new data products and tools in an ADRF testbed.
- **Democratizing data through a community of practice** that is built through ADA trainings, the state-led regional data collaboratives, and the partner agencies that work together on the ADRF platform. This community of practice helps to ensure that the "ties to community and local demand" (Lane 2020b, 9) are strengthened.

The first part of this brief describes these three components of the Coleridge Initiative's efforts to democratize data, including strengths, successes, and challenges. Then, the brief reviews how states and federal agencies have forged ahead in using the ADRF, ADA trainings, and community of practice to build regional collaboratives, develop partnerships with researchers, and explore new policy areas with

research and data tools. These experiences provide a set of best practices and new state-led ideas that can be used by future partners.

## Democratizing Data through the Administrative Data Research Facility

The ADRF democratizes data by providing a secure, accessible environment for linking and processing administrative data that is difficult to obtain and use effectively. The ADRF hosts deidentified data that is managed by approved data stewards who approve data users and projects. Data users access deidentified data remotely through their web browser so that the data remains in the secure ADRF environment. Data stewards with statutory authority over the requested data control data users' level of access to data on the platform. In some cases, data is accessible in a testbed for ADA training; in other cases, broader access is granted to approved users.

When data stewards across states and agencies make their data available to be linked together securely, the ADRF platform can facilitate the development of linked longitudinal data across jurisdictions to support evidence-based policy. A Tennessee state agency staff member contrasts the ADRF with state longitudinal data systems and notes that “the complexity of the [state longitudinal data] system drives many people away because there are different systems and different identification numbers that are system specific.” Linking data in the ADRF is comparatively seamless and controlled by data users through the data hashing application.

A state agency partner from Arkansas points to several benefits of the ADRF that make it more accessible to states and researchers. First, he notes that the ADRF is cost-effective because it is a secure system that meets all technical requirements and has already been developed with philanthropic support, eliminating development costs for states. He also highlights “the community of practice aspect” of the ADRF as particularly attractive and important for productive use of the platform.

The ADRF has technical advantages over other longitudinal data systems. In addition to highlighting the usability of data on the ADRF, state agency partners repeatedly cite the ADRF's technical advantages. A data manager from Tennessee points to the ADRF's hashing algorithms, which are used to securely link individuals across datasets and assign them a new unique identification number. Strong hashing is essential for producing reliable linked data and for producing data that adequately secure sensitive personal identifying information. Data users reported that ADRF hashing is stronger than both Tennessee's state longitudinal data hashing and linking by the National Student Clearinghouse (a common source of cross-state linked postsecondary records).

Finally, the ADRF balances security and access with simple rules. Five simple rules, the “five safes,” ensure that the ADRF is securely accessed by users, balancing privacy against utility. The five safes follow:

- **Safe projects:** All projects must be agreed to by data stewards with statutory authority for agency data. Users do their work in isolated workspaces.
- **Safe users:** Only approved users can work on the ADRF.
- **Safe settings:** The ADRF is designed to ensure secure data transfer from state agencies, particularly transfers of data that include personally identifying information.
- **Safe data:** Sensitive microdata is kept safe through a secure hashing algorithm that provides a unique identification for linked data and through secure data stewardship by approved stewards.
- **Safe exports:** Exports from the secure ADRF environment are restricted and reviewed by Coleridge Initiative staff and data stewards.

The structure of the ADRF, the data hashing application, and the five safes are all introduced to data users in what the Arkansas staff member referred to as the Coleridge Initiative’s “community of practice,” and in particular through ADA training classes. ADA training empowers data users with the tools that they need to access and use the ADRF.

## Democratizing Data through ADA Training

ADA training democratizes data by providing partners with a testbed environment to build partner capacity, creating value with new data products and strengthening new partner networks.

### Creating Value by Building Partner Capacity

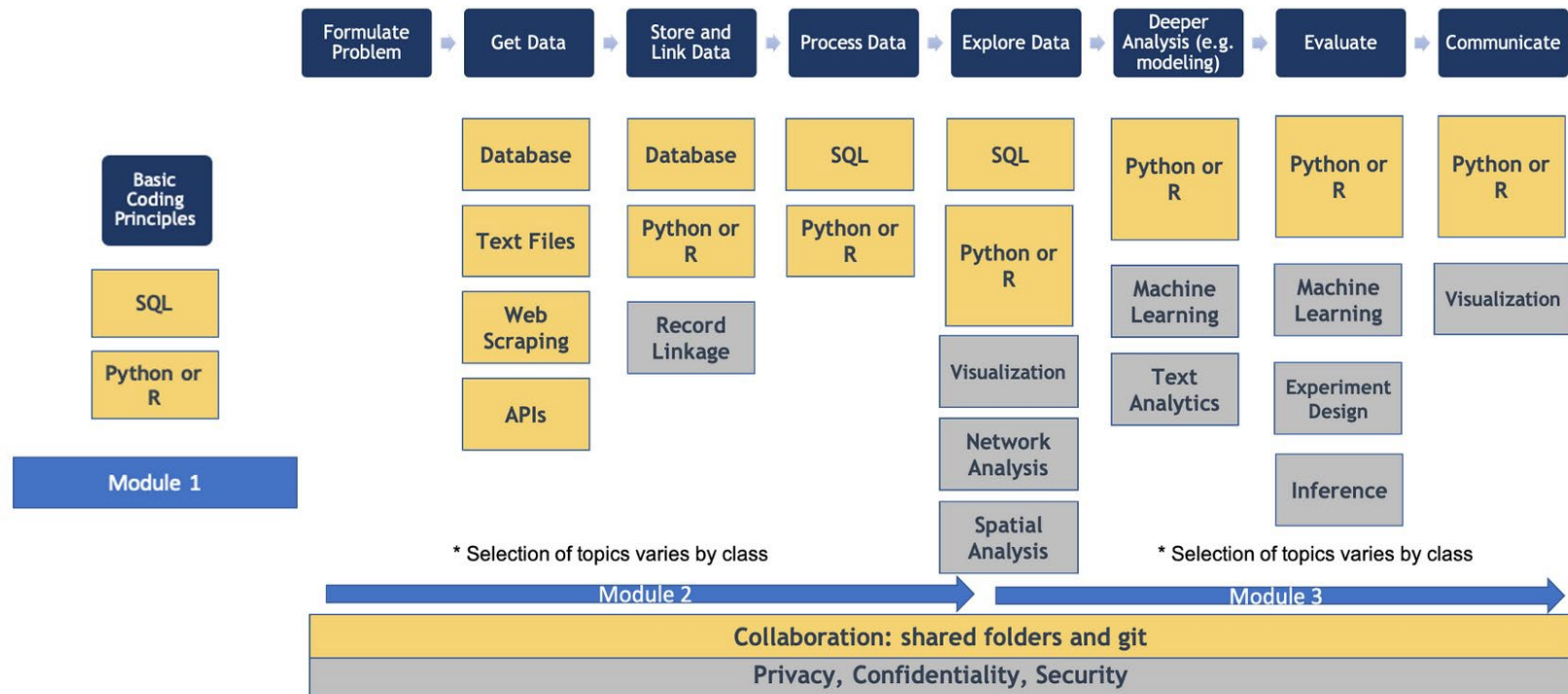
Each ADA training is modular and project based (figure 1). The first half of the course covers data, record linking, data visualization, and project preparation. The second half covers machine learning techniques, inference, and privacy. Participants are taught Python, R, and SQL. Participants are divided into teams that work on projects and present their results to the class at the end of the course.

