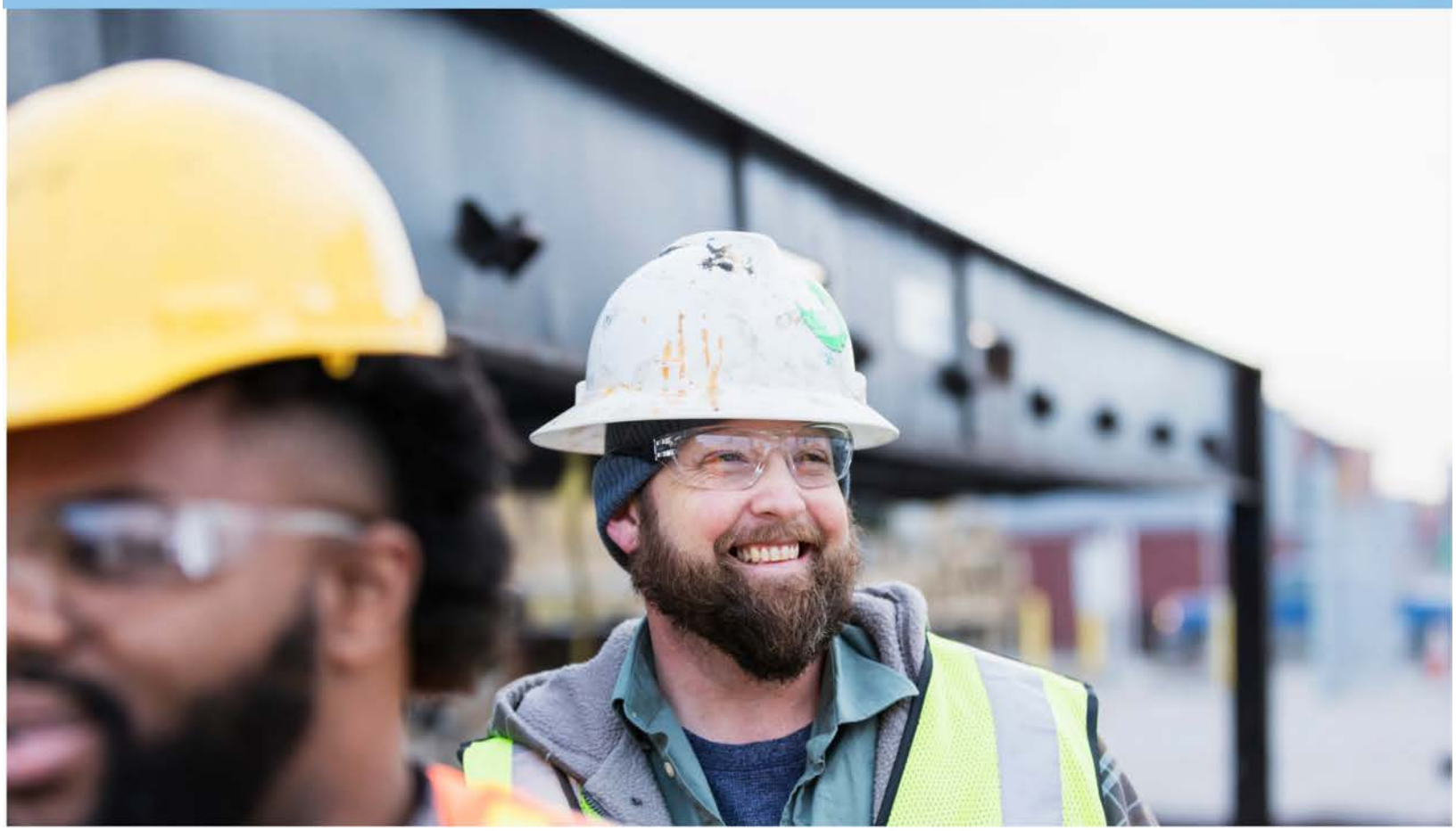
PATHWAYS TO WORK
Evidence Clearinghouse



Protocol for the Pathways to Work Evidence Clearinghouse

Methods and Standards

March 2020
Revised: April 2022

OPRE Report Number 2020-44

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PROTOCOL FOR THE PATHWAYS TO WORK EVIDENCE CLEARINGHOUSE: METHODS AND STANDARDS

OPRE Report 2020-44

March 2020

Updated April 2022

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U.S. Department of Health and Human Services

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Overview

Over the past several decades, evaluations have produced a great deal of research on interventions designed to improve the employment outcomes of recipients of Temporary Assistance for Needy Families (TANF), beneficiaries of other public benefit programs, and other people with low incomes. However, the sheer volume of research combined with the diversity of the findings can make it challenging to find applicable research, identify the most reliable and relevant studies, and use information from the studies to inform practical decision making. Using this research to guide decision making is complicated further by the complex nature of programs and policies that aim to improve employment, earnings, and other related outcomes. These programs and policies typically involve multiple components and lead to changes in outcomes through complicated pathways.

To help decision makers use this research literature, the Office of Planning, Research, and Evaluation, within the Administration for Children and Families, U.S. Department of Health and Human Services, contracted with Mathematica, and partners MEF Associates and Hager Sharp, to establish the Pathways to Work Evidence Clearinghouse. The Pathways Clearinghouse seeks to be a comprehensive resource that a range of audiences, including state and local TANF administrators, can use to identify the services that will best help people with low incomes succeed in the labor market. To become this comprehensive resource, the Pathways Clearinghouse aims to answer the following research questions:

1. What research exists on the effectiveness of interventions that aim to improve the employment and earnings of people with low incomes?
2. Which programs and policies have evidence of improving employment, earnings, education, and training for people with low incomes and of reducing public benefit receipt?

This report provides a protocol for the Pathways Clearinghouse review, describing the methods and standards used by the Pathways Clearinghouse team to answer these questions. We first detail how the Pathways Clearinghouse team identifies eligible studies, including the scope of the review, how the team searches for manuscripts containing eligible research, and how it prioritizes research for review. Next, we document how the team determines the quality of evidence provided by research studies, including how team members assess, document, and assign quality ratings to studies. Finally, we describe how team members group studies into interventions and assign effectiveness ratings to these interventions based on the results of the reviews and the information documented.

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CONTENTS

EXHIBITS

I. INTRODUCTION

Over the past several decades, evaluations have produced a great deal of research on interventions designed to improve the employment outcomes of recipients of Temporary Assistance for Needy Families (TANF), beneficiaries of other public benefit programs, and other people with low incomes. However, the sheer volume of research combined with the diversity of the findings can make it challenging to find applicable research, identify the most reliable and relevant studies, and use information from the studies to inform practical decision making. Using this research to guide decision making is complicated further by the nature of programs and policies that aim to improve employment, earnings, and other related outcomes. These programs and policies typically involve multiple components and lead to changes in outcomes through complicated pathways (Guise et al. 2017a, Guise et al. 2017b).

To help decision makers use this research literature, and in response to the Consolidated Appropriations Act of 2017 (Pub. L. 115-31), the Office of Planning, Research, and Evaluation (OPRE), within the Administration for Children and Families (ACF), U.S. Department of Health and Human Services, contracted with Mathematica, in partnership with MEF Associates and Hager Sharp, to establish the Pathways to Work Evidence Clearinghouse. The Pathways Clearinghouse seeks to be a comprehensive resource that a range of audiences, including state and local TANF administrators, can use to identify the services that will best help people with low incomes succeed in the labor market.

This report describes the methods and standards used to conduct the review for the Pathways Clearinghouse. The Clearinghouse seeks to provide a systematic assessment of the effectiveness of employment-related services and policies for people with low incomes (Moher et al. 2015, Munn et al. 2018).[1] To provide this assessment, the Pathways Clearinghouse aims to answer the following research questions:

1. What research exists on the effectiveness of interventions that aim to improve the employment and earnings of people with low incomes?
2. Which programs and policies have evidence of improving employment, earnings, education, and training for people with low incomes and of reducing public benefit receipt?

Many systematic reviews of evidence apply the PICOTS (population, intervention, comparators, outcomes, timing, and setting) framework to explain the review's scope. Exhibit I.1 formally summarizes the scope of this review, using that framework.

[1] This review is classified as a scoping review, rather than a systematic review, as its goal is to use systematic methods for searching, selecting, and synthesizing research to understand the broad field of evidence on interventions that aim to improve the employment and earnings of people with low incomes, rather than using these methods in a targeted review that solely assesses the evidence on specific interventions (Colquhoun et al. 2014).

Exhibit I.1. Research targeted by the Pathways Clearinghouse review

Population	People ages 16 and older with low incomes
Interventions	Programs, policies, and strategies that aim to improve employment and earnings
Comparators[a]	Services typically provided to people with low incomes or other programs and policies for which people with low incomes might be eligible
Outcomes	Employment, earnings, public benefit receipt, and attainment of education and training credentials
Timing	The review restricts attention to analyses conducted in 1990 and later. The services or policies implemented within any particular intervention can be of any duration.
Setting	United States and Canada

Note: Classification based on PICOTS framework. See Thompson et al. (2012).

[a] In the PICOTS framework, these are services provided to the comparison group in the targeted research.

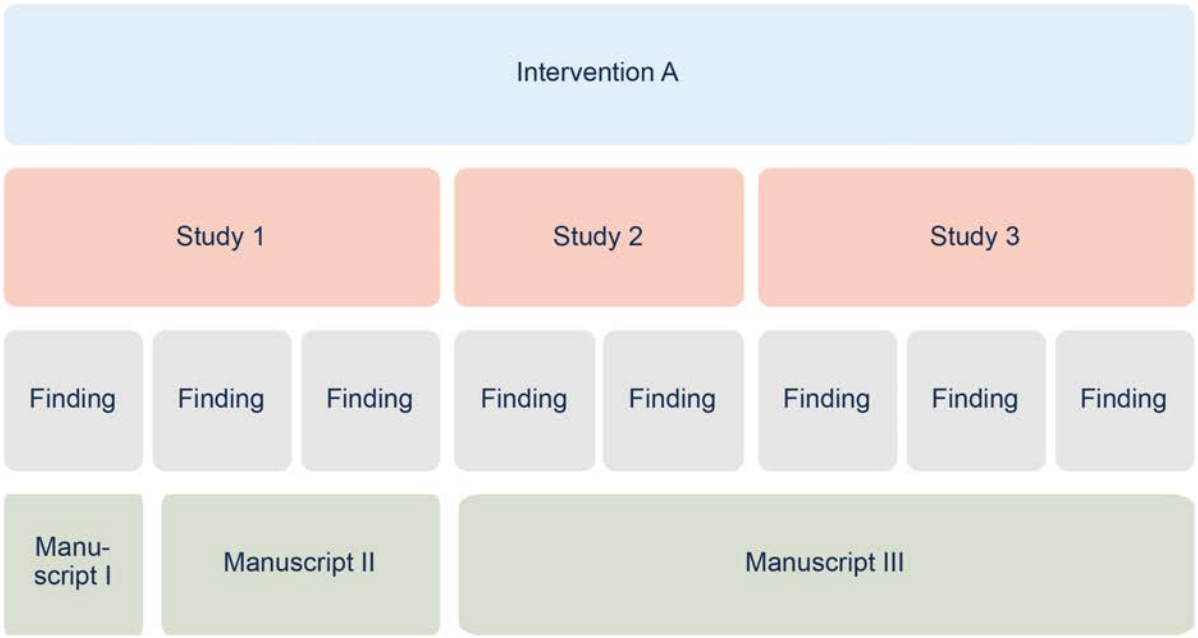
A. Key terms

The Pathways Clearinghouse relies on specific terminology to classify research. It defines the following terms.

- An **intervention** is a specific bundle of services or policies implemented in a given context.
- A **study** is an analysis of a distinct implementation of an intervention.
- **Manuscripts**, which describe studies, may include published and unpublished research, such as journal articles, working papers, and book chapters. Note that in some cases, one manuscript may include several studies; in other cases, one study may be reported across multiple manuscripts.
- **Findings** summarize the effect of an intervention on an **outcome** measure related to employment, earnings, public benefit receipt, education, or training.

Exhibit I.2 illustrates how each of the above phenomena might relate to a single intervention. For more detail about how the Pathways Clearinghouse will group research into studies, see Chapter III, Section A.

Exhibit I.2. Nesting of interventions, studies, and findings, and non-nesting of manuscripts



B. Overview of review process

The remainder of this report provides a protocol for the review, describing the overall approach to accomplishing the goals of the Pathways Clearinghouse (Exhibit I.3 also provides a graphical overview).[2] In Chapter II, we detail the scope of the review, how the Pathways Clearinghouse team searches for manuscripts containing eligible research, and how it prioritizes research for review. In Chapter III, we document how research is grouped into studies and how **reviewers** assess, document, and assign quality ratings to studies. In Chapter IV, we describe how, based on the results of the reviews and the information documented, staff group studies into interventions and assign effectiveness ratings to these interventions. Appendix A provides a brief overview of the process used to develop this protocol.

The review plans specified here address each section of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis for Protocols (PRISMA-P; Moher et al. 2015) and the methods section of the PRISMA for Complex Interventions (PRISMA-CI; Guise et al. 2017b). This report also serves as the protocol for the review (PRISMA-CI element 5). A checklist version of the PRISMA elements appears in Appendix B. Other PRISMA-CI items (such as those related to presenting and discussing results) will eventually appear on the Pathways Clearinghouse website: PathwaytoWork.acf.hhs.gov.

[2] The project uses a pair of databases to catalog manuscripts and their corresponding studies as a management tool to track the literature search, screening, and review processes.

