

**REPORT**

2020

**SYSTEMATISC REVIEW:**  
Education to improve  
labor market opportunities

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**Responsible** Camilla Stoltenberg, director

**Authors** Jose F. Meneses-Echavez, *project leader, researcher*  
Asbjørn Steiro, *researcher*  
Christopher James Rose, *statistician*  
Hilde T. Myrhaug, *researcher*  
Heid Nøkleby, *researcher*  
Johan Siqveland, *researcher*

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# Content

<b>CONTENT</b>	<b>3</b>
<b>KEY MESSAGES</b>	<b>5</b>
<b>EXECUTIVE SUMMARY (ENGLISH)</b>	<b>6</b>
<b>HOVEDBUDSKAP</b>	<b>9</b>
<b>SAMMENDRAG</b>	<b>10</b>
<b>PREFACE</b>	<b>13</b>
<b>ABBREVIATIONS</b>	<b>14</b>
<b>BACKGROUND</b>	<b>15</b>
<b>METHODS</b>	<b>20</b>
What is a systematic review?	20
Inclusion criteria	20
Search strategy	24
Study selection	24
Data extraction	25
Quality appraisal	25
Data analysis	25
Certainty in the effect estimate (GRADE)	28
<b>RESULTS</b>	<b>30</b>
Search results	30
Included studies	31
Characteristics of the included studies	33
Description of the participants	39
Description of the educational interventions	41
Description of the outcome measures	50
Quality appraisal of the included studies	52
Outcome effects of educational interventions	54
Effects on employment	54
Effects on earnings	65
Effects on working hours	81
Effects on job duration	82
<b>DISCUSSION</b>	<b>85</b>

Summary of main results	85
Overall completeness and applicability	86
Certainty of the evidence	87
Potential biases in the review process	88
Agreements and disagreements with other studies or reviews	88
Implications for practice	89
Implications for research	90
<b>CONCLUSION</b>	<b>91</b>
<b>APPENDIX</b>	<b>92</b>
Appendix 1. Types of education programs	92
Appendix 2. Glossary	93
Appendix 3. Search strategies	94
Appendix 4. Excluded studies	103
Appendix 5. Registry-based studies (n=26)	106
Appendix 6. Characteristics of the participants in the included studies	112
Appendix 7. Description of the services provided in the included studies	116
Appendix 8. Participation rates in education programs in the included studies	124
Appendix 9. Quality appraisal of the included studies	131
Appendix 10. Effects on total earnings	135
<b>REFERENCES</b>	<b>138</b>

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# Key messages

The Norwegian Labor and Welfare Administration (NAV) commissioned the Norwegian Institute of Public Health to summarize research on the effects of educational interventions aimed at improving labor market opportunities for adults, who either are out of the labor force or have low skills, on employment outcomes.

We searched electronic databases and grey literature sources to identify randomized-controlled trials (RCTs) and registry-based studies (RBs). International methods standards were followed to synthesize the evidence. We included seven RCTs involving about 74,000 participants. All but one Dutch study were conducted in USA, mostly during the 1990s. Most of the RCTs did not randomize participants adequately. Because of incomplete information in the studies, it was challenging to assess their methodological quality. The RCTs evaluated multi-component programs, which included education but also various work-related services. Here, we refer to the interventions as ‘educational programs’. The most common comparison was no program participation. We also present information on six Nordic RBs (with 383,566 participants), although drawing causal inferences from RBs is more difficult due to the RBs’ retrospective design and selection bias. Briefly, the results are:

- Educational programs may result in little to no difference on people’s employment probability up to five years follow-up.
- Educational programs may result in little to no difference on people’s total earnings, average total earnings, working hours, and job duration (weeks worked).
- It is uncertain whether educational programs, compared to no intervention, improve people’s employment rates, average monthly earnings, and average annual earnings.
- It is uncertain whether educational programs, compared with programs focusing on on-the-job training and job search assistance, improve people’s employment probability and average annual earnings.
- Six Nordic registry-based studies suggest that education may improve employment probabilities for immigrants and sick-listed adults.

**Title:**  
Education to improve labour market opportunities: a systematic review  
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**Type of publication:**  
**Systematic review**  
A review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyse data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyse and summarise the results of the included studies.  
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**Doesn’t answer everything:**  
- Excludes studies that fall outside of the inclusion criteria  
- No health economic evaluation  
- No recommendations  
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**Publisher:**  
Norwegian Institute of Public Health  
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**Updated:**  
Last search for studies:  
October 2018.

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# Executive summary (English)

## Background

The Norwegian Labor and Welfare Administration (NAV) commissioned the Norwegian Institute of Public Health to summarize research on the effects of educational interventions aimed at improving labor market opportunities for adults, who either are out of the labor force or have low skills, on employment outcomes. This systematic review aimed to summarize the effects of educational interventions aimed at improving labor market opportunities for adults, who are either out of the labor force or have low skills, on employment outcomes.

## Method

A systematic literature search in major literature databases and grey literature sources was conducted in October 2018. We searched for randomized-controlled trials (RCTs) and registry-based studies (RBs) that evaluated the effects of educational programs on labor market outcomes. Two independent reviewers selected and critically appraised the RCTs and RBs. The certainty of the evidence from the RCTs was evaluated following the GRADE approach (Grading of Recommendations Assessment, Development and Evaluation).

## Results

We included seven RCTs (12 publications with about 74,000 participants). We also identified 26 RBs and described findings from six Nordic RBs (383,566 participants). Four RCTs included unemployed adults, and three included both low-skilled and low-wage workers. The RCTs evaluated multi-component programs, which offered a mixed package of services consisting of educational services (classroom education/training) alongside various work-related services. Here, we refer to the interventions as 'educational programs'. The outcome measures reported in the RCTs were: employment, earnings, working hours, job duration (weeks worked). We synthesized the results and conducted meta-analyses when possible. Poor data reporting of number of participants and precision measures precluded more detailed analyses.

## Employment

### Comparison 1: Educational programs versus no intervention

*Employment rate:* At 1-year follow-up, assuming that 10 of 100 people are employed under no intervention, we observed no difference between educational programs and no intervention (3 RCTs). The analyses showed that three more people (between 1-4 more people) would be employed if they participate in educational programs at 2-years

follow-up. A larger effect of four more people being employed (between 1-6 more people) was observed at 3-years follow-up. This difference decreased to one more person being employed (between 0-1 more person) at 4-years follow-up. No difference was observed at 5-years follow-up (very low certainty in the evidence).

*Employment probability:* At 1-year follow-up, assuming 933 per 1000 people are employed under no intervention, nine more people would gain employment (19 more unemployed to 37 more employed) if they participate in educational programs (1 RCT). At 2-years follow-up, the difference in favor of the educational program increased up to 36 more people gaining employment (between 12-66 more employed) (2 RCTs; very low certainty). At 3-years follow-up, assuming 797 per 1000 people are employed under no intervention, eight more people would gain employment (between 40 more unemployed to 56 more employed) if they participate in educational programs (1 RCT; low certainty). No difference was observed at 4-years follow-up (low certainty).

#### *Comparison 2: Educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA)*

*Employment probability:* The analysis used data from four sites in one RCT. Assuming 822 per 1000 people are employed under OJT/JSA programs, the analyses showed that 25 fewer people would be employed if they participate in educational programs up to 5-years follow-up (very low certainty).

*Overview of findings from the Nordic registry-based studies (n=6):* In general, the Nordic RBs reported that educational programs resulted in positive employment effects. Four Norwegian studies reported favorable employment effects for educational programs. A Norwegian study showed that ordinary education did not lead to any employment effect for young people with reduced work ability in the long term. One Danish study concluded that ordinary education and wage-subsidized job training resulted in positive employment effects for sick-listed employees, whereas the two other programs, non-formal education and subsidized internships, yielded negative employment effects.

#### ***Earnings, working hours and job duration***

We assumed earnings of 10,000 NOK/month as a baseline effect under no intervention to interpret differences between educational programs and no intervention. This assumption applies for all earnings measures.

#### *Comparison 1: Educational programs versus no intervention*

*Total earnings:* People with low skills would earn 5,000 NOK more (between 1,000 NOK to 10,000 NOK more) by taking part in educational programs at 1-year follow-up. Similar benefits were observed up to 5-years follow-up (low certainty). People with high skills would earn 400 NOK more (between 1,000 NOK less to 10,000 NOK more) by taking part in educational programs at 1-year follow-up (very low certainty); larger benefits of 1,000 NOK more in total earnings were observed at 2-5-years follow-up (low certainty).

*Average total earnings:* One RCT provided data for employed adults receiving welfare benefits. Participants in the educational program (community college) earned on average about 21,000 NOK (about \$2,300 USD) less than peers who did not participate over 2.5-years follow-up (low certainty).

*Average monthly earnings:* One Dutch RCT reported that the average monthly earnings of low-skilled workers who participated in classroom training were 10.9% higher than those who did not participate in any training at 2-years follow-up (low certainty). One US RCT found no difference between educational programs and no intervention on single mothers' average monthly earnings at 2-3-years follow-up (very low certainty).

*Average annual earnings:* People with low skills would earn 100 NOK/month less by participating in educational programs at 1-3-years follow-up. A positive difference of 300 NOK/month more was found at 4-6-years follow-up. Similarly, a larger difference of 500 NOK/month more was found at 7-9-years follow-up (very low certainty).

#### *Comparison 2: Educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA)*

*Average annual earnings:* People would earn 200 NOK/month more if they participated in OJT/JSA programs compared to educational programs at 10-15-years follow-up (very low certainty).

*Working hours:* Participants in the educational programs worked on average 13.3 hours more per week (between 3-24 hrs more) than peers under no intervention at 1-year follow-up (low certainty). This effect increased up to 18.3 hours more (between 6-31 hrs more) at 2-years follow-up (low certainty).

*Job duration (weeks worked):* Participants in educational programs worked 0.39 weeks more than those in no intervention at the 1-year follow-up. This effect was 0.35 weeks more worked at 2-years follow-up (low certainty for both estimates).

## **Conclusion**

Overall, the evidence suggests that educational programs may result in little to no difference for most of the labor market opportunities for unemployed adults or low-wage workers. With respect to employment rates, the results show that it is uncertain whether participants in educational programs have better employment rates compared to non-participants. We note that these findings are based on RCTs, mostly carried out in USA during the 1990s, that have serious methodological weaknesses. Additionally, their transferability to the Norwegian context is limited. The six Nordic RBs, with data from the 2000s, similarly indicated small positive employment effects, and might be used in evidence-informed policymaking, taking into consideration the limitations of non-experimental studies.

Taken together, the results from the RCTs and the RBs suggest small positive effects of educational programs, but there is a need for additional research.



# Hovedbudskap

Arbeids- og velferdsdirektoratet (NAV) ba område for helsetjenester i Folkehelseinstituttet om å utføre en systematisk oversikt over effekter av utdanning for å bedre arbeidsmarkedsmuligheter for voksne, som enten er utenfor arbeidsmarkedet eller har lav kompetanse (mangelfulle formelle kvalifikasjoner eller svake grunnleggende ferdigheter).

Vi søkte i elektroniske litteraturdatabaser og i grå litteratur for å identifisere randomiserte kontrollerte studier (RCTer) og registerbaserte studier (RBER). Internasjonale metodestandarder ble fulgt for å oppsummere funn fra disse studiene. Vi inkluderte syv RCTer med i alt 74 000 deltakere. Alle RCTene ble gjennomført i USA, bortsett fra en nederlandsk studie; de fleste på 1990-tallet. Majoriteten av studiene hadde mangelfull randomisering av deltakerne, og mangelfull rapportering gjorde det vanskelig å utføre en kritisk vurdering av metodene. RCTene evaluerte sammensatte programmer som tilbød en kombinasjon av klasseromsundervisning/opplæring og forskjellige arbeidsrelaterte tiltak. Her refererer vi til disse som 'utdanningsprogrammer'. Den vanligste kontrollgruppen inneholdt personer som ikke fikk et utdanningsprogram. Vi presenterer også informasjon om seks nordiske RBER (383 566 deltakere). I RBER er det vanskeligere å vurdere om det er tiltaket som har ført til endringer, på grunn av det retrospektive designet og mulige seleksjonsskjevheter. Kort fortalt er resultatene:

- Det er mulig at utdanningsprogrammer kan bidra litt til økt sannsynlighet for at folk kommer i arbeid etter fem års oppfølging.
- Det er mulig at utdanningsprogrammer kan bidra litt til at folk får økte totale inntekter, økt gjennomsnittlig total inntekt, økt arbeidstid og arbeidslengde (uker i arbeid).
- Det er usikkert om utdanningsprogrammer, sammenlignet med ingen tiltak, øker antall personer som kommer i arbeid, gjennomsnittlig månedlig inntekt og gjennomsnittlig årlig inntekt.
- Det er usikkert om utdanningsprogrammer, sammenlignet med programmer som fokuserer på arbeidstrening og jobbsøkningsassistanse, øker sannsynligheten for å få arbeid og høyere gjennomsnittlig årsinntekt.
- Seks nordiske RBER antyder at utdanningsprogrammer kan øke sannsynligheten for at innvandrere og sykmeldte voksne kan komme i arbeid.

## **Tittel:**

Utdanning for å bedre arbeidsmarkedsmuligheter: en systematisk oversikt

## **Publikasjonstype:**

### **Systematisk oversikt**

En systematisk oversikt er resultatet av å

- innhente
- kritisk vurdere og
- sammenfatte relevante forskningsresultater ved hjelp av forhåndsdefinerte og eksplisitte metoder

## **Svarer ikke på alt:**

- Ingen studier utenfor de eksplisitte inklusjonskriteriene
- Ingen helseøkonomisk evaluering
- Ingen anbefalinger

## **Hvem står bak denne publikasjonen?**

Folkehelseinstituttet har gjennomført oppdraget etter forespørsel fra NAV

## **Når ble litteratursøket utført?**

Søk etter studier ble avsluttet i oktober 2018.

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# Sammendrag

## Innledning

Arbeids- og velferdsdirektoratet (NAV) ba område for helsetjenester i Folkehelseinstituttet om å utføre en systematisk oversikt over effekter av utdanning for å bedre arbeidsmarkedsmuligheter for voksne, som enten er utenfor arbeidsmarkedet eller har lav kompetanse på arbeidsrelaterte utfall.

## Metode

Vi søkte systematisk i elektroniske litteraturdatabaser og i grå litteratur i oktober 2018. Vi søkte etter randomiserte kontrollerte studier (RCTer) og registerbaserte studier (RBer), som evaluerte effekten av utdanningsprogrammer på arbeidsutfall. To medarbeidere valgte ut og kritisk vurderte RCTene og RBene uavhengig av hverandre. Tilliten til kunnskapsgrunnet fra RCTene ble vurdert med hjelp av GRADE-metoden (Grading of Recommendations Assessment, Development and Evaluation).

## Resultat

Vi inkluderte syv RCTer (12 publikasjoner med i alt ca. 74 000 deltakere). I tillegg identifiserte vi 26 RBer, og etter avtale med oppdragsgiver beskrev vi funn fra seks nordiske RBer med data fra senest år 2000 (383 566 deltakere). Seks RCTer var fra USA og én var fra Nederland. RCTene var publisert mellom 1992 og 2014. Fire av RCTene inkluderte arbeidsledige voksne, mens de tre andre inkluderte lavt utdannede voksne eller ansatte med lav inntekt. RCTene evaluerte sammensatte program som tilbød en kombinasjon av klasseromsundervisning/opplæring og forskjellige arbeidsrelaterte tiltak. Her refererer vi til disse som 'utdanningsprogram'. Studiene rapporterte utfallsmål som arbeid, inntekt, arbeidstid og arbeidslengde (uker i arbeid). Vi slo sammen data og gjennomførte metaanalyser der det var mulig. Manglende rapportering av antall deltakere og nøyaktige resultater hindret en mer detaljert og presis dataanalyse.

### ***Arbeidsrelaterte utfall***

#### ***Sammenligning 1: Utdanningsprogram versus ingen tiltak***

*Antall personer i arbeid:* Basert på våre analyser (3 RCTer) anslo vi at 10 av 100 personer var i fast arbeid ved ingen tiltak. Vi fant ingen forskjell mellom utdanningsprogrammer og kontrollgruppe ved 1 års oppfølging. Analysene viste at ytterligere tre personer kom i arbeid (mellom 1-4 personer) hvis de deltok i et utdanningsprogram ved 2 års oppfølging. En større effekt ble observert ved 3 års oppfølging, der fire flere personer var i arbeid (mellom 1-6 personer). Denne forskjellen ble redusert til én person ved 4 års oppfølging, mens det var ingen observert forskjell ved 5 års oppfølging. Vi har svært

lav tillit til disse resultatene på grunn av risiko for systematiske feil i studiene, sprikende resultater og forskjeller mellom tiltakene.

*Sannsynlighet for å komme i arbeid:* Analysen viste at hvis 933 per 1000 personer var i arbeid ved ingen tiltak, så ville ytterligere ni personer komme i arbeid (fra 19 færre til 37 flere) hvis de deltok i et utdanningsprogram ved 1 års oppfølging (1 RCT). Ved 2 års oppfølging så vi at forskjellen i favør av utdanningsprogrammene økte til 36 flere personer i arbeid (12-66 flere) (2 RCTer; svært lav tillit). Analysen viste at hvis 797 per 1000 personer var i arbeid ved ingen tiltak, så ville ytterligere åtte personer komme i arbeid (fra 40 færre til 56 flere) hvis de deltok i et utdanningsprogram ved 3 års oppfølging (1 RCT; lav tillit). Det var ingen forskjell etter 4 år (lav tillit).

#### *Sammenligning 2: Utdanningsprogram versus program som fokuserer på arbeidstrening/jobbsøkningsassistanse*

*Sannsynlighet for arbeid:* Vi hentet data fra fire studiesteder rapportert i én RCT. Analysen viste at hvis 822 per 1000 personer var i arbeid ved arbeidstrening/jobbsøkningsassistanse, så ville 25 færre personer være i arbeid hvis de deltok i et utdanningsprogram ved 1-5 års oppfølging. Vi har svært lav tillit til disse resultatene.

*Oversikt over funn fra de nordiske registerbaserte studiene (n= 6):* Generelt viste de nordiske RBene at utdanningsprogrammer resulterte i økt sannsynlighet for å komme i arbeid. Fire norske studier viste positive effekter av utdanningsprogrammer når det gjelder å komme i arbeid. En norsk studie viste ingen endring i andelen unge med nedsatt arbeidsevne som kom i arbeid på lang sikt. En dansk studie konkluderte med at ordinær utdanning og arbeidstrening med lønn ga positive sysselsettingseffekter for sykmeldte ansatte, mens de to andre programmene – ikke-formell utdanning og subsidierte praksisplasser – ga negative sysselsettingseffekter.

#### ***Inntekter, arbeidstid og arbeidslengde***

Vi tok utgangspunkt i en inntekt på 10 000 NOK per måned som et gitt utgangspunkt ved ingen tiltak for å kunne tolke forskjellen mellom utdanningsprogram og ingen tiltak. Denne beregningen gjelder for alle målinger av inntekt.

#### *Sammenligning 1: Utdanningsprogram versus ingen tiltak*

*Total inntekt:* Personer med lav arbeidsrelatert kompetanse ville tjent 5000 NOK mer (fra 1000 til 10 000 NOK mer) ved å delta i et utdanningsprogram ved 1 års oppfølging. Samme fordel i favør av utdanningsprogram ble observert med opptil 5 års oppfølgingstid (lav tillit). Personer med høy kompetanse ville tjent 400 NOK mer i totale inntekter (fra 1000 NOK mindre til 1000 NOK mer) hvis de deltok i et utdanningsprogram ved 1 års oppfølging (svært lav tillit) og 1000 NOK mer ved 2-5 års oppfølging (lav tillit).

*Gjennomsnittlig total inntekt:* Kun én RCT rapporterte data om voksne som mottok sosial/velferdsstønader. Deltakerne i utdanningsprogrammet (*community college*), tjente ca. 21 000 NOK (ca. 2300 USD) mindre enn jevnaldrende som ikke deltok (ingen tiltak), ved oppfølging etter 2,5 år (lav tillit).

*Gjennomsnittlig månedsinntekt:* En nederlandsk studie viste at gjennomsnittlig månedsinntekt var 10,9 % høyere for arbeidstakere med lav kompetanse som deltok i klasseromsopplæring, enn for de som ikke deltok i noen form for opplæring, ved 2 års oppfølging (lav tillit). En amerikansk studie fant at det var ingen forskjell mellom utdanningsprogram og ingen tiltak på månedlig gjennomsnittsinntekt for en gruppe alenemødre ved 2-3 års oppfølging (svært lav tillit).

*Gjennomsnittlig årlig inntekt:* Personer med lav kompetanse ville tjent 100 NOK mindre i måneden ved deltakelse i et utdanningsprogram med en oppfølgingstid på 1-3 år. Vi fant en forskjell i favør av utdanningsprogrammet på 300 NOK med en oppfølgingstid på 4-6 år. Ved oppfølging 7-9 år var det en noe større forskjell, 500 NOK mer per måned (svært lav tillit).

### *Sammenligning 2: Utdanningsprogram versus program som fokuserer på arbeidstrening/ jobbsøkningsassistanse*

*Gjennomsnittlig årlig inntekt:* Deltakere i arbeidstrening/ jobbsøkningsassistanse tjente 200 NOK mer per måned sammenlignet med deltakere i utdanningsprogrammer, ved 10-15 års oppfølging (svært lav tillit).

*Arbeidstid:* Deltakere i et utdanningsprogram arbeidet i gjennomsnitt 13,3 timer per uke mer (mellom 3-24 timer) enn jevnaldrende som ikke fikk noen tiltak ved 1 års oppfølging (lav tillit). Effekten økte til 18,3 timer mer (mellom 6-31 timer mer) ved 2 års oppfølging (lav tillit).

*Arbeidslengde (uker i arbeid):* Deltakere i et utdanningsprogram arbeidet 0,39 uker mer enn de som ikke deltok, ved 1 års oppfølging. Denne fordelten var 0,35 uker mer per år ved 2 års oppfølging (lav tillit for begge estimer).

## **Konklusjon**

Kunnskapsgrunnlaget indikerer at utdanningsprogrammer kan bidra litt til økt sannsynlighet for bedring på de fleste utfall når det gjelder arbeidsmarkedsmuligheter for voksne arbeidsledige eller lavinntektsarbeidere. Når det gjelder det å få seg arbeid, så er det usikkert om deltakere i utdanningsprogram oftere får arbeid sammenlignet med de som ikke mottar noe tiltak. Vi understreker at disse resultatene er basert på RCTer med store metodiske svakheter. De er hovedsakelig utført i USA på 1990-tallet og overføringsverdien av resultatene til dagens norske kontekst er begrenset. Det nærmeste vi kommer den norske konteksten er seks RBER, som også indikerte noen små positive effekter på arbeidsmarkedsmulighetene. Det er viktig å ta i betraktning begrensningene ved ikke-eksperimentelle studier fordi vi ikke vet om effektene faktisk skyldes tiltaket.

Samlet sett antyder både RCTene og RBene små positive effekter av utdanningsprogrammer, men det er behov for mer forskning.

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# Preface

The Division for Health Services in the Norwegian Institute of Public Health was commissioned by NAV to identify, critically appraise and synthesize empirical research on the effects of educational interventions aiming to improve labor market opportunities for adults. Findings from this systematic review serve to inform the development and implementation of effective education and training policies within NAV and other parts of public services, as well as contribute to the Norwegian Strategy for Skills Policy 2017-2021.

The Division for Health Services within the Norwegian Institute of Public Health follows a standard approach in conducting systematic reviews, which is described in the NIPH handbook "*Slik oppsummerer vi forskning.*" We may use standard formulations when we describe the methods, results and discussion of the findings.

## **Contributors to the project:**

- Project coordinator: Jose Meneses-Echavez, *researcher*, NIPH
- Other contributors: Asbjørn Steiro, Christopher James Rose, Hilde T. Myrhaug, Heid Nøkleby, and Johan Siqveland from NIPH.

We want to thank Lien Nguyen for designing and running the search strategies, and Gunn Elisabeth Vist and Pål Schøne for serving as peer-reviewers of the final report.

## **Declared conflicts of interest:**

All authors filled out a form to document potential conflicts of interest. No conflicts of interest were declared.

NIPH is responsible for the contents of the review presented in this report. The commissioner of the review and peer reviewers bear no responsibility.

Kåre Birger Hagen  
*Research director*

Rigmor C Berg  
*Department director*

Jose F. Meneses-Echavez  
*Project leader*

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# Abbreviations

Active Labor Market Programs, ALMPs  
Adult Basic Education, ABE  
Aid to Families with Dependent Children, AFDC  
Cochrane Effective Practice and Organization of Care, Cochrane EPOC group  
Confidence Interval, CI  
English as a second language, ESL  
General Educational Development test, GED test  
Grades of Recommendation, Assessment, Development and Evaluation approach, GRADE approach  
Greater Avenues for Independence study, GAIN study  
Human Capital Development, HCD  
Individual Learning Accounts study, ILA study  
Intention-to-treat analysis, ITT analysis  
International Labor Office, ILO  
International Standard Classification of Education, ISCED  
Job Training Partnership Act study, JTPA study  
Labor Force, LF  
Labor Force Attachment, LFA  
Minority Female Single Parent study, MFSP study  
National Evaluation of Welfare-to-Work Strategies study, NEWWS study  
Norwegian Krone, NOK  
Norwegian Labor and Welfare Administration, NAV  
On-the-job training and job search assistance, OJT/JSA  
Opportunities Industrialization Center, OIC  
Ordinary least squares, OLS  
Organization for Economic Co-operation and Development, OECD  
Randomized-controlled trials, RCTs  
Registry-based studies, RBs  
Risk difference, RD  
Risk ratio, RR  
United States Dollar, USD  
Work Advancement and Support Center study, WASC study

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# Background

Unemployment exerts serious consequences at both the individual and population level as well as on economies worldwide. It is deemed as a crucial concern, and is exposed to continuous study (1). An unemployed person is defined by the International Labor Office (ILO) as someone who is aged 15-74, without a job, available for work and either has searched for work in the past four weeks or is available to start working within two weeks and/or is waiting to start a job already obtained (2).