- **Module 1: Coding basics.** In the first module of the ADA training, participants learn the basics of SQL and either Python or R. Participants come with a range of coding experience and proficiency, so the first module is essential for guaranteeing a baseline level of knowledge. Although members of an ADA training team will still have different levels of coding proficiency, the first module will ensure that all participants can follow subsequent modules.
- **Module 2: Getting and processing the data.** The second module teaches participants how to access data on the ADRF, link records across datasets, and process the data for analysis. Participants use the SQL, Python, and R skills they learned in module 1 to process data. The

data a participant processes depends on what data the training host provides in the ADRF sandbox, but it usually involves a combination of wage, college, or program data.

- **Module 3: Analysis and visualization.** The third module of the ADA training provides participants with the tools they need to analyze their data using Python and R, including text analysis, machine learning, and experimental design. Participants are also taught how to visualize the data they are analyzing, so that the evidence they develop can be effectively communicated to policymakers and other stakeholders.
- **Final report and presentations.** Training teams work on a project using the skills they develop during training and the training data housed on the ADRF sandbox. These projects are focused on creating new value using agency data, including data products and tools, research findings relevant to policy, and new approaches to linking and analyzing data.

FIGURE 1  
ADA Training Structures

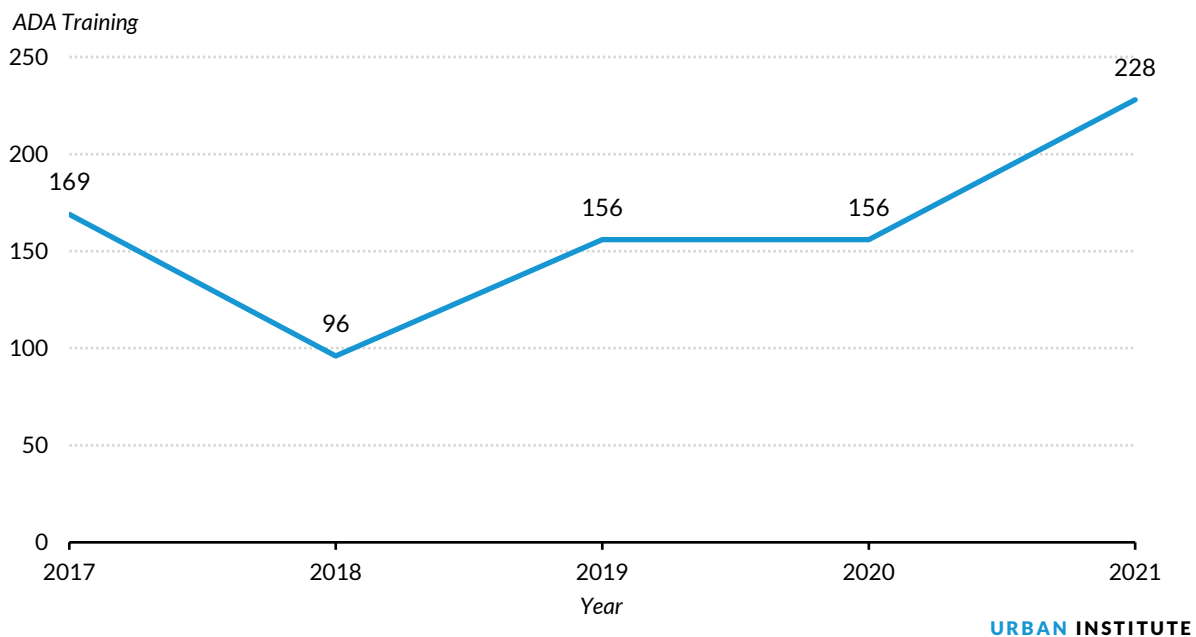


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The COVID-19 pandemic forced in-person ADA trainings to operate virtually, but this disruption had no identifiable impact on the growth of ADA training (figure 2). More participants attended ADA trainings in 2021 than in any other year, and 2020 had the same number of participants as 2019. Almost a third of the combined ADA training participants in 2020 and 2021 (114 out of 384) participated in one of four US Department of Labor Employment and Training Administration (ETA) classes, which focused on the reemployment trajectories of unemployment insurance benefits claimants. The ETA classes were timely and especially relevant for policy because between March 2020 and April 2020 the national unemployment rate increased from 4.4 percent to 14.8 percent. The increase in unemployment put an incredible strain on state unemployment insurance claims processing and reemployment services. The ETA classes demonstrate how Coleridge Initiative efforts have been responsive to current policy needs, even during a global pandemic.

**FIGURE 2**  
**Participants in Recent ADA Trainings Hosted by State Partners**



Source: Participant lists obtained from the Coleridge Initiative.

On the surface, ADA training provides technical and research methods instruction to participants. But the training also has critical “community of practice” elements that create value by building relationships across agencies and states that supports the development of data products and future policy impact. Relationships across states also help to expand the use of the ADRF in new states, which creates new value in those neighboring states. The next section describes how ADA training has built productive relationships across agencies and across states and provides insights from participants on how they have adapted their ADA training to better meet state needs.

## Creating Value with Data Products and Projects

The purpose of the ADRF and ADA training is for states to create value with their own data on the ADRF platform with the support of the Coleridge Initiative. That value creation begins immediately in ADA trainings, as participants process and analyze data in the ADRF testbed and apply the skills that they learn in training. ADA participants have completed over 130 projects, all of which illuminate specific analytic or programmatic problems facing local, state, and federal agencies.<sup>3</sup> In many cases, these data projects inspire or evolve into future work and value creation. The specific content of an ADA training class is determined by state and federal agency hosts, with the advice and support of the Coleridge Initiative. Data products produced by training teams are shaped by the data available on the ADRF for that training and by the focus of the training. Two of the most successful data products created during the ADA trainings are the Unemployment to Reemployment Portal and the Multi-State Postsecondary Report. These state-led data tools have been shared and emulated by new state partners and are continuously expanded and improved by the project teams that created them.

**The Unemployment to Reemployment Portal** provides workforce development practitioners and policymakers with real-time labor market information using the ADRF. The portal uses deidentified unemployment insurance claims data to display claimant behavior by geography, demographics, educational attainment, and industry. It also presents the net economic impact of unemployment insurance by local geography. Although the portal was initially focused on Illinois, it was later expanded to Indiana and Tennessee.