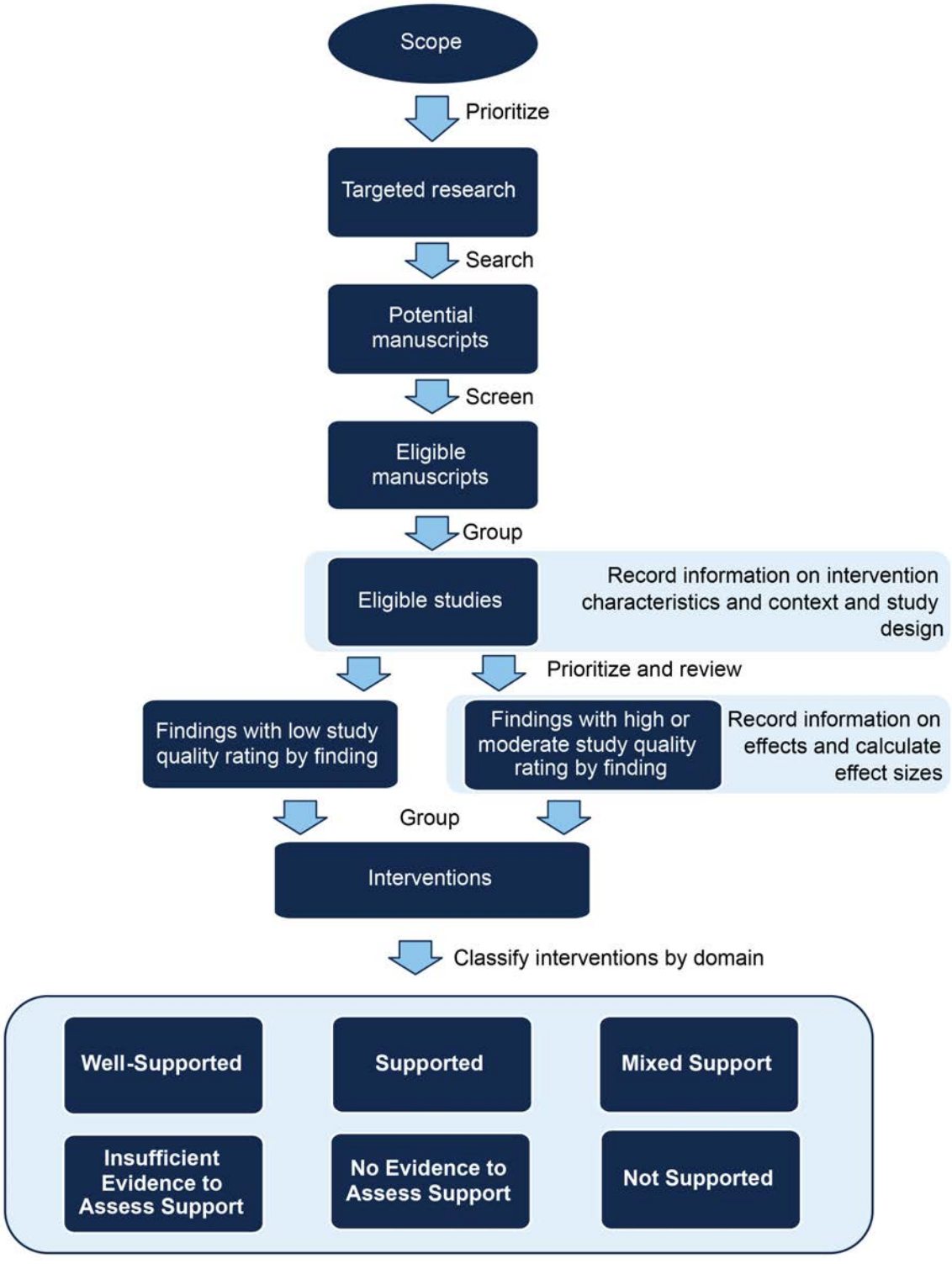
C. Updates to this report

This protocol was originally published in March 2020 and updated in April 2022. The April 2022 update made the following substantive changes:

1. Expanded the scope of the Pathways Clearinghouse to include a broader set of interventions. The original scope of the Pathways Clearinghouse included only employment and training interventions. The revised scope will include all interventions that could improve participants' employment and earnings. Examples of these interventions include housing assistance and general education programs. Other eligibility criteria were unchanged, including that eligible studies must include only participants with low incomes and must examine impacts of the intervention on employment or earnings outcomes.
2. Clarified the types of outcomes eligible for review within the educational attainment domain.
3. Clarified the Quality Review Team process for studies funded by OPRE.
4. Added information on additional elements (primary services) collected as part of the Pathways Clearinghouse.
5. Clarified that controlling for a propensity score summarizing the probability of group assignment (rather than directly controlling for the baseline or lagged measures used to construct the propensity score) is not an acceptable method of controlling for pre-intervention outcomes.
6. Clarified that the Pathways Clearinghouse review team may request information from analyses that authors mention conducting, but do not report in the manuscript, but does not ask authors to conduct new analyses.

If the scope of the Pathways Clearinghouse is further updated, or any other notable changes are made to its protocol, standards, or procedures, we will issue a revised version of this report. This section of the report will note any updates and their potential consequences for the Pathways Clearinghouse.

Exhibit I.3. Overview of the Pathways Clearinghouse review effort



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II. IDENTIFYING ELIGIBLE STUDIES

This chapter details the process for identifying eligible studies to include within the Pathways Clearinghouse. Section A details the scope of the Pathways Clearinghouse, Section B describes the process for searching the literature, and Section C details the eligibility criteria staff apply to determine which of the identified manuscripts are eligible for review by the Pathways Clearinghouse. Section D provides an overview of how research will be prioritized for review, including how the scope of the Pathways Clearinghouse might be expanded over time.

A. The scope of the Pathways Clearinghouse

To provide systematic information most useful to a variety of audiences, it is important for the Pathways Clearinghouse to have a well-defined scope that delineates the bounds for the research it will include. Working with OPRE, the Pathways Clearinghouse team has therefore set clear bounds on the interventions and studies to be catalogued by the Pathways Clearinghouse.

Work conducted under a precursor project, the Employment Strategies for Low-Income Adults Evidence Review (ESER), provided the starting point for the scope of the Pathways Clearinghouse, with the Clearinghouse including all research catalogued by ESER. To be eligible for review under ESER, research must have met the following criteria:

1. Quantitatively measured the effectiveness of an intervention using a **study design** that compared the outcomes for an intervention group (that could receive the program or was subject to the policy) to a similar comparison group (that was **not** assigned to receive the program or was **not** subject to the policy). Eligible designs included **randomized controlled trials (RCTs)** and **comparison-group quasi-experimental designs (QEDs).**
2. Been published in 1990 through mid-2014 (the year the ESER literature search occurred).
3. Estimated the effect of an employment or training intervention on outcomes related to employment, earnings, public benefit receipt, education, or training.
4. Examined the effects of the program or policy for adults with low incomes (age 18 and older).
5. Examined a program or policy implemented in the United States or Canada (with programs or policies in Canada having been cited by a consulted literature review).[3]

In addition to research reviewed under ESER, the Pathways Clearinghouse includes any literature that would have met these criteria but which was not available to the ESER research team (either because it was not discovered in the ESER literature search and call for studies, or because it was not yet published).

The Pathways Clearinghouse also expands upon ESER by (1) including research on youth and adults ages 16 and older (instead of restricting its scope to research on adults age 18 and older), (2) relaxing the requirement that research on programs implemented in Canada had to have been

[3] Under ESER, research on interventions conducted in the United Kingdom was also eligible for review if that research was cited in a consulted literature review. However, no such studies were identified.

cited in a consulted literature review, and (3) relaxing the requirement that studies focus on employment or training interventions, thereby including studies of interventions that support employment through strategies other than employment services and training such as general education and supportive housing. (Pathways did not relax the requirement that studies include employment or earnings outcomes.) As of Spring 2021, the Pathways Clearinghouse database included all research identified as eligible for review under expansions (1) and (2), published from 1990 to 2019. Work to review research published in 2020 or newly eligible under expansion (3) began in 2021.

B. Searching the literature

The ESER database comprises the primary source for the research initially included in the Pathways Clearinghouse. Therefore, the Pathways Clearinghouse team began the process of identifying research for the Pathways Clearinghouse by revisiting the manuscripts included in ESER and regrouping them into studies as defined in Section A of Chapter I. The team then identified additional literature that meets the expanded criteria discussed in Section A of this chapter.

Team members used the following five strategies to identify potential research for review. In addition, for the scope expansion described above that included studies of interventions that support employment through strategies other than employment services and training, team members examined manuscripts found in previous searches that had been deemed ineligible. The Pathways Clearinghouse team will continue to employ similar strategies to identify newly eligible or newly available research.

1. Integrate studies considered by ESER

To establish the Pathways Clearinghouse, the Clearinghouse team drew on the work conducted by the ESER team in two main ways. In particular, the team included all research reviewed by ESER within the Pathways Clearinghouse review. The team also re-examined manuscripts that had been identified during the ESER literature search, but were considered “out of scope” for ESER (and, thus, not reviewed by ESER), to determine whether any were eligible for review under the scope of the Pathways Clearinghouse. This initially included any research studies that included youth ages 16 and 17 or focused on an intervention implemented in Canada but that was not referenced in a consulted literature review.

If the scope of the Pathways Clearinghouse is again expanded, the team will again examine the research that was initially identified in the ESER literature search but determined to be out of scope for that project to determine if any additional studies fall within the newly expanded scope of the Pathways Clearinghouse.

2. Examine existing literature reviews

The Pathways Clearinghouse team identified several literature reviews on the effectiveness of employment and training programs published since the ESER literature search was conducted in 2014. These new literature reviews were published between 2014 and 2020. To this list, the team

also added reviews of programs for disconnected youth, reflecting the broadened scope of the Pathways Clearinghouse. Appendix C lists the reviews initially consulted by the Pathways Clearinghouse team as well as additional reviews that reflected the expanded scope of the Pathways Clearinghouse to include studies of interventions that support employment through strategies other than employment services and training. The team anticipates adding to this list as additional reviews are published and if the scope of the Pathways Clearinghouse expands.

3. Search electronic citation databases

The Pathways Clearinghouse team systematically searched several electronic citation databases to find relevant research. The team began the search process with the list of terms employed in the ESER literature search, and then expanded upon it as needed to account for the extensions in eligibility criteria for the Pathways Clearinghouse. For the years fully included in ESER (1990–2013), the team added search terms to capture research related to disconnected youth and conducted in Canada.[4] For 2014 through 2020, to widely identify the most recent literature, the team also added terms related to study design, outcomes, and samples.

Team members used a modified Peer Review of Electronic Search Strategies (PRESS) method to refine the search terms. To do this, one librarian carefully searched the selected electronic databases, documenting each step of the process, and another applied most of the PRESS 2015 Evidence-Based Checklist (McGowan et al. 2016) to provide guidance and check the results.[5] We summarize the final search strategy in Exhibit II.1.

Exhibit II.1. Database search strategy for the Pathways Clearinghouse

Criterion	Keywords
Intent terms	effect* OR efficac* OR improv* OR progress* OR increas* OR gain* OR rise* OR raise* OR higher OR decreas* OR reduc* OR lower* OR impact*
Design terms	regression OR experiment* OR quasiexperiment* OR pseudoexperiment* OR nonexperiment* OR causa* OR statistical* OR (random* n2 assign*) OR (random* n2 trial) OR (random* n2 evaluation) OR (random* n2 stud*) OR correlat* OR descript* OR "propensity score" OR "matching design" OR "fixed effects" OR "interrupted time series" OR "least square*" OR "treatment on the treated" OR "intent to treat" OR "treatment effect*" OR "instrumental variable" OR "local average treatment effect*" OR "regression discontinuity" OR "event stud*" OR (pre n2 post) OR "formative evaluation*" OR "formative stud*" OR "outcome evaluation*" OR "outcome stud*" or "program evaluation*" OR "policy evaluation*"
Outcome terms	employ* OR reemploy* OR selfemploy* OR wage* OR earn* OR "self-sufficien*" OR "number of jobs" OR (held n3 jobs) OR (hold n3 jobs) OR (holds n3 jobs) OR "are in work" OR "were in work" OR "is in work" OR "was in work" OR "back in work" OR "find work" OR "found work" OR "finding work" OR "returned to work" OR "return to work" OR "returns to work" OR "back to work" OR "out of work" OR "not in work" OR "are not working" "were not working" OR "are working" OR "were working" OR "is working" OR "was working" OR "career advance*" OR "job retention" OR "labor market" OR "labour market"

[4] The ESER literature search also covered part, but not all, of 2014. To support complete coverage of research from this year, we treated research published in 2014 in the same manner as research published in a later year.

[5] One step in the PRESS method involves checking each database's list of subject terms and adjusting search terms to make sure differences in the subject terms are captured. However, the Pathways Clearinghouse search terms are designed to be broad enough to capture research regardless of how databases define their subject terms. Thus, the Pathways Clearinghouse eliminated this step from its process.

Exhibit II.1 (*continued*)

Criterion	Keywords
Sample terms	"low-income" OR "low incomes" OR "low-wage" OR "low wages" OR "low-skill" OR "low-skills" OR "low-skilled" OR "low earners" OR "low earnings" OR "income below" OR "incomes below" OR "wage below" OR "wages below" OR "earnings below" OR "income under" OR "incomes under" OR "wage under" OR "wages under" OR "earnings under" OR "income less" OR "incomes less" OR "wage less" OR "wages less" OR "earnings less" OR "earn less" OR "earns less" or "earned less" OR poverty OR impoverished OR "FPL" OR disadvantaged OR unemployed OR underemployed OR unskilled OR jobless OR (("public benefit" OR "public benefits" OR "public beneficiary" OR welfare OR "AFDC" OR "TANF" OR "WIC" OR "SNAP" OR "Food Stamp" OR "Food Stamps" OR "Social Security" OR Medicaid OR "social program" OR "social programs" OR "social assistance" OR "income support" OR "income assistance") n3 (benefi* OR recipient* OR client* OR customer* OR participant* OR recei*)) OR homeless OR housing OR offender OR exoffender OR parole OR parolee OR parolees OR paroled OR probation OR "criminal history" OR (justice n3 involve*) OR incarcerated OR "disconnected youth" OR "disconnected youths" OR "youth disconnected" OR "youths disconnected" OR "opportunity youth*" OR "at-risk youth" OR "at-risk youths" OR "youth at risk" OR apprentic* OR trainee OR ((participa* OR attend* OR complet*) n3 train*) OR (poor* n3 (worker* OR individual* OR American* OR Canadian* OR citizen* OR resident* OR communit* OR member* OR famil* OR household*)) OR "working poor"
Geographic terms	"America" OR "American*" OR "United States" OR "U.S." OR "US" OR Alabam* OR Alaska* OR Arizona* OR Arkansa* OR Californi* OR Colorad* OR Connectic* OR Delaware* OR Florid* OR Georgia* OR Hawaii* OR Idaho* OR Illinoi* OR Indiana* OR Hoosier OR Iowa* OR Kansa* OR Kentuck* OR Louisian* OR Maine* OR Maryland* OR Massachus* OR "Bay State*" OR Michigan* OR Minnesota* OR Mississippi* OR Missouri* OR Montana* OR Nebraska* OR Nevada* OR "New Hampshir*" OR "New Jersey*" OR "New Mexic*" OR "New York*" OR Carolin* OR Dakota* OR Ohio* OR Oklahoma* OR Oregon* OR Pennsylvania* OR "Puerto Ric*" OR "Rhode Island*" OR Tennesse* OR Texas OR Texan OR Utah* OR Vermont* OR Virginia* OR Washington* OR Wisconsin* OR Wyoming* OR "District of Columbia" OR Samoa* OR Guam* OR Mariana* OR "Virgin Island*" OR Canad* OR Ontari* OR Quebec* OR "Nova Scotia*" OR "New Brunswick*" OR Manitoba* OR "British Columbia*" OR "Prince Edward Island*" OR Saskatchewan* OR Alberta* OR Newfoundland* OR Labrad* OR "Northwest Territor*" OR Yukon* OR Nunavu*
Databases	Academic Search Premier, Business Source Corporate Plus, EconLit, Education Research Complete, E-Journals, ERIC, PsycINFO, ProQuest Dissertations and Theses, Scopus, and SocINDEX with full text

Notes: The database search required a study to match at least one term for each eligibility criterion. An asterisk indicates a truncation. That is, when used as a search term, all words with the root will appear in the results. For instance, a search on “effect*” will return citations with the words that have “effect” as the first six letters, including “effect,” “effects,” “effective,” and “effectiveness.” In addition, “word1 nX word2” indicates that word1 and word2 should appear within X words of each other. For example, “holds n3 jobs” means that “holds” should appear within three words of “jobs,” such as “holds more than four jobs” or “holds one job.”