As declared by the OECD, “focusing exclusively on *how many* jobs an economy generates provides only a partial perspective on the challenge confronting policy makers, since people’s well-being depends crucially on *how good* their jobs are” (3). In this regard, the OECD defines extreme low-paid job as “a disposable per capita income of USD 2 (PPP-adjusted) per day in a typical household with a single earner who works full-time” (4). Job quality and quantity are recognized as key drivers of increased labor force participation, productivity and better economic development. These notions have been confirmed by the G20 Labour Ministers Declaration in 2015, when they also endorsed the Job Quality framework proposed by the OECD (3). This framework suggests the following three domains for assessing job quality: quality of earnings, labour market insecurity, and working conditions/environment. The OECD Job Quality Framework has a double objective: assessing labour market performance, both in quantitative and qualitative terms, and better capturing well-being at the workplace (3). This framework is used in the current systematic review for referring to adults working in poor conditions.

## *Unemployment in Norway and in the Nordic countries*

The current unemployment rates in Norway (as percentage of the labor force, LF) are comparable to those seen twelve years ago (5). The seasonally-adjusted unemployment rate in the country was 3.9% LF in September 2019 (5). The lowest rate was observed in early 2008 (2.47% LF), followed by increases until 2010. The country reached its highest rate of unemployment in 2015 (4.84% LF).

The Nordic countries score relatively well on most or all indicators of employment. OECD data on unemployment as LF in the last quarter of 2017 indicated the lowest rates in the total country labor force were seen in Iceland (2.7%). Norway was in the second place (4.2%), followed by Denmark (5.7%) whose statistics were similar to the OECD average (5.5%). Sweden exhibited higher unemployment, at 6.7%, with respect to the OECD average, while the highest unemployment rate in the Nordic region was observed in Finland (8.6%).

### *What is the labor force and who is out of it?*

The labor force is constituted by the working population in the age range 16-64 who are currently employed or seeking employment (6). Thus, adults out of the labor force are those who are neither employed nor unemployed. This category includes retired persons, students, those taking care of children or other family members, and others who are neither working nor seeking work (6). When unemployment is high, some people become discouraged and stop looking for work; they are then excluded from the labor force. This implies that the unemployment rate may fall, or stop rising, even though there has been no underlying improvement in the labor market (1). In Norway, data from the Labour Force Survey 1998-2008 showed that discouragement was an important reason for married and cohabiting women to exit the labor force, especially when it came to finding acceptable work. The analysis showed that about one third of the women outside the labor force were discouraged and wanted to be active in a more favorable economic situation (7).

### *The Norwegian Strategy for Skills Policy 2017-2021*

The Norwegian labor market has been changing over the last decades, and the country recognizes that the population's skills are the most important resource and the basis for welfare, growth, wealth creation and sustainability (8). The *Norwegian Strategy for Skills Policy 2017-2021* constitutes the current overall strategy for development, mobilization, and utilization of the skills in the entire Norwegian society and labor market. The strategy aims to ensure that individuals and businesses have the skills that give the country a competitive business sector, an efficient and sound public sector, and an inclusive labor market. Education and training are highlighted as the central axis within the strategy. In order to achieve the policy goal, the involved partners<sup>1</sup> agreed to:

- “Contribute to making informed choices for the individuals and society”
- “Promote better learning opportunities and effective use of skills in the labor market”
- “Strengthen the skills of adults with poor basic skills, poor Norwegian and/or Sami skills and little formal education”

The Norwegian strategy also promotes further developments in cooperation between education and training providers and the social partners, to make education relevant and to provide better access to qualified labor in all regions (8). In addition to the skills requirements, many people with disabilities may also have incomplete qualifications, adding to the high probability of getting out of the labor force. At the same time, being

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<sup>1</sup> The Norwegian Government represented by the Ministry of Labour and Social Affairs, the Ministry of Justice and Public Security, the Ministry of Local Government and Modernisation, the Ministry of Education and Research, and the Ministry of Trade, Industry and Fisheries. In addition the Sami Parliament represents Sami interests. The social partners represented by The Employers' Association Spekter, The Norwegian Association of Local and Regional Authorities (KS), The Confederation of Norwegian Enterprise (NHO) and the Enterprise Federation of Norway (Virke) from the employer side and The Federation of Norwegian Professional associations (Akademikerne), The Norwegian Confederation of Trade Unions (LO), The Confederation of Unions for Professionals (Unio) and The Confederation of Vocational Unions (YS) from the employee side. The voluntary sector and adult learning associations represented by the Norwegian association for Adult Learning (VOFO).



out of the labor market also contributes to lower participation in educational activities for employability (8).

### *Connecting low skilled immigrants to the labor market*

More than a half million people has immigrated<sup>2</sup> to Norway in the past eight years (9). Without taking into account western European countries and north-America, the five largest groups of immigrants to Norway in 2017 were from Poland (5163), Syria (3964), Lithuania (2708), Lebanon (1594), and the Philippines (1592) (9). Naturally, the diversity of these groups and their backgrounds pose challenges to the country when trying to include them into the labor force, especially when it comes to language, professional and basic skills, and education matching (8-11). In 2013, a report published by the Norwegian Institute for Social Research (in Norwegian, *Institutt for samfunnsforskning*) highlighted important wage gaps between Norwegian-born people and immigrants from low-income countries in Africa, Asia and Latin America, and Eastern and Central Europe (12). The report found that immigrants were more likely to work in low-paid companies, while Norwegian-born people tended to work in companies that offer relatively higher salaries. Immigrants had a much higher probability than Norwegian-born for being unemployed and not being under education (12).

Given the situation described above, there exists clear consensus that the country must respond to the challenges that immigration implies to the labor market, and therefore must recognize and utilize immigrants' skills, and provide opportunities for education (8;10;13). The Norwegian strategy states "people of all educational levels are faced with new skills demands and changes in the labour market. However, people without completed upper secondary education, poor basic skills or lacking skills in Norwegian or Sami language are particularly vulnerable in a labour market with rapid technological development and high demands for flexibility" (8). The introduction programs organized by the Norwegian government target persons in need of basic qualification, and as a minimum must include Norwegian language training, knowledge about society and initiatives that prepare participants for further education/training or the labour market (11). These initiatives may entail work practice or other initiatives organized by NAV, vocational training, computer training, lower secondary or upper secondary studies, etc.

### *Increasing labor market opportunities by providing education and training*

Different educational programs that focus on basic skills building, training, and mismatched education for enhancing the connection with the labor market have gained vital relevance in the international arena, as described in the OECD Employment Outlook 2017 (13). Within these programs, Active Labor Market Programs (ALMPs) constitute an attempt to reduce unemployment by improving skills (13;14). ALMPs are defined as all social expenditure that is aimed at the improvement of the beneficiaries' prospect of finding gainful employment or to otherwise improve their working conditions (15).

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<sup>2</sup> Immigrants are persons born abroad to two foreign-born parents and four foreign grandparents (Statistics Norway)

The present systematic review mainly focuses on ALMPs for human capital enhancement aiming to increase inflow into employment, and to increase productivity and labor market matching (14).

In light of this, *labor market training* is given special attention in the context of this systematic review, as it encompasses measures such as classroom training and work experience (15). The training can provide either a more general education (e.g. language courses, basic computer courses) or specific vocational skills (e.g. advanced computer courses, courses providing technical or manufacturing skills) (14). The main objective of labor market training is to develop the productivity and employability of the participants and to enhance human capital by increasing skills. Besides, training programs constitute the 'classic' component of ALMPs (13). In addition, ALMPs might involve in most cases *improved labor market matching policies* aiming at raising the probability, efficiency and quality of labor market matching by supporting job seekers and employers as well as by taking an intermediate and brokerage role to overcome informational deficiencies (e.g., employer intermediation services) (14).

#### *Previous research on educational interventions to improve labor market opportunities*

In Norway, around 60% of the immigrants who participated in introduction programs are working or studying one year after completion, while 11% remain registered as unemployed and/or on labor market measures (11). Understandably, taking Norwegian language courses is the most common activity within the introduction programs (90%). However, 15% are involved in work practice, 17% take primary or lower education, 4% take upper secondary education, and 3% seek approval of their education (matching) (11).

Reviewed evidence on educational programs and similar ALMPs has shown mixed results. It has been suggested that educational programs may increase long-run employability, earnings, and labor market attachment of disadvantaged workers (16), whereas wages may remain unchanged (14). Recent meta-analyses have demonstrated that labor market training programs – the most commonly used type of active policy – exert positive effects on unemployment (17) in the short-term and the long-term (18), and that combining classroom training with on-the-job training increases the probability of a positive impact on unemployment by 30% compared with classroom training only (17). A report commissioned in 2013 by the Danish Agency for Labour Market and Recruitment (in Danish *Arbejdsmarkedsstyrelsen*) summarized quantitative studies on the effects of ordinary education initiatives for unemployed persons (19). The studied initiatives, reported in 78 publications, included primary vocational education, vocational courses and general skills courses and adult- and continuing education. The authors of the review found that education showed positive benefits in the longer run, and classroom training demonstrated larger benefits than on-the-job training programs.

Supplementary to varying research results, a lack of experimental studies to enable researchers to prove causal effects of educational and training programs for connecting adults with low skills to the labor market has been highlighted recently in Norway (20). Moreover, most of the reviews that have summarized the scientific evidence in this

field lack (acceptable) quality appraisal of the included studies and quality of the evidence remains unknown. To date, no systematic reviews have addressed the effects of educational interventions aimed at enhancing labor market opportunities for adults, who are either out of the labor force or have low skills, on employment outcomes.

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# Methods

We conducted a systematic review in order to determine the effects of educational interventions aimed at improving labor market opportunities for adults, who are either out of the labor force or have low skills, on employment outcomes. The systematic review does not address ethics or economic aspects related to educational interventions aimed at improving labor market opportunities.

This systematic review was conducted in accordance with the Handbook used by the Division of Health Services in the Norwegian Institute of Public Health (<https://www.fhi.no/kk/oppsummert-forskning-for-helsetjenesten/slik-oppsummerer-vi-forskning/>), which is based on international standards, including the Cochrane Handbook of Systematic Reviews of Interventions (21). The review team and the commissioner (NAV) held several meetings to discuss and agree upon the general methods and the inclusion criteria, to ensure that the review would be relevant and meaningful to the commissioner. At the same time, the review is independently conducted by researchers at FHI. The commissioner had no role in the research itself or in the preparation of the results or conclusions of the review. The commissioner approved the protocol, which is available on the NIPH website (<https://www.fhi.no/en/cristin-projects/ongoing/education-for-labor-market-opportunities/>).

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## What is a systematic review?

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A systematic review is a review that includes: a clearly stated set of objectives with pre-defined eligibility criteria for studies; an explicit, reproducible methodology; a systematic search that attempts to identify all studies that would meet the eligibility criteria; an assessment of the validity of the findings of the included studies, for example through the assessment of risk of bias; and a systematic presentation, and synthesis, of the characteristics and findings of the included studies (21).

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## Inclusion criteria

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We included studies that examined:

## Population

Adults (18-64 years old) who are: a) unemployed, b) out of the labor force, or c) employed in low-wage jobs or in low-quality jobs/working poor. Definitions are provided in the background.

In addition, at least one of the following characteristics had to be present:

1. People with low education. This was defined as not having completed at least level three of the International Standard Classification of Education (ISCED) levels of education (22) (i.e., upper secondary education or high school). To operationalize this criterion, we followed the ISCED levels of education (22):
  - Level 0: Early childhood education.
  - Level 1: Primary education
  - Level 2: Lower secondary education
  - Level 3: Upper secondary education
  - Level 4: Post-secondary non-tertiary education
  - Level 5: Short-cycle tertiary education
  - Level 6: Bachelor's or equivalent level
  - Level 7: Master's degree or equivalent level
  - Level 8: Doctor's degree or equivalent level
2. People with poor basic skills, such as basic reading, writing and mathematics (e.g., immigrants who do not speak or write the host country language), regardless of level of completed education (e.g., ISCED level 0 or higher). *Basic skills* refer to those skills that a person needs to either find or to be fitted into a job, such as the ability to read, write, speak, compute, and solve problems at levels of proficiency necessary to function on the job and in society, as well as to achieve one's goals, and to develop one's knowledge and potential (23).
3. People who have mismatched education/skills that make it difficult for them to find employment. This can occur at all levels of education, including high-educated people. Skill mismatch is defined by the European Commission as "a situation in the labour market where the level of skills of individuals does not match the level of skills required in the jobs. Mismatches can be vertical (when the level of skills or education is more or less than the level of skills or education required to perform a job), horizontal (when the type of education or skills is not appropriate for the current job, but the level of education or skills matches the requirements of the job) or geographical (when the workers with types and levels of skills or education required are based in a country or region different from where such skills are needed)" (24).
4. Persons who might or might not receive social benefits from the government (e.g., "welfare" or social assistance). Thus, they might be "job seekers" irrespective of receiving unemployment benefits (i.e., those who are not entitled to such benefits, or have low attachment to the labor market). Studies that include persons on health-related benefits, such as long-term sick leave, rehabilitation or temporary or permanent disability, were also included.

5. People who have reduced functionality/work capacity. In the context of this systematic review, work ability did not only refer to the individuals' functionality or ability to perform a certain task; it rather involves several factors of worklife, including the interactions between individual, the workplace, and the social environment (25;26).

We included studies in which at least 75% of participants met these inclusion criteria.

### **Intervention**

The focus of the intervention had to be an educational component that aimed to improve a person's labor market opportunities. This educational component could be part of a more comprehensive program, but an educational component was a compulsory requirement for study inclusion. In light of this, we included the following two types of interventions:

*1. Educational training programs* aiming to strengthen participants' possibilities and capabilities of getting a job. An education program represents a coherent set or sequence of educational activities designed and organized to achieve pre-determined learning objectives or accomplish a specific set of educational tasks over a sustained period. Within an education program, educational activities may also be grouped into sub-components variously described in national contexts as 'courses', 'modules', 'units' and/or 'subjects'. A program may have major components not normally characterized as courses, units or modules – for example, play-based activities, periods of work experience, research projects and the preparation of dissertations (22).

In the context of this systematic review, education programs could comprise language skills, digital skills training, skills building, and/or formal schooling (i.e., primary, secondary or higher education), which may last several years even when they did not provide a certificate. Interventions may demand either full or part-time attendance. In addition, participants may have received formal qualifications, such as certificated training, qualifications or competencies required by employers. Thus, we restricted our inclusion criteria to the different types of education programs suggested by the ISCED (18): formal education, informal learning, initial education, non-formal education, vocational education, and work-based education. Please refer to appendix 1 for a complete definition of each educational program.

Educational training programs may comprise either a 100% classroom component or both classroom and work-based components. To be considered for inclusion, the classroom component must have comprised at least 30% of the training program. We excluded 100% work-based programs, also known as on-the-job training, as they do not involve a classroom educational component. Online programs could also be considered for inclusion.

Language teaching programs for immigrants were not considered for inclusion in this systematic review as they are already covered by other systematic reviews conducted by researchers at the NIPH. Flodgren and colleagues found scarce evidence-base for effective language teaching methods for adult immigrants with little or no schooling –

only two controlled studies were included (27). A review examining language teaching programs for adults is being conducted at the time of writing this report.

2. *Active Labor Market Programs (ALMPs)* were included only if it included a classroom educational component at least 30% of the ALMP, especially those classified as labor market training (15). A definition of ALMPs is presented in the background.

*Other criteria:* We did not limit for neither the length nor the intensity of the interventions (i.e., it could vary from short drivers' education to formal education that lasted some years). We did not exclude studies based on year of publication, language or where the studies were conducted.

## **Comparison**

No participation in education/training, any other type of education/training, standard practice, or any other type of ALMP.

## **Outcomes**

### *Primary outcome*

Employment or job acquisition (i.e., moving from unemployment to employment)

### *Secondary outcomes*

- Earnings, as measure of salary/income
- Working hours
- Job duration, as a measure of stability
- Transition from part-time to full-time employment

## **Study design**

The following study designs were considered for inclusion: randomized-controlled trials (RCTs), non-randomized controlled trial, controlled before-and-after study, and interrupted time series study. Definitions are presented in the glossary (see Appendix 2). These study types were prioritized, because they enable researchers to establish causal relationships among an intervention or exposure and outcomes (21;28).

In the event that either few or small controlled-prospective studies were identified, we considered including registry-based studies (RBs) (also known as panel data analysis), which involve the statistical analysis of data sets from registries containing multiple observations over time of a sampling unit (29). RBs can entail pooling of time-series observations across a variety of cross-sectional units, including individuals, countries, or companies (29;30). However, these studies do not fully enable researchers to establish causal relationships among an intervention or exposure and outcomes (30). RBs can include: matching methods, difference-in differences, and regression discontinuity designs. This approach has been used in similar reviews in this field (31;32).

## **Context**

Studies conducted in high-income economies (GNI per capita of \$12,056 or more) as defined by the World Bank (Link: <https://datahelpdesk.worldbank.org/knowledge-base/articles/906519-world-bank-country-and-lending-groups>).

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## Search strategy

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We developed and conducted a systematic search of the literature during October 2018 in the following databases:

- MEDLINE (OVID)
- PsycINFO (OVID)
- EMBASE (OVID)
- Cochrane Library (CDSR & CENTRAL)
- Centre for Reviews and Dissemination (DARE & HTA)
- ERIC (EBSCO)
- Web of Science (Core Collection)
- Epistemonikos
- Sociological Abstracts & Social Services Abstracts (ProQuest)
- SveMed+

The search strategy was developed by a search specialist and was peer reviewed by another search specialist. The full search strategies for each database are available in Appendix 3. We employed both «subject headings» (e.g. MeSH terms in Medline) and free text related to the intervention and population. Google Scholar was searched using terms related to the free text used in the database search, as well as the reference lists of relevant publications, and we contacted experts in the field to identify any unpublished, or difficult to access literature. In addition, we searched the websites of international directorates and relevant research centers, especially those from Scandinavian countries. Furthermore, we searched the following registers for ongoing studies:

- WHO International Clinical Trials Registry Platform ([www.who.int/ictrp/](http://www.who.int/ictrp/))
- ClinicalTrials (<https://clinicaltrials.gov/>)

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## Study selection

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Pairs of reviewers checked independently all titles and abstracts retrieved from the systematic literature searches, and included/excluded references according to the selection criteria listed above. We used the screening software Rayyan (33). Independent pair of reviewers also conducted full-text screening by using a pre-defined inclusion form. A third review author was consulted to resolve any eventual conflicts regarding inclusion.



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## Data extraction

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One researcher (JM) extracted data from the included studies and another researcher checked the extraction for accuracy and completeness. We extracted data about: publication (i.e., author, title, and date), population (e.g., number, age, and education), intervention and comparison (e.g., content, length), outcomes, study design, number and characteristics of participants, dropout. When necessary data were missing we contacted the authors of the study, and if sufficient data were not provided we excluded the studies from any pooled analyses and report the results narratively. If available, reviewers extracted contextual information related to the time when the studies were published (e.g., crisis periods).

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## Quality appraisal

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Pair of reviewers critically appraised the risks of bias of the included studies, independently of one another using established checklists:

*Randomized-controlled trials:* We followed the criteria described in the Cochrane Handbook for Systematic Reviews of Interventions to assess study quality (34). This set of criteria is based on evidence of associations between potential overestimation of effect and the level of risk of bias of the study that may be due to aspects of: sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting, and other sources of bias. For other sources of bias, we considered potential sources of bias such as baseline differences despite randomization. Each criterion was rated as low, high, or unclear risk of bias. It is important to highlight that we did select the criterion 'unclear risk' when the review authors' ability to determine the potential for bias could not be determined by information on the primary article or contact with author.

*Registry-based studies (RBs):* We critically appraised the RBs by using the checklist for cohort studies described in the NIPH handbook '*Slik oppsummerer vi forskning*' (35). This 10-items checklist evaluates known sources of bias, such as selection bias, incomplete or lack of reporting of outcome assessment, dropouts, confounding factors, and blinding of outcome assessment. We used this tool because it is the most suitable appraisal tool we could identify for RBs. We search extensively and asked methodological experts, and their recommendation was to use the checklist for cohort studies. While this checklist has limitations, to the best of our knowledge, there is no unique checklist for appraising RBs.

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## Data analysis

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We performed pairwise meta-analyses of results reported by multiple studies when we judged that they covered similar populations, interventions, comparisons, and outcomes.

*Measures of treatment effect*

We quantified the relative treatment effect of dichotomous outcomes (e.g., employed versus not employed) as risk ratios (RR) or risk differences (RD), as appropriate (36). A RR is the ratio of the probability of an outcome event (e.g., being employed) under one treatment (e.g., educational programs) to the probability of the outcome event under a comparator treatment (e.g., no educational program) (36). A RR value of one represents no difference between the treatment and comparator. A RD is simply the difference in the probabilities of the outcome between the treatment and comparator. A RD value of zero represents no difference between the treatment and comparator. If necessary, we imputed (i.e., calculated) RR or RD, and measures of precision such as standard errors, for each included study (e.g., by extracting the number of events and participants in each trial arm).

We quantified the relative treatment effect of continuous outcomes (e.g., job duration) as differences in means between treatment and the comparator. For monetary quantities (e.g., earnings), we extracted values in US dollars (USD) and quantified relative treatment effect as differences on the natural logarithmic scale. We used the logarithmic scale for the following reasons:

1. Monetary quantities such as earnings are typically skewed, with a large proportion of people earning relatively little and a small proportion of people earning a large amount. Therefore differences in means on the original measurement scale do not facilitate meaningful comparisons. For example, a 1 USD/hour wage increase may be important for a low-wage earner, but meaningless to a high-wage earner.
2. It is not meaningful to perform meta-analysis on differences in monetary quantities (e.g., income) on the original measurement scale if there are meaningful differences in such quantities between the studies. For example, if one of the included studies was performed in a relatively wealthy country, participants may earn uniformly more than participants in studies performed in poorer countries. Therefore, any effect of an intervention (measured as a simple difference) would appear to be larger in the richer country, which would result in a biased meta-analysis result.
3. Difference in mean incomes on a logarithmic scale is mathematically related to the ratio of mean incomes (recall that  $\log a - \log b = \log \frac{a}{b}$ ). An income ratio of 2, for example, indicates that mean income is two times larger under one treatment (e.g., educational program) compared to another (e.g., no educational program). Income ratios facilitate generalizing a numerical meta-analysis result into the Norwegian context (provided that the studies included in the meta-analysis been performed in suitably similar contexts).

To perform meta-analysis, it is necessary to obtain a point estimate and a measure of precision for each study (36). A point estimate is a single estimate of the relative treatment effect (e.g., a RR) that best agrees with the evidence collected by the study. A measure of precision (e.g., a standard error) quantifies the uncertainty on the point estimate due to chance (i.e., studies with more participants provide more precise point estimates than studies with few participants). Unfortunately, some of the included studies were poorly reported and did not provide exact statements of precision (some studies did not even report sample sizes).

Where possible, we used the reported information (i.e., P-value inequalities) to impute upper bounds on standard error. For example, if a study reported “ $P < 0.05$ ”, we imputed that in fact, “ $P = 0.05$ ”; when studies reported that a result was “not significant”, we imputed that the P-value was actually close to 1 (this is equivalent to imputing that the confidence intervals are almost infinitely wide). We used a first-order Taylor expansion to impute upper bounds on standard errors on the logarithmic scale. This is a conservative approach in the sense that the 95% confidence intervals we report for the meta-analysis results are the widest intervals that are consistent with the available evidence. These intervals favour no difference between educational programs and the comparators used. This approach therefore leads to meta-analyses that differ from conventional results in two ways:

1. The confidence intervals we report should be interpreted as lower and upper bounds on the confidence interval that we would have calculated if the included studies had reported precision in a more useful way. In other words, the conclusions we draw are conservative in the sense that they are more likely to conclude that the intervention may not be effective. We accounted for this limitation by “down-GRADEing” the certainty of evidence for the affected outcomes.
2. Studies that reported “non-significant” results can have very little weight in the meta-analysis. This is simply a consequence of adopting a conservative approach in which we assumed that such studies would have P-values close to 1. As a result, the confidence intervals we report are wider (i.e., less precise) than they would be if the included studies used more transparent reporting. We accounted for this limitation by “down-GRADEing” the certainty of evidence for the affected outcomes.

We used a random-effect model for all analyses unless homogeneity among studies was observed, in which case a fixed-effect model was chosen. We used RevMan 2014 and Stata software to perform statistical analyses and generate forest plots (37).

Where there was only a single study (or only one site per study) for a comparison, or it was not possible to pool results from multiple studies within a comparison, we presented a narrative synthesis of the findings for the primary outcomes from included studies. We presented the results (e.g. effect sizes) in a table for the primary outcomes, displayed individual study results graphically, as they are reported in the primary studies.

#### *Assessment of heterogeneity*

##### *Clinical and methodological heterogeneity*

We evaluated possible explanations for heterogeneity related to participants, intervention and methods. The following sub-group analyses were performed when possible:

Population: employed, unemployed, and/or out of the labor force

Intervention: pure or mixed educational interventions to improve labor market opportunities

These subgroups are based on data from a recent meta-analysis, which demonstrated the effects of ALMPs that included a training component differ importantly in terms of level of employment and also according to the program components (level and type of training) (38).

#### *Statistical heterogeneity*

We inspected figures to investigate possible statistical heterogeneity and quantified between-study heterogeneity using the  $I^2$  statistic. We tested null hypotheses of no heterogeneity using  $\chi^2$  tests, using the significance criterion  $P < 0.1$ . We interpreted statistically significant  $I^2$  value greater  $\geq 50\%$  as evidence of substantial heterogeneity (34).

#### *Dealing with missing data*

Most of the studies did not provide exact precision measures (e.g., p-values). The two largest studies (GAIN study (39-41) and NEWS study (42;43)) did not report the number of participants analysed in some follow-up periods. We specify the cases in which data were missing throughout the data analysis chapter. Furthermore, we attempted to obtain missing data from authors, if feasible, and carefully evaluated important numerical data such as screened, randomised participants as well as intention-to-treat (ITT), and as-treated and per-protocol populations.