**The Kentucky Multi-State Postsecondary Report** is a flexible, accessible online data tool that allows users to track labor market outcomes across state lines for postsecondary completers in Kentucky and Ohio.<sup>4</sup> Users can track in-state and out-of-state employment and earnings for credential program completers by credential type, major, and institution. The report, which draws on the ADRF for its data, was developed by the Kentucky Center for Statistics at the 2019 Ohio ADA training with the support of Ohio State University.

Several states and the US Department of Labor ETA have hosted ADA trainings built around the **transition from unemployment to employment**. Participants in these trainings worked with state workforce data, including both wage records and unemployment insurance claimant records. The most prominent data product from the transition from unemployment to employment trainings was the Unemployment to Reemployment Portal, but training teams also explored research questions related to unemployment insurance benefit exhaustion and unemployment patterns across different industries and demographic groups. Projects and data products produced during these trainings follow:

- **Tools for workforce boards to predict unemployment insurance benefit exhaustion.** Several teams developed tools to help local workforce boards better understand the likelihood that their clients would exhaust unemployment insurance benefits. Empowering workforce boards with these insights helps to allocate scarce resources and provide at-risk workers with targeted supports. One ETA training team including staff from Alabama and Arkansas developed a dashboard that visualizes benefit exhaustion for different industry and demographic subgroups



by local area. A team member described how the tool identifies “pockets of risk somewhere you might not expect.” For example, although most benefit exhaustion occurred among workers from the accommodation and food services industry, workers from the information sector with low educational attainment are a “pocket of risk” with high exhaustion rates.<sup>5</sup> Another ETA training team with participants from Maine and Illinois created a similar dashboard that identified “priority counties” in central Illinois with high concentrations of claimants at risk of benefit exhaustion based on their characteristics.<sup>6</sup>

- **Analysis of the relationship between benefit generosity and reemployment.** In addition to dashboards and tools, ADA training teams produced policy analysis to inform the work of state workforce agencies and local workforce boards. For example, a team of state agency staff members from New Jersey participating in the ETA training found that more generous unemployment insurance benefits were associated with longer unemployment spells. The team noted that longer unemployment spells could be caused by systematic differences among claimants, or it could be a direct result of benefit generosity. In either case, they recommend that state workforce agencies target reemployment services to claimant populations with high unemployment insurance replacement rates.<sup>7</sup>

Another focus for ADA trainings hosted by several states has been **transitions in education and work**. These trainings featured linked data from state workforce and postsecondary education agencies. Training teams explored research questions related to the employment and earnings outcomes of college students. They compared credential program completers with noncompleters and participants in different postsecondary programs. The most notable data product developed during the ADA trainings focused on transitions in education and work was the Multi-State Postsecondary Report, but other projects and data products include the following:

- **Employment outcomes for detailed credentials.** Several project teams participating in the transitions in education and work trainings used college records linked to workforce data to understand outcomes for specific credentials, including nondegree credentials. A team from the Kentucky ADA training explored the employment outcomes and geographic mobility of students completing different types of credentials in the Kentucky community and technical college system. They found that although associates degree earners consistently had higher earnings than graduates with certificates or diplomas, their earnings were also strongly associated with fields of study. Graduates with certificates or diplomas in manufacturing had higher average earnings than graduates of trades or transportation programs.<sup>8</sup> During Ohio’s 2020 ADA training, a team of staff from Tennessee state agencies investigated the employment outcomes for completers and noncompleters of Ohio welding programs. The team wanted to investigate anecdotal reports that students were in such high demand that they were hired before completing school. They found that contrary to these anecdotal reports, noncompleters had worse employment outcomes than completers and were less likely to be employed in industries that hired welders.

- **Employment outcomes for registered apprentices.** The transitions in education and work trainings also provided project teams with opportunities to analyze employment outcomes for populations outside of traditional colleges and universities, including registered apprentices who receive on-the-job training from an employer. A multistate team in the 2019 Ohio ADA training compared the employment experiences of apprentices who had completed and dropped out of their programs and found that completers experienced much stronger earnings and employment growth than noncompleters.

Although many ADA trainings were built around the themes of transitions from unemployment to reemployment or transitions in education and work, other state and federal agency hosts supported trainings focused on populations or programs. For example, the University of Maryland supported two ADA trainings focused on the Temporary Assistance for Needy Families program, operated in cooperation with the Temporary Assistance for Needy Families Data Collaborative. In 2018, the Kauffman Foundation supported two ADA trainings focused on economic development, hosted by Missouri and Illinois. Projects and data products produced during these trainings include the following:

- **Analysis of employment and recidivism experiences of formerly incarcerated people.** Participants in Missouri’s 2019 ADA training used the state’s linked Department of Corrections and Department of Labor and Industrial Relations data to understand the relationship between employment and recidivism for people who were formerly incarcerated. One training team composed of staff from four different Missouri state agencies determined that postrelease employment is paradoxically associated with increased recidivism. They concluded that even individuals who connect to employment after release can benefit from supportive services. Another Missouri team found that participation in vocational training programs while in prison improved employment stability for formerly incarcerated individuals after their release.<sup>9</sup>
- **Research on Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and food purchases.** In 2019, the US Department of Agriculture sponsored an ADA training focused on the WIC program, which provides food and nutrition support to women, infants, and children with low incomes. Several teams studied the impact of WIC benefits on the purchase of whole grain bread and found that the program increased whole grain purchases compared to families who were eligible but did not participate. Another team showed that WIC participants and eligible nonparticipants both purchased juice that was high in sugar content, suggesting that there may be opportunities to improve nutritional education provided to participants.

## Democratizing Data through a Community of Practice

ADA training can be the first step toward a state uploading and using data on the ADRF. A participant from Arkansas described how ADA training provides a way of “starting to test the waters of the ADRF to see if it was something we would be interested in” because it provides a testbed for creating new data products. An ADA training participant from Michigan reported that their agency hired a new staff