The team also executed custom Google searches and direct searches of key websites to identify additional studies (see Box II.1). These sources of research are relevant to the review but have restrictions such as not allowing search limitations by date range or restrictions to certain fields, so the team searched them in a way that matched, as closely as possible, the process described above. Finally, the team executed searches in the Harvard Think Tank Engine. This publicly available customized Google search engine searches the websites of more than 1,200 institutions that generate public policy research, analysis, and activity. These sites are affiliated with universities, governments, advocacy groups, foundations, nongovernmental organizations, and businesses.

Box II.1. Organizational websites included in custom Google search

- Abt Associates
- Administration for Children and Families
- Abdul Latif Jameel Poverty Action Lab
- Annie E. Casey Foundation
- Arnold Ventures
- Campbell Collaboration
- Center for Law and Social Policy
- Center for Study of Urban Poverty
- Center on Poverty and Inequality (Georgetown Law)
- Center on Poverty, Work and Opportunity
- Chapin Hall
- Clearinghouse for Labor Evaluation and Research
- Employment & Training Administration Research Database
- Impaq Associates
- IZA
- Institute for Research on Poverty
- Joblessness and Urban Poverty Research Program*
- Joint Center for Poverty Research
- Mathematica
- MDRC
- Multidisciplinary Program in Inequality and Social Policy*
- NBER Working Papers
- National Center for Children in Poverty
- National Center for Policy Analysis
- National Poverty Center*
- NORC
- Opportunity Insights
- Ray Marshall Center
- RAND
- RePEc
- RTI International
- Self-Sufficiency Research Clearinghouse
- Social Policy Research Associates
- Social Science Research Network
- The Stanford Center on Poverty and Inequality*
- University of Kentucky Center for Poverty Research
- Upjohn Institute
- Urban Institute
- William K. Kellogg Foundation

*Team searched website of university housing the center.

4. Coordinate with other federal evidence reviews

The scope of the Pathways Clearinghouse includes research also eligible for review by the Department of Labor's Clearinghouse for Labor Evaluation and Research (CLEAR) and OPRE's Home Visiting Evidence of Effectiveness (HomVEE) review. Therefore, the team examined the CLEAR and HomVEE databases to identify additional studies. This effort targeted the following CLEAR topic areas: apprenticeship and on-the-job training, Career Academies, community college, disability employment policy, job search assistance, low-income adults, opportunities for youth, and reentry (for people who were formerly incarcerated). It also targeted studies included in the HomVEE review that measured family economic self-sufficiency as an outcome.

5. Issue calls for papers

The Pathways Clearinghouse issues calls for papers to encourage authors and other experts to share studies directly with the Clearinghouse. We send these calls to research organizations, professional associations, individual researchers, and the Pathways Clearinghouse expert groups, in addition to posting them on OPRE's web page. Mathematica and OPRE also publicize the calls for papers through their respective social media accounts and newsletters, as well as several distribution lists maintained by Mathematica.

The first Pathways Clearinghouse call for papers was issued on May 28, 2019, and remained open until July 3, 2019. A second call for papers was issued on June 1, 2021 to account for expansions in the review scope, and remained open until June 30, 2021. Specifically, that call for papers aimed to capture research on interventions that support employment through strategies other than employment services and training, such as general education programs, mental health services, supported housing, and two-generation programs.

C. Screening research against eligibility criteria

The methods described in the previous section generated a large quantity of research, much of which is not eligible for inclusion in the Pathways Clearinghouse. To identify the research eligible for review, trained screeners apply a set of eight criteria. Research must meet all eight to be eligible for review.

1. **Analyses must have been conducted in 1990 or later.** The Pathways Clearinghouse includes research first published in 1990 or later (for unpublished manuscripts, the team will use the date the manuscript was first made available). A single study might have had multiple publications presenting its results. Publications in or after 1990 that repackage study conclusions disseminated before 1990 (such as a journal article summarizing an earlier report) are ineligible. However, publications in or after 1990 that provide new conclusions not provided in an earlier report (such as a report that provides results for a longer period than an earlier report did) are eligible.
2. **Conducted in the United States or Canada.** Eligible research examines an intervention implemented in the United States or Canada.
3. **Assessed effectiveness using quantitative methods.** Initially, only studies based on RCTs and comparison-group QEDs (including comparative interrupted time series designs) are eligible for review.[6] The team screens out all studies that used purely descriptive methods (for example, studies that examine only outcomes of a program and do not use a comparison group) and studies that focused only on a program's implementation. In the future, the Pathways Clearinghouse might develop standards to review other designs, such as regression discontinuity or instrumental variables designs.

[6] In some cases, comparative interrupted time series designs can be reviewed as comparison-group QEDs. The Pathways Clearinghouse began its review effort by taking this approach. The team might revise the approach to include specific standards for reviewing comparative interrupted time series studies in the future, if OPRE deems appropriate.

4. **Examined an intervention serving people with low incomes.** Eligible research must focus on interventions intended to serve people ages 16 or older at the time of enrollment with low incomes. Research meets this criterion if a manuscript's authors declare a sample or population to have low income, using any definition of low income the authors provide. Alternatively, research also meets this criterion if the authors examine a sample or population of whom the majority are in a group that Pathways classified as having low income, following ESER's approach: people experiencing homelessness, people who were formerly incarcerated, people receiving means-tested public benefits, disconnected youth, and people characterized by authors as having low skills, including those who are in adult basic education, adult literacy education, or other basic skills programs.[7] If a sample is neither declared to have low income nor in one of the specified groups, the Pathways Clearinghouse considers people to have low income if all sample members have incomes below the national median income in the year the study began. The Pathways Clearinghouse does not categorically classify individuals who are not currently employed to have low income because lack of employment might be temporary.
5. **Examined an intervention aiming to directly or indirectly improve employment or earnings.** Eligible interventions include employment and training programs (for example, a job search assistance or occupational training program) and interventions that could indirectly improve employment through strategies such as general education (for example, a community college tuition assistance program), two-generation programs, and helping individuals stabilize their lives (for example, housing assistance).
6. **Examined the effect of an intervention on employment or earnings outcomes.** Research must examine impacts on some measure of employment or earnings, including but not limited to the outcomes eligible for review described in Chapter III, Section B.2.
7. **Examined an intervention serving individual job-seekers in a specific context.** Research that examined policies or actions that affected communities, such as enterprise zones, or employers, such as tax credits for hiring disadvantaged workers, is not eligible for review. In addition, as under ESER, studies on how a policy affects an entire state or country do not meet this criterion.
8. **Articulated details on the services provided.** Because the Pathways Clearinghouse aims to be a repository of information on intervention effectiveness, the research must describe the intervention examined in sufficient detail so that other studies of the same intervention could potentially be identified by reviewers.

The Pathways Clearinghouse uses a two-stage process for study screening. In the first stage, screeners examine manuscripts' titles and abstracts and screen out duplicate citations and those that obviously do not meet the criteria for inclusion. For all studies not screened out by this initial process, screeners then skim a study's full text to finalize eligibility. Screeners record the citation and note a small number of characteristics of the intervention being examined and the methods used to examine it in a tracking tool created for this purpose.

[7] Research that focuses on recipients of Unemployment Insurance or Social Security Disability Insurance is not eligible for review unless recipients are explicitly classified by the authors as having low income, as these programs are not means-tested.

To ensure consistency in the screening process, all screeners receive a two-hour training via video conference. This training covers (1) the background and context of the intervention, (2) the eight study eligibility criteria, (3) how to identify eligible and ineligible studies, and (4) how to use the requisite software tools. In addition, the screening task leader checks the disposition of each screener's first 50 studies for accuracy at the initial screening phase, and first 25 studies at the second, more detailed screening phase, providing additional guidance as needed.

Once screeners have identified research as eligible for review, the Pathways Clearinghouse team groups manuscripts into studies. Then, team members determine whether a study had previously been reviewed by ESER, CLEAR, the What Works Clearinghouse (WWC), or Home Visiting Evidence of Effectiveness.[8] If a study has been reviewed by these efforts, the team imports data from the previous review. These data guide the new review and ensure that any differences in findings across reviews are consistent with differences in the standards used and that the team can explain any apparent discrepancies.

D. Prioritizing research for review

For the launch of the Pathways Clearinghouse, the team prioritized reviewing research previously reviewed under ESER[9] and the most recent research eligible for review under its initial scope.[10] Next, the Pathways Clearinghouse prioritized reviewing research that examined interventions that support employment through strategies other than employment and training, such as general education or supportive housing programs.

In the future, the Pathways Clearinghouse will also consider expanding its scope in the following ways.

1. Including research using regression discontinuity designs to estimate impacts.
2. Examining outcomes other than employment, earnings, public benefit receipt, and education and training in studies already reviewed by the Pathways Clearinghouse.
3. Including research on interventions that use any strategy that could improve employment and earnings among people with low incomes (for example, a supportive housing program that could improve employment) that do not directly examine employment or earnings outcomes.
4. Including research on interventions implemented in the United Kingdom, Australia, and New Zealand.
5. Including research using rigorous designs other than RCTs, comparison-group QEDs, and regression discontinuity designs (for example, instrumental variables).

[8] These reviews were selected as they (1) use standards similar to those of the Pathways Clearinghouse and (2) might include studies within the scope of the Pathways Clearinghouse.

[9] To promote efficiency, reviewers used the ESER review results to assess these studies whenever possible.

[10] This includes research eligible under ESER, as well as research that was outside of the scope of ESER because it was implemented in Canada or included youth ages 16 and 17.

6. Re-assessing studies using comparative interrupted time series or difference-in-differences designs using criteria specialized for these designs (these designs will initially be reviewed using the standards for comparison-group QEDs).

This list reflects the priority ordering as of the publication of this report but is subject to change. If OPRE elects to expand the scope of the Pathways Clearinghouse, the Clearinghouse team will work with OPRE and an external team of experts to re-assess priorities and determine which expansions could be most beneficial to the field. Once a specific expansion is identified as a potential priority, the Pathways Clearinghouse team will provide OPRE with an estimate of the volume of research it will likely yield and a discussion of any changes in procedures or standards that would be needed to accommodate the expansion (such as creating new standards for different research designs or relaxing eligibility criteria). If OPRE approves the expansion given this information, the Pathways Clearinghouse team will then search for research within the expanded scope and screen citations for inclusion (see Sections B and C of this chapter).

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III. ASSESSING A STUDY'S STRENGTH OF EVIDENCE

Well-specified standards to assess research quality support the Pathways Clearinghouse review in providing systematic and unbiased ratings of the strength of causal evidence provided by studies. The ESER team previously engaged in an extensive consultation period with experts on both federal evidence reviews and the field of employment and training intervention research to develop its review standards (see Mastri et al. 2015). The Pathways Clearinghouse team capitalized on this earlier work in developing its own standards. However, to incorporate the most up-to-date thinking on research quality, the team also engaged in its own process of consultations to validate and update the ESER standards for the current review effort.

This chapter provides a brief overview of how studies are identified within and across manuscripts (Section A), the standards staff use to review studies (Section B), the review process for applying the standards (Section C), and the data extracted from studies during the review process (Section D).[11] These review standards apply to RCTs and comparison-group QEDs only. If the scope of the Pathways Clearinghouse expands, studies using other designs (such as regression discontinuity or instrumental variable designs) might become eligible for review. The Clearinghouse team will revise this report in the event that such an expansion occurs.

A. Identifying studies within and across manuscripts

Pathways Clearinghouse reviews assess the quality of evidence at both the finding and study levels. As discussed in Chapter I, the Pathways Clearinghouse defines a study as an analysis of a distinct implementation of an intervention (analyses of different interventions cannot constitute the same study). This means that the Clearinghouse can find that an individual manuscript contains multiple studies or that a single study is presented across multiple manuscripts. How the Pathways Clearinghouse groups research into studies across manuscripts can have important implications for the Pathways Clearinghouse's conclusions (see Chapter IV).

Many evaluations take place in multiple locations, include individuals enrolled in the evaluation at multiple points in time, and include multiple target populations (for example, TANF applicants and TANF recipients, or men and women). The Pathways Clearinghouse defers to study authors in determining whether different groups of people are subject to the same distinct implementation of an intervention. In particular, if study authors present analyses of employment and earnings outcomes that pool groups of people, the Pathways Clearinghouse considers these people to have received the same implementation of the intervention. If, instead, authors only

[11] Note that although the Pathways Clearinghouse team applies very similar standards as ESER, the definitions of a study under ESER and the Clearinghouse are different. Therefore, applying the same standards might not produce identical results.

present subgroup-specific analyses for employment and earnings outcomes, the analysis of each subgroup is considered a separate study.[12, 13]

As an example, consider a manuscript assessing the impact of a training program implemented in three Ohio cities: Cleveland, Cincinnati, and Columbus. If the authors presented impacts both by city and combined for all individuals served in all three cities, the Pathways Clearinghouse team would focus on the impacts for all individuals served and would characterize this manuscript as containing one study. If, instead, the authors only presented city-specific analyses, the Pathways Clearinghouse team would treat the manuscript as if it contained three studies, one for each city. In this way, we defer to the authors' assessment of whether the implementation was similar enough in each city to warrant estimating impacts based on the sample pooled across cities.

Box III.1. Pathways Clearinghouse ratings

The Pathways Clearinghouse will assign a variety of ratings to characterize findings, studies, and interventions.

Findings will receive a quality rating, called the study quality rating by finding, based on the strength of the causal evidence a study provides on the effects of an intervention on the outcome associated with the finding.

Studies will receive a study quality rating based on the highest rating received by any finding from that study related to earnings, employment, public benefit receipt, or education and training outcomes.

Interventions will receive effectiveness ratings within each domain (or group of outcomes, see Section B.2) based on the extent to which high- and moderate-quality causal evidence indicates the intervention improves outcomes in that domain.