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### **Certainty in the effect estimate (GRADE)**

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We assessed our certainty in the effect estimate for the primary outcomes using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) Working Group grades of evidence (44). In the 'Summary of findings' tables, we integrated our assessments of certainty of evidence and the meta-analysis results (45). The GRADE approach considers risk of bias and the body of literature to rate certainty of evidence using four levels:

*High certainty:* We are very confident that the true effect lies close to that of the meta-analysis result.

*Moderate certainty:* We are moderately confident in the meta-analysis result: The true effect is likely to be close to the meta-analysis result, but there is a possibility that it is substantially different.

*Low certainty:* Our confidence in the meta-analysis result is limited: The true effect may be substantially different from the meta-analysis result.

*Very low certainty:* We have very little confidence in the meta-analysis result: The true effect is likely to be substantially different from the meta-analysis result.

Assessments were made for each primary outcome under each comparison and were based on evidence from the individual primary studies contributing to the outcome. For more information on GRADE visit [www.gradeworkinggroup.org](http://www.gradeworkinggroup.org).

*Re-expressing relative treatment effects as anticipated effects*

To help readers interpret the relative treatment effect estimates resulting from meta-analyses, we re-express relative effects as anticipated effects in summary of findings tables.

For the employment rate outcome, for example, we re-express risk difference as the number of people out of 100 people we would anticipate would be employed if an educational intervention was implemented compared to if no educational intervention. Such calculations are based on an assumed employment rate for the control treatment and are therefore indicative only.

Similarly, for the total earnings outcome, for example, we re-express difference in log mean earnings as the total monthly earnings (in NOK) we would anticipate if an educational intervention was implemented compared to if no educational intervention. Again, such calculations are based on an assumed total monthly earnings value for the control treatment and are therefore indicative only.

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# Results

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## Search results

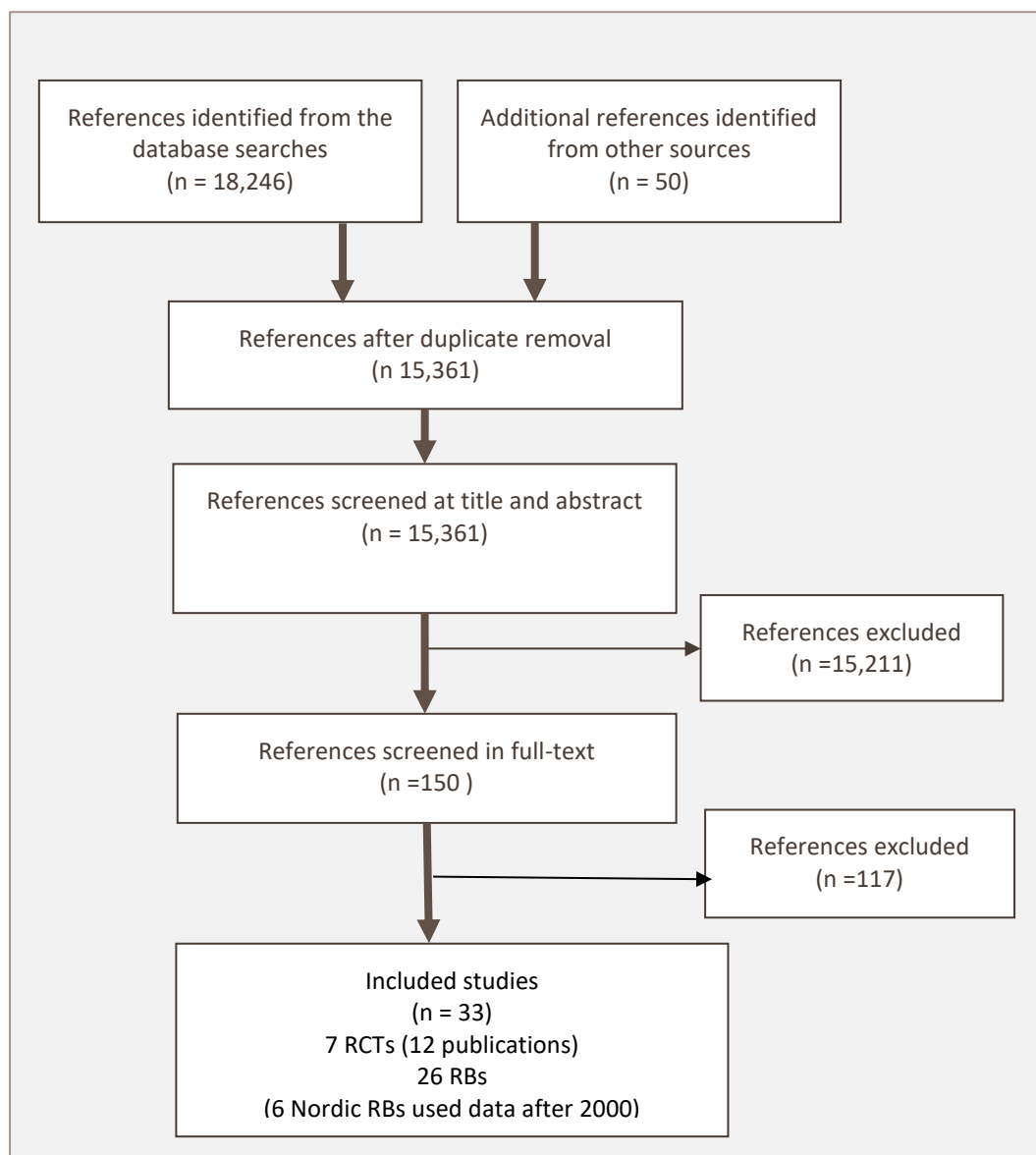
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The electronic searches in the major databases yielded 18,246 references, and additional searches in grey literature sources added 50 references. No relevant ongoing studies were identified by searching in the trial registries. A total of 2,935 duplicates were removed. One-hundred and fifty out of the 15,361 references that were read at title and abstract were promoted to full-text screening.

We included seven RCTs reported in 12 publications. Furthermore, and in line with our project protocol, we provide a short overview of the 26 RBs that were retrieved in the literature search. In accordance with agreement with the commissioner, we present findings from six Nordic RBs that used data after year 2000. Figure 1 depicts the flow diagram for the selection of the studies.

## Excluded studies

The most common reasons for exclusion were different population and intervention. Some studies included youths or did not provide separate subgroups for adults and therefore were not eligible for inclusion. Regarding the intervention, many studies evaluated vocational rehabilitation programs or supported employment initiatives, which did not reach a 30% provision of educational services within the programs. Appendix 4 lists the studies excluded at full-text screening.



**Figure 1.** Flow diagram of the selection of studies

### **Amendment to the protocol**

During the final work of this systematic review, at the request of the commissioner (NAV), it was discussed and decided that, in order to enhance the relevance and usability of this report to the Norwegian context, we should also briefly describe data from the Nordic RBs that have used data after year 2000. In light of this, we present data on the main characteristics of six Nordic RBs and their methodological quality. We declare this amendment does not represent any substantial change to the findings from this systematic review.

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### **Included studies**

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#### **Randomized controlled studies (RCTs)**

We included seven RCTs reported in 12 publications. These are described below.

## Registry-based studies (RBs)

All in all, we identified 26 RBs in the literature searches. The majority of the studies came from the Nordic countries (i.e., ten studies from Sweden, seven studies from Norway, and four studies from Denmark). The remaining studies were conducted in USA, France, Spain and Switzerland. Data presented in the RBs came from nationwide registries and involved about two million participants. Participants were mainly unemployed adults, welfare recipients, and sick-listed employees, some of them in vocational rehabilitation.

Regarding the intervention, the programs evaluated in the RBs included general adult education classes, classroom and labor market training, comprehensive education, as well as job readiness, job search assistance, and intensive training. Employment and earnings were the most common outcome measures. Administrative data taken from the registries represented the most common data source. Overall, the 26 RBs showed mixed results for improving employment and earnings between participants in educational programs compared to those in the control group who did not attend an educational program. Appendix 5 presents the characteristics of the RBs and their main findings. Further details on the RBs are available on request.

The seven Norwegian studies, published between 2002 and 2015, analyzed retrospective data from NAV, which might facilitate the formulation of public policies and further research. Four studies suggested favorable effects of educational programs on employment. In 2003, Aakvik observed that participants in the educational programs had around eight times higher employment rates compared to nonparticipants in a sample of partially disabled employees (46). Westlie in 2008 (47), found that educational programs increased the employment probability by 11.7 and 15.4 percent compared to work training programs in adults in vocational rehabilitation services. In 2015, Hauan (48) reported that educational programs (i.e., mainly ordinary public or private education) resulted in the largest increases in employment compared to work practice in adults with reduced work ability, receiving work assessment allowance. Similar findings were reported in non-western immigrants (49). However, opposite findings were reported by Hardoy in 2005 (50), who found that classroom courses did not affect employability of unemployed adults. See Appendix 5.

Two of the Norwegian studies suggested positive effects of education on participants' earnings. Dahl and colleagues (51) reported that training programs aiming to provide the social assistance recipients with labor market skills were associated with higher overall earnings, whereas employment programs resulted in no effects (51). Raaum and colleagues (52) found that labor market training programs increased earnings compared to no participation over 5 years in unemployed adults. Participants without recent work experience prior to the training had less benefits. See Appendix 5.

### *Nordic RBs studies that analyzed data after 2000*

As mentioned, in accordance with agreement with the commissioner, we present further details on the six Nordic RBs that analyzed registry data after year 2000 (i.e., five Norwegian studies (48;49;53-55) and one Danish study (56)). The details provided in this report about the Nordic RBs do not affect the systematic review's conclusions. Data



from these studies are described throughout the different sections of this report. These studies are:

*Norwegian RBs (n=5):*

- Cools, S., I. Hardoy, K. von Simson. Sosial bakgrunn, utdanning, arbeid og stønader til personer under 30 år med nedsatt arbeidsevne. ISF-rapport; 2018.
- Hauan E. Labor market programs in Norway. Do labor market programs improve the job prospects for individuals with reduced working ability? An evaluation. Tromsø UiT, The Arctic University of Norway; 2015.
- Kvinge T, Djuve AB. Bruk av arbeidsmarkedstiltak for ikke-vestlige innvandrere. Hvem deltar, og hvordan er sysselsettingseffektene? Oslo: FAFO; 2006. 517.
- Salvanes, K.V., R.B. Reiling, A.M. Sandsør. Utdanning som arbeidsrettet tiltak for ungdom med redusert arbeidsevne. Søkelys på arbeidslivet 1-2/2018.
- Zhang T. Virker arbeidspraksis i ordinær virksomhet etter sitt formål? Søkelys på arbeidslivet 2016;33(1-02):45-65.

*Danish RB (n=1):*

- Holm A, Hogelund J, Gortz M, Rasmussen KS, Houlberg HS. Employment effects of active labor market programs for sick-listed workers. Journal of Health Economics 2017; 52:33-44.

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## Characteristics of the included studies

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### Randomized-controlled trials (RCTs)

This systematic review included seven multisite RCTs (presented in twelve publications). Six studies were conducted in the USA (41;42;57-60), mainly during the early 1990s, and one study was conducted in the Netherlands by Hidalgo and colleagues (61). Table 1 presents an overview of the included RCTs, the follow-up reports, and the sites at which the studies took place.

The included RCTs evaluated mostly large-scale national welfare-to-work programs in a mixed group of participants. The programs evaluated in the RCTs covered various services and were not limited to education (e.g., language classes, job search assistance, and on-the-job training). We present further details about the characteristics of the RCTs in this section.

**Table 2.** Overview of the reports derived from the included RCTs (n=7)

Included study/study name	Publications/ follow-up period	Country and study sites
The California's Greater Avenues for Independence (GAIN) study	Riccio 1994 (41) (2-3 years)	USA: Alameda, Butte, Los Angeles, Riverside, San Diego, Tulare
	Freedman 1996 (39) (5 years)	Alameda, Butte, Los Angeles, Riverside, San Diego, Tulare
	Hotz 2000 (40) (9 years)	Alameda, Los Angeles, San Diego
Individual Learning Accounts (ILA) study	Hidalgo 2014 (61) (2 years)	Several cities in the Netherlands <sup>1</sup>
The Job Training Partnership Act (JTPA) study	Bloom 1993 (57) (18 months)	16 sites across the USA <sup>1</sup>
The Minority Female Single Parent (MFSP) study	Burghardt 1992 (58) (1-3 years)	Rhode Island, USA
New Visions study	Fein 2006 (59) (1-2.5 years)	USA: Riverside
The National Evaluation of Welfare-to-Work Strategies (NEWWS) study	Freedman 2000 (42) (2 years)	USA: Atlanta, Grand Rapids, Riverside, Columbus, Detroit, Oklahoma, Portland
	Hamilton 2001 (43) (5 years)	Atlanta, Grand Rapids, Riverside, Portland
	Hamilton 2016 (62) (10-15 years)	Atlanta, Grand Rapids, Riverside
The Work Advancement and Support Center (WASC)	Miller 2009 (60) (1 year)	USA: Dayton, San Diego
	Miller 2012 (63) (1-4 years)	Dayton, San Diego, Bridgeport

<sup>1</sup>Data are presented in aggregated form

Below, we present the aims of the included RCTs and details about their chronological trajectories.

The California's Greater Avenues for Independence (GAIN) study began in 1986 and, in 1989, became the state's official Job Opportunities and Basic Skills Training (JOBS) program. The GAIN study was authorized by the Family Support Act, the nation's attempt to reform the welfare system in the late eighties. The program was also known as the nation's largest welfare-to-work program. The GAIN study aimed to increase both employment and self-sufficiency in recipients of Aid to Families with Dependent Children (AFDC) by providing basic education as well as getting them quickly into jobs. Several reports cover the follow-up data of the GAIN study. In 1994, Riccio and collaborators (41) reported follow-up data for about 33,000 people from 6 counties who entered GAIN between 1988 and 1990 (i.e., Alameda, Butte, Los Angeles, Riverside, San Diego, and Tulare). Five-year follow-up data are presented in Freedman 1996 (39), and the latest follow-up data, at nine years post-randomization, are contained in Hotz 2000 (40).

In 2014, Hidalgo and collaborators published a secondary analysis of the Individual Learning Accounts (ILA) study (61), which aimed to evaluate the effects of training vouchers on training participation and labor market outcomes of low-skilled workers in the Netherlands. The study was conducted by the CINOP Centre of Expertise and was initiated and partially funded by the Ministry of Education of The Netherlands. The vouchers were given to the treatment group in 2006, and follow-up data were reported at two years after baseline. A primary report about the effects of vouchers on training participation was published in 2009 (64).

The Job Training Partnership Act (JTPA) study (57) aimed to measure the impacts and costs of selected employment and training programs for economically disadvantaged Americans, most of them unemployed. The study reported findings on earnings and employment of adults in 16 sites at 18 months after enrollment in the program, which took place between November 1987 through September 1989 (57).

The Minority Female Single Parent (MFSP) study (58) aimed to determine the impacts of comprehensive employment training and support services on the self-sufficiency of minority single mothers, and reduce their dependence on welfare. The project involved four sites: the Atlanta Urban League (AUL); Opportunities Industrialization Center (OIC) of Rhode Island in Providence; the Center for Employment Training (CET) in San Jose, California; and Wider Opportunities for Women (WOW) in Washington, D.C. We restrict our analysis of data from OIC to Rhode Island, as this was the only site in which educational programs represented more than 30% of the total program. The evaluation report (58) summarized findings of the MFSP program on the economic, social, and psychological well-being of women during the first 30 months after entering the program. Randomization occurred between 1982 and 1988.

The New Visions study (59) aimed to estimate the impacts of community colleges as “bridge programs” to prepare employed adults receiving welfare benefits for community college occupational training programs, foster lifelong learning, and promote job advancement. Participants entered the program between September 1998 and May 2002.

The National Evaluation of Welfare-to-Work Strategies (NEWWS) study (42) was a large and randomized program evaluation of 11 welfare-to-work programs implemented in seven sites across USA (i.e., Atlanta, Columbus, Detroit, Grand Rapids, Oklahoma, Portland, and Riverside). Participants were allocated to the program services or to a control group between 1992 and 1994. Several publications have been derived from the NEWWS study. However, after a thorough examination of the different publications, this systematic review presents data from evaluations conducted at two (42), five (43), and 10-15-year follow-up data (62).

The Work Advancement and Support Center (WASC) demonstration study (60) assisted low-wage workers to stabilize their employment, improve their skills, and increase their earnings. The study included low-wage workers in three sites: Bridgeport, Connecticut; Dayton, Ohio; and San Diego, California. Miller et al. 2009 (60) presented

findings on program implementation from all three sites and first-year effects on employment, earnings, and work supports receipt in Dayton and San Diego. Miller et al. 2012 (63) presented final impacts (four years post-enrollment) in all sites. Table 2 provides an introductory overview of the population, intervention, and outcomes across the seven included RCTs.

**Table 2.** Characteristics of the included RCTs (n=7)

<b>Study</b>	<b>Population</b>	<b>Intervention</b>	<b>Control</b>	<b>Outcomes</b>
GAIN study (41)	Unemployed adults, single parents, welfare recipients from six sites in California, USA	Adult basic education; post-secondary education; job search assistance; work experience (N=17,851) <sup>1</sup>	No participation in GAIN services but participants could seek other services in the community on their own (N=5,141) <sup>1</sup>	Employment Earnings
ILA study (61)	Low-skilled workers in the Netherlands <sup>2</sup>	Education and classroom training vouchers (Individual Learning Account (ILA)) (N=465)	No voucher (N=468)	Earnings
JTPA study (57)	Unemployed adults, welfare recipients from 16 sites in the USA <sup>2</sup>	Classroom training in occupational skills; adult basic education; on-the-job training; job search assistance; work experience; miscellaneous services (N=5,169)	No participation in JTPA services (N=5,724)	Employment Earnings Job duration
MFSP study (58)	Unemployed single mothers, welfare recipients, mostly with low skills, from Rhode Island, USA	The study followed a “sequential” strategy in which women with poor reading, writing and math skills were placed in classroom course, and were offered job training only after they had met certain academic standards. (N=346)	No participation in MFSP services but participants could seek other services in the community on their own (N=163)	Employment Earnings Job duration
New Visions study (59)	Employed adults, welfare recipients from USA	College courses and adult basic education (N=528)	No participation in New Visions services (N=515)	Earnings
NEWWS study (42)	Unemployed adults, welfare recipients, mostly with low skills, from seven sites across the USA	Human Capital Development (HCD): adult basic education; post-secondary education; vocational training; college courses. (N=17,650) <sup>1</sup>	Labor Force Attachment (LFA): job club; job search assistance; work experience (N=incomplete reporting) No participation in NEWWS services but	Employment Earnings

			participants could seek other services in the community on their own (N=17,521) <sup>1</sup>	
WASC study (60)	Low-wage workers from USA	Adult basic education; college courses; on-the-job training; job search assistance; vocational training (N=1,343)	No participation in WASC services but participants could seek other services in the community on their own (N=1,339)	Employment Earnings Job duration

GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

<sup>1</sup> The numbers do not correspond to the participants in each group across sites.

<sup>2</sup> Data are presented in an aggregated manner

### Nordic registry-based studies

The six Nordic RBs were published between 2006 and 2018 (table 3). One study was reported as a Master's Thesis in Economics at the University of Tromsø (48), one was an organizational report from Forskningsstiftelsen (In English, the Fafo Research Foundation) (49), one was a report from Institutt for samfunnsforskning (53), and the three remaining were published in peer-reviewed journals (54-56).

The Nordic RBs had similar research aims. The five Norwegian RBs focused on labor market programs. In 2006, Kvinge and Djuve (49) explored the effects of labor market programs for non-western immigrants. Later in 2015, Hauan (48) utilized an econometric framework to investigate the effects of labor market programs to improve the job prospects for individuals with reduced working ability, whereas in 2016, Zhang (55) evaluated the effects of work practice and education for ordinary job-seekers between 2003-2012. In 2018, Cools and colleagues (53) evaluated the effects of labor market programs for young people with reduced work ability. Similarly, Salvanes (54) evaluated the long-term employment effects of a national reform that raised the age limit for education support (ordinary education) from 22 to 26 years in 2004 for young people with reduced work ability.

The Danish study published by Holm and colleagues (56) in 2017 used register data of sick-listed employees in Denmark over the period 2008–2011 to study the employment effects of active labor market programs for this population. Table 3 depicts the main characteristics of the six Nordic RBs.

**Table 3.** Characteristics of the Nordic registry-based studies (n=6)

Study	Population	Intervention	Control(s)	Outcomes
Cools 2018 (53)	Young people with reduced	Education <sup>1</sup> (N=21,131)	Work Practice (N=16,667) Follow-up measures (N=6,410) Clarification measures (N=5,804)	Employment

	work ability receiving welfare benefits		Wage subsidies (N=2,480) Facilitated work (N=441) Other measures (N=741)	
Kvinge 2006 (49)	Unemployed non-western immigrants	Education (N=1,778)	Work practice (N=1,451) Wage subsidies (N=513) No program (11,497)	Employment
Hauan 2015 (48)	Adults with reduced working ability because of physical/mental/social issues	Ordinary public or private education + labor market training (N=20,800)	Work practice (N=19,630) Assistance (N=17,393) No program (N=14,585)	Employment
Salvanes 2018 (54)	Young people with reduced work ability	Ordinary education (N=5,222)	Other active programs (on-the-job training or shielded business) (N=5,222)	Employment
Zhang 2016 (55)	Ordinary jobseekers	Education <sup>1</sup> (N= 108,039)	Work practice (N=55,169)	Employment
Holm 2017 (56)	Sick-listed employees	Ordinary education (N=3,476)	Non-formal education (N=14,153) Subsidized internships (N=8,174) Wage subsidized job training (N=2,301)	Employment Duration until return to work <sup>2</sup>

<sup>1</sup> AMO kurs: arbeidsmarkedsoppl ring

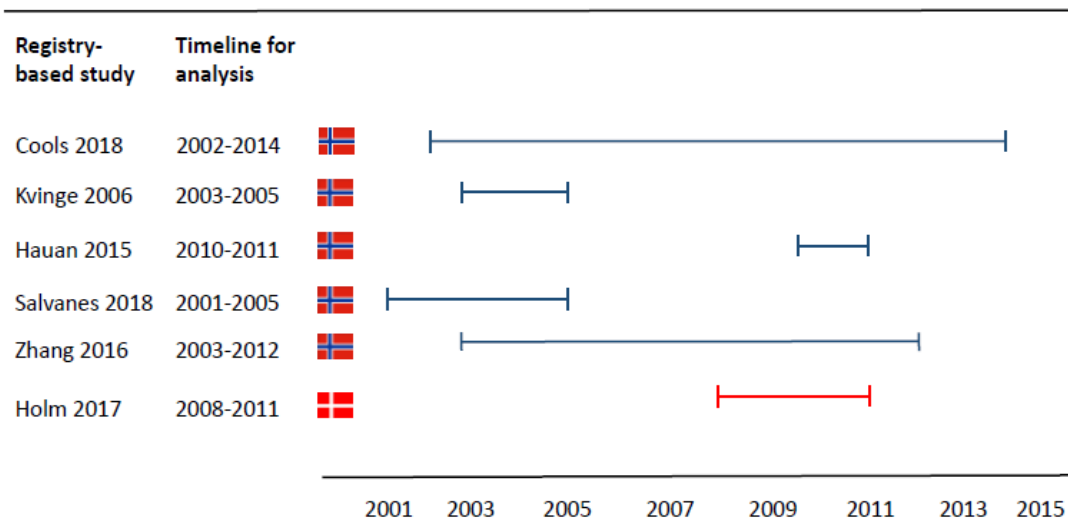
<sup>2</sup> Not reported in this systematic review

### *National registries used for analysis*

All six Nordic RBs used data from national registries. Two out of the five studies conducted in Norway utilized data from the Norwegian Labor and Welfare Administration (NAV), as follows:

- Kvinge and Djuve analyzed data from unemployed non-western immigrants from 2003 through 2005 (49).
- Hauan analyzed data from individuals with reduced working ability between 2010-2011 (48).

Cools 2018 (53), Salvanes 2018 (54), and Zhang 2016 (55), utilized registry data taken from Statistics Norway (In Norwegian, Statistisk sentralbyr ) for ordinary unemployed people from 2002 through 2014. In Denmark, Holm and colleagues (56) utilized spells of sick-listed employees from the Danish Registry for Evaluation of Marginalization (DREAM) between 2008-2011. Figure 2 illustrates the years for data analysis across the six Nordic RBs. This suggests an important overlap in the cases based on the NAV registry, between the Norwegian studies, although they did focus on different groups. Further analysis on the use of the registry data fall beyond the scope of this systematic review. We provide further descriptions in the sections below.



**Figure 2.** Dispersion of the years for data analysis across the Nordic registry-based studies (n=6)

## Description of the participants

### Randomized-controlled trials (RCTs)

Approximately 74,000 participants were reported in the included studies. However, in most of the studies, the numbers do not correspond to the final number of participants for which outcome data were reported. The two largest studies (i.e., GAIN study (41) and NEWWS study (42)) did not report the number of participants that were analyzed in the different follow-up periods. Besides, these two studies (41;42) categorized the participants who at enrollment lacked a high school diploma or GED test, who had low math or reading skills, or who required English remediation to be “*in need of basic education*”. The studies presented outcome data for this subgroup although the number of participants analyzed in each subgroup was missing. Those participants were categorized as “participants with low skills” for the purpose of this systematic review. Table 4 presents the main characteristics of the participants in the included studies.

The mean age of participants was approximately 32 years. White, non-hispanic adults represented 8% to 52% in the three studies that reported this data (41;59;60); this rate was 86% in Butte in the GAIN study (41). Up to 69% of the participants were black, non-hispanic adults in four studies (41;58-60). The MFSP study (58) included only single-mothers who applied for training at the different community services. Single mothers were also included in the NEWWS study, in which the most common profile of participant was a single parent 30-year-old female with two children. Around half of the women became mothers as teenagers (42). See Appendix 6 for a more detailed description of the participants in the included studies.