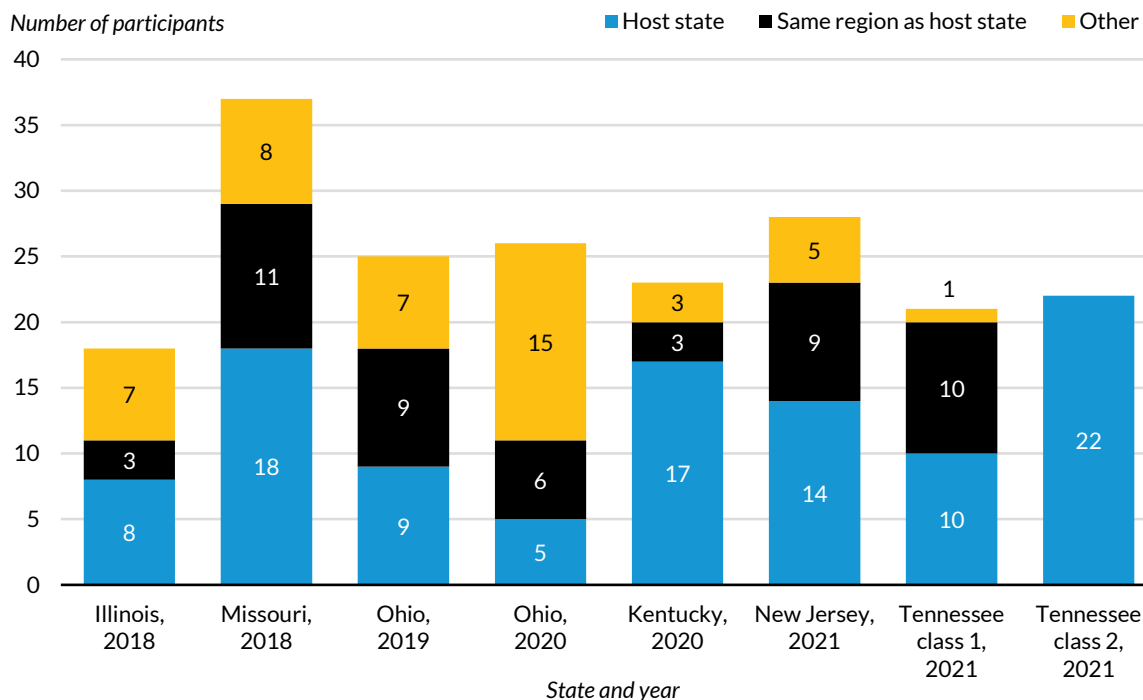
member for data analytics after their ADA training to make better use of the agency's administrative data and the state's relationship with the ADRF.

ADA trainings are widely advertised to potential participants inside and outside host states. In some cases, out-of-state participants were specifically approached to participate to introduce their state to the ADRF. The states selected final participants jointly with the Coleridge Initiative. To bring new state partners into the ADRF, ADA trainings typically include trainees from multiple states, including data stewards and users in states that have expressed interest in the work of the Coleridge Initiative.

Of all the Coleridge Initiative partners' ADA trainings, the Ohio trainings included the highest share of participants from out of state. As a result, the Ohio training teams generated data products with significant value across multiple states (e.g., the Multi-State Postsecondary Report), and inspired ADA training in other states, such as Tennessee (Kuehn 2022b). Only 36 percent (9 out of 25) of the 2019 Ohio training participants and 19 percent (5 out of 26) of the 2020 Ohio training participants were from Ohio. In 2020, over 50 percent of the participants (15 out of 26) were not only from out of state but from outside the Midwest region entirely.<sup>10</sup> Although Ohio hosted the smallest share of ADA participants from in state, this approach to ADA training was followed by Illinois, Missouri, and the first Tennessee class, in which less than 50 percent of participants came from in state. Arkansas is currently planning as many as three ADA trainings and expects that approximately 50 percent of the participants in each training will from out of state.

Other state ADA trainings were heavily weighted toward in-state participants. Seventy-four percent of participants in the Kentucky training were from in state, and all the participants in the second Tennessee training were from in state.

**FIGURE 3**  
**Participants in Recent ADA Trainings Hosted by State Partners**



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**Source:** Participant lists for the New Jersey and Tennessee trainings were obtained from “Past Programs,” Coleridge Initiative, accessed December 14, 2021, <https://ada.coleridgeinitiative.org/previous-programs>.

**Notes:** Figure only includes selected ADA trainings, with a focus on state partnerships.

ADA training participants from out of state are sometimes from the most successful and innovative teams. For example, the Kentucky Multi-State Postsecondary Report was developed in the 2020 Ohio ADA training by out-of-state participants from Kentucky. The report is an online data platform that allows users to track employment and earnings outcomes for postsecondary completers in Kentucky and Ohio, including for jobs in other states (currently Indiana, Kentucky, Ohio, and Tennessee).<sup>11</sup> A Kentucky agency staff member reported that “without that data environment [the ADRF] and the network and state collaborations that we have developed,” the report “would be impossible to do.” Ohio State University staff have already provided policymakers with more accurate data on Ohio graduates using the report (Kuehn 2022a).

Ohio and Kentucky’s contrasting approaches to inviting out-of-state participants to ADA training show that there is no right or wrong way to approach building ADA training. Both states have been successful Coleridge Initiative partners with important data products and policy impacts.

## ADA Training Builds Networks and Relationships across Agencies

Within a state, ADA training participants come from multiple agencies. Representatives from postsecondary and workforce agencies are always in attendance at trainings and regional collaborative

convenings, and these staff were often joined by representatives from other agencies, including corrections, social services, evaluation offices, and governors' or mayors' offices. Training participants from different agencies strengthened or built new relationships, sometimes only to make progress on the ADA team project, but sometimes in support of new efforts to benefit the state.

One participant shared that they had “incorporated the lessons learned [in the ADA training] into several projects and a department-level longitudinal database program.” Through this effort, they “engaged local boards and WIOA [Workforce Innovation and Opportunity Act] partners, including eligible training providers, which has spun into several new projects.” Another participant reported working with “two counties that had staff participate in the training. They gained a lot of good skills in the course. We've collaborated on analysis over the past year and a half.” Other ADA training participants reported the following:

- “Through the ADA I began to work much more collaboratively with others in my agency in a multidisciplinary manner. We now have dedicated groups of program experts, coders, and management to develop better code and to exist in a more holistic learning environment.”
- “I was able to make connections within the agency to people who now assist with better data access and understanding, and collaborate on gathering information for analytical efforts we have underway.”
- “I have collaborated with people within my agency on data-related questions. I have made points of contact with the other state agencies participating in the training, with people engaged in similar or overlapping work.”
- “We are now participating in regular data sharing with our Department of Labor.”
- “We have entered a shared data agreement with the University of Chicago UrbanLabs and are in the process of negotiating some specific data projects to collaborate on.”
- “We have held consistent meetings with colleagues on our research project and larger research discussions; we have shared resources from the ADA training with colleagues who did not get to participate in the class.”
- “It is easier to discuss the data and the purpose of the data collection with other state agencies.”

Stronger relationships between state agencies following ADA training sessions also have an impact on state policy and on deepening Coleridge Initiative partnerships. In Tennessee, staff reported that ADA training deepens relationships between agencies in the state, which was instrumental to full participation in the ADRF. ADA training provided an opportunity for Tennessee staff to be in touch with each other during and after their training, which made it easier for these agencies to explore submitting data to the ADRF.

## ADA Training Builds Networks and Relationships across States

ADA training participants also report strengthening relationships with their counterparts in other states, particularly states in their region. Several participants from the South describe following up with their out-of-state colleagues at the Southern Regional Data Collaborative facilitated by the Coleridge Initiative, SHEEO, and the National Association of State Workforce Agencies (NASWA). Other states reported participating in the Midwestern Regional Data Collaborative after their training.