B. Standards for reviewing studies

1. Study quality ratings

The central goal of the study review is to assess the strength of a study's design (that is, its risk of bias) and assign it the most appropriate **study quality rating** (see Box III.1). Exhibit III.1 includes the possible ratings reviewers will assign to summarize a study's evidence. A **high rating** indicates that the risk is relatively low that the study produces biased estimates of an intervention's causal effect, while a **low rating** suggests the risk of bias could be high. A **moderate rating** falls in between: there is some risk of bias but the intervention is likely to have contributed to the finding to at least some extent. Reviewers also assign an individual study quality rating by finding for each finding (related to an earnings, employment, public benefit

[12] If authors present both pooled and subgroup analyses, but clearly indicate that the pooled analyses should be considered supplemental or exploratory, while the subgroup analyses are the primary results of interest, the Pathways Clearinghouse classifies each subgroup analysis as a separate study. In addition, if the authors present subgroup-specific analyses for employment and earnings outcomes but pooled analyses (and no subgroup-specific analyses) for education and/or public benefit receipt outcomes, the Pathways Clearinghouse will review the subgroup-specific analyses of employment and earnings outcomes and the pooled analyses of education and public assistance outcomes.

[13] If authors provide separate estimates for subgroups of people defined by any characteristic other than location or time of service receipt, and those subgroups were eligible for the same services, the subgroup estimates are treated as if they are from the same study for the purposes of assigning intervention effectiveness ratings (but catalogued as separate studies on the Pathways Clearinghouse website). Studies that focus on a specific site or cohort of individuals are treated as separate studies for all purposes. See Chapter IV for details.

receipt, or education and training outcome) that was selected for review. They then assign a study the highest rating given to any of its associated findings.

Exhibit III.1. Study quality ratings

Rating	Interpretation
High	There is strong evidence that the findings are solely attributable to the intervention examined.
Moderate	There is some evidence that the findings are attributable, at least in part, to the intervention examined. However, other factors not accounted for in the study might also have contributed to the findings.
Low	There is little evidence that the findings are attributable, in part or as a whole, to the intervention examined.

2. Outcomes eligible for review

Many studies of employment and training interventions examine a wide variety of outcome measures and include findings related to these measures at several time horizons. Including all such measures in the review could result in spurious conclusions about **statistical significance** of findings.[14] It also might be difficult for an individual accessing the Pathways Clearinghouse to sort through and make sense of study results if too many findings are included in reports.

To avoid these issues, reviewers select a limited number of findings on which to focus their reviews, using the guidance outlined in Exhibit III.2. Selected findings examine outcomes falling within one of seven **domains** (or groups of related outcomes):

1. **Short-term employment:** including measures of employment status and duration and consistency of work within the first 18 months after an individual is assigned to a study group.[15]
2. **Long-term employment:** including measures of employment status and duration and consistency of work more than 18 months after an individual is assigned to a study group.
3. **Short-term earnings:** including measures of earned income within the first 18 months after an individual is assigned to a study group.
4. **Long-term earnings:** including measures of earned income more than 18 months after an individual is assigned to a study group.

[14] The Pathways Clearinghouse considers statistical significance to be support for the existence of an effect of an intervention. The Pathways Clearinghouse considers an effect estimate statistically significant if the *p*-value of a two-sided hypothesis test of whether the effect is equal to zero is less than 0.05. A *p*-value is the probability of observing an effect estimate as large or larger than the one observed, if there were no actual effect

[15] The Pathways Clearinghouse defines short- and long-term based on the amount of time after an individual was first assigned to a study group. If studies instead present results based on time since services were last received, and Pathways Clearinghouse reviewers cannot re-align outcomes based on the timing of service commencement (for example, because different study participants received services for different lengths of time), the team instead uses time since services were last received in differentiating between short- and long-term outcomes.

5. **Short-term public benefits:** including measures of the receipt of public benefits from programs such as TANF and the Supplemental Nutrition Assistance Program, and the amount of benefits received, measured within the first 18 months after an individual is assigned to a study group.[16]
6. **Long-term public benefits:** including measures of the receipt of public benefits from programs such as TANF and the Supplemental Nutrition Assistance Program, and the amount of benefits received, more than 18 months after an individual is assigned to a study group.
7. **Education and training:** including measures of the attainment of educational degrees and other credentials of potential value in the labor market.

In cases where research has been conducted to examine intervention effects for more than five years, reviewers also utilize three additional domains: very long-term earnings, very long-term employment, and very long-term public benefits. These domains include outcomes covering follow-up periods of greater than five years, while the long-term domains will include outcomes for the period from 19 to 60 months following assignment to study groups. As studies rarely follow intervention recipients for more than five years, these domains are only noted when useful.

If the research provides findings for multiple outcome measures, the team prioritizes findings for review based on outcome measure, following the prioritization process used by ESER and summarized in Exhibit III.2. The finding prioritization process occurs independently for each data source.[17] For example, if both surveys and administrative records were used to assess earnings, reviewers select two sets of earnings findings for review: one measured using survey data and one measured using administrative data. The Pathways Clearinghouse team selects findings based on the full sample of study participants, if available. If no findings for the full sample are available within a given domain and data source, the team reviews findings for a random subsample of study participants, participants at a subset of study locations, or participants enrolled in the study during a portion of the enrollment period.

Reviewers also assess whether each outcome examined in a study has sufficient validity to include in the review. Many evidence reviews include specific criteria that individual outcomes must meet to be considered valid and reliable (that is, for reviewers to have confidence that the outcome correctly measures the concepts they seek to measure). The Pathways Clearinghouse requires all outcomes to have **face validity**—that to a general reader, the outcome should seem to measure its intended concept (for example, earnings are not an outcome that has face validity as a measure of educational attainment). Generally, employment, earnings, public benefit receipt, and education and training outcomes are objective measures with strong face validity.

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[16] In order to include information on all types of benefits deemed relevant by study authors, findings related to the receipt of any benefits provided by federal, state, or local governments (other than employment and training services) are included in the public benefit domains.

[17] Pathways Clearinghouse reviewers treat multiple rounds of data collection that leverage similar survey instruments or the same administrative database as the same data source.

Exhibit III.2. Selecting findings for review, by outcome domain and measure

Rules for selecting findings based on outcome measures	Notes
Employment	
Select the finding examining the outcome measure that is first in this list: 1. Employment status at the time of follow-up 2. Employment status during the latest available month 3. Employment status during the latest available quarter 4. Employment status during the latest available year 5. Employment status over the entire follow-up period (for example, employed since random assignment) Also select findings examining cumulative measures of employment status (such as duration of employment, quarters employed, employment over consecutive quarters, or number of consecutive time periods of employment) for the longest elapsed period (for example, 18 or 12 months for short-term, 3 years for long-term).	**Include** • One set of findings for short-term outcomes and one set for long-term outcomes (and an additional set for very long-term outcomes if applicable) • Findings for outcomes capturing both overall and unsubsidized employment if both are considered (or unsubsidized and subsidized employment if presented in this way) • Findings for outcomes for full- and part-time employment separately if a combined measure is not available **Exclude findings related to the following outcome measures** • Employment by job characteristics (for example, percentage employed in a job offering benefits) • Point in time measures of employment other than those at follow-up (for example, exclude a measure such as employed in Quarter 1)
Earnings	
Select the findings examining the outcome measure that is first in this list: 1. Annual earnings for the latest elapsed year of the follow-up period 2. Average annual earnings over the follow-up period 3. Total earnings over the follow-up period 4. Quarterly earnings for the latest elapsed quarter of the follow-up period 5. Monthly earnings for the latest elapsed month of the follow-up period 6. Average hourly wage rate at follow-up 7. Median hourly wage rate at follow-up	**Include** • One set of findings for short-term outcomes and one set for long-term outcomes (and an additional set for very long-term outcomes if applicable) • Findings for outcomes capturing both overall and unsubsidized earnings if both are considered (or earnings from unsubsidized and subsidized employment if presented in this way) **Exclude findings related to the following outcome measures** • Earnings measures for only people who are employed

Exhibit III.2. (continued)

Rules for selecting findings based on outcome measures	Notes
Public benefit receipt	
Select the findings examining the outcome measures that are first in this list: 1. Indicators of benefit receipt both overall and by specific benefit type and amount (dollars) of annual benefit receipt for the longest elapsed follow-up year (for example, receipt in Year 4 of a 4-year follow-up) 2. Indicators of benefit receipt both overall and by specific benefit type and average amount of annual benefits over the follow-up period (for example, average benefits Years 1–8) 3. Indicators of benefit receipt both overall and by specific benefit type and amount of total benefits received over the follow-up period (for example, total benefits collected Years 1–3) 4. Indicators of benefit receipt both overall and by specific benefit type and amount of benefits received for the latest elapsed follow-up quarter 5. Indicators of benefit receipt both overall and by specific benefit type and amount of benefits received for the latest elapsed follow-up month	**Include** • One set of findings for short-term outcomes and one set for long-term outcomes (and an additional set for very long-term outcomes if applicable) • Findings for decompositions of benefit receipt if they are presented by study authors (for example, measures of receiving TANF, Supplemental Nutrition Assistance Program, or Unemployment Insurance benefits) • Measures of months of benefit receipt if indicators of overall benefit receipt are not available **Exclude findings related to the following outcome measures** • Benefit amounts for only people who receive benefits
Education and training	
Select the findings examining measures of educational attainment over the follow-up period (for example, acquisition of a GED, associate's degree, bachelor's degree, attaining a certificate or credential)	**Exclude findings related to the following outcome measures** • Decompositions of the measures over time (for example, obtained GED within one year) • Measures combining different educational milestones (such as training completion or degree attainment) if individual measures are available • Measures of credit attainment • Measures of educational attainment at a specific institution or group of institutions, unless the group of institutions for which data is available is (1) similar to the set of institutions covered in an established data source (for example, the National Student Clearinghouse), or (2) similar to the set of institutions attended by all study participants [a]

[a] Similarity is judged using the attrition threshold. That is, the authors should demonstrate that the overall and differential differences in the rate at which study participants enroll in the group of institutions should be below the thresholds for overall and differential attrition, as described in Chapter III, Section B.4.

Note: If a study does not examine any listed outcomes within a domain but does examine one or more closely related outcomes, review team leaders will use discretion in selecting findings for review.

Nevertheless, if the Pathways Clearinghouse reviews a study including outcomes without face validity, those outcomes will receive a low study quality rating.[18] The Pathways Clearinghouse tracks any outcomes determined to have insufficient face validity in a centralized list so that these outcomes can be systematically excluded across reviews and reviewers. In the event the scope of the Pathways Clearinghouse expands to include other outcomes for which face validity might be less straightforward to assess, the team will expand these requirements as needed.

3. Determination of study design

The Pathways Clearinghouse currently reviews research using two eligible designs: RCTs and comparison-group QEDs.

- In RCTs, researchers randomly assign study participants to an intervention group or a comparison group. RCTs are considered to produce the strongest evidence possible on effectiveness because random assignment ensures no systematic differences exist between the study groups.
- Comparison-group QEDs also use intervention and comparison groups but people are not randomly assigned to them. Instead, researchers typically identify an intervention group that received the program or policy being tested and construct a comparison group that did not receive the services but is otherwise as similar as possible to the intervention group, based on both groups' observed characteristics. Non-random comparison group designs are considered weaker than RCTs because many factors could have led members of the intervention group to choose to receive services and members of the comparison group to choose not to do so. These factors might also have led to differences in outcomes.

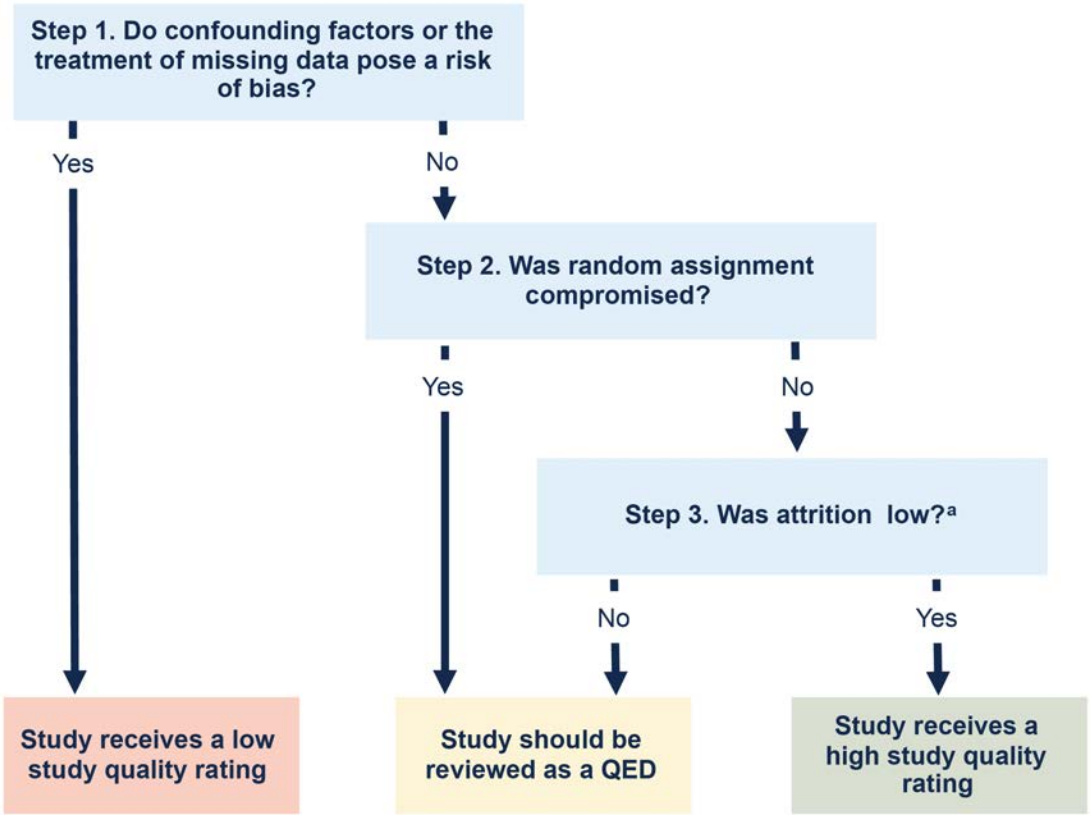
As the first step of the review process, reviewers confirm the study used an eligible design and classify the design as an RCT or comparison-group QED. They then proceed to use the appropriate standards (described in the next two sections) to review the study.

4. Standards for reviewing RCTs

Reviewers assess the strength of the evidence provided by RCTs using three main steps (Exhibit III.3).

[18] In these rare instances, Mathematica will consult with OPRE to confirm the outcome is not valid.