**Table 4.** Characteristics of the participants in the included RCTs (n=7)

Study	Treatment group <sup>1,2</sup>	Control group <sup>2</sup>	Age (years)	Sex (% female)	Participants with low skills <sup>3</sup>	Participants receiving welfare benefits	Currently employed	Employed in past 2 years
GAIN study (41)	17,851	5,141	34-38	NR	41%-65%	Yes	5%-11%	16%-59%
ILA study (61)	465	468	38	30%	57%	No	100%	100%
JTPA study (57)	5,169	5,724	33	45%-55%	26%-31%	Yes	13%-15%	NR
MFSP study (58)	346	163	27	100%	NR	Yes	NR	33%
New Visions study (59)	528	515	NR	94%	29%	Yes	87%	NR
NEWWS study (42)	17,650	17,521	28-33	89%-97%	34%-45%	Yes	7%-11%	21%-69%
WASC study (60)	1,343	1,339	34	67%-81%	10%-26%	No	100%	100%

GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

<sup>1</sup> Treatment group corresponds to the study group in which participation in educational courses represented more than a 30% of the total program.

<sup>2</sup> Numbers are aggregated for the sites in each included study, if applicable.

<sup>3</sup> Those participants who at enrollment lacked a high school diploma or GED test, who proved low skills on math or reading, or who required English remediation

Two studies focused on low-skilled workers (60;61). Low-wage workers or people working poor were heavily included in two studies (59;60). In the WASC study (60), the majority of participants were earning less than \$10 per hour and had family incomes below 130 percent of the poverty line, and about 35% of all participants across the three sites were working full-time (35 or more hours per week). Similarly, around one third of the participants in the New Visions study (59) earned less than six USD dollars per hour, and 41% earned between 6-7 dollars. See Appendix 6.

### Nordic registry-based studies

All in all, the Nordic studies included data from 383,566 participants with an average age of 35 years. Kvinge 2006 (49) included the oldest group of participants (40-45 years old in average), whereas the participants in Cools 2018 (53) that received ordi-



nary education were the youngest (18-29 years). Females represented half of the participants across the four studies; the lowest rate was found in Kvinge 2006 (49) (44% female) and the highest in Holm 2017 (56) (55% female).

The Nordic studies focused on different groups of unemployed adults. Three Norwegian studies focused on individuals with reduced working ability (48;53;54). The two remaining studies included non-western immigrants (49), and ordinary unemployed adults (55). The Danish study included sick-listed employees (56).

All the Nordic studies included immigrants in their analyses. Around half of the non-western immigrants included in Kvinge 2006 (49) came from Asia (48%), a third of the participants came from Eastern-Europe, 19% came from Africa, and 6% of the participants came from Latin America. Immigrants counted for 13% of the sample in the study of Hauan 2015 (48), and for 25% in the study of Zhang 2016 (55) (42% of the participants in the education group were immigrants). It was not possible to estimate the number of immigrants included in Cools 2018 (53) and Salvanes 2018 (54). Holm 2017 (56) stated that 3% of the participants came from a Western country, and 4% came from a non-Western country, respectively.

With regard to employment status, twenty-one percent of the participants in the study of Kvinge 2006 (49) were employed and participated in the labor market programs. Hauan 2015 (48) reported that 12,717 participants (39%) of the individuals with reduced working ability were employed. The remaining studies did not provide information on participants' employment status (53-56). Six percent of the participants in Holm 2017 (56) were employed in the last two-years.

Low educated participants were included in all the six Nordic RBs. A third of the youth included in Cools 2018 had completed high school (53). Half of the participants in Kvinge 2006 (49) had completed either basic education or high school (30% among immigrants from Asia and 25% of those from Africa). This group counted for 79% in Hauan 2015 (48). Half of the participants in Salvanes 2018 (54) had completed basic school, 39% had completed high school, and 9% had higher education. In Zhang 2016, 34% of the participants had completed primary school and 29% had completed high school (55). Sixty percent of the participants in Holm 2017 (56) had completed primary school (45%) or high school (14%).

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## **Description of the educational interventions**

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### **Randomized-controlled trials (RCTs)**

In general, the included RCTs evaluated multi-component programs, which offered a mixed package of services consisting of educational services (classroom education/training) alongside different work-related services (table 5). The educational services provided in the included studies comprised Adult Basic Education (ABE) (e.g., full-time adult basic education, GED preparation, or English as a Second Language (ESL)), as well as other educational services, such as post-secondary or college courses.

Work-related services included on-the-job training, job search assistance, work experience, etc. Data on the duration and length of attendance in the programs varied considerably across the studies, and not all the included RTCs provided this information. Appendix 7 presents a description of the services provided in the included RTCs.

**Table 5.** Services provided in the included RTCs<sup>1</sup>

Services provided in the included studies	Description	Duration	Length
<b>Educational services</b>			
Adult Basic Education (ABE)	Full-time ABE, high school, GED, and ESL before skill training.	9-16 h/wk	1.1 to 9 months
Classroom training in occupational skills	In-class instruction teaching specific job skills,	53 hours	3.8 - 5.6 months
<b>Work-related services</b>			
On-the-job-training	Subsidized training in paid job, often in a private sector, and jobs supposed to be permanent.	107 hours	1.9- 2.1 months
Job search assistance	Assessment of participants' job skills and interests, along with training in job-finding techniques and help in locating job openings.	NR	0.7- 2.1 months
Work experience	Temporary jobs to provide basic employment skills and effective work habits	13 hours	1.7- 2.4 months
Job club	Job-seeking and psychological skills, interviewing skills, motivation, self-esteem, identifying interest.	15-30 hours/per week	1-3 weeks
Vocational training	Vocational education, training courses, general skills and specific skills such as computer or word processing.	NR	1.9 to 4.5 months
Miscellaneous services	Assessment, job-readiness training, customized training, vocational exploration, job shadowing, and try-out employment	NR	1.7- 2.4 month

English as a second language, ESL; General Educational Development, GED test.

<sup>1</sup> Data presented in the table are illustrative for those presented in the included RTCs. Further details are provided in Appendix 7.

### **Nordic registry-based studies**

All the six Nordic RBs studied educational interventions, as part of labor market training (LMT) within their national employment programs. The educational interventions aimed to improve participants' skills for facilitating their either entrance or return to the labor force. Apart from Holm 2017 (56) and Cools 2018 (53), the Norwegian studies failed to report details on the intervention components (48;49;54;55). Hauan 2015 (48) stated that the educational intervention consisted mainly of ordinary public or pri-

vate education within labor market training but no details on the intervention components were provided. Table 6 presents the characteristics of the educational interventions in the Nordic RBs.

In Norway, Cools 2018 (53) studied the effects of the following labor market programs for youth with reduced work ability:

- *Training programs*: aimed to increase participants' competence for the labor market. Training programs were provided both in the form of shorter labor market courses (In Norwegian, AMO courses), as qualifications in the labor market or in the ordinary education system. Ordinary education lasted up to three years, qualification in the labor market up to two years, while AMO courses usually lasted up to ten months with the possibility of extension of up to six months. In Cools 2018 (53), ordinary education was the most commonly provided training program, followed by AMO courses, while qualification in the labor market was about six percent.
- *Clarification measures (In Norwegian, Avklaringstiltak)*: offered to young people in need of more comprehensive assistance than the employment and welfare services can offer. The purpose was to identify and assess the participant's ability to work and any additional assistance needed to enter the labor market. Clarification measures lasted up to four weeks, but could be extended up to eight weeks.
- *Follow-up measures (In Norwegian, Oppfølgingstiltak)* offered to people in need of more comprehensive follow-up assistance than the employment and welfare services can offer. These measures aimed to provide the participant with assistance for either obtaining or retaining work. Duration was up to six months, but could be extended for a further six months and in special needs for up to three years. In Cools 2018 (53), the most commonly provided follow-up measures were work with assistance, individual follow-up and a job club.
- *Work Practice*: aimed to try out the participant's opportunities in the labor market, provide relevant work experience and strengthen the opportunity to get regular work. Work practices could be provided in both ordinary and sheltered activities. The duration of ordinary work practices was up to one year, but could be extended by another year for persons with reduced working capacity. In Cools 2018 (53), close to 60 per cent of work practice measures were in the ordinary sector, while just over 40 per cent were in the protected sector.
- *Wage subsidies*: given to employers hiring people who had problems for entering the labor market on ordinary pay and working conditions. The goal was permanent employment in ordinary activities. Wage subsidies could be provided in both private and public enterprises, and the participant must perform ordinary tasks. Wage subsidies were usually granted for up to one year, but the allowance could be granted for up to three years for persons with

reduced work capacity. Persons with a permanent disability may be granted an indefinite duration subsidy. In Cools 2018 (53), just over seven per cent of wage earners received wage subsidies of indefinite duration.

- *Facilitated work (In Norwegian, Tilrettelagt arbeid)*: aimed at people who were either or were about to become disabled pensioners. The measure usually took place in the shielded sector, and there was no time limit on these measures.
- *Other measures* was a residual category that comprised measures that do not fall under any of the other categories. Examples of measures in this category were work-oriented rehabilitation, self-establishment and public employment measures.

In Denmark, Holm 2017 (56) reported that ordinary education comprised secondary education, vocational courses (e.g., carpenter, cycle mechanic, plumber), and college degrees. All interventions gave formal qualifications for work or further studies. Other interventions described in the Danish study were the following:

- *Non-formal education*: counselling and shorter courses, targeted at enhancing employability and qualifications for people coming from unemployment or sick leave. The sick-listed employee and the caseworker decided the type of education jointly. The courses covered both specific labor market qualifications and counselling or shorter and more informal courses of a very heterogeneous character (e.g., consultations with occupation therapists, nutritionist or a psychologist, stress courses, mindfulness, physical exercises, back schools).
- *Subsidized internships*: offered in private and public firms and may last for up to 13 weeks. The internships aimed to assist the caseworker in assessing participant's working capacity and workplace accommodation needs. Participants receive social benefits while in the program, and the employer has no wage costs (100% subsidy rate for this).
- *Wage-subsidized job training*: offered to sick-listed employees where there is a specific development plan and a clear employment. This program provided rehabilitation of professional, social, and educational skills, and was individually determined.

Overall, educational interventions were compared against work practice in all the Norwegian studies (48;49;55), while other controls were wage subsidies (49) and assistance services (48). Information of the control groups and the sample sizes per group is presented earlier in table 3.

**Table 6.** Characteristics of the educational interventions in the Nordic RBs (n=6)

Study	Educational intervention	Setting	Components	Control group(s)
Cools 2018 (53)	Education (LMT) <sup>1</sup>	Ordinary educational settings	NR	Work Practice; follow-up measures;

				clarification measures; wage subsidies; facilitated work; other measures
Kvinge 2006 (49)	Education (LMT) <sup>1</sup>	NR	NR	Work practice; wage subsidies; no program
Hauan 2015 (48)	Education (LMT) <sup>1</sup>	Public and private ordinary educational settings	Mainly ordinary public or private education within labor market training. This is a combination of practical and theoretical training at a workplace <sup>2</sup>	Work practice; assistance; no program
Salvanes 2018 (54)	Education (LMT) <sup>1</sup>	NR	NR	Other active programs: on-the-job training or shielded business
Zhang 2016 (55)	Education (LMT) <sup>1</sup>	Public school and workplace	NR	Work practice
Holm 2017 (56)	Ordinary education (LMT)	High school, technical school, college, workplace, etc.	Secondary education (high school), vocational education (e.g., carpenter, cycle mechanic, plumber), and college degrees.	Non-formal education; subsidized internships; wage subsidized job training

Labor Market Training, LMT; Not reported, NR

<sup>1</sup> Labor market training, LMT.

<sup>2</sup> The reported data did not allow for the separation of these two components.

## Participation rates in educational services across the included studies

### *Randomized-controlled trials (RCTs)*

Table 7 gives a general description of the participation rates in the multi-component programs evaluated in the included RCTs. The participation rates correspond to the proportion of participants who took part in the different services offered in the programs. Note that the numbers do not add up to 100% participation because participants could move to other services or leave the program. In line with the aim of this systematic review, we treated as the intervention group of “*educational programs*” to the study group in which educational services represented >30% of the total participants’ attendance in the training program.

In general, the most common educational service provided across the RCTs was Adult Basic Education (ABE), and exhibited the highest rates of participation. Naturally, participants with low skills (in need to ABE) in the GAIN study (41) and NEWWS study (42) had the highest concentration of educational services (>60% participation). Three

RCTs offered post-secondary education (41;42;60), whereas only the JTPA study reported classroom training in occupational skills (57). Regarding work-related services, the most common service was job search assistance, followed by on-the-job training, work experience, and vocational training.

Further details on participation rates across studies and sites are presented in Appendix 8. The appendix contains only data for those studies whose interventions comprised other services than classroom training or education; hence, data from the ILA study (61) and The New Vision study (59) are not presented in the appendix. Furthermore, around 85% of the participants in the treatment group in the MFSP study (58) participated in basic education or on-the-job training (aggregated data, as reported in the main publication from the study).

**Table 7.** Services provided and participation rates in the multi-component programs evaluated in the RCTs (n=7)

Services provided in the RCTs	GAIN study (41)	ILA study (61)	JTPA study (57)	MFSP study (58)	New Visions study (59)	NEWWS study (42)	WASC study (60)
<b>Educational services</b>							
Adult Basic Education (ABE)	18%-42% <sup>1</sup> 31%-60% <sup>2</sup>		4%-11%	85% <sup>3</sup>	68%-78% <sup>4</sup>	9%-58% <sup>1</sup> 18%-69% <sup>2</sup>	7%-9%
Post-secondary education	13%-35% <sup>1</sup> 11%-24% <sup>2</sup>					5%-21% <sup>1</sup> 1%-22% <sup>2</sup>	19%-56% <sup>4</sup>
Classroom training in occupational skills		71%-75%	9%-49%				
<b>Work-related services</b>							
On-the-job training			3%-28%	85% <sup>3</sup>			14%-18%
Job search assistance	14%-38% <sup>1</sup> 11%-32% <sup>2</sup>		12%-30%			1%-39% <sup>1</sup>	38%-43%
Work experience	1%-2% <sup>1</sup> 1%-1.5% <sup>2</sup>		1%-4%			1%-12% <sup>1</sup> 2%-18% <sup>2</sup>	
Vocational training						14%-30% <sup>2</sup>	19%-37%
Miscellaneous services			6%-31%				

GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

<sup>1</sup> Total sample

<sup>2</sup> Participants in need to adult basic education (low skills)

<sup>3</sup> The study reported participation rates in aggregated manner

<sup>4</sup> College courses were also provided

Finally, and in order to facilitate a better understanding of the educational programs across the included RCTs, we provide a description of each of the multi-component programs in the following paragraphs.

### GAIN study (41)

Participants “*in need of basic education*” entered one of three basic education programs: Adult Basic Education (ABE), GED preparation, or English as a Second Language (ESL). They may choose to take job search assistance first but must enroll in basic education classes if they did not find a job. Alternatively, participants may choose to take basic education and then job search or take both concurrently.

The participants who were categorized as “*not in need of basic education*” (i.e., those who had a high school diploma or a GED certificate, proved high literacy in math or reading, and were fluent in English) were first referred to job search activities. These activities included job club group training sessions in which participants learned basic job-seeking and interviewing skills and supervised job search. The participants had access to telephone banks, job listings, employment counseling, and other assistance under staff supervision. Job search activities usually lasted three weeks.

#### *Individual Learning Accounts (ILA) study (61)*

In 2014, Hidalgo and colleagues (61) studied the effects of ILAs for low-skilled workers in the Netherlands. Each participant received a 1000€ voucher for a training (500€ from the government and 500€ from private funds). The vouchers could be used during the two years of the study for a course or training of their choice, which had to contribute to the participants’ labor market position. The study did not provide data on the specific topics taught in the courses. The majority of the courses (75%) taken by the participants were related to the current job (71% in treatment group and 80% in control group). Half of the courses were facilitated outside of working hours. In communication with the study author, he confirmed that only 7% of the participants participated in distance courses; the rest of the participants attended a formal education setting.

#### *JTPA study (57)*

Participants were classified into three subgroups based on the services that program staff recommended prior to random assignment: classroom training in occupational skills (classroom training subgroup); on-the-job training (OJT) and job search assistance (OJT/JSA subgroup); or other services (i.e., work experience or miscellaneous services). Miscellaneous services included assessment, job-readiness training, customized training, vocational exploration, job shadowing, and tryout employment. The study did not provide further details on the specific contents of the services.

#### *MFSP study (58)*

Within the MFSP demonstration, single mothers in the treatment group of the Opportunities Industrialization Center (OIC) program received the following support services: basic skills training and job-skills assessments, counselling, remedial education, job-skill training, job placement assistance, and childcare assistance. Services were offered in-house. At entrance, program participants took a standardized test of basic skills followed by an evaluation of their motivation and personal skills.

OIC adopted a “sequential” approach, in which women with poor basic skills started adult basic education, and then, after reaching some academic requirements, could enter a job-skill training. Educational classes included ABE, ESL and GED preparation in a full-time basis. GED was used as a prerequisite to enter job-skills training. This training

comprised data entry, word processing, and programming as well as nontraditional course in machine operation. The program staff reported that nearly half of the women never made it into such training.

#### *New Visions study (59)*

As mentioned, the New Visions study aimed to prepare welfare recipients for community college occupational training programs and promote job advancement. Following a one-week orientation session, New Visions participants entered a 24-week core program of academic instruction and career guidance. The core program design responded to the special needs of low-income adult students in several ways. It offered a flexible schedule and individualized instruction delivered in a group setting.

The program included college preparatory classes in math, English, reading, office-related computer software, and guidance. Academic instruction relied heavily on applied learning and hands-on assignments drawn from work situations (e.g., math problems arising in varying occupations, resume and cover letter preparation) and other areas of daily living (e.g., interest on loans, income taxes). The guidance class concentrated on critical thinking, problem-solving, communication and study skills needed for success at college, work, and home.

#### *The NEWWS study (42)*

This multicenter study (42) aimed to evaluate the effects of two main welfare-to-work programs, relative to a control group. The first program, “Labor Force Attachment” (LFA), emphasized in placing the participants into jobs quickly to build their work skills. Conversely, the second program, the “Human Capital Development” (HCD), prioritized education as the main channel to build work skills. The HCD program was conceived as an investment in the “human capital” of welfare recipients that allows them to obtain better and more secure jobs.

Three out of the seven sites (i.e., Atlanta, Grand Rapids, and Riverside) included in NEWWS used a three-group random allocation method through which participants were allocated to either one of two active welfare-to-work programs (Human Capital Development or Labor Force Attachment) or a control group (no program participation). Unlike this three-group approach, three sites (i.e., Oklahoma City, Detroit, and Portland) did not design any specific program and assigned participants to similar services according to their needs. Finally, Columbus tested two models of case management (Traditional vs. Integrated models).

The programs studied in the NEWWS study are described below:

*Human Capital Development (HCD):* Case managers in HCD used educational tests (i.e., math or reading literacy tests) as part of a deep assessment of the participants’ obstacles and needs to find a job. An employment development plan was then created for each participant, which might contain education, vocational training, and other activities aiming to prepare the participant for better employment opportunities. HCD activities were expected to be completed within two years but longer participation could be allowed for more disadvantaged participants. Adult basic education (ABE) was the



most common services provided in HCD, due to the high number of participants “*in need to basic education*”. ABE encompassed GED and high school completion programs, as well as courses for adults with low literacy or mathematics skills (usually 8th grade level or below), and English as a Second Language (ESL) programs for non-English speakers.

The program expected that the participants could find a job after completing their educational activities. However, those who did not succeed were offered additional activities, such as more education, vocational training, job search activities, or work-experience. No educational institution in any site served exclusively to participants in the welfare-to-work programs tied to NEWS; participants attended classes together with regular students.

*Labor Force Attachment (LFA)*: Participants assigned to this program were assisted by a case manager to enroll a job club (the first LFA activity), in which they were taught job search skills and underwent job search activities. Later, they entered a “phone room” where they called employers and lined up interviews under supervision by program’s staff. These activities lasted between three to five weeks and included minor classroom components. After assessment by the case managers, the majority of the participants who did not find a job were assigned longer job search activities (i.e., more intense and individualized support). Some participants could also be assigned to short-term basic education or vocational training lasting up to nine months, or to on-the-job training or unpaid work experience in the public or private not-for-profit sector.

*Integrated and Traditional models of case management: Columbus*.: Columbus was the only site testing two different case management models. In the Traditional model, two different case managers handled all welfare department’s employment and training and income maintenance functions. Both case managers worked with relatively large caseloads. Conversely, the Integrated model involved only one case manager, working with smaller caseload than either of the traditional workers and was expected to provide more intensive services (42).

In general, Atlanta HCD, Grand Rapids HCD, Riverside HCD, Columbus Integrated and Traditional programs, Oklahoma, and Detroit emphasized on basic education (Human Capital Development). Conversely, Atlanta LFA, Grand Rapids LFA, Riverside LFA, and Portland focused on LFA activities. This last group is designed as on-the-job training and job search assistance (OJT/JSA) subgroup.

#### WASC study (60)

Participants typically went directly to an orientation and first meeting with a career coach. Services provided to participants included job search activities, on-the-job training, and educational services, such as ABE, GED, ESL, high school, and college courses. Each of the three sites (i.e., Dayton, San Diego, and Bridgeport) in the study successfully implemented the basic program model, which comprised two main components:

*Skills development.* Participants were offered traditional classroom-based training, on-the-job training opportunities, and paid work experience in order to increase their skills to qualify for better-paying jobs.

*Career coaching.* Career coaches assisted participants to define short and long-term advancement goals and the steps necessary to reach them. For example, participants received guidance about securing promotions, raises, increased hours, and benefits in their current jobs. Coaches also guided participants find higher-paying positions elsewhere, with job developers sometimes identifying such positions. Besides, coaches set up informational interviews with employers.

### ***Nordic registry-based studies***

All details that were available in the publications of the six Nordic RBs are presented in the section “*Educational interventions in the included studies*”. The authors did not provide a description of the participation rates and the components taught through the educational interventions. The level of description is mostly categorical, which indicates the participants were enrolled in an educational service, but no further details were available in the publications.

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## **Description of the outcome measures**

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### **Randomized-controlled trials (RCTs)**

The seven included RCTs evaluated the effects of educational programs on employment, earnings, working hours, and job duration (table 8). These outcomes were prioritized in line with the commission’s interest. Apart from the ILA study (61) and New Visions study (59), all included studies reported on participants’ employment. The most common measures were employment rate and employment probability (reported in the studies as “ever employed”). The GAIN study (39;41), The JTPA study (57), and The NEWWS study (43) reported participants’ employment rates; whereas The GAIN study (39-41), The MFSP study (58), The NEWWS study (42), The WASC study (60;63) reported on employment probability.

All studies measured impacts on earnings, especially on average total earnings (41;43;57-59). Hamilton et al. in 2016 (62) reported on the impacts of educational programs on average annual earnings at 10-15 years after entry into the program, which is the longest follow-up reported in this systematic review. Three studies reported measures of working hours (57;58;60), such as average working hours per week in the WASC study (60;63), working hours (average per quarter) in the JTPA study (57), or average working hours per month in the MFSP study (58). Job duration measures (weeks worked) were reported in the MFSP study (58).

### ***Data sources for outcome measurement***

The majority of the included studies did not report complete details about the sources for outcome measurement. The main two outcomes of this systematic review (i.e., em-

ployment and earnings) were measured by administrative data, such as state unemployment and earnings records, and by client surveys (mostly interviews). Four studies used both administrative data and client surveys to track impact data (41;42;57;59), whereas the WASC study (60) used only administrative data; the MFSP study (58) used interviews; and the ILA study (61) collected data by using an unspecified written questionnaire. See table 9.

**Table 8.** Overview of the outcome measures reported in the RCTs (n=7)

Outcome measure	GAIN study (41)	ILA study (61)	JTPA study (57)	MFSP study (58)	New Visions study (59)	NEWWS study (42)	WASC study (60)
<b>Employment measures</b>							
Employment rate	X		X			X	
Employment probability	X			X		X	X
<b>Earning measures</b>							
Total earnings	X			X		X	X
Average total earnings	X		X		X	X	
Average monthly earnings		X		X			
Average annual earnings	X					X	X
<b>Working hours measures</b>							
Working hours (average per quarter)			X				
Average working hours per week							X
Average working hours per month				X			
<b>Job duration measures</b>							
Weeks worked			X				

GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

**Table 9.** Data sources for outcome measurement in the RCTs (n=7)

Included study	Data source for outcome measurement
GAIN study (41)	Administrative data: California State Unemployment Insurance Earnings and Benefits Records. Client survey from a randomly selected sample of participants.
ILA study (61)	Unspecified written questionnaire.
JTPA study (57)	Administrative data: State employment records, and The national Job Training Quarterly Survey (JTQS) of JTPA participants drawn from administrative records. Client survey from a randomly selected sample of participants.
MFSP study (58)	All findings come from interviews conducted at 12 months and at 30 months after entering the program.
New Visions study (59)	Administrative data: not specified. Client survey from a randomly selected sample of participants.

NEWWS study (42)	Administrative data: Statewide unemployment insurance earnings records and National Directory of New Hires quarterly wage records. Client survey from a randomly selected sample of participants.
WASC study (60)	Administrative data: Unemployment insurance (UI) wage records, provided by the Ohio Departmental Family Services (ODJFS) and the Employment Development Department (EDD) in California.

GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

### Nordic registry-based studies

All the six Nordic RBs reported on the effects of educational interventions on participants' employability (i.e., employment rates or probabilities). In Denmark, Holm and colleagues (56) reported also on duration of the subsequent employment spell (employment duration) and return-to-work (RTW); the last outcome is not described in the present systematic review. All outcomes were measured by using registry data, which are listed at the end of the section "*Characteristics of the included studies*".

## Quality appraisal of the included studies

### Randomized-controlled trials (RCTs)

Two of the seven RCTs (60;61) (29%) were judged to be at low risk for random sequence generation in the selection bias domain, whereas none of the RCTs provided sufficient details or made efforts to conceal participants' allocation to the study groups. None of the studies reported details about the blinding of participants nor outcome assessors. Only one study used appropriate methods to prevent attrition bias due to incomplete outcome data (59). Reporting bias was high in two studies (41;42), the remaining studies provided insufficient details to judge reporting bias (table 10). Appendix 9 presents further details on the quality appraisal.