ADA training participants shared the following:

- “We are currently meeting, twice a month, with staff from other states to review code and learn from their more experienced coders. This collaboration has been invaluable to our staff and me personally as we continue to refine and expand our coding skills.”
- “Our state [not a current Coleridge partner state] has been discussing potential projects with the Midwest Collaborative and the state of Illinois [a current Coleridge partner state].”
- “Someone from another state comes to our state meetings to listen in and learn new coding tips. We also meet every other week to review that state's analysis and make suggestions.”
- “We have shared federal grant options with other states that were in our training, and other resource ideas.”
- “[ADA training] has built a shared understanding of what each state is working on. In turn this has helped with interactions with other states on how each side has worked on the problem independently in the past and how to collaborate in the future.”
- “We've reached out to Colorado to inquire about their WDQI [Workforce Data Quality Initiative] grant and request documentation on their WDQI reporting.”
- “We have been in communication with other states and have made changes to our state policies and procedures based on the results that other states have had with their use of administrative data.”
- “We have had regular meetings with state and county employees from other states who are doing the same research work to build on each other's learning and build community.”

In cases in which an ADA participant was the only participant from their state, the training helped to foster cooperation across states. One participant who was the only in-state trainee continued to stay in touch with their colleagues from other states through SHEEO and a joint grant application for further research.

Participants that did not deepen relationships with other states after ADA training cited other responsibilities that constrained their time for outreach. One training participant shared that they did not reach out to other states “due to the volume of work required for WIOA and currently limited staffing capacity, and pandemic recovery,” although even this participant reported increased

cooperation within the state because of ADA training, particularly with labor market information analysts outside of their office.

## Adapting ADA Training to Meet Participant Needs

By the end of 2021, over 750 individuals participated in ADA training from over 250 different organizations. ADA training has evolved in response to feedback from these participants and in response to new training needs of host agencies and states. The Coleridge Initiative regularly reflects on this feedback as it plans new ADA trainings. Key lessons and insights identified by several ADA training participants include the following:

- **With planning, ADA training can be adapted to meet specific states' needs.** ADA training is structured but is also flexible, and that flexibility can be used to meet different state needs. A Kentucky partner describes how their ADA training focused on using R rather than Python because they “wanted to build up other Kentucky agencies’ R capabilities because that’s what we use in house.” These ADA curriculum adaptations are facilitated by communication and planning between the Coleridge Initiative and its state partners.
- **Paying ADA training tuition on behalf of participants can encourage state agency participation, but it has costs.** ADA training tuition can be a barrier to agency participation in the Coleridge Initiative. The Coleridge Initiative sees tuition as “skin in the game” to ensure ADA participants take their training seriously, but in some states, the process of getting approval for professional development is burdensome and poses a barrier to participation. A state-agency staff member in Arkansas plans to use alternative grant funding to cover the full cost of tuition because it “can be very difficult to get training dollars” from the state. A training participant from Ohio noted that agencies already have “skin in the game” when they agree to release a staff member from their job for extended training, and that those costs should be considered alongside tuition. States’ professional development policies and grant opportunities vary, but all states should explore ways to make ADA training accessible without threatening the dedication or quality of participants.

## Regional Collaboratives Provide Guidance for ADA Training Content and Data Sharing

Just as ADA training is important for relationship-building across states and agencies, the regional data-sharing collaboratives are critical for crafting sustained relationships between states. One Coleridge Initiative partner emphasized that the success of the collaboratives depends on their ability to be state-led initiatives supported by the Coleridge Initiative and its partners, NASWA and SHEEO. The Coleridge Initiative has supported three collaborative meetings across two regions:

- In September 2018 and March 2020, the **Midwest Regional Collaborative** convened with the support of the Coleridge Initiative and NASWA to discuss principles of data governance acceptable to all states in the region and strategies for scaling regional participation in the ADRF.
- In September 2021, the **Southern Regional Collaborative** convened with the support of the Coleridge Initiative, NASWA, and SHEEO to discuss new outcomes and research topics, opportunities for building on the Multi-State Postsecondary Report, and potential changes to ADA training.

The Midwest and Southern regions were defined pragmatically, based on the collection of states interested in collaborating on data analysis and products rather than on rigid Census regions. For example, while the first Midwest Regional Collaborative meeting in 2018 was framed around the Bureau of Labor Statistics' regional divisions,<sup>12</sup> the second Midwest Regional Collaborative meeting in 2020 included traditional Midwestern states, but also Kentucky, New Jersey, and Tennessee. These states are outside the Midwest but collaborate with Ohio, Indiana, and other states in the region on projects based in the ADRF environment.

The Midwestern and Southern regional collaboratives have been successful because they produce new value for participating states and strike an appropriate balance among different interests within and across partner states. Examples follow:

- **Produce value by coordinating research agendas across different states.** Regional collaboratives force states to think about regionally appropriate research topics and new data tools. A NASWA staff member pointed out that regional data collaboratives discipline states and require them to think about common problems that are ripe for research. Because “the products are cross-state efforts,” members of a collaborative “need to have common ground.”
- **Balance the perspectives of workforce agencies and postsecondary agencies.** The state-run collaboratives balance the perspectives of workforce agencies with the perspective of postsecondary agencies by including representatives from both agencies and other agencies in the state. The September 2021 meeting of the Southern Collaborative even required that states in the meeting identify a state-level postsecondary education representative, a state workforce agency representative, a representative from a state college or university with education and workforce data experience, and a state data manager with expertise in education and workforce data.<sup>13</sup> Data security and sharing requirements vary across these domains, so representation of all perspectives generates the most robust approach to data governance.
- **Balance privacy and data sovereignty with secure data linking and sharing.** All states are concerned about privacy and maintaining control over access, but these concerns must be balanced with the benefits of secure data linking and sharing. A state cannot learn from its data if it does not share its data. Staff in Tennessee worked with their Coleridge Initiative partners to carefully select a facilitator for the Southern Regional Collaborative that could balance these concerns and determined that SHEEO would be the most effective partner in this role. SHEEO



is a nationally respected organization that works with individual states and understands their interests and concerns about data sovereignty. SHEEO also upholds universal professional values and understands the benefits of data sharing and cooperation across state lines.

- **Balance data governance and procedures with research vision and applications.** The topics discussed at the regional collaborative convenings included both procedural questions related to data governance and access and consideration of new outcomes of interest and research areas. For example, the Southern Regional Collaborative meeting took up both data governance questions and new potential research topics. Southern Regional Collaborative participants explored the possibilities for analyzing the value of different postsecondary credentials rather than educational attainment levels (Coleridge Initiative 2021).

The work of the regional collaboratives is supported by ADA training and the ADRF platform, but states also saw value in the collaboratives and the regional meetings as an opportunity to promote partnerships in new states. In addition to more established Coleridge Initiative partners, the Southern Regional Collaborative included representatives with less ADA training and ADRF experience from Arkansas, Louisiana, Maryland, Texas, Virginia, and West Virginia. Some of these states, such as Arkansas and Texas, had already started down the path of data sharing and contributed their perspectives on the challenges around using and sharing state administrative data, and the value of Coleridge Initiative support. A data manager from Arkansas shared how departmental silos in the state were a barrier to data linking and sharing. He felt that the stewards of state data needed to be persuaded that the ADRF addressed these issues in a constructive and secure way. The Southern Collaborative also provided states with less ADA training or ADRF experience, such as Louisiana and Virginia, with an introduction to the tools and support available from the Coleridge Initiative that could foster deeper partnerships in the future.