Exhibit III.3. Process for reviewing RCTs



[a]Based on both differential and overall attrition.

Step 1. Do confounding factors or the treatment of missing data[19] pose a risk of bias?

Two factors can lead an RCT to automatically receive a low study quality rating: confounding factors and mishandling of missing data. **Confounding factors** cause differences between the intervention and comparison groups that cannot be disentangled from the effect of an intervention. One type of confounding factor is an element external to the intervention that reaches only the members of one study group, for example, if all members of the intervention group lived in one TANF administrative region and all members of the comparison group lived in another TANF administrative region. In this example, it would be impossible to disentangle the effect of the program or policy from that of local economic conditions or local policies. If a confounding factor that is perfectly aligned with one study group is present, a study receives a low study quality rating.

Study authors must also handle missing data appropriately. The most common and straightforward method researchers use when data are missing is to simply remove observations with missing data from the sample they analyze. This approach is called a **complete-case analysis**. But other methods for assessing missing data are sometimes used, including **imputation** (replacing observations with guesses as to the most reasonable value) or **maximum**

[19] The ESER protocol did not consider authors' treatment of missing data. The Pathways Clearinghouse team decided to add this consideration based on the research community's evolving understanding of when the treatment of missing data poses a risk to study validity (and when it does not).

likelihood (creating a statistical model to account for the missing data). The WWC Standards Handbook Version 4.0 lists five acceptable approaches to handle missing data (WWC 2017a), including the three listed above. Pathways Clearinghouse reviewers assume a study using any of these methods handled missing data appropriately.[20] If a study uses a method other than these, the Pathways Clearinghouse principal investigator or review team lead examines the description of the method and determines whether the information is sufficient to ensure that the handling of missing data will not result in biased estimates of intervention effects.[21] If results might be biased due to the handling of missing data, a study receives a low study quality rating.[22]

Step 2. Was random assignment compromised?

A random assignment design is the strongest possible design because the intervention and comparison groups are formed by chance and thus researchers can be confident that observed differences are due to the program or policy being studied. If a reviewer identifies deviations from random assignment, such as reassigning or replacing group members or researchers varying the probability of random assignment to each condition over time without adjusting for this variation in the analysis, the Pathways Clearinghouse will treat a study as a comparison-group QED. Otherwise, the review will proceed to Step 3.

Step 3. Was attrition low?

Attrition is the main determinant of whether estimates from an RCT are free of bias and therefore whether the evidence of the program's effectiveness is strong. Attrition refers to the loss of individuals from the study sample over time, or the proportion of the randomly assigned sample not included in the estimation of effects. Both **overall attrition** (percentage of missing cases) and **differential attrition** (how the percentage missing differs across the intervention and comparison groups) are a concern, because both might lead to bias in the estimated effects. To determine whether an RCT had low attrition, the project team has adopted the attrition boundary used by ESER (see Appendix D). This boundary—called the cautious attrition boundary—was selected through an empirical bias model developed for the WWC and is based on the levels of overall and differential attrition.

If an RCT has low attrition, random assignment was not compromised, and no issues are posed by confounding factors or the treatment of missing data, a study receives a high study quality rating. If attrition is high or random assignment was compromised, but there are no issues related

[20] In particular, authors must use complete-case analysis, regression imputation, maximum likelihood, nonresponse weights, or, for missing regression controls only, replace the missing data with a constant value and include a missing data indicator in the regression. No additional requirements are placed on the use of these methods. For example, the Pathways Clearinghouse will not require that nonresponse weights are constructed in a specific manner.

[21] Like the handling of other rare cases, the Pathways Clearinghouse review team lead centrally documents these exceptions to support consistency among review decisions across all research included in the review.

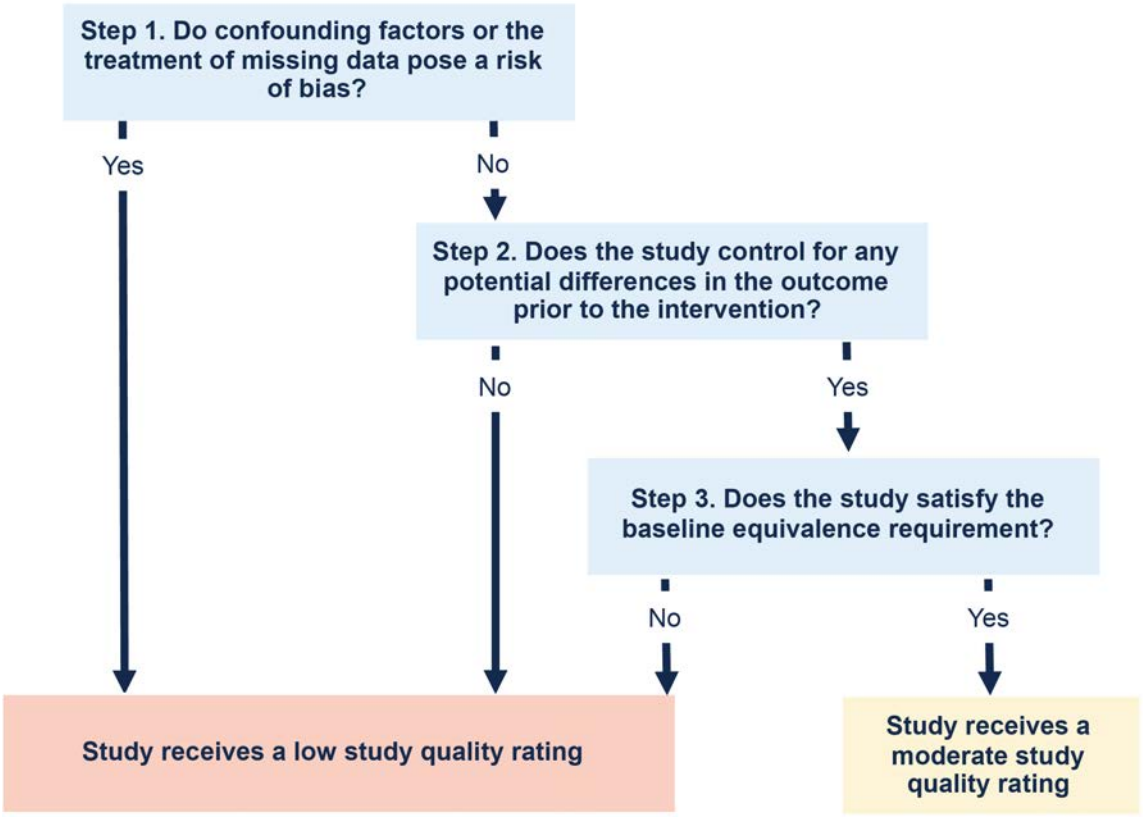
[22] For example, the Pathways Clearinghouse has determined that hot deck imputation, a common method of imputation not listed by the WWC as acceptable, will produce biased estimates unless combined with a regression approach (see Andridge and Little 2010 for a discussion of the method). Therefore, findings produced using this method receive a low rating.

to confounding factors or missing data, a reviewer proceeds by reviewing the study as if it used a comparison-group QED.

5. Standards for reviewing comparison-group QEDs

Reviewers assess the strength of the evidence provided by comparison-group QEDs using three steps (Exhibit III.4).[23] Reviewers also use this process to determine whether RCTs that cannot receive a high study quality rating can instead receive a moderate rating.

Exhibit III.4. Process for reviewing comparison-group QEDs



Step 1. Do confounding factors or the treatment of missing data pose a risk of bias?

This step proceeds in the same manner as Step 1 for reviewing RCTs. See Section B.4 of this chapter for details.

[23] Although the Pathways Clearinghouse's review standards for RCTs closely match those used by CLEAR (2015), which also reviews research on programs and services to improve employment and earnings for people with low incomes, standards differ somewhat for comparison-group QEDs between these two reviews. CLEAR uses a set of more general regression analysis criteria to review comparison-group QEDs and relaxes some of the criteria that the Pathways Clearinghouse applies in cases where groups are similar at baseline or authors compare intervention and comparison groups over multiple periods. In addition, CLEAR requires reviewers to assess whether sample members' anticipation of an intervention could bias results. The Pathways Clearinghouse does not use this criterion.

Step 2. Does the study control for any potential differences in the outcome before the intervention?

To receive a moderate rating, a study must control for potential differences in the outcome before the intervention began. If the outcome examined is an earnings or employment measure, this control should be measured at least one year before the intervention began.[24] For all other outcomes, this control should be measured shortly before the intervention or study began. Studies typically control for pre-intervention outcome measures by including control variables in their regression analysis.[25] If a comparison-group QED (or, an RCT that cannot receive a high study quality rating) does not adjust for a pre-intervention outcome measure, reviewers assign it a low study quality rating. Otherwise, reviewers proceed to the final step of the review process.

Step 3. Does the study satisfy the baseline equivalence requirement?

To produce credible evidence, comparison-group QEDs must demonstrate that the intervention and comparison groups had similar characteristics at baseline (that is, before intervention group members received intervention services). Ensuring that the groups were similar before one group was able to receive services helps establish that differences observed between the two groups after receiving services were actually the result of the intervention examined. The Pathways Clearinghouse requires studies to demonstrate baseline equivalence based on (1) earnings (or employment for employment outcomes), measured one year or more before baseline; (2) a measure of socioeconomic status (such as educational attainment or receipt of some means-tested public benefit, such as food stamps), measured shortly before the intervention or study began; (3) race and ethnicity; (4) gender; and (5) age.[26,27] The Pathways Clearinghouse considers two groups to be equivalent based on a characteristic if the difference in means across the two groups is not statistically significant at the 0.05 level (using a *chi*-squared test for categorical variables and a two-tailed *t*-test otherwise).

Comparison-group QEDs, and RCTs with high attrition or compromised random assignment, that meet the control and baseline equivalence requirements, and do not have any issues related

[24] Observations from one year or more before baseline are required because people commonly experience a dip in earnings before study enrollment (first formally documented in Ashenfelter 1978, and commonly referred to as the preprogram dip or Ashenfelter dip). See Heckman and Smith (1999) for details.

[25] Pathways follows the current WWC procedures and standards to determine which methods of adjustment for potential differences in pre-intervention outcomes are acceptable. Controlling for a propensity score summarizing the probability of group assignment (rather than directly controlling for the baseline or lagged measures used to construct the propensity score) is not an acceptable method of controlling for pre-intervention outcomes.

[26] To avoid overburdening study authors, Pathways Clearinghouse reviewers may assess baseline equivalence using information for a sample of individuals that differs slightly from the sample of individuals used to produce a finding (for example, due to item-level nonresponse on a survey) so long as the difference in samples falls below the threshold for high attrition (see Section B.4, Step 3 of this chapter).

[27] If multiple measures of socioeconomic status are available to use in assessing baseline equivalence, reviewers examine the broadest measure possible (for example, choosing receipt of any public benefits over receipt of TANF benefits). If no measure is clearly preferred, the following priority order should be used: years of education, educational attainment in categories, share that did not attain a high school diploma or equivalent certificate, share receiving any public benefits, share receiving SNAP or Food Stamp benefits, share receiving TANF or other cash assistance, and share receiving Medicaid or other means-tested, publicly-funded medical services.

to confounding factors or missing data, receive a moderate study quality rating. Otherwise, reviewers assign these studies a low study quality rating.

C. The review process

The Pathways team has implemented the following processes to support consistency and quality of reviews.

1. Study review process

The study review process was designed to ensure every study is carefully considered and assigned the most appropriate study quality rating. Two Pathways Clearinghouse reviewers examine each study selected for review. The first reviewer documents all relevant information and assigns a preliminary study quality rating. The second reviewer thoroughly checks the review to make sure the study quality rating criteria were correctly applied, and the review captured all appropriate information. When the first and second reviewers are not certain of a rating or come to different conclusions, they further consult with the review team lead.

Some studies do not contain all the information desired for the review effort. When key information is missing, the review team requests it from study authors in a two-stage process.[28] Team members first reach out to study authors to determine if they are willing to answer a query and then draft a full query after receiving a positive response. If study authors do not provide the requested information, the review team makes the most conservative assumptions that the information provided can support. For example, if the information needed to assess attrition is not available, the team will assume attrition is high. Reviewers also document whether a study might have received a higher rating if additional information had been available.

2. Challenges to review findings

The Pathways Clearinghouse Quality Review Team (QRT) handles any challenges audiences make about a review's findings, the inclusion of a study within the Pathways Clearinghouse, or other individual judgements the Pathways Clearinghouse team makes. The QRT addresses any issues with reviews that audiences raise, so long as they are (1) submitted in writing to PathwaysClearinghouse@Mathematica-MPR.com, (2) related to a specific study or well-defined set of studies, and (3) coherently explained (and the inquirer is available to answer any clarifying questions).

When a request is submitted to the QRT, a team member first verifies the request meets the criteria listed above. After this confirmation, the team member examines the study and any related materials, discusses the review with the original study reviewers, and presents a summary of the review and any potential flaws to the QRT. The QRT then determines whether the initial

[28] In some cases, the review team may use information from analyses that authors mention conducting in the manuscript, but do not report the findings from, to determine study ratings or calculate effect sizes. In these cases, the review team may request information about methods used and numerical results from such analyses. The Pathways Clearinghouse does not ask authors to conduct new analyses.

review should be revised, notifies OPRE and the inquirer of its findings and, if necessary, edits any Clearinghouse products to reflect the updated review.[29]

3. Handling potential conflicts of interest

The Pathways Clearinghouse requires all reviewers to sign a certification disclosing any potential conflicts of interest, such as having been a member of the research team of a study that the Pathways Clearinghouse potentially reviews. Reviewers are not permitted to make final decisions related to the results of study reviews or intervention effectiveness ratings if they have a conflict of interest. If members of the QRT are asked to evaluate a study for which they have a conflict of interest, they will consult with other Pathways Clearinghouse staff who do not have such conflicts in responding to the QRT request.

D. Extracting data from a study

Throughout the process of determining study ratings, the Pathways Clearinghouse team records several key pieces of information at the study, manuscript, and findings levels (see Exhibit III.5). Reviewers use a template to systematically record this data. These templates are then combined to form the Pathways Clearinghouse database.

Using the findings-level information, the team estimates an **effect size** for each finding with a high or moderate rating and for which sufficient information is provided to do so. Effect sizes are a valuable tool for conducting meta-analyses and syntheses. More broadly, they provide a way to combine or compare results measured in different units across outcomes, interventions, and studies. For example, effect sizes allow practitioners to directly compare an impact of 10 percent on employment with an impact of $1,200 on earnings, as well as to average these two effects. Effect sizes also allow researchers to compare an estimated impact to any statistical distribution. For example, one could compare the estimated impact of a training intervention to the overall distribution of earnings for workers in the intervention's target population in a specific year. That is, one can use effect sizes to estimate an average effect across multiple studies and outcomes, and then transform that average back into an easy-to-understand number, such as dollars or percentage points. The Pathways Clearinghouse takes this approach to summarize results.