**Table 10.** Quality appraisal of the RCTs (n=7)

Included study	Selection bias: Random sequence generation	Selection bias: Allocation concealment	Performance bias: Blinding (participants, personnel)	Detection bias: Blinding (outcome assessment)	Attrition bias: Incomplete outcome data	Reporting bias: Selective reporting
GAIN study (41)	High	Unclear	Unclear	Unclear	Unclear	High
ILA study (61)	Low	High	Unclear	Unclear	High	Unclear
JTPA study (57)	High	Unclear	Unclear	Unclear	Unclear	Unclear
MFSP study (58)	High	Unclear	Unclear	Unclear	Unclear	Unclear

New Visions study (59)	High	High	Unclear	Unclear	High	High
NEWWS study (42)	High	Unclear	Unclear	Unclear	Low	Unclear
WASC study (60)	Low	Unclear	Unclear	Unclear	Unclear	Unclear

GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

### Nordic registry-based studies

All the Nordic RBs exhibited moderate methodological quality (table 11). For obvious reasons, none of the studies blinded outcome assessors nor were prospective. The use of registry data is deemed as a reliable source for outcome assessment. Therefore, these items should not be taken into consideration when appraising the quality of retrospective registry-based studies. Kvinge 2006 (49) was the only study that reported the absence of differences on background variables between groups. Two studies reported the use of appropriate methods for dealing with missing data.

**Table 11.** Quality appraisal of the Nordic registry-based studies (n=6)

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Overall
Cools 2018	-	+	+	-	+	+	+	+	+	-	Moderate
Hauan 2015	-	+	+	-	+	+	+	+	+	-	Moderate
Holm 2017	-	+	+	-	+	+	+	+	+	-	Moderate
Kvinge 2006	+	+	+	-	+	+	-	+	+	-	Moderate
Salvanes 2018	-	+	+	-	+	+	+	+	+	-	Moderate
Zhang 2016	-	+	+	-	+	+	-	+	+	-	Moderate

Q1: Were the groups comparable for important background factors?

Q2: Were the exposed individuals representative of a defined population?

Q3: Was the study prospective?

Q4: Was the control group(s) selected from the same population as the exposed group(s)?

Q5: Was exposure and outcome measured equally and reliably in the groups?

Q6: Were many enough people in the cohort followed-up?

Q7: An analysis of attrition was done to explain whether those who have abandoned the study differ from those who have been followed-up?

Q8: Was the follow-up time long enough to show positive and/or negative outcomes?

Q9: Were known, possible confounding factors taken into account in the design and/or analysis of the study?

Q10: Was the person who assessed the results (endpoints) blinded to who was exposed and who was not exposed?

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## Outcome effects of educational interventions

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We present the effects of interventions per comparison: educational programs versus no intervention, and educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA), and by outcome (primary and secondary), followed by different follow-up periods. Statistical considerations used due to incomplete data reporting (e.g., scale transformation and imputations of precision measures) are reported under each analysis when applicable.

A narrative description of the findings from the Nordic RBs is presented at the end of the results sections, separated from the results of the RCTs. The description is narrative and does not represent any synthesis across studies.

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## Effects on employment

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This systematic review summarizes effect data for two measures of employment:

- employment rate
- employment probability.

Table 12 presents the summary of the measures of employment and follow-up periods.

**Table 12.** Measures of employment and comparisons for analysis in the included RCTs (n=7)

Measure of employment	Follow-up period(s)	Primary studies (number of sites)
<b>Comparison 1: Educational programs versus no intervention</b>		
Employment rate	Year 1	GAIN 1994 (2 sites) JTPA study (1 site) NEWWS 2000 (8 sites)
	Year 2	GAIN 1994 (2 sites) JTPA study (1 site) NEWWS 2000 (8 sites)
	Year 3 to 5	GAIN 1994 (2 sites) NEWWS 2000 (8 sites)
Employment probability (ever employed)	Year 1	WASC (3 sites) (2009,12)
	Year 2	NEWWS 2000 (8 sites) WASC (3 sites) (2009,12)
	Year 3	WASC (2 sites) 2012
	Year 4	WASC (2 sites) 2012
	Years 1-5	GAIN 1996 (2 sites) NEWWS 2001 (8 sites)
	Years 1-3 Years 4-6 Years 7-9	GAIN 2000 (3 sites) Participants with low skills
<b>Comparison 2: Educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA)</b>		

Employment probability (ever employed)	Years 1-5	NEWWS 2001 (4 sites)
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GAIN study, The California's Greater Avenues for Independence study; JTPA study, The Job Training Partnership Act study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

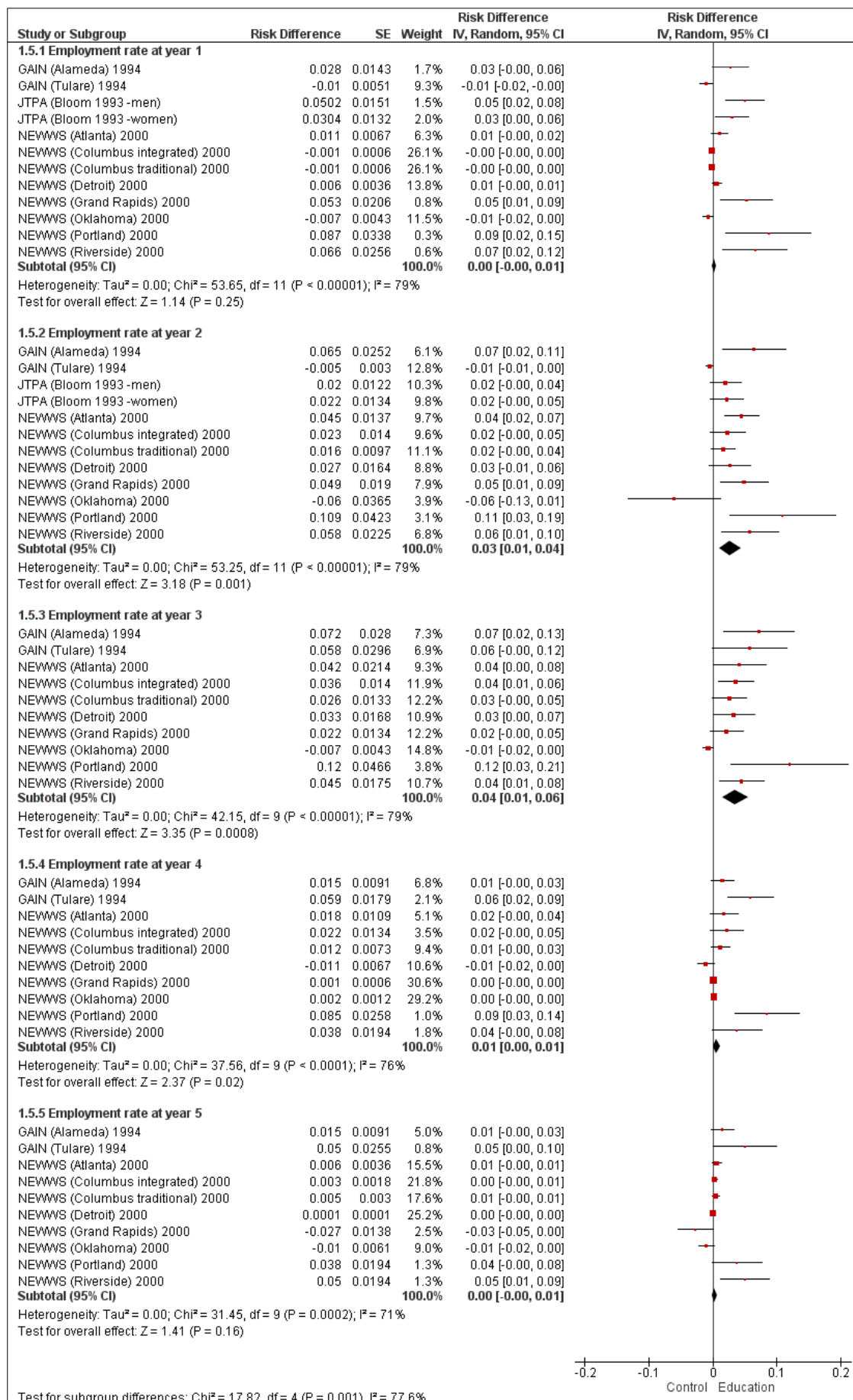
### **Comparison 1. Effects of educational programs versus no intervention (no program participation) (main comparison)**

#### ***Employment rate***

Three studies provided data for the meta-analysis (i.e., GAIN study (39;41), JTPA study (57); NEWWS study (42;43). Because the included studies did not report the number of participants in each group nor exact statements of precision (e.g., p-values), the 95% confidence intervals presented here are the widest intervals that are consistent with the available evidence (see data analysis in the methods section for further details).

#### ***Effects at years 1-5***

No difference between educational programs and no intervention was observed at first year follow-up (Risk Difference 0.0% (95% CI -0% to 1%); P=0.25) (Figure 3). Assuming that 10 out of 100 people are employed under no intervention, we anticipate that three more people (between one to four people more) would be employed if they take part in educational programs at two years follow-up (Risk Difference 0.03 (95% CI 0.01 to 0.04); P=0.001). A larger effect, indicating that four more people would be employed (between one to six people more) by taking part in educational programs was observed at three years follow-up (Risk Difference 0.04 (95% CI 0.01 to 0.06); P=0.0008). This difference decreased to one more person being employed (between none to one person more) at four years follow-up (Risk Difference 0.01 (95% CI 0.0 to 0.01); P=0.02). No difference was observed at five years follow-up (Risk Difference 0.00 (95% CI -0.00 to 0.01); P=0.16). Very low-quality evidence suggests that it is uncertain whether educational programs improve employment rate compared to no intervention in unemployed adults up to five years follow-up (table 13).



Test for subgroup differences: Chi<sup>2</sup> = 17.82, df = 4 (P = 0.001), I<sup>2</sup> = 77.6%



**Figure 3.** Effects of educational programs versus no intervention on employment rate at years 1-5

**Table 13.** Summary of findings table: effects of educational programs versus no intervention on employment rate

Comparison: educational programs versus no intervention						
Setting: USA						
Intervention group: educational programs						
Control group: no intervention						
Population: Unemployed adults, welfare recipients						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			№ of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated control	Anticipated Education	Difference (Education minus no intervention)		
Employment rate: 1 year	RD 0 (-0.00 to 0.01)	10 per 100 people	10 per 100 people (10 to 11 people)	No difference (0 to 1 person)	Approx. 49,000 (3 RCTs)	⊕○○○ VERY LOW <sup>123</sup>
Employment rate: 2 years	RD 0.03 (0.01 to 0.04)	10 per 100 people	13 per 100 people (11 to 14 people)	3 people more employed (1 to 4 people)	Approx. 49,000 (3 RCTs)	⊕○○○ VERY LOW <sup>123</sup>
Employment rate: 3 years	RD 0.04 (0.01 to 0.06)	10 per 100 people	14 per 100 people (11 to 16 people)	4 people more employed (1 to 6 people)	Approx. 38,000 (2 RCTs)	⊕○○○ VERY LOW <sup>123</sup>
Employment rate: 4 years	RD 0.01 (0 to 0.01)	10 per 100 people	11 per 100 people (10 to 11 people)	1 person more employed (0 to 1 person)	Approx. 38,000 (2 RCTs)	⊕○○○ VERY LOW <sup>123</sup>
Employment rate: 5 years	RD 0 (-0.00 to 0.01)	10 per 100 people	10 per 100 people (10 to 11 people)	No difference (0 to 1 person)	Approx. 38,000 (2 RCTs)	⊕○○○ VERY LOW <sup>123</sup>

\* The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the comparison group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial; RD: Risk difference  
 1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")  
 2. High inconsistency ( $I^2 > 70\%$ )  
 3. Indirectness due to differences in the interventions: multi-component programs.

### Employment probability

#### Effects at years 1-4

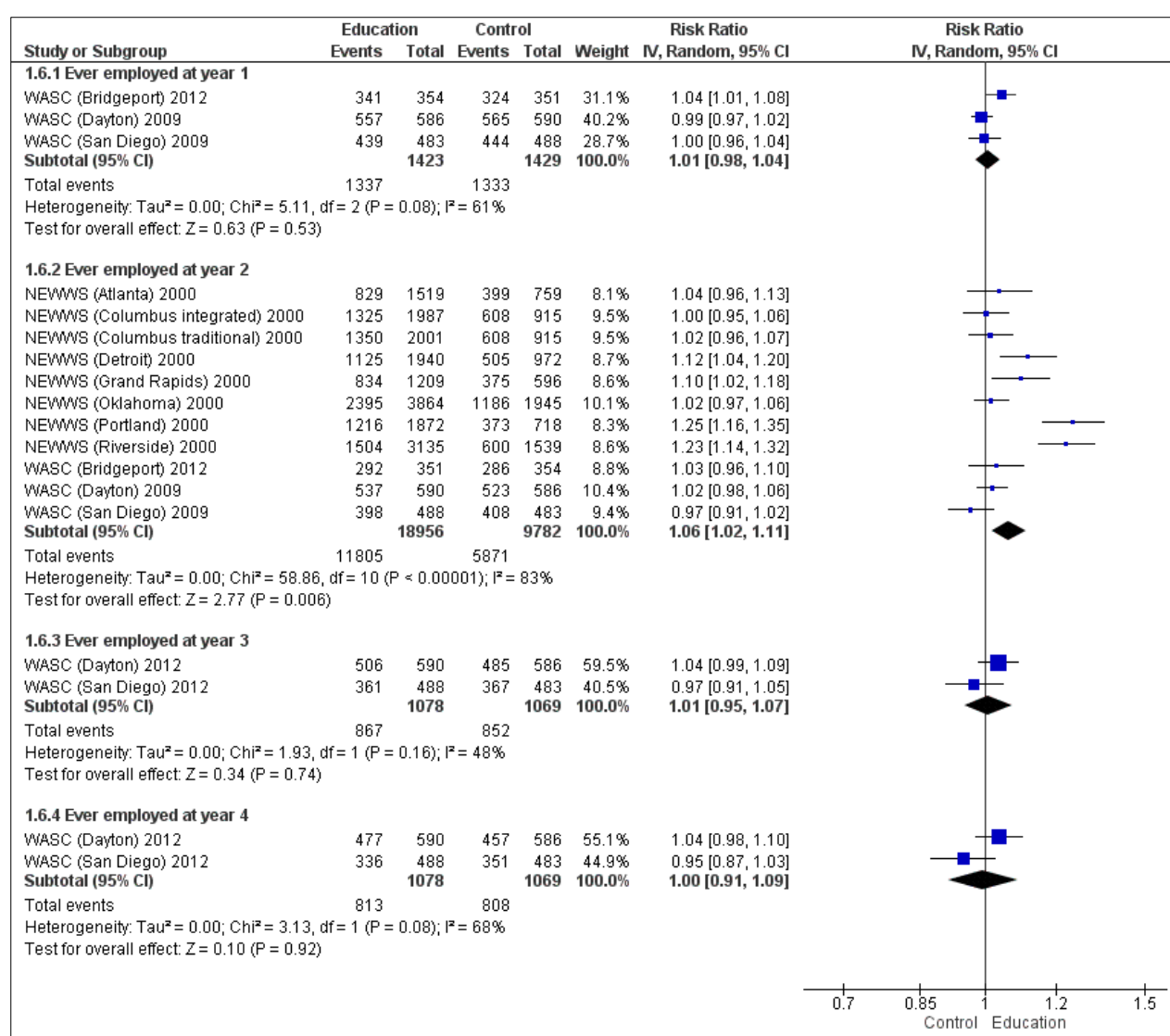
The following three studies provided data for the meta-analysis: the GAIN study (39;41), NEWWS study (42;43), and WASC study (60;63). We did not impute any data for this analysis. We did not use data from the MFSP study (58) in the meta-analysis due to the different follow-up periods reported (i.e., 1-3 years and 2-3 years). The study found no difference in participants' employment probability between educational programs and no intervention for either of the two follow-up periods (58).

Pooled data from the three sites in the WASC study (60;63) indicated that, assuming 933 per 1000 people would be employed after one year if no intervention were implemented, 9 more people per 1000 (95% CI 19 fewer to 37 more) would gain employment if an educational program was implemented (RR 1.01 (95% CI 0.98 to 1.04); P=0.53) (Figure 4).

At two years follow-up, data from all sites in both the NEWWS (42) and the WASC study (60;63) showed that the difference in favor of the educational programs increased: up

to 36 more (95% CI 12 to 66 more) people gaining employment (RR 1.06 (95% CI 1.02 to 1.11); P=0.006) (Figure 4). Very low-quality evidence suggests that it is uncertain whether educational programs improve employment probability compared to no intervention during the first two years follow-up (table 14).

Two sites from the WASC study (60;63) provided data for both three and four years follow-up. Assuming that 797 per 1000 people are employed under no intervention, we anticipate 8 more (95% CI 40 fewer to 56 more) people would gain employment if they participate in educational programs compared to no intervention at three years follow-up (RR 1.01 (95% CI 0.95 to 1.07); P=0.74) (Figure 4). Conversely, no difference was observed at four years follow-up (RR 1 (95% CI 0.91 to 1.09); P=0.92) (figure 4). Low-quality evidence suggests that educational programs may result in little to no difference in employment probability during the third and four years of follow-up (table 14).



**Figure 4.** Effects of educational programs versus no intervention on employment probability in years 1-4

**Table 14.** Summary of findings table: effects of educational programs versus no intervention on employment probability in years 1-4

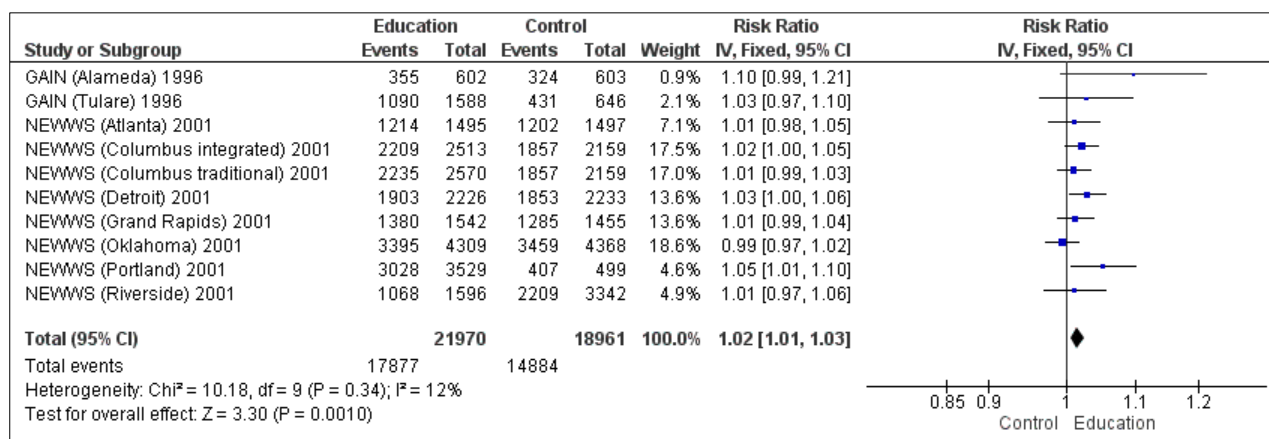
Comparison: educational programs versus no intervention						
Setting: USA						
Intervention group: educational programs						
Control group: no intervention						
Population: low skilled workers and unemployed adults						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			No of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated control	Anticipated Education	Difference (Education minus no intervention)		
Employment probability: 1 year	<b>RR 1.01</b> (0.98 to 1.04)	933 per 1 000 people	942 per 1 000 people (914 to 970)	9 more employed (19 more unemployed to 37 more employed)	2,852 (1 RCT)	⊕○○○ VERY LOW <sup>1,2,3</sup>
Employment probability: 2 years	<b>RR 1.06</b> (1.02 to 1.11)	600 per 1 000 people	636 per 1 000 people (612 to 666)	36 more employed (12 to 66 more employed)	28,738 (2 RCTs)	⊕○○○ VERY LOW <sup>2,4,5</sup>
Employment probability: 3 years	<b>RR 1.01</b> (0.95 to 1.07)	797 per 1 000 people	805 per 1 000 people (757 to 853)	8 more employed (40 more unemployed to 56 more employed)	2,147 (1 RCT)	⊕⊕○○ LOW <sup>2,3</sup>
Employment probability: 4 years	<b>RR 1.00</b> (0.91 to 1.09)	756 per 1 000 people	756 per 1 000 people (688 to 824)	No difference (68 more unemployed to 68 more employed)	2,147 (1 RCT)	⊕⊕○○ LOW <sup>2,3</sup>

\* The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the comparison group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial; RR: Risk ratio

1. High inconsistency: wide variance in effect estimates; substantial heterogeneity ( $I^2=61\%$ ).
2. Indirectness due to differences in the interventions: multi-component programs.
3. Imprecision: confidence intervals include appreciable benefit or harm.
4. High risk of bias for random sequence generation (participants were randomly allocated "by chance") in NEWWS study
5. High inconsistency due to considerable heterogeneity ( $I^2=83\%$ ).

### Effects at years 1-5

Data from two sites in the GAIN study (39) and all sites in the NEWWS study (43) indicated that assuming 785 per 1000 people are employed under no intervention, we anticipate that 16 more (95% CI 8 to 24 more) people would gain employment by participating in educational programs compared to no intervention (RR 1.02 (95% CI 1.01 to 1.03);  $P=0.001$ ) (Figure 5). Low-quality evidence suggests that educational programs may result in little to no difference compared to no intervention in employment probability between one to five years of follow-up (table 15).



**Figure 5.** Effects of educational programs versus no intervention on the employment probability at years 1-5

**Table 15.** Summary of findings table: effects of educational programs versus no intervention on employment probability at years 1-5.

Comparison: educational programs versus no intervention						
Setting: USA						
Intervention group: educational programs						
Control group: no intervention						
Population: unemployed adults						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			№ of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated control	Anticipated Education	Difference (Education minus no intervention)		
Employment probability: years 1-5	<b>RR 1.02</b> (1.01 to 1.03)	785 per 1 000 people	<b>801 per 1 000 people</b> (793 to 809)	16 more employed (8 to 24 more employed)	40,931 (2 RCTs)	⊕⊕○○ LOW <sup>1,2</sup>

\* The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the comparison group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial; RR: Risk ratio

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs.

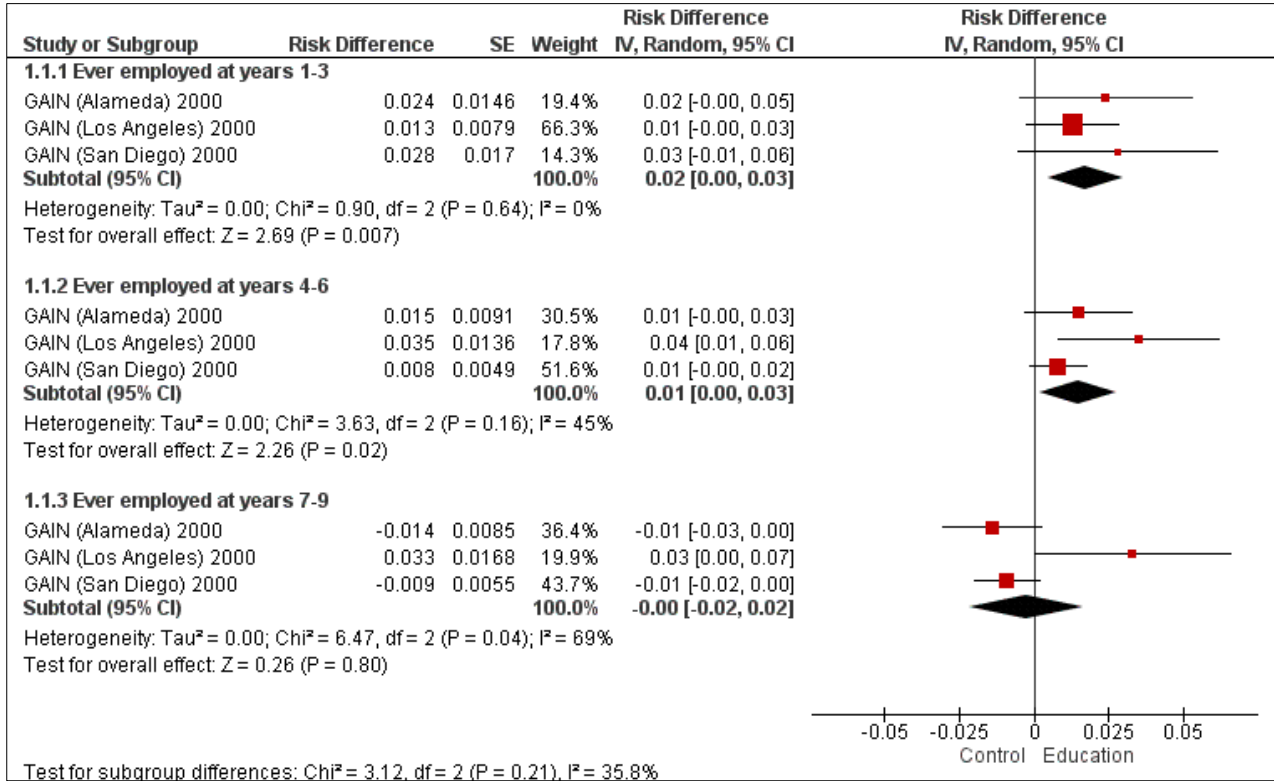
### Participants with low skills (subgroup 1)

Three sites in the GAIN study (39;41) provided data for the subgroup of participants with low-skills at enrollment (see Figure 6). Because the included studies did not report the number of participants in each group nor exact statements of precision (e.g., p-values), the 95% confidence intervals presented here are the widest intervals that are consistent with the available evidence (see data analysis in the methods section for further details).

The results indicated that assuming 10 per 100 people are employed under no intervention, 2 more (95% CI 0 to 3 more) people would be employed if they take part in educational programs relative to no intervention at years 1-3 follow-up (Risk Difference 0.02 (95% CI 0.00 to 0.03); P=0.007) (Figure 6). A smaller difference of 1 more (95% CI 0 to 3 people more) person being employed by participating in educational programs would be anticipated after 4–6 years (Risk Difference 0.01 (95% CI 0.0 to 0.03);

P=0.02) (Figure 6). Low-quality evidence suggests that educational programs may result in little to no difference in employment probability for participants with low skills at years 1-3 and 4-6 follow-up (table 16).