## States See Value in Cooperation with University-Based Researchers

University-based social scientists and researchers from public and private research organizations already actively participate in ADA trainings alongside state agency staff at the invitation of states. In some cases, these researchers participate in ADA trainings because they are partnering directly with the Coleridge Initiative to host the training or add state longitudinal data to the ADRF (e.g., researchers at Ohio State University). However, a large majority of ADA training participants have been staff from federal, state, and local workforce, postsecondary, and social services agencies.<sup>14</sup> Some of these agency staff have research backgrounds or are members of the agency's data analytics team, but they generally do not conduct or publish independent social scientific research and evaluation. Focusing ADA training on state agency staff is appropriate because at this stage in the growth of the ADRF, the priority is building out the data available on the platform and engaging frontline data users to conduct analyses that inform policymaking. Nevertheless, independent researchers not working directly for a state

agency comprise a second key constituency that may also be of interest to states in the future to produce new policy-relevant peer-reviewed research.

Most ADA training participants have been state agency data analytics staff, but the ADRF is also being used with the permission of state data stewards to produce peer-reviewed research. For example, Whittemore and colleagues (2021) published an article in the *Journal of Emergency Management* using data on the ADRF to investigate the relationship between walking distance to “points of dispensing” (i.e., sites used to rapidly distribute medical services to prevent the spread of disease in a public health crisis) and characteristics associated with health disparities in New York City. The research assessed the state of health equity in the city and found that more vulnerable populations had shorter walking distances to points of dispensing.

State partners are actively thinking and learning about how to include more social scientists in the work of the Coleridge Initiative. One state agency staff member from Tennessee shared how difficult it is for researchers in his state to access the state longitudinal data system and noted that these barriers could be resolved by sharing state data through the ADRF. Coleridge Initiative state partners provide several key lessons for working with social scientists based at universities or independent research organizations:

- **When researchers participate in ADA trainings, they provide insights into data use to state data agency staff.** An ADA training participant from an Arkansas state agency found it particularly valuable to be in training with university-based researchers who could discuss how they used and analyzed linked longitudinal data. He shared, “I really needed that perspective on what is going to work for researchers.” State-agency staff and university-based researchers learned how they could work together and what kinds of activities would be mutually beneficial.
- **State-led partnerships with university departments can promote use of the ADRF by university-based researchers.** Kentucky is an example of a state that successfully promoted the ADRF with university-based researchers outside the Kentucky Center for Statistics (also known as KYSTATS). The Kentucky Center for Statistics is piloting a model for external use of ADRF data with a core team of researchers at the University of Kentucky’s Martin School of Public Policy and Public Administration. Martin School researchers have already conducted several projects with ADRF data and are currently coordinating with the state’s Council on Postsecondary Education to develop a research agenda to make use of the ADRF data environment.
- **Some states or federal agencies may be interested in specialized ADA trainings targeted to researchers in universities and private research organizations.** Alternative ADA training that can encourage researcher use of the ADRF, following the successful example of federal research agencies like the National Center for Science and Engineering Statistics, which hosted trainings in 2019 and 2020. Interest in this approach to ADA training would have to be driven by the data stewards, but a similar ADA training could be hosted by federal or state evaluation offices, such as the US Department of Labor’s Chief Evaluation Office or the US Department of

Health and Human Service’s Administration for Children and Families’ Office of Planning, Research, and Evaluation. Evaluation offices regularly contract with independent researchers for research and evaluation services using workforce agency data across multiple states. ADA training could be advertised to research and evaluation contractors, perhaps with a special focus on currently contracted evaluations that cover multiple states. Both the Department of Labor (through the Employment and Training Administration) and the Department of Health and Human Services (through the Administration for Children and Families) have already sponsored ADA training for state agency staff.

## Emerging State-Led Research Topics

A Coleridge Initiative partner from Illinois shared that after entering into an agreement to share data on the ADRF, “envisioning data products has taken precedence over concern for procurement of IT services” in the state. States can make the most of their ADA training and their work with the ADRF by monitoring emerging ADRF research topics that break new ground. Every project team in every ADA training class has faced the task of “envisioning data products” and research topics, but research questions explored during ADA trainings are still curated by team leaders and training hosts. A participant in the 2021 New Jersey ADA trainings describes how team leaders “kept us within guardrails” when choosing a research topic.

One way to approach the development of emerging ADRF research topics is to identify what new opportunities the ADRF opens to states. The clearest advantage that the ADRF has over state longitudinal data systems is that it securely links confidential microdata across state lines. Interstate data linking is critical for high-quality longitudinal data analysis of labor market behavior because of high levels of interstate migration and commuting in the United States. Many ADA training projects and data products using the ADRF already fall under the broad category of interstate migration analyses or capturing labor market outcomes for students who travel across state lines for work. Several emerging ADRF research topics move beyond interstate migration analyses to answer alternative questions.

## Supporting Reemployment during COVID-19 and Beyond

Coleridge Initiative partners in Illinois and the Midwest Collaborative developed the Unemployment to Reemployment Portal to produce real-time labor market information using the ADRF. The portal uses deidentified unemployment insurance claims data to visually display unemployment insurance claimant behavior and net economic impact of unemployment claims by geography, demographics, educational attainment, and industry. This level of detail is not available in federal weekly claims data<sup>15</sup> and is only possible by processing individual claimant data in the ADRF. The portal was subsequently expanded to Indiana and Tennessee.

The astonishing growth of unemployment in the initial weeks of the COVID-19 pandemic made the Unemployment to Reemployment Portal especially salient for researchers and policymakers. The portal was completed at a time when researchers were aggressively pursuing real-time estimates of

unemployment rates and initial claims (e.g., Goldsmith-Pinkham and Sojourner 2020; Larson and Sinclair 2021). The portal fulfilled this purpose and was actively used by Illinois during the early months of the pandemic.

The Coleridge Initiative's Julia Lane (2020a) argues that the unemployment crisis caused by the public health crisis can serve as a catalyst for changing how unemployment insurance wage records are collected and analyzed and how the portal can be used in the future. One potential alternative use for the Unemployment to Reemployment Portal is to support the Reemployment Services and Eligibility Assessment (RESEA) evaluation effort. The RESEA program provides federally funded reemployment services to unemployment insurance claimants and serves as an entry point to other workforce programs. All states have a statutory requirement to evaluate their RESEA programs, but individual claimant data linking and processing have been identified as key challenges facing RESEA evaluators (Mills de la Rosa et al. 2021). Most of the claimant data required for these evaluations is already processed in the Unemployment to Reemployment Portal, so the portal could be a critical tool for evaluators in those states.