The team calculates effect sizes as **Hedges' *g***, the ratio between the estimated impact of the intervention and the standard deviation pooled across intervention and comparison groups.[30] To

[29] OPRE will review QRT findings and provide input as needed. However, QRT evaluations of studies funded by HHS (of which OPRE is a part) will be conducted independently by the Pathways Clearinghouse team and will not be subject to change based on comments from OPRE.

[30] Some systematic reviews use alternative indices to estimate effect sizes for binary variables (that is, those that take on values of 0 and 1 only, such as employment). For example, the WWC uses the Cox index. Although research has shown that using the Cox index can be preferable to using Hedges' *g,* this research is based on assumptions that are unlikely to hold for the key binary outcomes of interest to the Clearinghouse (Sánchez-Meca et al. 2003). For example, the Cox index produces artificially large effect sizes when most people in the sample have a 0 or 1 value for the outcome of interest, a condition that is likely to hold for employment and benefit receipt in some studies the Pathways Clearinghouse reviews (where some studies will have a very high proportion

avoid bias due to small sample sizes, team members also apply a sample size correction to effect sizes (the correction gets vanishingly small as the sample size grows).

Exhibit III.5. Key data elements collected during study review process

Study-level	• Design • Target populations • Sample characteristics • Setting • Analytic methods • Time period over which the evaluation occurred (enrollment and follow-up periods) • Program history • The intervention tested and its implementation • Services received by the comparison group • Outcomes examined but not selected for review
Manuscript-level	• Citation • Authors • Year of publication • URL
Findings-level	• Measure • Outcome • Data source • Sample description • Sample sizes • Pre-intervention means and standard deviations • For findings rated high or moderate: – Means and standard deviations of outcome measures – Estimated impacts – Information related to the precision and statistical significance of estimates

Note: To promote efficiency, for studies rated low (see Section B of this chapter), reviewers only record information at the study level on the intervention and comparison group conditions (including the services examined, intervention name, and whether any services were mandatory); limited information on the setting, time period, and target population for the study; the citations for associated manuscripts; and the information leading the study to receive a low rating.

Because, for many findings, the standard deviations needed to calculate effect sizes are not available, Pathways Clearinghouse reviewers attempt to calculate two effect sizes for each finding rated high or moderate. These effect sizes include one that uses a study-specific standard deviation to normalize the impact estimate, and one that uses a national standard deviation to normalize the impact estimate (see Box III.2). The team calculates an effect size using study-specific data if the Pathways Clearinghouse can obtain from the study authors the information needed to do so. The team calculates an effect size using national data when a nationally representative measure of the standard deviation of the outcome can be constructed. Appendix E provides the details on the calculation of these effect sizes.

Each finding catalogued and determined to have a high or moderate rating is also categorized based on its **sign** (positive or negative), statistical significance (statistically significant at the 0.05 level or **null,** meaning not statistically significant), and **size** (small, or moderate or large). The

receiving benefits or a very low proportion employed). The Pathways Clearinghouse therefore uses Hedges' *g* for both binary and nonbinary variables.

Pathways Clearinghouse also labels findings as **favorable** or **unfavorable**, with favorable effects associated with increases in employment, earnings, education, and training or decreases in public benefit receipt and unfavorable effects associated with decreases in employment, earnings, education, and training or increases in public benefit receipt.[31] Findings with a low rating are not categorized in this way or otherwise reported. The Pathways Clearinghouse classifies an impact as moderate or large if its corresponding effect size is more than 0.25 standard deviations. The WWC (2017b) uses this effect size to classify impacts as substantively important. The cutoff should be thought of as providing a reasonably high bar. For a population with a typical employment rate around 80 percent, an effect size of 0.25 would correspond to an increase in employment of about 10 percentage points. For a population with a typical employment rate around 50 percent, an effect size of 0.25 would correspond to an increase in employment of about 12 percentage points. According to Card et al. (2017), the average labor market program for disadvantaged workers raised the employment rate by only about 5 percentage points.

Box III.2. Comparing the two measures of the effect size

The Pathways Clearinghouse team attempts to calculate two effect sizes for each finding rated high or moderate: one calculated using a study-specific standard deviation (g_{study}), and one calculated using a standard deviation based on data from the Current Population Survey, a nationally representative survey of U.S. households that has consistently collected information on income and employment since 1962 ($g_{national}$). Using study data to calculate effect sizes produces estimates of the size of an intervention's effects relative to variation in the outcome for study participants. Using national data to calculate effect sizes produces estimates of the size of effects relative to variation in the outcome across the set of all individuals in the U.S. with low incomes.

To highlight the differences in these measures, consider two studies that both examined an intervention that increased quarterly earnings by $300. Study 1 includes a reasonably homogenous population with a low standard deviation of earnings, and Study 2 includes a more diverse population with a higher standard deviation of earnings. The two studies would have the same value of $g_{national}$, but the value of g_{study} for Study 1 would be higher than the value of g_{study} for Study 2.

We are not aware of other clearinghouses that have used national data to estimate effect sizes. The Pathways Clearinghouse team will therefore use the findings for which it can compute both effect sizes to compare the different measures. This will enable the team to determine the circumstances under which the measures produce similar results and when and why results might differ. ◢

[31] The Pathways Clearinghouse interprets reduced public benefits as a favorable finding because of the overall focus of the project on identifying effective ways to help people with low incomes move from public benefit receipt to employment.

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IV. ASSESSING THE EVIDENCE OF EFFECTIVENESS FOR AN INTERVENTION

The Pathways Clearinghouse seeks to move beyond reviewing individual studies and toward creating a repository of interventions with rigorous evidence of effectiveness. This chapter describes the approach to synthesizing evidence in this manner. Section A provides details on how studies are grouped into interventions and Section B describes how interventions are classified based on effectiveness. Section C provides an overview of the presentation of findings.

Box IV.1. Categories of services used to define an intervention

- Apprenticeships
- Case management
- Education
- Employment coaching
- Employment retention services
- Financial education
- Financial incentives
- Health services
- Individual placement and support
- Job development/Job placement
- Job search assistance
- Occupational or sectoral training
- On-the-job training
- Physical health services
- Sanctions
- Soft skills training
- Subsidized employment
- Substance use disorder treatment and mental health services
- Supportive services
- Training
- Transitional jobs
- Unpaid work experience
- Work and work-based learning
- Work experience
- Work readiness activities

A. Grouping studies into interventions

The *Federal Register* Notice (FRN) associated with the Pathways Clearinghouse, 83 FR 26290, defines an intervention as "a specific bundle of services and/or policies implemented in a given context" (p. 26291). Following this, the Pathways Clearinghouse defines an intervention based on the services offered to the intervention group but not offered to the comparison group.[32] That is, two studies are considered to examine the same intervention only if the same services were offered in both cases. For the purposes of implementing these criteria, the Clearinghouse team has defined several categories of services, listed in Box IV.1.[33] In addition, studies in which participation was mandatory (for continued benefit receipt or other reasons) are classified as examining different interventions from studies with voluntary participation.

[32] See Chapter II for a discussion of the context in which an intervention must have taken place for it to be eligible for review by the Pathways Clearinghouse.

[33] Although we refer to these elements collectively as services for ease of exposition, a small number might instead be classified as public benefit policies. This list is subject to change as studies of interventions other than employment and training programs are reviewed.

In some cases, studies might examine the same services with the same participation requirements but implemented in fundamentally different ways. For example, two programs might provide both training and case management, with one providing one year of training paired with monthly case management meetings and the other providing a two-week training paired with bi-weekly case-management meetings for one year. Although the programs provide the same services, the intensity and focus of service delivery varies greatly.

Box IV.2. Categories of primary services

- Case management or other supports
- Education and training
- Employment retention services
- Employment services
- Incentives and sanctions
- Work and work-based learning

Therefore, the Pathways Clearinghouse team first groups studies examining the same services and having either mandatory or voluntary participation but then, the principal investigator and review task lead determine whether the studies within a group examine the same intervention. When studies in a group examine services with fundamentally different theories of change or approaches, the team recommends grouping these studies into multiple interventions. These choices are subject to the review and approval of the Pathways Clearinghouse project director and deputy project director. Pathways Clearinghouse staff also consult, as needed, with Mathematica internal experts and OPRE about how to sort studies into interventions.

In addition to classifying all intervention services, the Pathways Clearinghouse also designates one service as an intervention's **primary service.** An intervention's primary service is the principal service of the intervention. To identify primary services, listed in Box IV.2, reviewers examine each study and identify the service provided as part of the examined intervention (1) that a large proportion of intervention group members received and a large proportion of comparison group members did not and (2) was described by the study authors as most integral to the theory of change tested by the study. Both the first and second study reviewer independently assess an intervention's primary service and discuss the study until they achieve consensus.

B. Determining interventions' evidence of effectiveness

The Pathways Clearinghouse aggregates information from across studies to determine an intervention's **effectiveness rating** within each of the outcome domains. Possible ratings, defined in Exhibit IV.1, fall into five categories:

1. Interventions receiving the **Well-Supported** rating in a domain are those in which the evidence indicates an intervention is likely to improve outcomes in a domain if the intervention were replicated. Findings rated high or moderate from at least two studies conducted in the United States must show favorable and statistically significant effects, with

no strong countervailing evidence, for this rating to be assigned.[34] However, because implementation challenges and successes often vary, and no two implementations of an intervention are identical, Pathways Clearinghouse users should not view this rating as a guarantee of success.

2. Interventions receiving the **Supported** rating in a domain are those with more limited evidence of success within the domain. These interventions have at least one study showing evidence of favorable and statistically significant effects in the domain, but the evidence is less conclusive than that for well-supported interventions.
3. Interventions receiving the **Mixed Support** rating in a domain are those with some evidence indicating that they improve outcomes, and some evidence indicating they worsen outcomes. These interventions might produce positive or negative effects, depending on contextual and implementation factors.
4. Interventions receiving the **Not Supported** rating in a domain are those that demonstrate a pattern of null and/or unfavorable effects. These interventions are not likely to improve outcomes if implemented in contexts similar to those used in prior research.
5. Interventions receiving the **Insufficient Evidence to Assess Support** rating in a domain are those that have been studied but lack a sufficient body of evidence to receive one of the other ratings. These interventions require further study to support conclusions about their effectiveness.
6. Interventions receiving the **No Evidence to Assess Support** rating in a domain are those that have no high- or moderate-quality evidence and can therefore not receive a rating. These interventions also require further study to support conclusions about their effectiveness.

Exhibit IV.2 provides further examples of how the team would rate an intervention within a domain based on all possible combinations of findings from two studies that each included one finding in the domain.

[34] Although the Pathways Clearinghouse includes research conducted in Canada, its chief goal is to inform decision makers working within the policy environment of the United States. Therefore, to receive the highest effectiveness rating, an intervention must demonstrate evidence of effectiveness in the United States. Interventions tested only outside of the United States can still receive the Supported rating.

Exhibit IV.1. Potential effectiveness ratings of interventions, by domain

Intervention-domain designation	Requirements
Well-Supported	Based on all studies with a moderate or high study quality rating conducted in the United States, and within findings receiving a high or moderate rating: • There are favorable and statistically significant findings in the domain from two or more studies of the intervention. AND • There are no unfavorable and statistically significant findings in the domain. AND • Across all findings in the domain, the average effect size (weighted by the sample sizes used to estimate the effect) is favorable. AND • There are at least as many impacts in the domain that are favorable and either statistically significant or moderate or large, as the number that are either unfavorable or favorable and small.
Supported	Based on all studies with a moderate or high study quality rating, and within findings receiving a high or moderate rating: • The intervention has at least one favorable and statistically significant finding in the domain. AND • The intervention has no unfavorable and statistically significant findings in the domain. AND • The intervention does not meet the criteria for being classified as Well-Supported within the domain.
Mixed Support	Based on all studies with a moderate or high study quality rating, and within findings receiving a high or moderate rating: • The intervention has at least one favorable and statistically significant finding in the domain. AND • The intervention has at least one unfavorable and statistically significant finding in the domain.
Insufficient Evidence to Assess Support	Based on all studies with a moderate or high study quality rating and within findings receiving a high or moderate rating: • There is a single study with a moderate or high study quality rating examining findings in the domain. AND • The study has only null findings in the domain. OR • There are multiple studies with a moderate or high study quality rating examining outcomes in the domain. AND • There have been no studies that demonstrate a statistically significant effect on an outcome in the domain. AND • At least one study demonstrates a moderate to large and favorable effect on at least one outcome in the domain.
No Evidence to Assess Support	There is no study that included outcomes in the domain that received a moderate or high study quality rating.

Exhibit IV.1 (*continued*)

Intervention-domain designation	Requirements
Not Supported	At least one study has been conducted and received a moderate or high study quality rating and examined findings in the domain that received a high or moderate rating AND None of the above apply.

Note: If authors provide separate estimates for subgroups of people defined by any characteristic other than site or timing of service receipt, the subgroup estimates will be treated as if they are from the same study for the purposes of assigning intervention effectiveness ratings (but will be catalogued as separate studies on the Pathways Clearinghouse website). Studies that focus on a specific site or cohort of individuals are treated as separate studies for all purposes.

Exhibit IV.2. Potential designations of an intervention with two studies

Study A: Designation of single finding in domain	Study B: Designation of single finding in domain	Intervention rating
Favorable, statistically significant	Favorable, statistically significant	Well-Supported
Favorable, statistically significant	Favorable, null, moderate or large	Supported
Favorable, statistically significant	Null, small	Supported
Favorable, statistically significant	Unfavorable, null, moderate or large	Supported
Favorable, statistically significant	Unfavorable, statistically significant	Mixed Support
Favorable, statistically significant	Did not examine outcomes in domain	Supported
Favorable, null, moderate or large	Favorable, null, moderate or large	Insufficient Evidence
Favorable, null, moderate or large	Null, small	Insufficient Evidence
Favorable, null, moderate or large	Unfavorable, null, moderate or large	Insufficient Evidence
Favorable, null, moderate or large	Unfavorable, statistically significant	Not Supported
Favorable, null, moderate or large	Did not examine outcomes in domain	Insufficient Evidence
Null, small	Null, small	Not Supported
Null, small	Unfavorable, null, moderate or large	Not Supported
Null, small	Unfavorable, statistically significant	Not Supported
Null, small	Did not examine outcomes in domain	Insufficient Evidence
Unfavorable, null, moderate or large	Unfavorable, null, moderate or large	Not Supported
Unfavorable, null, moderate or large	Unfavorable, statistically significant	Not Supported
Unfavorable, null, moderate or large	Did not examine outcomes in domain	Insufficient Evidence
Unfavorable, statistically significant	Unfavorable, statistically significant	Not Supported
Unfavorable, statistically significant	Did not examine outcomes in domain	Not Supported
Did not examine outcomes in domain	Did not examine outcomes in domain	No Evidence

Note: If authors provide separate estimates for subgroups of people defined by any characteristic other than site or timing of service receipt, the subgroup estimates will be treated as if they are from the same study for the purposes of assigning intervention effectiveness ratings (but will be catalogued as separate studies on the Pathways Clearinghouse website). Studies that focus on a specific site or cohort of individuals are treated as separate studies for all purposes.