No difference between educational programs and no intervention was observed at years 7-9 follow-up (Risk Difference -0.00 (95% CI -0.02 to 0.02); P=0.80) (Figure 6). Very low-quality evidence suggests that it is uncertain whether educational programs improve employment probability compared to no intervention in unemployed people with low skills at years 7-9 follow-up (table 16).



**Figure 6.** Effects of educational programs versus no intervention on employment probability in unemployed adults with low skills at enrollment

**Table 16.** Summary of findings table: effects of educational programs versus no intervention on employment probability in unemployed adults with low skills at enrollment

Comparison: educational programs versus no intervention						
Setting: California, USA						
Intervention group: educational programs						
Control group: no intervention						
Population: unemployed adults with low skills (no high school at program enrollment)						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			№ of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated control	Anticipated Education	Difference (Education minus no intervention)		
Employment probability: years 1-3	<b>RD 0.02</b> (0 to 0.03)	10 per 100 people	12 per 100 people (10 to 13)	2 more employed (0 to 3 more employed)	Approx. 13,000 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>

Employment probability: years 4-6	<b>RD 0.01</b> (0 to 0.03)	10 per 100 people	11 per 100 people (10 to 13)	1 more employed (0 to 3 more employed)	Approx. 13,000 (1 RCT)	⊕⊕○○ LOW <sup>1,2</sup>
Employment probability: years 7-9	<b>RD 0</b> (-0.02 to 0.02)	10 per 100 people	10 per 100 people (8 to 12)	No difference (2 more unemployed to 2 more employed)	Approx. 13,000 (1 RCT)	⊕○○○ VERY LOW <sup>1,2,3</sup>

\* The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the comparison group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial; RR: Risk ratio

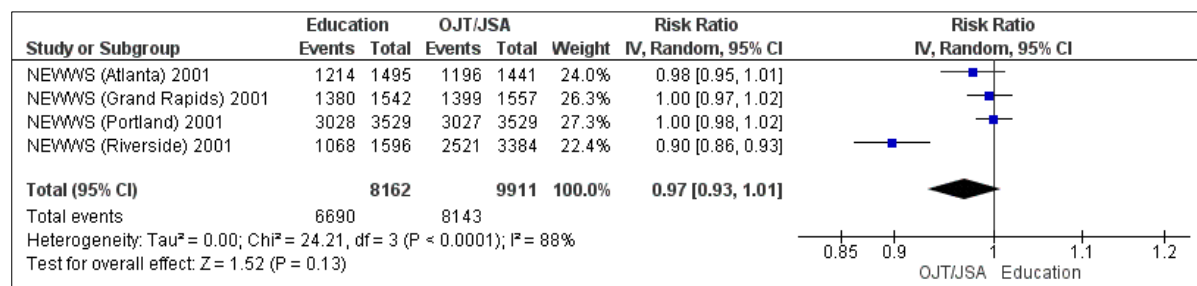
1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs
3. Imprecision: confidence intervals include appreciable benefit or harm.

## Comparison 2. Educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA)

Data from four sites in the NEWWS study (43) provided data for this comparison (i.e., Atlanta, Grand Rapids, Portland, and Riverside). The other sites did not report separate data for programs that focused on OJT/JSA. The literature also refers to this group as work-related services.


### Employment probability

Assuming 822 per 1000 people are employed under OJT/JSA programs, we anticipate that 25 fewer (95% CI 58 fewer to 8 more) people would be employed if they participate in educational programs compared to OJT/JSA programs after 5 years (RR 0.97 (95% CI 0.93 to 1.01); P=0.13). See Figure 7. Very low-quality evidence suggests that it is uncertain whether educational programs improve employment probability compared to OJT/JSA programs in unemployed adults at years 1-5 follow-up (table 17).



**Figure 7.** Effects of educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA) on employment probability at years 1-5

**Table 17.** Summary of findings table: effects of educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA) on employment probability at years 1-5

Comparison: Educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA)						
Setting: USA						
Intervention group: educational programs						
Control group: OJT/JSA programs						
Population: unemployed adults, welfare recipients						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			No of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated OJT/JSA	Anticipated Education	Difference (Education minus no intervention)		
Employment probability: years 1-5	<b>RR 0.97</b> (0.93 to 1.01)	822 per 1 000	797 per 1 000 people (764 to 830)	25 fewer employed (58 fewer employed to 8 more employed)	18,073 (1 RCT)	 VERY LOW <sup>1,2,3</sup>

\* The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the comparison group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial; RR: Risk ratio

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs
3. Imprecision: confidence intervals include appreciable benefit or harm.

## Overview of employment effects from the Nordic RBs

In general, the Nordic RBs showed that educational programs resulted in positive employment effects (table 18). We first provide a summary of the main findings of the Norwegian RBs (48;49;53-55) and end the section with findings from the Danish RB of Holm and colleagues (56).

Cools 2018 (53) observed that youth with reduced work ability that participated in educational programs as part of labor market training had lower employment probabilities than those who did not participate in any program (8.2% lower probability, ranging from 12.6% lower to 3.6% lower) during program participation (Hazard ratio 0.92, 95%CI 0.87 to 0.96). But, they had higher employment probabilities (9.7% higher probability, ranging from 3.2% higher to 16.7% higher) after program completion (Hazard ratio 1.09, 95%CI 1.03 to 1.16).

In 2006, Kvinge and Djuve (49) found that 35% of the non-western immigrants that participated in any labor market program were employed at the end of the two-year observation period (employment rate: men 35% and women 31%). The largest effect was seen for wage subsidies (employment rate: men 59% and women 53%), while education demonstrated the second largest effect (employment rate: men 39% and women 36%). Conversely, the smallest effects were seen for those who did not participate in any program (employment rate: men 32% and women 28%) and those who participated in work practice (employment rate: men 36% and women 34%). Further analyses revealed that immigrants from Latin America had the largest employment effect (close to 50% employment rate), whereas those from Africa benefited least from the educational interventions (employment rate close to 30%). Participation in education

plus wage subsidies was positively correlated with employment for immigrants from Africa, Asia, and Eastern Europe but not for those from Latin America. The authors observed that non-western immigrants usually become involved in jobs related to the health and social sector, hotel, restaurant, and trade in goods.

In 2015, the study published by Hauan (48), which included participants with reduced work ability, found that labor market training (i.e., a combination of practical and theoretical training at a work place) increased participants' employment probabilities by 15 percentage points compared to a benefit of 5 percentage points observed for those who received assistance services. Participants in work practice had the lowest benefit (0.9 percentage points). The author indicated that the difference between the results advocated training as the best program when the goal is regular work.

In 2018, Salvanes and colleagues (54) evaluated the impact of the introduction of a national reform that raised the age limit for education support from 22 to 26 years in 2004, comparing employment outcomes for young people who were registered as disabled before and after the reform change. The participation in education services led to a 6.9% decrease in employment rates at five years (regression coefficient -0.034; standard error 0.030), while no negative results were observed in employment nine years later (regression coefficient -0.023; standard error 0.030).

The study by Zhang (55) indicated that participants' employment probabilities were negative (total effect of 13% lower probability) while attending educational courses, but they turned positive once the participants completed the intervention and they started looking more actively for employment (total effect of 29% higher probability). These findings represented an interesting evidence of the so-called lock-in effect, which refers to the negative employment effects that activation programs initially produce since participants spend less time and effort on job search activities due to the attendance when compared to non-participants (65). This will be further mentioned in the discussion of our findings. Immigrants showed the largest lock-in effect (34% lower employment probabilities while in the educational program). Participants with low education showed a lock-in effect of -10% employment probabilities, and a favorable effect of 28% increase in employment probabilities once the courses were completed. Overall, the study found that education had stronger employment effects and less lock-in effect than work practice. This means, a train-then-place approach worked out better than place-then-train, especially for young people, low-educated participants, and immigrants. This last subgroup was the one who benefited most from the educational intervention.

The participation in education after work practice proved an effect of 73% higher employment probabilities in the whole population, being highest for immigrants (105% higher probabilities) and lowest for low-educated participants (23% higher probabilities). On the other hand, the provision of work practice after education resulted in an increase of 15% on employment probability; higher among immigrants (46%) and low-educated participants (30%). The lock-in effects for this last form of intervention was about 46%.



In Denmark, Holm and colleagues (56) concluded that two out of the four labor market programs studied, namely ordinary education and wage-subsidized job training, yielded positive employment effects. The authors argued that the positive effect of ordinary education was due to a positive effect on the duration of the subsequent employment spell, while the positive effect of subsidized job training corresponded to a positive effect on the transition into employment. The two other programs, non-formal education and subsidized internships resulted in negative employment effects. In terms of average treatment effects, taking into account both the lock-in effect as well as the post program effect, ordinary education delayed the transition into employment by two days (effect estimate: 0.059; 5.9% of a month), while a larger lock-in effect of seven days delay was seen for non-formal education (23% of a month). The other two programs had also negative effects of three weeks for subsidized job training, and less than one day for subsidized internships, respectively. Finally, ordinary education was the only program which in the study that prolonged the subsequent employment duration (11 days; 38% of a month).

**Table 18.** Summary of results across the Nordic registry-based studies (n=6)

	Employment rate/probability	Low-educated participants	Immigrants	Employment duration
Cools 2018 (53)	+1			
Kvinge 2006 (49)	+		+	
Hauan 2015 (48)	+			
Salvanes 2018 (54)	+			
Zhang 2016 (55)	+1,2		+1	
Holm 2017 (56)	+1	+1		+

Legend: + favors the intervention (education) relative to no program. Empty cell means the study did not examine the outcome or did not report separate data for the subgroup of interest.

<sup>1</sup> The study reported evidence of lock-in effect.

<sup>2</sup> Favorable results as the initial negative employment effects disappeared in the long term (nine years).

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## Effects on earnings

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We present data for four different measures of earnings:

- total earnings
- average total earnings
- average monthly earnings
- average annual earnings.

In order to facilitate a better understanding of the subgroups under study, we present data for participants with low skills in the GAIN study (i.e., participants who at enrollment lacked a high school diploma or GED test, who proved low skills on math or reading, or who required English remediation) as an independent subgroup of *participants with low skills*. Furthermore, we categorized as *participants with high skills* to those

groups in which most of the participants entered the educational programs with a high school diploma or GED test. However, due to unclear reporting in the primary studies, this last subgroup might also contain participants with low skills. Table 19 presents the summary of the measures of earnings and follow-up periods.

We calculated difference in log mean earnings and its 95% confidence interval. A salary of 10,000 Norwegian kroner (NOK) was assumed as an anticipated level of earnings in the control group in order to facilitate a clearer interpretation of the differences between educational programs and control group (no intervention) on participants' earnings. See data analysis in the methods section for further details.

**Table 19.** Measures of earnings and comparisons for analysis in the included studies

Measure of earnings	Follow-up period(s)	Subgroup of interest	Primary studies (sites)	
<b>Comparison 1: Educational programs versus no intervention</b>				
<b>Total earnings</b>	Year 1	Participants with low skills	GAIN 1994 (6 sites)	
		Participants with high skills	GAIN 1994 (2 sites) JTPA study NEWWS 2001 (8 sites) WASC study (2 sites)	
	Year 2	Participants with low skills	GAIN 1994 (6 sites)	
		Participants with high skills	GAIN 1994 (2 sites) JTPA study NEWWS 2001 (8 sites) WASC study (3 sites)	
	Year 3	Participants with low skills	GAIN 1994 (6 sites)	
		Participants with high skills	GAIN 1994 (2 sites) MFSP study NEWWS 2001 (8 sites) WASC study (3 sites)	
	Year 4	Participants with low skills	GAIN 1994 (6 sites)	
		Participants with high skills	GAIN 1994 (2 sites) NEWWS 2001 (8 sites)	
	Year 5	Participants with low skills	GAIN 1994 (6 sites)	
		Participants with high skills	GAIN 1994 (2 sites) NEWWS 2001 (8 sites)	
	<b>Average total earnings</b>	Year 1	Employed adults	New Visions
		Year 2	Employed adults	New Visions
Year 3 (first half)		Employed adults	New Visions	

	Years 1-3	Participants with low skills	GAIN 1994 (6 sites)
	Years 1-5	Participants with low skills	GAIN 1994 (6 sites)
	Year 5	Participants with high skills	NEWWS 2001 (8 sites)
<b>Average monthly earnings</b>	Year 2	Low-skilled workers	ILA study (Hidalgo 2014)
	Years 2-3	Unemployed single mothers	MFSP study
<b>Average annual earnings</b>	Years 1-3	Participants with low skills	GAIN 2000 (3 sites)
	Years 1-4	Low-wage workers	WASC study (3 sites)
	Years 4-6	Participants with low skills	GAIN 2000 (3 sites)
	Years 7-9	Participants with low skills	GAIN 2000 (3 sites)
	Years 10-15	Participants with high skills	NEWWS 2016 (3 sites)

**Comparison 2: Educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA)**

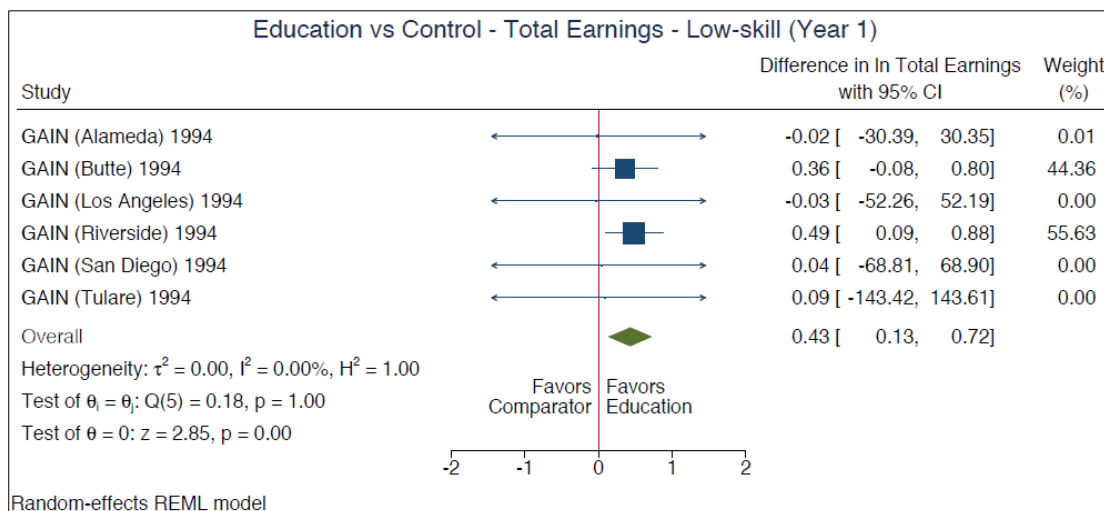
<b>Average annual earnings</b>	Years 10-15	Participants with high skills	NEWWS 2016 (3 sites)
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GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

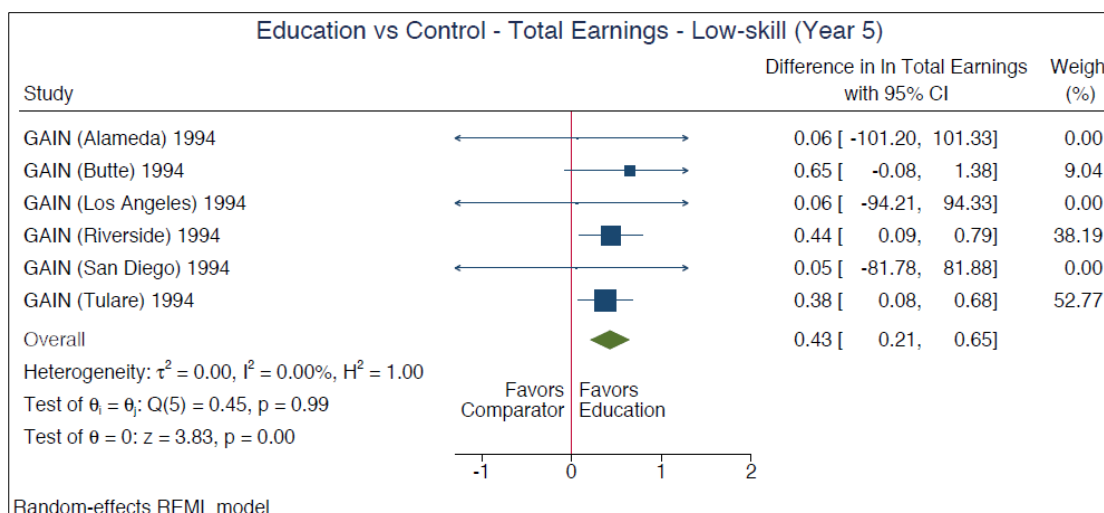
**Total earnings**

***Participants with low skills (subgroup 1)***

Assuming earnings of 10,000 NOK per month with no intervention, after one year people with low skills would be anticipated to earn 5,000 NOK (95% CI 1,000 NOK to 10,000 NOK) per month more by taking part in educational programs compared to no intervention (Difference in ln mean earnings 0.43 (95% CI 0.13 to 0.72); P<0.0001) (Figure 8). A similar benefit of 5,000 NOK (95% CI 2,000 NOK to 9,000 NOK) more would be anticipated after five years (Difference in ln mean earnings 0.43 (95% CI 0.21 to 0.65); P<0.0001) (Figure 9). Findings for years 2, 3, and 4 are consistent with this trend and are presented in Appendix 10. Low-quality evidence suggests that educational programs may result in little to no difference compared to no intervention in total earnings of people with low skills during the first five years follow-up (table 20).



**Figure 8.** Effects of educational programs versus no intervention on total earnings of participants with low skills at year 1



**Figure 9.** Effects of educational programs versus no intervention on total earnings of participants with low skills at year 5

**Table 20.** Summary of findings table: effects of educational programs versus no intervention on total earnings of participants with low skills.

Comparison: educational programs versus no intervention						
Setting: USA						
Intervention group: educational programs						
Control group: no intervention						
Population: Unemployed adults, welfare recipients						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			No of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated No intervention	Anticipated Education	Difference (Education minus no intervention)		
	Diff. In mean earnings 0.43 (0.13 to 0.72)	10,000 NOK	15,000 NOK	5,000 NOK more	Approx. 22,000	

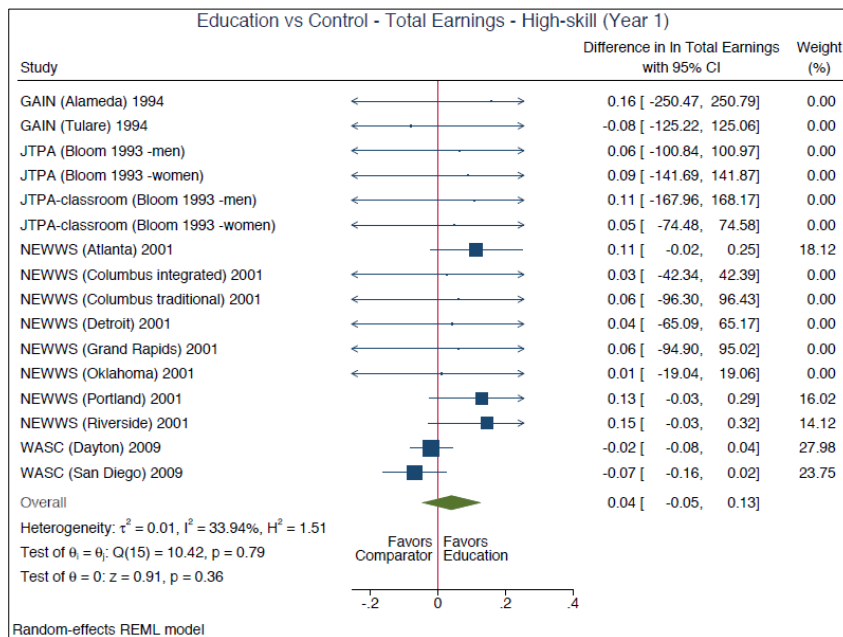
Total earnings: 1 year	<b>Relative diff. mean earnings</b> 1.5 (1.1 to 2)		(11,000 to 20,000)	(1,000 to 10,000)	(1 RCT)	⊕⊕○○ LOW <sup>12</sup>
Total earnings: 2 years	<b>Diff. In mean earnings</b> 0.53 (0.18 to 0.88)	10,000 NOK	17,000 NOK (12,000 to 24,000)	7,000 NOK more (2,000 to 14,000)	Approx. 22,000 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>
	<b>Relative diff. mean earnings</b> 1.7 (1.2 to 2.4)					
Total earnings: 3 years	<b>Diff. In mean earnings</b> 0.42 (0.21 to 0.63)	10,000 NOK	15,000 NOK (12,000 to 19,000)	5,000 NOK more (2,000 to 9,000)	Approx. 22,000 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>
	<b>Relative diff. mean earnings</b> 1.5 (1.2 to 1.9)					
Total earnings: 4 years	<b>Diff. In mean earnings</b> 0.50 (0.25 to 0.74)	10,000 NOK	16,000 NOK (13,000 to 21,000)	6,000 NOK more (3,000 to 11,000)	Approx. 22,000 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>
	<b>Relative diff. mean earnings</b> 1.6 (1.3 to 2.1)					
Total earnings: 5 years	<b>Diff. In mean earnings</b> 0.43 (0.21 to 0.65)	10,000 NOK	15,000 NOK (12,000 to 19,000)	5,000 NOK more (2,000 to 9,000)	Approx. 22,000 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>
	<b>Relative diff. mean earnings</b> 1.5 (1.2 to 1.9)					

\*The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the comparison group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial

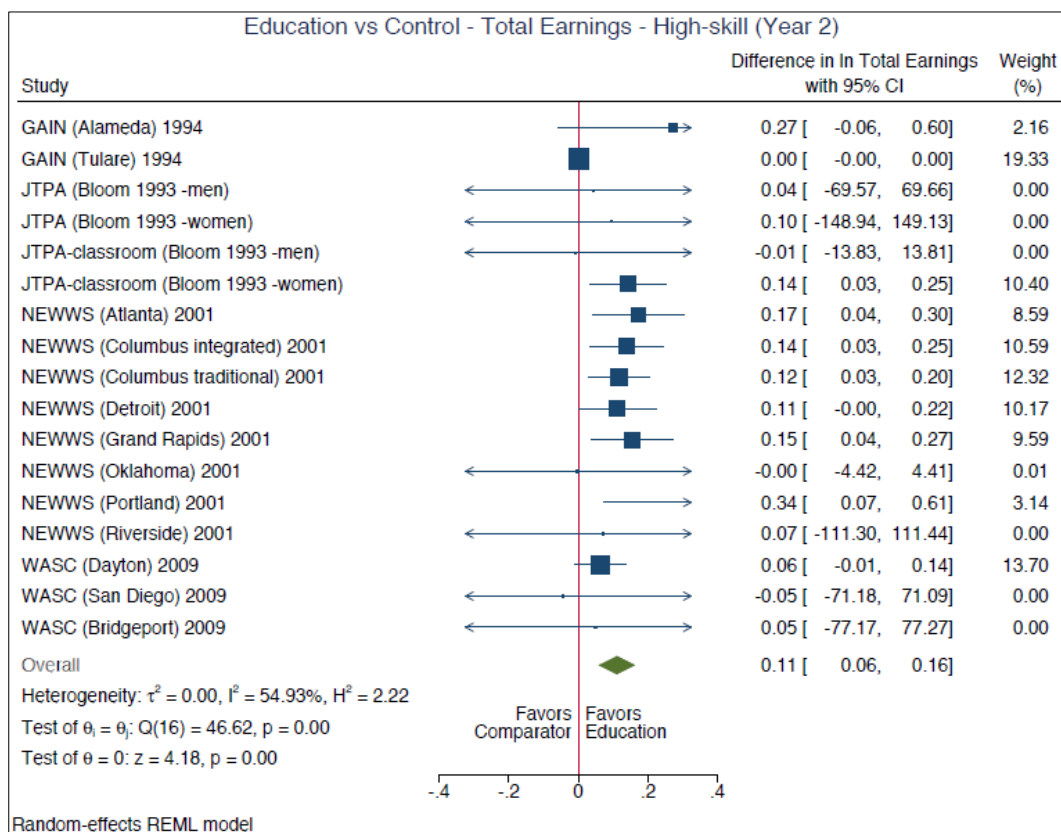
1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs

### ***Participants with high skills (subgroup 2)***

Assuming earnings of 10,000 NOK with no intervention, after one year people with high skills would be anticipated to earn 400 NOK more (95% CI 1,000 NOK less to 1,000 NOK more) by taking part in educational programs (Difference in ln mean earnings 0.04 (95% CI -0.05 to 0.13); P=0.36) (Figure 10). A benefit of 1,000 NOK more (between 600 NOK to 2,000 NOK more) would be anticipated after two years (Difference in ln mean earnings 0.11 (95% CI 0.06 to 0.16); P<0.0001) (Figure 11). Findings for years 3, 4, and 5 are consistent with this trend and are presented in Appendix 10. Very-low quality evidence suggests it is uncertain whether participating in educational programs raise total earnings after the first year; whereas low-quality evidence suggests educational programs may result in little to no difference in earnings of participants with high skills at years 2 to 5 follow-up (table 21).



**Figure 10.** Effects of educational programs versus no intervention on total earnings of participants with high skills at year 1 follow-up



**Figure 11.** Effects of educational programs versus no intervention on total earnings of participants with high skills at 2 years follow-up

**Table 21.** Summary of findings table: effects of educational programs versus no intervention on total earnings of participants with high skills.