### **Shifting Focus from Stopping Brain Drain to Attracting Talent**

The Multi-State Postsecondary Report supports policymakers by taking a base population of completers from a particular Kentucky or Ohio college and determining how many of those completers are still working in state after graduation. Kentucky and Ohio can use the report to track “brain drain” from the state. The report exemplifies how many Coleridge Initiative partners understand the value of the ADRF's linked microdata as a solution to the well-known problem that state unemployment insurance wage records stop at a state's border (Barnow and Greenberg 2015). A full accounting of an individual's (potentially multistate) employment history requires matching wage records across states.

However, there are ways of using ADRF data other than treating it as a solution to incomplete coverage of administrative wage records. For example, analysts who use linked educational records can shift the focus away from a brain-drain framing (the loss of workers to other states) to analyses of how to attract talent from colleges and universities across the country. This shift would require that the sample base of the Multi-State Postsecondary Report change from the graduates of a state's colleges and universities to a sample base of workers in the state (perhaps limited to workers in high-income jobs, defined as jobs that meet a particular quarterly wage level). Instead of linking the state's base of graduates to out-of-state wage records, the state's base of workers would be linked to out-of-state educational records. This alternative orientation of the Multi-State Postsecondary Report could answer a different set of questions focused on attracting talent to the state rather than retaining graduates (table 5).

TABLE 5

Potential Research Questions for Alternative Linked Data Sample Bases

Sample Base is All Graduates of State Colleges and Universities	Sample Base is All Workers with High-Income Jobs in the State
<ul style="list-style-type: none"> <li>How many students remain in the state to work after graduation?</li> <li>What fields of study lose the most graduates to other states?</li> <li>How do the earnings of graduates who remain in state compare to the earnings of graduates who leave for other states?</li> <li>What regions of the state are the most successful in retaining graduates?</li> </ul>	<ul style="list-style-type: none"> <li>How many workers in high-income jobs are attracted to the state from other states?</li> <li>What industries attract the most workers to high-income jobs from out of state?</li> <li>How are the earnings of coworkers affected by attracting talent from out of state?</li> <li>What regions of the state are the most successful at attracting new talent?</li> </ul>

**Notes:** “Sample base” refers to the data that defines the universe of longitudinally linked data. In December 2021’s Kentucky Multi-State Postsecondary Report, the sample base is either college completers in Kentucky or Ohio. These completers are linked to earnings records in other states. “Kentucky Postsecondary Graduate Outcomes by Credential,” KYSTATS, Ohio Education Research Center, and Coleridge Initiative, 2021, [https://kystats.ky.gov/Reports/Tableau/2021\\_MSPSR](https://kystats.ky.gov/Reports/Tableau/2021_MSPSR).

**Coenrollment: Getting the Right Mix of Supports and Services**

ADA training participants from Tennessee identified workers’ coenrollment in multiple workforce development and income support programs as an important policy area in which the state needed additional research and evaluation. Coenrollment in multiple programs is an increasing trend in state workforce development systems because of WIOA requirements for states to strategically align their workforce programs, increase emphasis on program navigation by practitioners, and actively promote state coenrollment planning by the US Department of Labor.<sup>16</sup> A staff member from Tennessee pointed out that because there were “so many different variations and flavors” of coenrollment, the state needed to better understand which coenrollment strategies were the most beneficial for workers.

The Unemployment to Reemployment Portal is one potential platform for developing states’ research on coenrollment. The unemployment insurance program is a critical entry point for other workforce programs, so data managers in Illinois are already planning to link these data to their claimant data in the ADRF. The portal would then help states to understand which claimants coenroll in workforce programs, their experiences in those programs, and their reemployment outcomes.

**Registered Apprenticeship: A Bridge between Education and Work**

Registered apprenticeship training is a potentially fruitful area for future research using the ADRF that several state partners are already interested in. Apprenticeships combine classroom-based technical instruction, often provided by community colleges, with paid on-the-job training by an employer. Apprentices are tracked in a federal administrative data system in most states but will also appear in college enrollment records and state unemployment insurance wage records, so linked longitudinal data

across federal and state agencies are ideal for studying the apprenticeship system. Administrative data on registered apprentices include the apprentices' wage rate at program exit, but it does not include any long-term employment and earnings outcomes.

Several ADA training participants have expressed interest in understanding their state-registered apprenticeship systems better with the ADRF. Arkansas plans to upload apprenticeship data to its state space in the ADRF and is one of the 25 states where apprenticeship programs are registered with the federal government. An Arkansas staff member cited the importance of registering apprenticeships as a workforce development policy and the fact that states collected standardized data on apprentices as a reason for the decision.

The federal government maintains administrative data on apprentices in the Registered Apprenticeship Partners Information Data System (RAPIDS). States using RAPIDS do not have full access to the names, dates of birth, and social security numbers necessary for linking their RAPIDS data to other data files in the ADRF, but the US Department of Labor can provide those identifiers with an appropriate data-sharing agreement.<sup>17</sup>

The 2020 Universities Measuring the Effects of Research on Innovation, Competitiveness, and Science (UMETRICS) ADA training provides an example of a training class built around specialized datasets that could be applied to the RAPIDS registered apprenticeship data. In the UMETRICS class, participants worked with data from the National Science Foundation (NSF) Survey of Earned Doctorates, Survey of Doctorate Recipients and Higher Education Research, and Development Survey, in addition to the UMETRICS data, maintained the Institute for Research on Innovation in Science.<sup>18</sup> Team projects and lectures were built around these data in a training funded by the NSF. Similar apprenticeship-focused trainings funded by either the US Department of Labor's Office of Apprenticeship, a consortium of interested states, or a foundation could support focused ADRF-based research on apprenticeship. Potential research questions for project teams could include the following:

- What are registered apprentices' long-term employment outcomes?
- Do apprentices maintain employment with the employer that trained them after completion of the apprenticeship, or are they "poached" by other employers?
- Do apprentices with nationally recognized occupational credentials migrate to other states after completion of their training?
- How do the earnings outcomes of registered apprentices compare to college students in the same state?

## Opportunities for Causal Analysis

Data sharing between states also opens the possibility for rigorous quasi-experimental causal analyses of state policy that are often impossible to implement for researchers that only have access to a single state's data. Causal analysis is an important complement to descriptive data analysis that could be incorporated into data products in the future, particularly as university-based researchers submit

project applications for data housed on the ADRF. States are already partnering with university-based researchers at Rutgers University and the University of Kentucky's Martin School of Public Policy and Administration. These relationships and any future research projects involving causal inference are and will continue to be state led.

Quasi-experimental policy analyses are used when a policy change cannot be administered in the context of a randomized experiment. Many quasi-experimental methods rely on comparisons among multiple states or jurisdictions. Because the ADRF links uniformly coded and structured outcome data across states, it is a potentially powerful platform for implementing the next generation of quasi-experimental policy analysis.