As in any systematic review, there is some risk that statistical bias could lead the Pathways Clearinghouse to come to incorrect conclusions about intervention effectiveness. However, two key elements of the approach limit this risk of bias. First, only studies and findings deemed to provide moderate- or high-quality evidence are used to classify interventions as Well-Supported, Supported, Mixed Support, Insufficient Evidence to Assess Support, or Not Supported. Studies rated as high and moderate are those in which the extent of bias is unlikely to be sufficiently large to alter the studies' main conclusions. Second, only interventions for which multiple studies reach the same conclusions about intervention effectiveness can receive the rating of Well-Supported. Consistent with the recommendations of the Cochrane Collaboration, we do not attempt to further summarize the overall risk of bias for the review effort as a whole (Higgins and Green 2011).

C. Presenting findings

The Pathways Clearinghouse website is powered by a searchable database with elements at the intervention, study, manuscript, and finding levels. Each intervention also has a dedicated web page, clearly indicating the findings that the Pathways Clearinghouse reviewed from each of the outcome domains. Users can learn more about the studies on each intervention, and about specific findings, on the intervention page and by navigating to additional pages.

The Pathways Clearinghouse team has developed several syntheses designed to further explain what services and policies work for whom, and under what conditions. Specifically, these syntheses provide an overview of interventions and their effects, a meta-analysis of how effects vary based on features of the interventions (for example, the intervention's primary service), an examination of interventions that are effective during recessions and recoveries, and a Bayesian meta-analysis of the types of interventions that have the highest probabilities of improving employment-related outcomes. The Pathways team will develop additional syntheses in the future. Topics will be selected based on input from ACF and from the Pathways Clearinghouse expert panel. These might focus on different primary services or guiding frameworks for providing services. Syntheses might also focus on common themes, such as specific populations, barriers to employment, or local conditions. Methods for each synthesis will be specified before work on that synthesis begins, in accordance with the PRISMA-P guidelines (Moher et al. 2015).

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Appendix A: Process for Developing Review Protocol

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The Pathways to Work Evidence Clearinghouse was developed in response to the Consolidated Appropriations Act of 2017 (Pub. L. 115-31), which directs the U.S. Department of Health and Human Services (HHS) to create a What Works Clearinghouse of Proven and Promising Projects to Move Welfare Recipients into Work. This appendix describes the process by which staff from Mathematica and the Office of Planning, Research, and Evaluation (OPRE), within the Administration for Children and Families (ACF), HHS, developed the protocol, methods, and standards for this Clearinghouse. This work occurred in two stages.

In the initial development stage, staff on the Employment Strategies for Low-Income Adults Evidence Review (ESER) project convened a working group and developed a Federal Register notice (FRN). A group of experts—including representatives from the U.S. Departments of Labor, Education, and Justice, and several HHS offices and agencies, including the Office of Family Assistance, OPRE, the Office of the Assistant Secretary for Planning and Evaluation, and the Agency for Healthcare Research and Quality—met with Mathematica staff to discuss key parameters for the effort. The group met several times in fall 2017 and early winter 2018. Key topics discussed included:

- Criteria for classifying interventions as Well-supported and Supported, as well as other classifications of interventions
- Definitions of key terms, including study and intervention
- Best practices in conducting systematic reviews
- How the Pathways Clearinghouse can be consistent with other federal review efforts

The ESER team also conducted extensive background research on established methods for reviewing complex interventions and resources related to consistency and transparency in systematic reviews. As a result of these discussions, ACF issued an FRN (83 FR 26290), which defined the key parameters of the Pathways Clearinghouse.

Next, OPRE competitively awarded the contract to Mathematica, in partnership with MEF Associates and Hager Sharp, to continue the work done under ESER and establish the Pathways Clearinghouse. To refine the parameters the FRN established, Mathematica staff met with an expert group in early spring 2019. Discussions focused on how to operationalize key terms and definitions for the Pathways Clearinghouse and how the scope of the Pathways Clearinghouse might be expanded beyond that considered by past OPRE systematic reviews. The expert group again included key federal experts, but was further expanded to include research experts on systematic reviews, employment and training services for people with low incomes, and the application of research to policymaking, as well as practitioners and policymakers. This report reflects these consultations.

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Appendix B: PRISMA-P and PRISMA-CI Elements

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Exhibit B.1. PRISMA-P elements

Element		Explanation	Section addressing
1a	Title	The title of this report, *Protocol for the Pathways to Work Evidence Clearinghouse: Review Methods and Standards*, clearly identifies this as a review protocol.	Front matter
1b	Update	This review updates work done under the Employment Strategies for Low-Income Adults Evidence Review (ESER).	Chapter II, Section A
2	Registry	We were unable to register this review with the only logical registry (PROSPERO) because that review requires prospective registration. Pathways partially relies on previously completed reviews conducted under ESER, so it was not possible to register Pathways' standards before reviews began.	Not applicable
3a	Contact	Information on the authors and their institution appears on the title page. Sama-Miller may be contacted at esamamiller@mathematica-mpr.com. Pathways Clearinghouse principal investigator (Sarah Dolfin) may be contacted at sdolfin@mathematica-mpr.com.	Front matter
3b	Contributions	The ordering of the authors provides information on the relative contributions of each. Sarah Dolfin, as principal investigator, is the guarantor of this work.	Front matter
4	Amendments	This protocol is an update of the previous protocol of the same name. Substantive updates include: 1. Expanding the scope of the Pathways Clearinghouse to include a broader set of interventions. The original scope of the Pathways Clearinghouse included only employment and training interventions. The revised scope will include all interventions that could improve participants' employment and earnings. Examples of these interventions include housing assistance and general education programs. Other eligibility criteria were unchanged, including that eligible studies must include only participants with low incomes and must examine impacts of the intervention examined on employment or earnings outcomes. 2. Clarifying the types of outcomes eligible for review within the educational attainment domain. 3. Clarifying the Quality Review Team process for studies funded by OPRE. 4. Adding information on additional elements (primary services) collected as part of the Pathways Clearinghouse. 5. Clarified that controlling for a propensity score summarizing the probability of group assignment (rather than directly controlling for the baseline or lagged measures used to construct the propensity score) is not an acceptable method of controlling for pre-intervention outcomes. 6. Clarified that the Pathways Clearinghouse review team may request information from analyses that authors mention conducting, but do not report in the manuscript. Information requested may include analytic methods used or numerical results. We will identify any future amendments by issuing an updated version of this document, which clearly indicates the changes in a distinct summary of updates section.	Chapter I, Section C

Exhibit B.1 (*continued*)

Element		Explanation	Section addressing
5a	Sources	This work was funded by the Office of Planning, Research, and Evaluation (OPRE), within the Administration for Children and Families (ACF), U.S. Department of Health and Human Services (HHS).	Front matter, Chapter I
5b	Sponsor	This work was funded by OPRE, within ACF, HHS.	Front matter, Chapter I
5c	Role of sponsor or funder	Staff from ACF provided comments on and approved this protocol. They also helped shape the scope of the review.	Chapters I and II
6	Rationale	The Pathways Clearinghouse seeks to be a comprehensive resource that a range of audiences, including state and local TANF administrators, can use to identify the services that will best help people with low incomes succeed in the labor market.	Chapter I
7	Objective	This review seeks to provide an overview of the broad field of the effectiveness of employment-related services and policies for people with low incomes. It aims to answer the following research questions: 1. What research exists on the effectiveness of interventions that aim to improve the employment and earnings of people with low incomes? 2. Which programs and policies have evidence of improving employment, earnings, education, and training for people with low incomes and of reducing public benefit receipt?	Chapter I
8	Eligibility criteria	Research must have met the following criteria: 1. Been published or prepared in 1990 or later 2. Conducted in the United States or Canada 3. Assessed effectiveness using quantitative methods 4. Examined an intervention serving people with low incomes 5. Examined an intervention aiming to improve employment or earnings 6. Examined the impacts of an intervention on employment and/or earnings outcomes 7. Examined an intervention serving individual job-seekers in a specific context 8. Articulated details on the services provided	Chapter II
9	Information sources	The review draws on a combination of database searches, literature reviews, other federal review efforts, and a call for papers.	Chapter II, Section B
10	Search strategy	The review used a modified version of the Peer Review of Electronic Search Strategies (PRESS) method (McGowen et al. 2016) to develop the database search terms in Exhibit II.1.	Chapter II, Section B.3
11a	Data management	The project uses a pair of databases (RefWorks and SharePoint) to catalog manuscripts and their corresponding studies as a management tool to track the literature search, screening, and review process.	Chapter I, Section B

Exhibit B.1 (*continued*)

Element		Explanation	Section addressing
11b	Selection process	The Pathways Clearinghouse uses a two-stage screening process, and two reviewers examine each study.	Chapter II, Section C; Chapter III, Section C
11c	Data collection process	Data is recorded using a template based on that previously used by the ESER team. Pathways Clearinghouse staff conduct author queries to gather information not reported in the study.	Chapter III, Sections C.1 and D
12	Data items	Team members collect data at the study, manuscript, finding, and intervention levels.	Chapter III, Section D
13	Outcomes and prioritization	The Pathways Clearinghouse team examines findings for outcomes in ten domains: short-term earnings, long-term earnings, very long-term earnings, short-term employment, long-term employment, very long-term employment, short-term public benefit receipt, long-term public benefit receipt, very long-term public benefit receipt, and education and training.	Chapter III, Section B.2
14	Risk of bias in individual studies	Studies and findings are assigned a study quality rating based on several criteria. Findings are not reported for studies without sufficient causal validity.	Chapter III, Section B
15	Synthesis	Studies are grouped into interventions and findings are summarized by intervention. Future efforts will examine other groupings, potentially including meta-analysis.	Chapter IV
16	Meta-bias	This element will vary based on the syntheses conducted and will be elaborated upon in future synthesis briefs.	Not applicable
17	Confidence in cumulative evidence	The confidence in the evidence on each intervention is summarized by the intervention's rating.	Chapter IV, Section B

Note: This exhibit follows Moher et al. (2015).

Exhibit B.2. PRISMA-CI methods elements not discussed in PRISMA-P

Element		Explanation	Section addressing
11a	Pathway complexity	This element will vary across interventions. Pathways complexity will be elaborated in future synthesis briefs.	Not applicable
11b	Intervention complexity	This element will vary across interventions and will be elaborated in an implementation brief for each intervention receiving a Well-Supported or Supported effectiveness rating. In these briefs, the Pathways Clearinghouse team will detail available information on intervention components; the expected and actual frequency, duration, and intensity of service receipt; and the staff involved in service receipt.	Not applicable
11c	Population complexity	Studies examining people ages 16 and older with low incomes are eligible for review. Each study review further documents population characteristics.	Chapter II, Section A; Chapter III, Section D
11d	Implementation complexity	This element will vary across interventions and will be elaborated in an implementation brief for each intervention receiving a Well-Supported or Supported effectiveness rating. In these briefs, the Pathways Clearinghouse team will detail available information on key implementation drivers.	Not applicable
11e	Contextual complexity	This element will vary across interventions and will be elaborated in an implementation brief for each intervention receiving a Well-Supported or Supported effectiveness rating. In these briefs, the Pathways Clearinghouse team will detail available information on the location of service receipt and local context.	Not applicable
11f	Timing	Services and policies can occur for any length of time; however, the review restricts attention to analyses conducted in 1990 or later.	Chapter II
13	Summary measures	We report effect sizes for each finding and average effect sizes by outcome domain and intervention.	Chapter III, Section D; Chapter IV, Section B
14	Synthesis of results	Studies are grouped into interventions and findings are summarized by intervention. Future efforts will examine other groupings, potentially including meta-analyses.	Chapter IV
16	Additional analyses	We will identify any additional analyses by issuing an updated version of this document, which clearly indicates the changes in a distinct section that summarizes updates.	Not applicable

Note: This exhibit follows Guise et al. (2017b).

Appendix C: List of Literature Reviews Consulted to Identify Studies Considered for Review

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Barnow, Burt S., and Jeffrey Smith (2015). *Employment and training programs,* NBER Working Paper, Cambridge, MA: National Bureau of Economic Research.

Bogle, Mary, Gregory Acs, Pamela J. Loprest, Kelly Mikelson, and Susan J. Popkin (2016). *Building blocks and strategies for helping Americans move out of poverty,* Washington, DC: U.S. Partnership on Mobility from Poverty.

Borradaile, Kelley, Alina Martinez, Peter Schochet, Elias Walsh, and Silvia Robles (2021). *Adult education strategies: Identifying and building evidence of effectiveness, appendices,* NCEE 2021-007A, Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance.

Cascio, Elizabeth (2021). *Early childhood education in the United States: What, when, where, who, how, and why,* NBER Working Paper 28722, Cambridge, MA: National Bureau of Economic Research.

Card, David, Jochen Kluve, and Andrea Weber (2017). What works? A meta-analysis of recent active labor market program evaluations, *Journal of the European Economic Association* 16(3): 894-931.

Chan, Marc K., and Robert Moffitt (2018). Welfare reform and the labor market, *Annual Review of Economics* 10: 347-381.

Chin, Eric, and Lawrence F. Katz (2021). *Neighborhoods matter: Assessing the evidence for place effects,* NBER Working Paper, Cambridge, MA: National Bureau of Economic Research.

Crépon, Bruno, and Gerard J. Van den Berg (2016). Active labor market policies, *Annual Review of Economics* 8: 521-546.

Dutta-Gupta, Indivar (2016). *Lessons learned from 40 years of subsidized employment programs: A framework, review of models, and recommendations for helping disadvantaged workers,* Washington, DC: Georgetown University School of Law, Center on Poverty and Inequality.

Greenberg, David H., Andreas Cebulla, and Stacey Bouchet (2005). *Report on a meta-analysis of welfare-to-work programs,* Madison, WI: Institute for Research on Poverty.

Gross, J.M., A. Monroe-Gulick, C. Nye, D. Davidson-Gibbs, and D. Dedrick (2020). Multifaceted interventions for supporting community participation among adults with disabilities: A systematic review, *Campbell Systematic Review* 16(20): e1092.