Comparison: educational programs versus no intervention
Setting: USA

Intervention group: educational programs  
 Control group: no intervention  
 Population: Unemployed adults, welfare recipients

Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			No of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated No interven- tion	Anticipated Education	Difference (Education mi- nus no intervention)		
Total earnings: 1 year	<b>Diff. In mean earnings</b> 0.04 (-0.05 to 0.13)	10,000 NOK	10,400 NOK (9,000 to 11,000)	400 NOK more (-1,000 to 1,000)	Approx. 52,000 (4 RCTs)	⊕○○○ VERY LOW <sup>1,2,3</sup>
	<b>Relative diff. mean earn- ings</b> 1.04 (0.9 to 1.1)					
Total earnings: 2 years	<b>Diff. In mean earnings</b> 0.11 (0.06 to 0.16)	10,000 NOK	11,000 NOK (10,600 to 12,000)	1,000 NOK more (600 to 2,000)	Approx. 52,000 (4 RCTs)	⊕⊕○○ LOW <sup>1,2</sup>
	<b>Relative diff. mean earn- ings</b> 1.1 (1.06 to 1.2)					
Total earnings: 3 years	<b>Diff. In mean earnings</b> 0.11 (0.07 to 0.14)	10,000 NOK	11,000 NOK (10,700 to 11,500)	1,000 NOK more (700 to 1,500)	Approx. 52,000 (4 RCTs)	⊕⊕○○ LOW <sup>1,2</sup>
	<b>Relative diff. mean earn- ings</b> 1.1 (1.07 to 1.15)					
Total earnings: 4 years	<b>Diff. In mean earnings</b> 0.14 (0.06 to 0.22)	10,000 NOK	11,000 NOK (10,600 to 12,000)	1,000 NOK more (600 to 2,000)	Approx. 38,000 (2 RCTs)	⊕⊕○○ LOW <sup>1,2</sup>
	<b>Relative diff. mean earn- ings</b> 1.1 (1.06 to 1.2)					
Total earnings: 5 years	<b>Diff. In mean earnings</b> 0.15 (0.03 to 0.26)	10,000 NOK	11,000 NOK (10,300 to 13,000)	1,000 NOK more (300 to 3,000)	Approx. 38,000 (2 RCTs)	⊕⊕○○ LOW <sup>1,2</sup>
	<b>Relative diff. mean earn- ings</b> 1.1 (1.03 to 1.3)					

\*The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the control group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs
3. Imprecision: confidence intervals include appreciable benefit or harm.

## Average total earnings

### **Employed adults: New Visions study**

The New Visions study reported on the effects of an educational program (i.e., community colleges) on participants' average total earnings over two and a half years follow-up. Overall, participants in the educational program earned about \$2,300 USD (about 21,000 NOK) less on average than peers who did not participate (Difference in earnings -2,301 USD;  $P < 0.05$ ). Low-quality evidence suggests that participating in an educational program results in little to no difference on average total earnings over two and a half years follow-up (table 22).

**Table 22.** Summary of findings table: effects of educational programs versus no intervention on average total earnings in employed adults.

Comparison: Educational programs versus no intervention					
Setting: Riverside, USA					
Intervention group: Educational program (community college)					
Control group: No program					
Population: employed adults receiving welfare benefits (New Visions study)					
Outcomes	Relative effect (P value)	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated control	Anticipated intervention		
Average total earnings (year 1)	Difference in earnings: -573 USD ( $P < 0.1$ )	-	-	1,043 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>
Average total earnings (2 years)	Difference in earnings: -1,193 USD ( $P < 0.05$ )	-	-	1,043 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>
Average total earnings (2.5 years)	Difference in earnings: -533 USD ( $P < 0.1$ )	-	-	1,043 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>

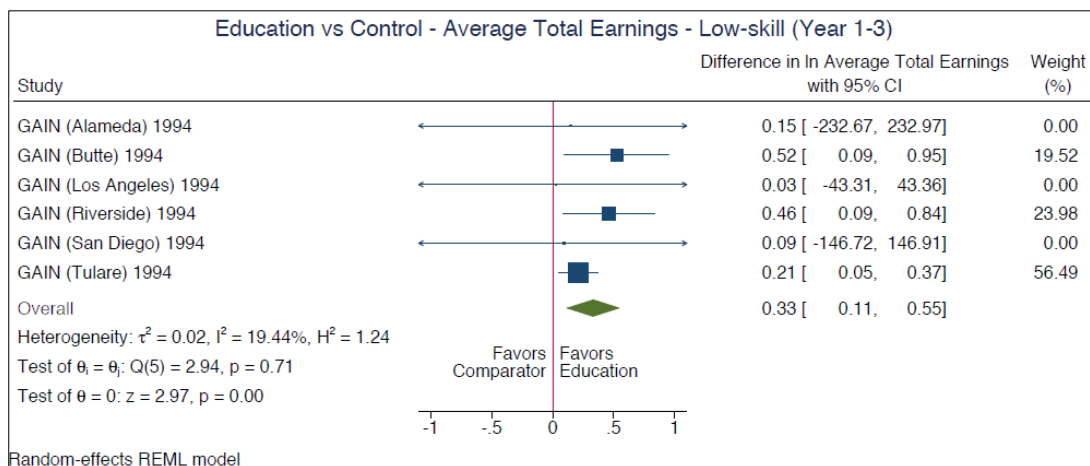
\*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Imprecision: only an approximate p-value was provided (incomplete information).

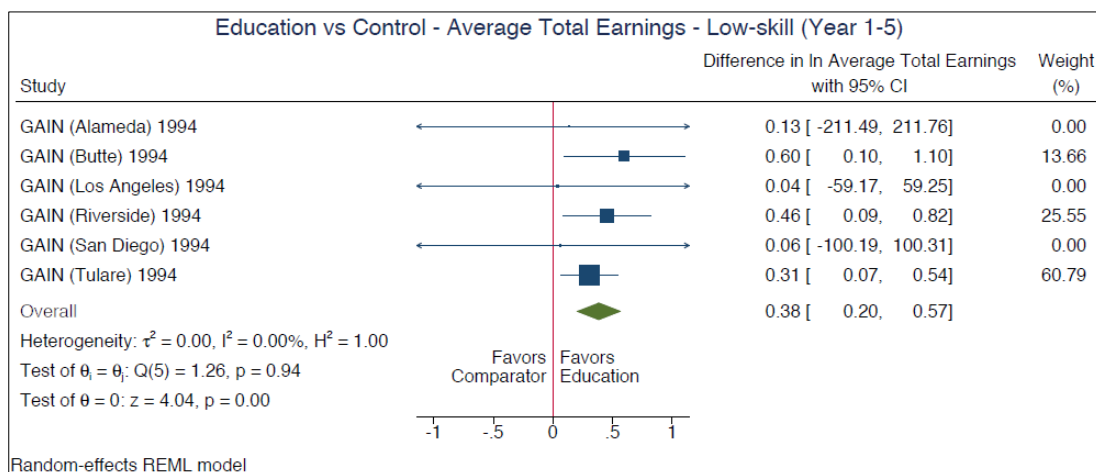
### **Participants with low skills (subgroup 1)**

Assuming earnings of 10,000 NOK with no intervention, after three years people with low skills would be anticipated to earn 4,000 NOK (95% CI 1,000 to 7,000 NOK) more by taking part in educational programs (Difference in ln mean earnings 0.33 (95% CI 0.11 to 0.55);  $P < 0.0001$ ) (Figure 12). A similar benefit of 5,000 NOK (95% CI 2,000 to 8,000 NOK) more would be anticipated after five years (Difference in ln mean earnings 0.38 (95% CI 0.20 to 0.57);  $P < 0.0001$ ) (Figure 13). Low-quality evidence suggests that educational programs result in little to no difference on average total earnings of people with low skills during the first five years follow-up (table 23).





**Figure 12.** Effects of educational programs versus no intervention on average total earnings of participants with low skills at years 1-3



**Figure 13.** Effects of educational programs versus no intervention on average total earnings of participants with low skills at years 1-5

**Table 23.** Summary of findings table: effects of educational programs versus no intervention on average total earnings of participants with low skills.

Comparison: educational programs versus no intervention						
Setting: USA						
Intervention group: educational programs						
Control group: no intervention						
Population: Unemployed adults, welfare recipients						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			№ of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated No intervention	Anticipated Education	Difference (Education minus no intervention)		
	<b>Diff. in mean earnings</b> 0.33 (0.11 to 0.55)	10,000 NOK	14,000 NOK		Approx. 22,000	

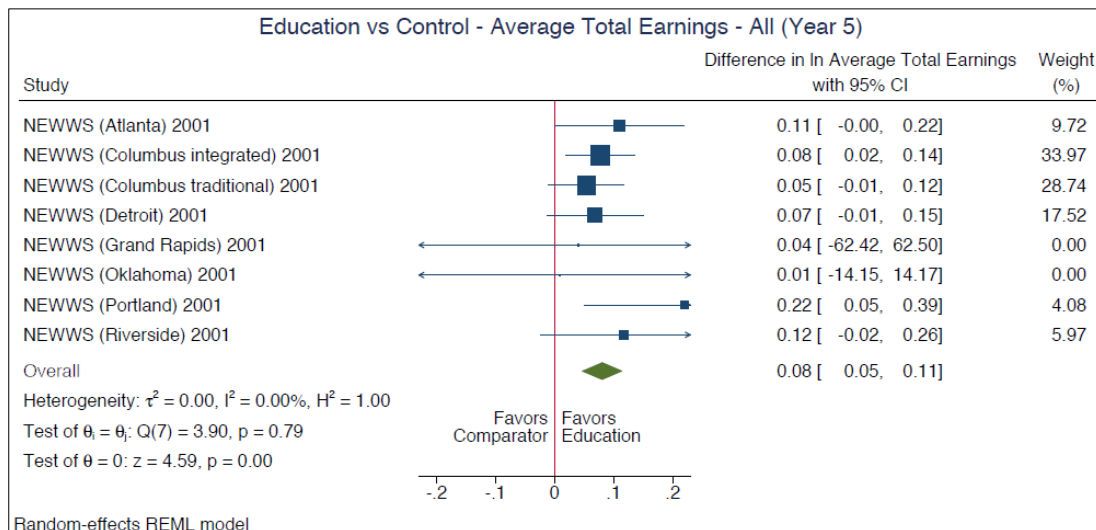
Average total earnings: years 1-3	<b>Relative diff. mean earnings</b> 1.4 (1.1 to 1.7)		(11,000 to 17,000)	4,000 NOK more (1,000 to 7,000 NOK)	(1 RCT)	⊕⊕○○ LOW <sup>12</sup>
Average total earnings: years 1-5	<b>Diff. In mean earnings</b> 0.38 (0.20 to 0.57) <b>Relative diff. mean earnings</b> 1.5 (1.2 to 1.8)	10,000 NOK	15,000 NOK (12,000 to 18,000)	5,000 NOK more (2,000 to 8,000 NOK)	Approx. 22,000 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>

\*The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the control group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs

### Participants with high skills (subgroup 2)

Pooled analysis of data from eight sites in the NEWWS study (43) indicated that assuming earnings of 10,000 NOK under no intervention, after five years we anticipate people would earn 1,000 NOK (95% CI 500 to 1,100 NOK) more by taking part in educational programs (Difference in ln mean earnings 0.08 (95% CI 0.05 to 0.11);  $P < 0.0001$ ) (Figure 14). Low-quality evidence suggests that educational programs result in little to no difference on average total earnings of people with high skills at five years follow-up (table 24).



**Figure 14.** Effects of educational programs versus no intervention on average total earnings of participants with high skills at year 5

**Table 24.** Summary of findings table: effects of educational programs versus no intervention on average total earnings of participants with high skills.

Comparison: educational programs versus no intervention
Setting: USA
Intervention group: educational programs
Control group: no intervention
Population: Unemployed adults, welfare recipients (mixed)

Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			No of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated No intervention	Anticipated Education	Difference (Education minus no intervention)		
Average total earnings: year 5	<b>Diff. In mean earnings</b> 0.08 (0.05 to 0.11)  <b>Relative diff. mean earnings</b> 1.1 (1.05 to 1.11)	10,000 NOK	11,000 NOK (10,500 to 11,100)	1,000 NOK more (500 to 1,100)	Approx. 35,000 (1 RCT)	⊕⊕○○ LOW <sup>1,2</sup>

\*The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the control group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval; RCT: Randomized-controlled trial

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")

2. Indirectness due to differences in the interventions: multi-component programs

## Average monthly earnings

In the ILA study, Hidalgo and colleagues (61) reported that the average monthly earnings of low-skilled workers who participated in training were 10.9% higher relative to those who did not participate in any training activity at two years follow-up (Ordinary least squares (OLS) estimate: 0.109; standard error 0.037 (P<0.01)). In the USA, the MFSP study found no difference between educational programs and control group on single mothers' average monthly earnings at 2-3 years after enrollment (mean difference: 20 USD; P >0.1). Data were not pooled due to the different estimates reported by the primary studies (Low to very-low quality evidence) (table 25).

**Table 25.** Summary of findings table: effects of educational programs versus no intervention on average monthly earnings

Comparison: Educational programs versus no intervention					
Setting: Netherlands and USA					
Intervention group: educational programs					
Control group: no intervention					
Population: Low-skilled workers (Hidalgo 2014), and unemployed single mothers (MFSP study)					
Outcomes	Relative effect (95% CI)	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated control	Anticipated intervention		
Average monthly earnings (2 years)	Ordinary least squares (OLS) estimate: 0.109; standard error 0.037 (P<0.01) (Hidalgo 2014)	-	-	687 (1 RCT)	⊕⊕○○ LOW <sup>1,2</sup>
Average monthly earnings (2-3 years)	Mean difference 20 USD (P>0.1) (MFSP study)	-	-	509 (1 RCT)	⊕○○○ VERY LOW <sup>2,3,4</sup>

CI: Confidence interval; RCT: Randomized-controlled trial

1. High risk of bias for allocation concealment: there was no attempt to hide the issuing of vouchers. Hawthorne effects is plausible.
2. Indirectness due to differences in the interventions: multi-component programs
3. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
4. Imprecision: only an approximate p-value was provided (incomplete information).

## Average annual earnings

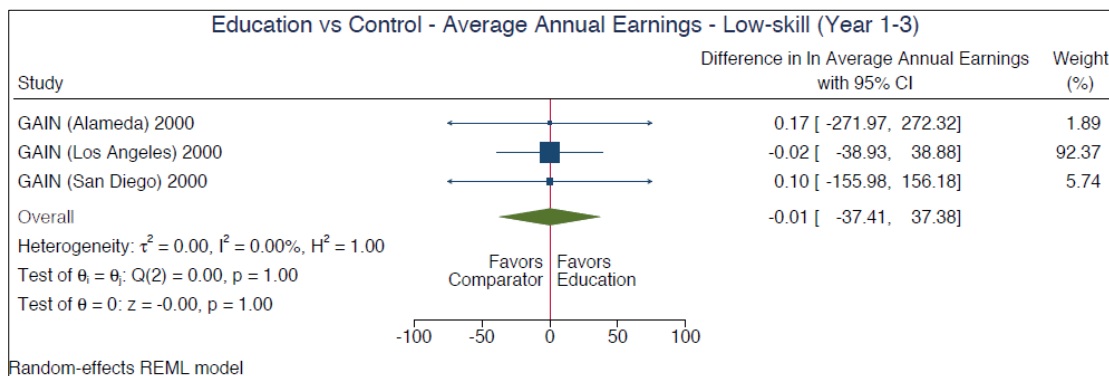
For this outcome, we present data for the comparison 1 of educational programs versus no intervention in participants with both low and high skills, as well as low-wage workers. For comparison 2 of educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA), the NEWS study (62) provided outcome data at years 10-15 follow-up (the longest follow-up period in this systematic review).

### Comparison 1: Educational programs versus no intervention

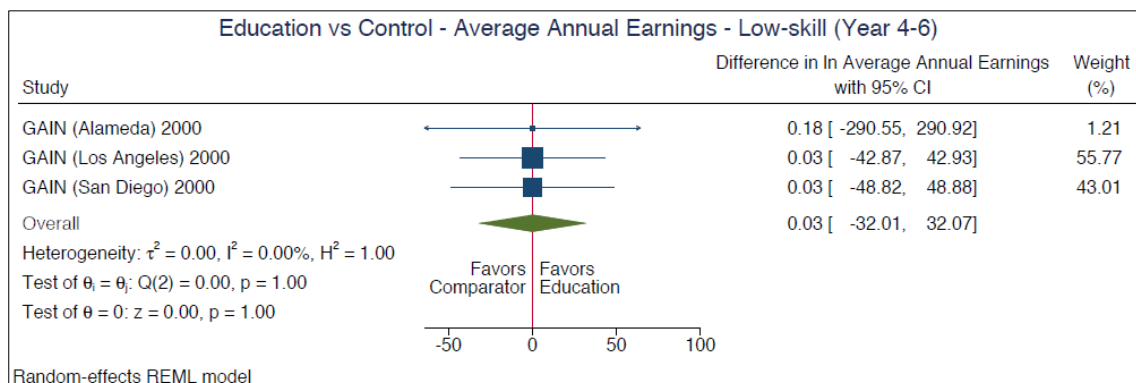
#### Participants with low skills (subgroup 1)

In order to facilitate a clearer interpretation, and in line with the analysis presented for previous earning measures, we assume earnings of 10,000 NOK/month under no intervention (control group) to interpret differences between educational programs and no intervention.

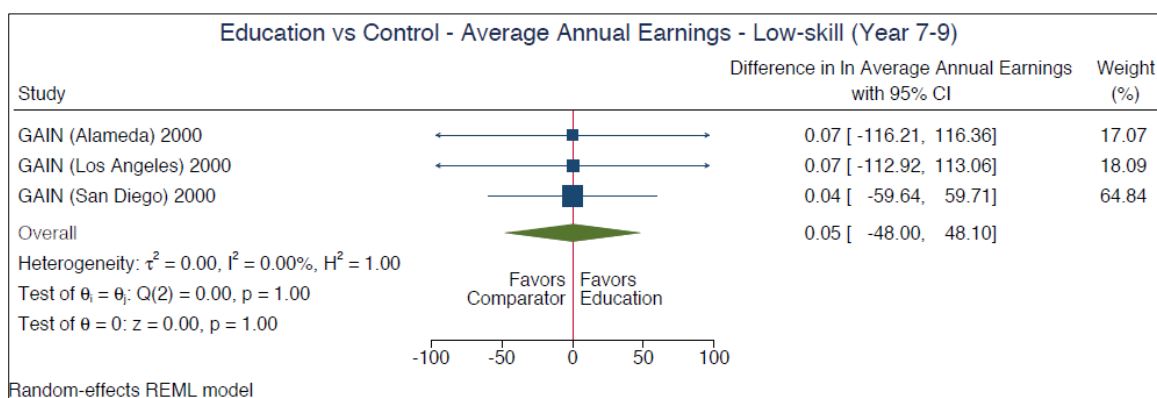
Assuming earnings of 10,000 NOK under no intervention, after three years people would be anticipated to earn 100 NOK/month (95% CI 3,700 NOK less to 3,700 NOK more) less by participating in educational programs (Diff. in ln mean earnings -0.01 (95% CI -37.4 to 37.4)) (Figure 15). Conversely, after 4–6 years people would be anticipated to earn 300 NOK/month (95% CI 3,200 NOK less to 3,200 NOK more) more if they participate in educational programs (Diff. in mean earnings 0.03 (95% CI -32 to 32.1)) (Figure 16). Similarly, a larger difference of 500 NOK/month (95% CI 4,800 NOK less to 4,800 NOK more) more would be anticipated after 7-9 years (Diff. in mean earnings 0.05 (95% CI -48 to 48.1)) (Figure 17). Very low-quality evidence suggests it is uncertain whether educational programs improve average annual earnings compared to no intervention in people with low skills up to nine years follow-up (table 26).



**Figure 15.** Effects of educational programs versus no intervention on average annual earnings of participants with low skills at years 1-3.



**Figure 16.** Effects of educational programs versus no intervention on average annual earnings of participants with low skills at years 4-6.



**Figure 17.** Effects of educational programs versus no intervention on average annual earnings of participants with low skills at years 7-9.

**Table 26.** Summary of findings table: effects of educational programs versus no intervention on average annual earnings of participants with low skills.

Comparison: educational programs versus no intervention						
Setting: USA						
Intervention group: educational programs						
Control group: no intervention						
Population: unemployed adults with low skills						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			№ of participants (studies)	Certainty of the evidence (GRADE)
		Anticipated No intervention	Anticipated Education	Difference (Education minus no intervention)		
Average annual earnings: years 1-3	Diff. in ln mean earnings -0.01 (-37.4 to 37.4)	10,000 NOK/month	9,900 NOK/month <sup>†</sup>	100 NOK/month less <sup>†</sup>	Approx. 13,000 (1 RCT)	⊕○○○ VERY LOW <sup>1,2,3</sup>
	Ratio of mean earnings in treatment to control 0.99 <sup>†</sup>					
Average annual	Diff. in ln mean earnings 0.03	10,000 NOK/month	10,300 NOK/month <sup>†</sup>	300 NOK/month more <sup>†</sup>	Approx. 13,000 (1 RCT)	⊕○○○ VERY LOW <sup>1,2,3</sup>

earnings: years 4-6	(-32 to 32.1) <b>Ratio of mean earnings in treatment to control</b> 1.03 <sup>†</sup>					
Average annual earnings: years 7-9	<b>Diff. in ln mean earnings</b> 0.05 (-48 to 48.1) <b>Ratio of mean earnings in treatment to control</b> 1.05 <sup>†</sup>	10,000 NOK/month	10,500 NOK/month <sup>†</sup>	500 NOK/month <b>more<sup>†</sup></b>	Approx. 13,000 (1 RCT)	⊕○○○ VERY LOW <sup>1,2,3</sup>

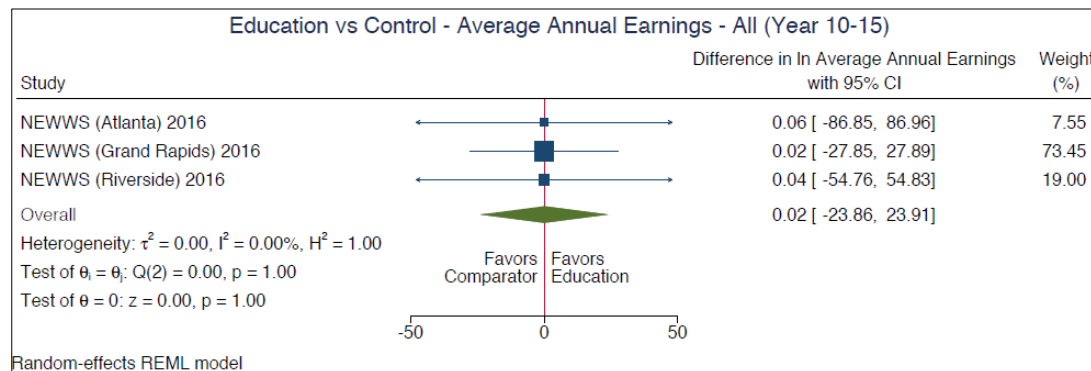
\*The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the control group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval

<sup>†</sup> Due to limitations in reporting of the included studies, the 95% confidence interval is too wide to be informative (see the confidence interval for difference in ln earnings).

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs
3. Imprecision: confidence intervals include appreciable benefit or harm.

### Participants with high skills (subgroup 2)

Assuming earnings of 10,000 NOK under no intervention, after 10-15 years people would be anticipated to earn 200 NOK/month (95% CI 2,300 NOK less to 2,300 NOK more) more by participating in educational programs (Diff. in ln mean earnings 0.02 (95% CI -23.9 to 23.9)) (Figure 18). Very low-quality evidence suggests it is uncertain whether educational programs improve average annual earnings compared to no intervention in people with high skills at 10-15 years follow-up (table 27).



**Figure 18.** Effects of educational programs versus no intervention on average annual earnings of participants with high skills at years 10-15.

**Table 27.** Summary of findings table: effects of educational programs versus no intervention on average annual earnings of participants with high skills at years 10-15.

Comparison: educational programs versus no intervention
Setting: USA
Intervention group: educational programs
Control group: no intervention
Population: unemployed adults with high skills

Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			No of participants (studies)	Quality of the evidence (GRADE)
		Anticipated No intervention	Anticipated Education	Difference (Education minus no intervention)		
Average annual earnings: years 10-15	<b>Diff. in ln mean earnings</b> 0.02 (-23.9 to 23.9) <b>Ratio of mean earnings in treatment to control</b> 1.02†	10,000 NOK/month	10,200 NOK/month†	200 NOK/month <b>more</b> †	Approx. 10,000 (1 RCT)	⊕○○○ VERY LOW <sup>1,2</sup> <sub>3</sub>

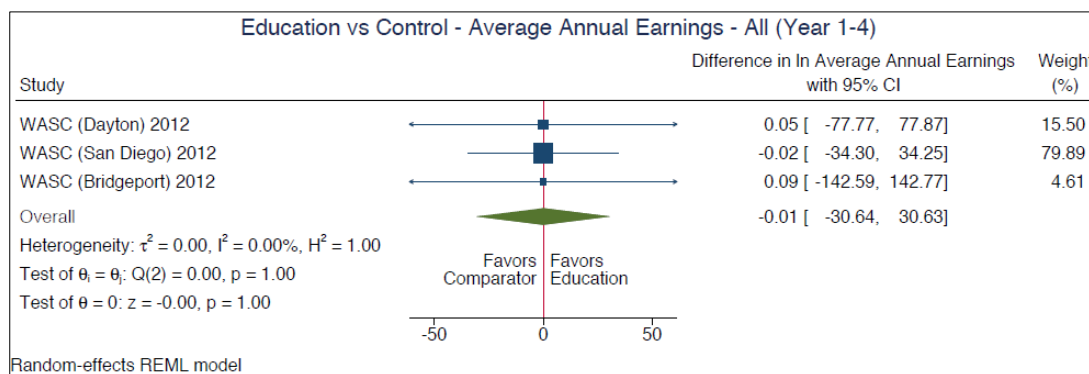
\*The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the control group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval

† Due to limitations in reporting of the included studies, the 95% confidence interval is too wide to be informative (see the confidence interval for difference in ln earnings).

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs
3. Imprecision: confidence intervals include appreciable benefit or harm.

### Low-wage workers (subgroup 3)

Assuming earnings of 10,000 NOK under no intervention, after four years low-wage workers would be anticipated to earn 100 NOK/month (95% CI 3,000 NOK less to 3,000 NOK more) less if they participate in educational programs (Diff. in ln mean earnings -0.01 (95% CI -30.6 to 30.6)) (Figure 19). Very low-quality evidence suggests it is uncertain whether educational programs improve average annual earnings compared to no intervention in low-wage workers at years 1-4 follow-up (table 28).