Three broad categories of quasi-experimental analyses that could be implemented using data housed on the ADRF are as follows:

- **Border studies.** Border studies are quasi-experimental studies that rely on the assumption that communities on one side of a state border are similar to communities immediately across the border in all respects except for the state policy environment of the two communities. The first border studies analyzed state policies to attract manufacturing employers (Holmes 1998) and bank deregulation (Huang 2008). Border studies have also been important for understanding the impact of the minimum wage on workers (Addison, Blackburn, and Cotti 2013; Dube, Lester, and Reich 2010).
- **Difference in differences.** Another common quasi-experimental method for determining the causal effect of a state policy is difference in differences. A difference-in-differences design compares the change in an outcome of interest (such as average quarterly earnings) in a state that implements a policy to the change in the same outcome in a state that does not implement the policy.<sup>19</sup> Implementing a difference in differences for state policies requires data that is collected comparably across multiple states, as in the ADRF.
- **Synthetic control studies.** Synthetic control studies are quasi-experimental studies that measure the impact of a policy change in a single state by comparing the experiences of that state to a weighted group of comparison states that did not experience the policy change. The weighted group of states is a “synthetic” version of the state that experiences the policy change and represents what would have happened if the policy were not implemented. Synthetic control studies are appropriate for policy changes that affect a single state, such as California’s early tobacco control program (Abadie, Diamond, and Hainmueller 2010).

As more states partner with the Coleridge Initiative and move their data to the ADRF, state policymakers may benefit from complementing the analyses conducted with ADRF data from descriptive analyses to causal analyses using rigorous quasi-experimental methods. These methods could not be incorporated into ADA training, but researchers familiar with these methods could be encouraged to participate in ADA training or subsequently apply for ADRF access for their projects.

## Future Challenges and Prospects

Linked state longitudinal data becomes more valuable as more states are added to the ADRF platform, so the future prospects for the Coleridge Initiative are closely tied to expansion to new states and new agencies within states. ADA training participants and current ADRF users universally agree that the Coleridge Initiative is in a strong position to expand to new states, both through ADA training outreach and the regional collaboratives. Of the two, the collaboratives are perhaps the least developed avenue for outreach to new states, but the experiences of the Midwest and Southern Regional collaboratives provide lessons for new convenings in New England, the Southwest, or the West. Collaborative participants have found that state decision-makers are often protective about their data sovereignty and need to see how the ADRF can benefit their state through data products and improved data infrastructure.

State interest in the ADRF is fueled by data products that provide a vision for how the platform can be used to improve policy in their state. The Unemployment to Reemployment Portal and the Multi-State Postsecondary Report have been instrumental in attracting new states to the Coleridge Initiative. However, new data products would improve Coleridge Initiative outreach efforts. New states may be less interested in existing data products than current state partners, and fresh data products demonstrate the versatility of the ADRF. This brief makes recommendations for new data products based on the interests and feedback of current state partners. Some build on the Unemployment to Reemployment Portal and the Multi-State Postsecondary Report, while others involve new analysis of alternative data.

## Notes

- <sup>1</sup> The ADRF is built around a “five safes” data strategy, with clear standards around safe projects, safe people, safe settings, safe data, and safe exports (“Five Safes Framework,” Coleridge Initiative, accessed December 14, 2021, <https://coleridgeinitiative.org/adrf/five-safes/>).
- <sup>2</sup> “Applied Data Analytics Training,” Coleridge Initiative, accessed December 14, 2021, <https://coleridgeinitiative.org/training-programs/>.
- <sup>3</sup> “Democratizing our Data: A Challenge to Invest in Data and Evidence-Based Policy,” Coleridge Initiative, accessed December 14, 2021, <https://coleridgeinitiative.org/democratizing-our-data-challenge/project-summaries/>.
- <sup>4</sup> “Multi-State Postsecondary Report: Kentucky Postsecondary Graduate Outcomes by Credential,” KYSTATS, Ohio Education Research Center, and Coleridge Initiative, accessed December 14, 2021, [https://kystats.ky.gov/Reports/Tableau/2021\\_MSPSR](https://kystats.ky.gov/Reports/Tableau/2021_MSPSR).
- <sup>5</sup> “ETA: Class 1 Final Presentation and Report,” Coleridge Initiative, accessed December 14, 2021, <https://ada.coleridgeinitiative.org/eta-class-presentations>.
- <sup>6</sup> “ETA: Class 3 Final Presentation and Report,” Coleridge Initiative, accessed December 14, 2021, <https://ada.coleridgeinitiative.org/eta-class-presentations-3>.
- <sup>7</sup> “ETA: Class 3 Final Presentation and Report,” Coleridge Initiative.



- <sup>8</sup> “Applied Data Analytics at KY - Program Content,” password “adrf,” Coleridge Initiative, accessed December 14, 2021, <https://ada.coleridgeinitiative.org/ky-2020#presentations>.
- <sup>9</sup> “Applied Data Analytics Training Program - Missouri 2019,” password “adrf,” Coleridge Initiative, accessed December 14, 2021, <https://ada.coleridgeinitiative.org/ada-2019-missouri#presentations>.
- <sup>10</sup> For the purposes of this brief, Kentucky is considered part of the Midwest region even though it is not counted in the Midwest Census region, because Kentucky is an active participant in the Midwest Collaborative and an active partner with Ohio on the Kentucky Multi-state Postsecondary Report.
- <sup>11</sup> KYSTATS, which developed the Multi-State Postsecondary Report, is currently in the process of adding Illinois to the platform.
- <sup>12</sup> “Midwest Office Information,” US Bureau of Labor Statistics, accessed December 14, 2021, <https://www.bls.gov/regions/midwest/home.htm>.
- <sup>13</sup> Although this was a requirement for the meeting, it was not a requirement for the collaborative itself.
- <sup>14</sup> As a rough indicator of relative magnitudes, a comprehensive ADA training participant list includes 111 participant emails with a “.edu” extension and 507 participant emails with a “.gov” extension. This provides only a rough count because some government employees may be research scientists, and some university employees are acting on behalf of their state to operate the state’s longitudinal data system. Some of the 111 participants with “.edu” extensions are also staff at state postsecondary organizations.
- <sup>15</sup> Weekly federal unemployment insurance claim data available at “Unemployment Insurance Weekly Claims Data,” Employment and Training Administration, US Department of Labor, accessed December 14, 2021, <https://oui.doleta.gov/unemploy/claims.asp>.
- <sup>16</sup> “WIOA Co-Enrollment Cohort - Lessons Learned,” Workforce GPS, July 18, 2018, <https://www.workforcegps.org/events/2018/06/21/15/09/WIOA-Co-Enrollment-Cohort-Lessons-Learned>.
- <sup>17</sup> In 25 states where apprenticeship programs are registered with the federal Office of Apprenticeship, and 18 of the 28 states and territories where apprenticeship programs are registered with a state apprenticeship agency use the RAPIDS database.
- <sup>18</sup> “Applied Data Analytics at NSF - Program Content,” password “adrf,” Coleridge Initiative, accessed December 14, 2021, <https://ada.coleridgeinitiative.org/ncses-2020>.
- <sup>19</sup> “Two-way fixed effects” estimates use the same estimation strategy but allow for different timing of the policy change across states or other treated groups.

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