Heinrich, Carolyn J. (2016). Workforce development in the United States: Changing public and Private roles and program effectiveness, In Douglas Besharov and Douglas Call (Eds.), *Labor activation in a time of high unemployment: Encouraging work while preserving the social safety-net,* Oxford/New York: Oxford University Press.

Hollederer, Alfons (2019). Health promotion and prevention among the unemployed: A systematic review, *Health Promotion International* 34(6): 1078-1096.

Holzer, Harry, and Robert Lerman (2014). *Work-based learning to expand jobs and occupational qualifications for youth,* Washington, DC: Center on Budget and Policy Priorities.

Hossain, F., and D. Bloom (2015). *Toward a better future: Evidence on improving employment outcomes for disadvantaged youth in the United States,* New York: MDRC.

Keenan, Ciara, Sarah Miller, Jennifer Hanratty, Terri Pigott, Jayne Hamilton, Christopher Coughlan, Peter Mackie, Suzanne Fitzpatrick, and John Cowman (2021). Accommodation-based interventions for individuals experiencing, or at risk of experiencing, homelessness, *Campbell Systematic Reviews* 17(2): e1165.

Lacoe, J., and H. Betesh (forthcoming). *Supporting reentry employment and success: A summary of the evidence for adults and young adults,* Oakland, CA: Mathematica.

Liu, Songqi, Jason L. Huang, and Mo Wang (2014). Effectiveness of job search interventions: A meta-analytic review, *Psychological Bulletin* 140(4): 1009-1041.

Marshall, Carrie A., Leonie Boland, Lee A. Westover, Blair Marcellus, Silka Weil, and Sarah Wickett (2020). Effectiveness of interventions targeting community integration among individuals with lived experiences of homelessness: A systematic review, *Health & Social Care in the Community* 28(6): 1843-1862.

Marshall, Tina, Richard W. Goldberg, Lisa Braude, Richard H. Dougherty, Allen S. Daniels, Sushmita Shoma Ghose, Preethy George, and Miriam E. Delphin-Rittmon (2014). Supported employment: Assessing the evidence, *Psychiatric Services* 65(1): 16-23.

Moledina, Aliza, Olivia Magwood, Eric Agbata, Jui-Hsia Hung, Ammar Saad, Kednapa Thavorn, and Kevin Pottie (2021). A comprehensive review of prioritised interventions to improve the health and wellbeing of persons with lived experience of homelessness, *Campbell Systematic Reviews* 17(2): e1154.

Moore, T.H.M, N. Kapur, K. Hawton, A. Richards, C. Metcalfe, and D. Gunnell (2017). Interventions to reduce the impact of unemployment and economic hardship on mental health in the general population: A systematic review, *Psychological Medicine* 47: 1062-1084.

Munthe-Kaas, Heather Menzies, Rigmor C. Berg, and Nora Blaasvær (2018). Effectiveness of interventions to reduce homelessness: A systematic review, *Campbell Systematic Reviews* 3.

Rog, Debra J., Tina Marshall, Richard H. Dougherty, Preethy George, Allen S. Daniels, Sushmita Shoma Ghose, and Miriam E. Delphin-Rittmon (2014). Permanent supportive housing: Assessing the evidence, *Psychiatric Services* 65(3): 287-294.

Sama-Miller, E., R. Kleinman, L. Timmins, and H. Dahlen (2019). *Employment and health among low-income adults and their children: A review of the literature,* OPRE Report #2019-38, Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

Sommer, Teresa Eckrich, Terri J. Sabol, Elise Chor, William Schneider, P. Lindsay Chase-Lansdale, Jeanne Brooks-Gunn, Mario L. Small, Christopher King, and Hirokazu Yoshikawa (2018). A two-generation human capital approach to anti-poverty policy, *RSF: The Russell Sage Foundation Journal of the Social Sciences* 4(3): 118-143.

Stiehl, Emily, Namrata Shivaprakash, Esther Thatcher, India J. Ornelas, Shawn Kneipp, Sherry L. Baron, and Naoko Muramatsu (2018). Worksite health promotion for low-wage workers: A scoping literature review, *American Journal of Health Promotion* 32(2): 359-373.

Treskon, Louisa. *What works for disconnected young people: A scan of the evidence,* Working Paper, New York: MDRC, 2016.

U.S. Department of Labor, U.S. Department of Commerce, U.S. Department of Education, and U.S. Department of Health and Human Services (2014). *What works in job training: A synthesis of the evidence,* Washington, DC: U.S. Department of Labor.

Younger, Kirsty, Louise Gascoine, Victoria Menzies, and Carole Torgerson (2019). A systematic review of evidence on the effectiveness of interventions and strategies for widening participation in higher education, *Journal of Further & Higher Education* 43(6): 742-773.

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Appendix D: Attrition Boundary

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Exhibit D.1. Highest differential attrition rate for sample to maintain low attrition, by overall attrition rate

Overall	Differential	Overall	Differential	Overall	Differential
0	5.7	22	5.2	44	2.0
1	5.8	23	5.1	45	1.8
2	5.9	24	4.9	46	1.6
3	5.9	25	4.8	47	1.5
4	6.0	26	4.7	48	1.3
5	6.1	27	4.5	49	1.2
6	6.2	28	4.4	50	1.o
7	6.3	29	4.3	51	0.9
8	6.3	30	4.1	52	0.7
9	6.3	31	4.0	53	0.6
10	6.3	32	3.8	54	0.4
11	6.2	33	3.6	55	0.3
12	6.2	34	3.5	56	0.2
13	6.1	35	3.3	57	0
14	6.0	36	3.2	58	-
15	5.9	37	3.1	59	-
16	5.9	38	2.9	60	-
17	5.8	39	2.8	61	-
18	5.7	40	2.6	62	-
19	5.5	41	2.5	63	-
20	5.4	42	2.3	64	-
21	5.3	43	2.1	65	-

Source: What Works Clearinghouse Procedures and Standards Handbook, Version 3.0.

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Appendix E: Details on Effect Size Calculations

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The Pathways to Work Evidence Clearinghouse attempts to estimate effect sizes for each finding rated as providing high or moderate evidence. In particular, Pathways Clearinghouse team members calculate effect sizes as Hedges' *g*, defined as:

$$g = \frac{\omega\left(y_i - y_c\right)}{S},$$

where y_i and y_c are the means of the outcome for the intervention and comparison groups, ω is an adjustment for sample size, and *S* is the pooled standard deviation of the outcome. ω and *S* are further defined as

$$\omega = 1 - \frac{3}{4\left(n_i + n_c\right) - 9}$$

and

$$S = \sqrt{\frac{(n_i - 1)s_i^2 + (n_c - 1)s_c^2}{n_i + n_c - 2}},$$

where n_i and n_c are the number of people in the intervention and comparison groups, and s_i^2 s_c^2 are the variances of the outcome for the intervention and comparison groups. When s_i^2 and s_c^2 are not both available, the Pathways Clearinghouse team uses an alternative measure for *S* based on one of the group-specific measures (that is, $S = s_i$ or $S = s_c$) or a measure of the standard deviation of the outcome taken across the pooled intervention and comparison groups. These accommodations could cause small differences in effect sizes; however, they should not produce qualitatively different results.

The Pathways Clearinghouse team uses methods for calculating Hedges' *g* that make the most use of information the study authors provide in the manuscripts under review (Exhibit E.1). This flexibility should minimize the burden on authors to provide supplemental information to the Clearinghouse.

As discussed in the body of the report, the Pathways Clearinghouse team attempts to calculate two effect sizes for each finding receiving a high or moderate study quality rating (by finding): one that uses study-specific data to normalize the impact estimate, and one that uses national data to normalize the impact estimate. The team calculates an effect size using study-specific data if the Pathways Clearinghouse can obtain from the study authors the information needed to apply one of the formulas in Exhibit E.1, either directly through the study, by calculating needed statistics based on the information reported in the study, or through an author query. The team calculates an effect size using national data when a nationally representative measure of the standard deviation of the outcome can be constructed.

Exhibit E.1. Alternative estimates of Hedges' *g*

Case	Method or formula Clearinghouse will use to calculate Hedges' *g*
The authors provide regression-adjusted means of the outcome (y_i' and y_c') and the information needed to estimate *S*.	$g = \frac{\omega\left(y_i' - y_c'\right)}{S}$
The authors provide an impact estimate *(*β*)* from a regression.	$g = \frac{\omega\beta}{S}$
The authors provide a measure of effect size calculated using Hedges' *g (*g'*)* that was not adjusted for sample size.	$g = \omega g'$
The authors provide a measure of effect size calculated using Cohen's *d* or Glass's delta.	These effect sizes use formulas similar to Hedges' *g*. The Pathways Clearinghouse team will therefore use the measures provided, applying the sample size correction (ω) if needed.
The authors provide unadjusted means of the outcome (y_i and y_c) and the information needed to estimate *S*.	$g = \frac{\omega\left(y_i - y_c\right)}{S}$
The authors provide a *t*-statistic *(t)* from a simple test of differences in means or a regression without additional control variables.	$g = \omega t\sqrt{\frac{n_i + n_c}{n_i n_c}}$
The authors provide a *z*-statistic *(z)* from a simple test of differences in means or a regression without additional control variables.	$g = \omega z\sqrt{\frac{n_i + n_c}{n_i n_c}}$
The authors provide an *F*-statistic *(F)* from a simple test of differences in means or a regression without additional control variables.	$g = \omega\sqrt{\frac{F\left(n_i + n_c\right)}{n_i n_c}}$
The authors provide a *p*-value from a simple test of differences in means or a regression without additional control variables.	Use the t-distribution to determine the *t*-statistic associated with the provided *p*-value and calculate $g = \omega t\sqrt{\frac{n_i + n_c}{n_i n_c}}$
The authors provide the odds ratio *(OR)* for a binary outcome.	Hedges' *g* might not be estimated, but we can estimate a Cox index instead: $d_{Cox} = \omega\frac{\ln\left(OR\right)}{1.65}$

Source: What Works Clearinghouse (WWC; 2017a).

Note: Estimates of Glass' delta, Hedges' *g*, Cohen's *d*, and the Cox index can all be compared with one another. For example, see WWC (2017a).

The Pathways Clearinghouse team used data from the Integrated Public Use Microdata Series version of the Current Population Survey (CPS) to estimate nationally representative standard deviations of outcomes (Flood et al. 2018). The CPS is a nationally representative survey of U.S. households that has consistently collected information on income and employment since 1962.

The team used the CPS to calculate one standard deviation for each outcome in each year from 1990 to 2019.

To estimate the appropriate standard deviations using national data, the team first identified the people in the CPS who could reasonably be considered to have "low income." Ideally, this would include people with low earnings potential and not those who have low earnings as the result of temporary investments in education or unemployment (for example, a graduate student pursuing an advanced degree, or a highly skilled individual who was recently laid off). To identify people with lower earnings potential, the team first ran a regression analysis using education, age, gender, and race and ethnicity to predict income within each CPS survey year from 1990 to 2019 (including only people ages 16 to 65). The team then defined people as having low income if their predicted income is in the bottom 20 percent of the distribution of predictions. The Pathways Clearinghouse selected this threshold because about 20 percent of adults in the United States participate in government assistance programs in any given month (Irving and Loveless 2015). Finally, the team used the actual outcome values for this population to estimate outcome standard deviations.

The Pathways Clearinghouse used the CPS to calculate standard deviations for several key outcomes, listed below. The Pathways Clearinghouse expects to select these outcomes most often for review:[35]

- Annual earnings (wage and salary income)
- Annual cash-based public assistance income
- Number of months received cash-based public assistance in past year
- Annual value of food stamps or Supplemental Nutrition Assistance Program (SNAP) benefits
- Monthly value of food stamps or SNAP benefits (only available from 1997 to 2014)
- Number of months received food stamps or SNAP benefits in past year
- Hourly wage rates
- Weekly earnings in current job

In addition, standard deviations for the following measures cannot be directly assessed using the CPS but can be estimated based on other CPS data using a few assumptions.

Monthly and quarterly earnings. The Pathways Clearinghouse estimated the standard deviations of monthly and quarterly income using information from the CPS on the variance of annual income and the variance of weekly income, and one key assumption about how people's incomes vary over time. In particular, suppose that an individual's earnings in week i, x_i, follows the trajectory $x_i = \rho x_{i-1} + \varepsilon$, where ε is a random error and $0 < \rho < 1$, and that the

[35] All listed outcomes are continuous. Standard deviations for binary outcomes can be calculated based on the means of these variables, making the use of nationally representative data unnecessary.

variance of x_i is constant over the course of a year. Then the variance of income summed over multiple weeks can be written as

$$var(\sum_{i=1}^{N} x_i) = var(x_i)[N + 2\sum_{i=1}^{N}\sum_{j=i+1}^{N} corr(x_i, x_j)].$$

Because of the trajectory that income is assumed to follow, $corr(x_i, x_j) = \rho^{|i-j|}$. Therefore, this can be reduced to

$$var\left(\sum_{i=1}^{N} x_i\right) = var(x_i)\left[N + 2\sum_{j=0}^{N-2}\sum_{i=1}^{N-j-1}\rho^i\right] = var(x_i)\left[N + 2\frac{\rho}{1-\rho}\left\{N - 1 - \left(\frac{\rho - \rho^N}{\rho^{-1} - 1}\right)\right\}\right].$$

Then, if y_i is a person's annual income, it can be shown that

$$var(y_i) = var(x_i)\left[52 + 2\frac{\rho}{1-\rho}\left\{51 - \left(\frac{\rho - \rho^{52}}{\rho^{-1} - 1}\right)\right\}\right].$$

This will enable the Pathways Clearinghouse team to estimate ρ, which in turn will allow the team to estimate the variances of quarterly and monthly earnings,

$$var\left(\sum_{i=1}^{13} x_i\right) \text{ and } var\left(\sum_{i=1}^{4} x_i\right), \text{ respectively.}$$

Monthly cash-based public assistance. The CPS data provide information on annual receipt of cash-based public assistance, as well as the number of months an individual received this assistance. The Pathways Clearinghouse team estimated monthly income from public assistance by assuming that an individual received the same amount of cash assistance in each month that any such income was received over the course of the year. That is, if *n* is the number of months an individual received cash assistance, and *y* is the amount of assistance received in the past year, the team assumed monthly assistance received was *y/n* in months when any income was received and 0 otherwise. The team can then use the standard deviation of this measure to calculate effect sizes for outcomes measuring monthly cash-based public assistance income.

Monthly value of food stamps or SNAP benefits for 1990–1996 and 2015 onward. Although the CPS reports the monthly value of food stamp or SNAP benefits for 1997–2014, it does not contain this measure in other years. The Pathways Clearinghouse team therefore assumed the ratio of the standard deviations of the annual and monthly values of food stamp or SNAP benefits remained constant from 1990–1997 and from 2014 onward.

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