**Figure 19.** Effects of educational programs versus no intervention on average annual earnings of low-wage workers at years 1-4.

**Table 28.** Summary of findings table: effects of educational programs versus no intervention on average annual earnings of low-wage workers.

Comparison: educational programs versus no intervention
Setting: USA
Intervention group: educational programs
Control group: no intervention
Population: low-wage workers

Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			№ of participants (studies)	Quality of the evidence (GRADE)
		Anticipated No intervention	Anticipated Education	Difference (Education minus no intervention)		
Average annual earnings: years 1-4	Diff. in In mean earnings -0.01 (-30.6 to 30.6) Ratio of mean earnings in treatment to control 0.99†	10,000 NOK/month	9,900 NOK/month†	100 NOK/month less†	1,371 (1 RCT)	⊕○○○ VERY LOW <sup>1,2,3</sup>

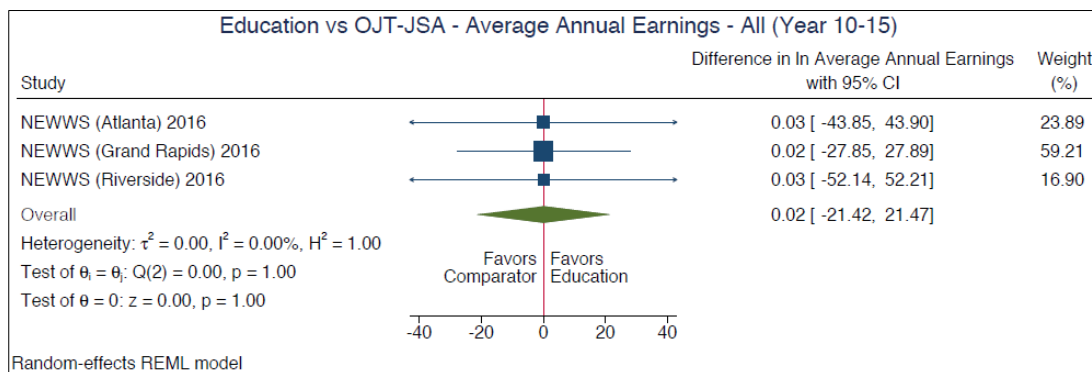
\*The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the control group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval

† Due to limitations in reporting of the included studies, the 95% confidence interval is too wide to be informative (see the confidence interval for difference in In earnings).

1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs
3. Imprecision: confidence intervals include appreciable benefit or harm.

## Comparison 2: Educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA)

Assuming earnings of 10,000 NOK under programs focusing on on-the-job training/job search assistance (OJT/JSA), after 10-15 years people would be anticipated to earn 200 NOK/month (95% CI 2,100 NOK less to 2,100 NOK more) more if they participate in educational programs (Diff. in In mean earnings 0.02 (95% CI -21.4 to 21.5)) (Figure 20). Very low-quality evidence suggests it is uncertain whether educational programs improve average annual earnings compared to programs focusing on on-the-job training/job search assistance (OJT/JSA) at years 10-15 follow-up (table 29).



**Figure 20.** Effects of educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA) on average annual earnings at years 10-15.

**Table 29.** Summary of findings table: effects of educational programs versus programs focusing on on-the-job training/job search assistance (OJT/JSA)

Comparison: educational programs versus no intervention
Setting: USA
Intervention group: educational programs
Control group: no intervention



Population: unemployed adults						
Outcomes	Relative effect (95% CI)	Anticipated absolute effects* (95% CI)			No of participants (studies)	Quality of the evidence (GRADE)
		Anticipated OJT/JSA	Anticipated Education	Difference (Education minus OJT/JSA)		
Average annual earnings: years 10-15	<b>Diff. in ln mean earnings</b> 0.02 (-21.4 to 21.5) <b>Ratio of mean earnings in treatment to control</b> 1.02 <sup>†</sup>	10,000 NOK/month	10,200 NOK/month <sup>†</sup>	200 NOK/month <b>more<sup>†</sup></b>	Approx. 10,000 (1 RCT)	⊕○○○ VERY LOW <sup>1,2,3</sup>

\*The anticipated effect in the intervention group (and its 95% confidence interval) is based on the assumed effect in the control group and the relative effect of the intervention (and its 95% CI). CI: Confidence interval

<sup>†</sup> Due to limitations in reporting of the included studies, the 95% confidence interval is too wide to be informative (see the confidence interval for difference in ln earnings).

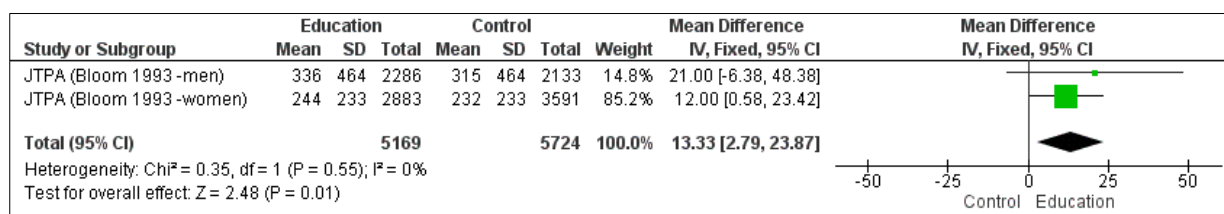
1. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
2. Indirectness due to differences in the interventions: multi-component programs
3. Imprecision: confidence intervals include appreciable benefit or harm.

## Effects on working hours

Three studies reported different measures for the effects of educational programs on working hours (57;58;60). The JTPA study reported effects on working hours at years 1 and 2; the WASC study reported on average working hours per week in years 1-4; and the MFSP study reported on average working hours per month in years 2-3.

### Effects at year 1

Participants in the educational programs worked in average 13.3 hours per week (95% CI 3 to 24 hours; P=0.01) more than peers in the control group at one-year follow-up (Figure 21). Low-quality evidence suggests that educational programs may result in little to no difference in working hours of unemployed adults at first year follow-up (table 30).

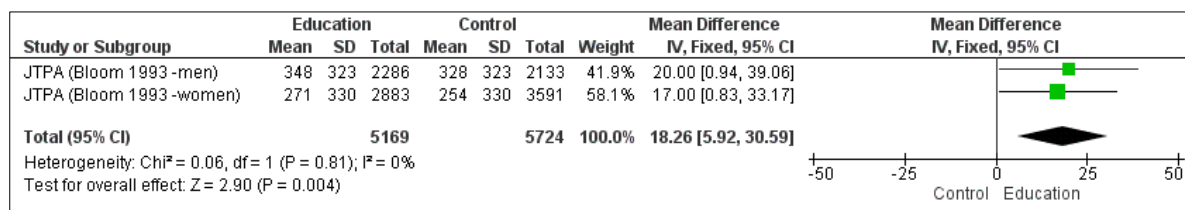


**Figure 21.** Effects of educational programs versus no intervention on working hours at year 1

### Effects at year 2

Participants in the educational programs worked on average 18.3 hours per week (95% CI 6 to 31 hours; P=0.004) more than peers in the control group at two years fol-

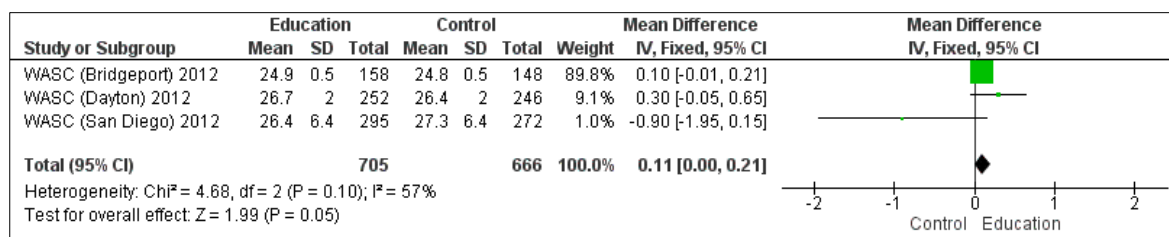
low-up (Figure 22). Low-quality evidence suggests that educational programs may result in little to no difference in working hours of unemployed adults at two years follow-up (table 30).



**Figure 22.** Effects of educational programs versus no intervention on working hours at year 2

### Effects in years 1-4

A small difference of 0.11 (95% CI 0 to 0.21; P=0.05) hours worked per week in favor of educational programs compared to no intervention was observed at years 1-4 follow-up (Figure 23). Very low-quality evidence suggests that it is uncertain whether educational programs improve working hours in low-wage workers at years 1-4 follow-up (table 30).



**Figure 23.** Effects of educational programs versus no intervention on working hours at years 1-4

### Effects in years 2-3

Data from the MFSP study indicated participants in the educational programs worked on average 3.1 hours less than participants in the control group at 2-3 years follow-up (Mean Difference -3.1 hours; P>0.01). It is uncertain whether educational programs improve working hours in unemployed single mothers at years 2-3 follow-up (table 30).

## Effects on job duration

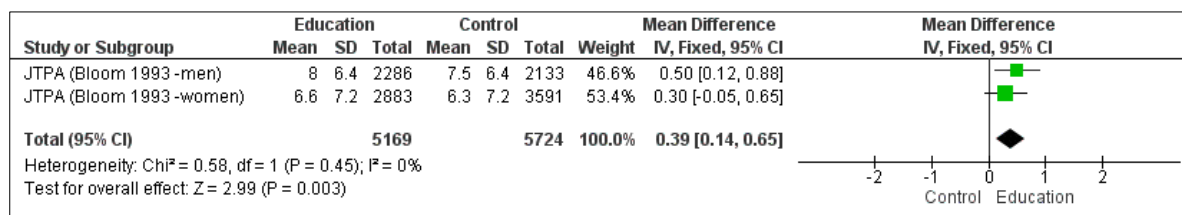
The JTPA study (57) evaluated the effects of educational programs on the number of weeks worked per year by economically disadvantaged Americans at years 1 and 2 of follow-up.

### Weeks worked

#### Effects at year 1

Participants in the educational programs worked in average 0.39 weeks per year (95% CI 0.1 to 0.6; P=0.003) more than peers in the control group at one year of follow-up

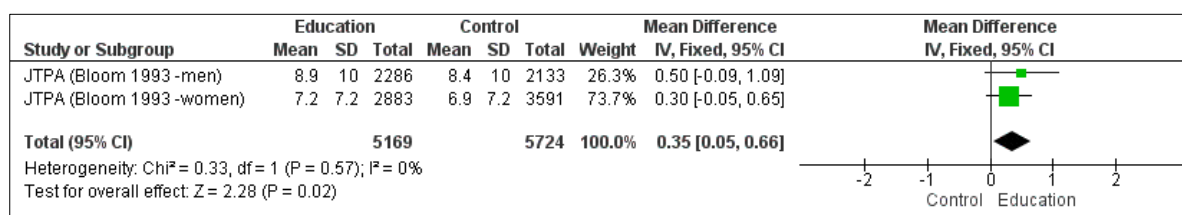
(Figure 24). Low-quality evidence suggests that educational programs may result in little to no difference in the number of weeks worked by unemployed adults at first year follow-up (table 30).



**Figure 24.** Effects of educational programs versus no intervention on the number of weeks worked at year 1

### Effects at year 2

The number of weeks worked per year by participants of the educational programs was 0.35 (95% CI 0.05 to 0.66; P=0.02) higher than for peers in the control group at two years of follow-up (Figure 25). Low-quality evidence suggests that educational programs may result in little to no difference in the number of weeks worked by unemployed adults at two years follow-up (table 30).



**Figure 25.** Effects of educational programs versus no intervention on the number of weeks worked at year 2

**Table 30.** Summary of findings table: effects of educational programs versus no intervention on working hours and weeks worked (job duration)

Comparison: Educational programs versus no intervention			
Setting: Netherlands and USA			
Intervention group: educational programs			
Control group: no intervention			
Population: unemployed adults, single-mothers unemployed, low-wage workers			
Outcomes	Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)
Working hours: year 1	Mean Difference 13.3 hours more (2.8 to 24)	10,893 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>
Working hours: year 2	Mean Difference 18.2 hours more (5.9 to 30.5)	10,893 (1 RCT)	⊕⊕○○ LOW <sup>12</sup>
Working hours: years 1-4	Mean Difference 0.11 hours more (0 to 0.21)	1,371 (1 RCT)	⊕○○○ VERY LOW <sup>2,34</sup>
Working hours: years 2-3	Mean Difference -3.1 hours less (P>0.01)	509 (1 RCT)	⊕○○○ VERY LOW <sup>2,5,6</sup>
Weeks worked: year 1	Mean Difference 0.39 weeks more (0.1 to 0.6)	10,893 (1 RCT)	⊕○○○ LOW <sup>12</sup>

Weeks worked: year 2	Mean Difference 0.35 weeks more (0.05 to 0.66)	10,893 (1 RCT)	⊕○○○ LOW <sup>12</sup>
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**CI:** Confidence interval; **RCT:** Randomized-controlled trial

1. High risk of bias for random sequence generation (a random assignment clerk from the study team assigned the participants to the groups).
  2. Indirectness due to differences in the interventions: multi-component programs
  3. High inconsistency: wide variance in effect estimates; substantial heterogeneity ( $I^2=57\%$ ).
  4. Imprecision: confidence intervals include appreciable benefit or harm.
  5. High risk of bias for random sequence generation (participants were randomly allocated "by chance")
  6. Imprecision: only an approximate p-value was provided (incomplete information).
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# Discussion

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## Summary of main results

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The present systematic review summarized findings from seven RCTs about the effects of educational programs for labor market outcomes. We also presented details on six Nordic RBs that analyzed registry data after year 2000. In the RCTs, the participation in educational programs versus no participation represented the most common comparison. The benefits of educational programs compared to no participation on employment rate varied between none to one more person being employed at four years follow-up, while no differences were observed at five years follow-up. Regarding employment probability, educational programs resulted in benefits that varied between 36 more people gaining employment at two years follow-up, and none at four years follow-up. However, data at 1-5 years follow-up suggested that 16 more people would gain employment if they participate in educational programs. Small to no benefit was found in people with low skills up to nine years follow-up.

The participation in educational programs led to a benefit of 5,000 NOK on total earnings of people with low skills compared to no intervention up to five years follow-up. Smaller benefits were observed for people with high skills. Educational programs resulted in a benefit of 500 NOK on average annual earnings in people with low skills at 7-9 years follow-up, whereas low-wage workers would earn 100 NOK/month less if they participate in educational programs at years 1-4 follow-up. We found that participants in educational programs worked on average 18 hours more than non-participants at two years follow-up. Single mothers who participated in educational programs worked on average three hours less than those who did not at 2-3 years follow-up, whereas a small benefit of 0.11 hours more worked was observed among low-wage workers at years 1-4 follow-up. Small benefits were found on the number of weeks worked.

Apart from the main body of evidence in this systematic review (i.e., RCTs), the findings from the six Nordic RBs that used data after 2000 indicated that the participation in educational programs within labor market schemes led to better employment probabilities. Those findings were derived from a mixed group of participants (e.g., sick-listed employees in Denmark, youth with reduced work ability, and non-western immigrants to Norway), and might serve as a more recent support to findings observed in the RCTs, bearing in mind the methodological differences between these two bodies of evidence. The scope of the present systematic review to further explore this argument is constrained.

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## Overall completeness and applicability

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The body of evidence summarized in this report is partially sufficient to address all of the objectives of the systematic review. The evidence in the included RCTs represents mostly unemployed adults receiving welfare benefits. Only two studies focused on low-wage workers. We found no RCTs targeting participants with mismatched education or participants with reduced work ability. Conversely, the Nordic RBs presented data for immigrants, low-educated unemployed adults, and employees with reduced work ability. It is important to keep in mind that we did not synthesize the results of the RBs in detail in this systematic review.

The interventions evaluated in the included RCTs do not exclusively refer to educational programs. In general, the educational programs were provided as part of multi-component welfare-to-work programs, which means the participants attended classroom educational services (training) alongside other services, such as on-the-job training or job search assistance. Although educational services represented more than the 30% of the program content, the role of the work-related services on the effects reported in the included RCTs should not be discarded. Besides, although no program participation was the most common comparison, participants in this group ended up receiving some welfare-to-work services, such as education or job search assistance. The transition from part-time to full-time employment was the only outcome for which no RCTs were found. A final consideration regarding the applicability of the review findings is that except for one RCT, all the RCTs were conducted in USA mostly during the early nineties. In order to counteract this constraint, the description of findings from the Nordic RBs, mostly from Norway, boost the applicability of the review findings to the Norwegian context within an evidence-informed decision-making system. A limitation we see on this regard is the incomplete reporting of details about the components taught in the educational interventions as well as other features related to their implementation, such as duration, length, or frequency.

Despite the fact that RCTs represented the main unit of analysis in the present systematic review, a number of RBs were also identified and we described briefly characteristics and findings from those that used registry data after 2000. The relevance of these RBs in the review question merit some discussion. It is widely accepted that well-conducted prospective, randomized controlled trials (RCTs) have the greatest capacity to detect causal effects because observed differences between trial arms can only be attributed to the intervention or the play of chance (66). Essential support for this statement may be based on the counterfactual approach for evaluating causal inference, which argues that a high comparability between exposed and unexposed individuals is needed to estimate any causal effect, as it is not possible — outside of crossover designs — for a single individual to receive intervention and control treatments (67-69).

Inferring causality from observational data is substantially more challenging due to a range of biases that well-conducted RCTs prevent (70), for example confounding by unobserved factors, reverse causation, and the ability for investigators to see the outcome

data before performing the study (68;71). Outcome data analysis is not preceded by the allocation of the individuals to different exposure levels, thus an equal distribution of observable and unobservable covariates between exposed and unexposed individuals may not be ensured (71;72). These issues can lead to incorrect causal inferences. Therefore, it is argued that estimates provided by observational studies might not serve as valid estimates of the true causal effect (72). As example, the Norwegian RB published by Kvinge and Djuve in 2006 (49) stated “the numbers do not indicate anything about the effects of the different programs because the selection is not random or by chance”. Nevertheless, important advantages of the Nordic RBs over the RCTs comprise the high level of applicability of the findings to the local context (external validity), large sample sizes, the use of more recent data sources, and long follow-up periods.

Despite the advantages of the RCT design for drawing causal inferences, in the case of this systematic review, the included RCTs showed serious methodological limitations, especially with respect to the randomization procedures used. We judge that it is likely that the methods used to allocate individuals to the various study arms were not robust enough to ensure that valid causal inferences can be made and that the estimates used in our meta-analyses are unbiased. We also judged that the studies were at risk of other biases such as poor adherence to the intervention, high attrition, and outcome measurement errors (73-77). We accounted for these possible shortcomings in our GRADE assessment.

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## **Certainty of the evidence**

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Our certainty in the review findings varied between low to very low. The most common reasons for rating down the certainty of the evidence were limitations concerning risk of bias, indirectness, and imprecision (35;44). Most of our included RCTs did not use appropriate methods to randomize participants to either educational programs or control groups. Further, none of the RCTs provided sufficient details or made efforts to conceal participants’ allocation to the study groups.

Regarding indirectness, the body of evidence summarized in this systematic review did not directly relate to the original research question. For example, most of the educational programs in the included RCTs were provided together with other services, such as on-the-job training or job search assistance. Therefore, our confidence in the effects of educational programs on labor market outcomes was regarded as indirect, because the review findings were derived from multi-component programs rather than purely classroom educational programs. Further, most of the studies included were performed in the USA, and so their findings may not generalize directly to the Norwegian context.

The final reason for downgrading the certainty on the evidence was imprecision. This was mainly due to poor data reporting in the included studies (see the methods section). To facilitate meta-analysis, we chose to impute upper bounds on standard errors consistent with the reported statements of “statistical significance”. This is a conserva-

tive approach in the sense that it is less likely to lead to type I errors (incorrectly concluding that an educational program leads to better or worse outcomes, when in fact it has no effect). However, the approach is more likely to lead to type II errors (here, failing to “rule out” no effect for an educational program that does actually have an effect). In most of cases, although the included RCTs likely had large sample sizes, the confidence intervals on the pooled effect estimates included both benefits and harms.

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### **Potential biases in the review process**

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Although there exists a tradition in the Nordic countries to use research data from the national registries to inform certain decision-making processes (78), the present systematic review prioritized RCTs over RBs. We only provided brief details about the main characteristics of the Nordic RBs. This decision was made in agreement with the commissioners (i.e., The Norwegian Labour and Welfare Administration and The Norwegian Directorate for Education and Training) after several rounds of discussion and dialogues. Furthermore, it is possible that the search strategy did not capture all relevant studies, as the indexing of studies in this area is poor (79). In order to counteract this source of bias, we explored grey literature sources and contacted international researchers to identify additional studies related to our selection criteria. Given that the searches were carried out in October 2018, there is the slight possibility that new studies have been published since that date.

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### **Agreements and disagreements with other studies or reviews**

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To date, we did not identify any systematic reviews of RCTs that evaluated the effects of educational programs for labor market outcomes. Non-systematic and narrative reviews of findings from RBs dominate the synthesized research in this area. In 2019, von Simson published a narrative review of the literature, which aimed to summarize empirical research about the activation policies in Norway (80). In this context, activation policies are all measures aiming to help people out of the labor force to find a job and to achieve stability in the labor market (80). The author also highlighted the challenges due to the incomplete reporting of the content and quality of the educational programs. Similar to some of our findings for employment, von Simson observed that studies reporting effect data for long follow-up periods are more likely to report positive results of educational programs on employability compared to those studies that reported short-term follow-up data.

The findings we presented from the six Nordic RBs align with those reported by von Simson in a narrative review of the literature (80), which indicated that participation in educational programs was associated with better employment probability in unemployed adults. Similarly, findings from three RBs suggested favorable impacts for immigrants who participated in educational programs, while three other RBs found positive employment effects of the participation in ordinary education for people with reduced work ability. Among recipients of social welfare benefits, two RBs observed that participants in educational programs had better employment and earnings outcomes relative



to non-participants. Finally, the author concluded that educational programs seem to have a positive effect on employment probabilities, especially when the programs are similar to the ordinary working environment. The positive effects of ordinary education programs on labor market outcomes for people with reduced work ability were confirmed in another narrative review of RBs, which was published in 2018 by Steskal (81). The lack of a systematic critical appraisal of the internal validity of the included studies is a major limitation in these reviews of the literature.

Recent meta-analyses of evaluations of labor market programs have been published, although they applied broad inclusion criteria, focusing not only on educational programs. In 2018, Card and colleagues (38) summarized data from 207 studies from USA and Europe and found that the participation in labor market programs raised employment probabilities by 4.5%; training programs that included classroom training showed an increase of 4.7%. The review concluded that training programs and wage subsidies yielded stronger effects for long-term unemployed and women. These findings were confirmed by Vooren and colleagues (18), who found similar effects for educational programs, especially in the long-term. Unlike the present systematic review, these meta-analyses pooled data from various study designs, most of them non-experimental program evaluations, and did not provide data for classroom training or educational programs as an independent subgroup. As a result, the similarities between the present systematic review and the available synthesized research (i.e., narrative reviews and meta-analyses of program evaluations) are limited.

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## **Implications for practice**

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Findings from the present systematic review represent a means to inform policy makers and stakeholders about the methodological limitations of the experimental evidence supporting the effects of educational programs for labor market outcomes. Informed decisions made for a country's policy for education and labor market, such as the Norwegian Strategy for Skills Policy 2017-2021 (8), should take into account the low to very-low certainty on the review findings that we discussed in this report.

The relationship between education and other training programs with labor market is complex. In spite of no clear impacts in the short-term, training programs that include a classroom component have shown positive long-term benefits for adults out of the labor force, and these programs are deemed as cost-effective from a long-term perspective (14). Naturally, unemployed adults may have less time or be less inclined to search for a job while they are participating in educational programs. This is known as the lock-in effect (65), which indicates that participants in training programs may have lower probabilities of finding a job compared to non-participants. The lock-in effect is stronger if participation is voluntary or if it is a requirement for the receipt of unemployment benefits (82). In the present systematic review, we observed little evidence of a potential lock-in effect on employment rate and employment probability, while no evidence of lock-in effect was observed on earnings. Some evidence of lock-in effects was also reported in the Nordic RBs and should also be taken into consideration. The poor

data reporting in the included studies and differences in the follow-up periods precluded a more informative analysis of the lock-in effect.

Along the same lines, we had no available information to study other relevant factors in this area, such as the cream-skimming effect, which suggests that only workers with high employment probabilities are selected into the training programs (83). The availability of consistent data for the study of long-term impacts would have enabled us to explore a displacement effect. This indicates that employment generated by the training programs displace or crowd regular employment (84). For example, firms tend to hire recently trained workers or untrained employed workers are fired and substituted by trained workers. Displacement effects are more common in work subsidies (84). Finally, findings presented in this report must be interpreted in line with the country's economic environment and the composition of and dynamics between labor market states need to be taken into account (14).

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## **Implications for research**

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In light of the methodological limitations that we found in the body of evidence about the effects of educational programs for labor market opportunities, researchers conducting further RCTs in this area should use appropriate randomization and blinding procedures. Better reporting of impact data is highly desired, since the poor reporting of some of the included studies limited the analyses conducted in the present systematic review. As declared by the Norwegian Strategy for Skills Policy 2017-2021 (8), “close contact between educational institutions and the labor market regarding contents, scope and work placement in educational programs, may increase relevance and motivation, and make students better prepared for the labor market”. In general, the included studies failed to report the specific contents of the educational programs. Therefore, a more complete reporting of the both program content and delivery methods will enhance the quality and applicability of further experimental studies. Further RCTs should be reported in line with international reporting guidance, such as the CONSORT (Consolidated Standards of Reporting Trials) Statement (85) and the template for intervention description and replication (TIDieR) checklist (86).

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# Conclusion

All in all, educational programs may result in little to no difference for most of the labor market opportunities for unemployed adults or low-wage workers. Participation in educational programs may lead to little to no difference compared to no intervention on employment probabilities in the long-term, total earnings, as well as working hours and the number of weeks worked. It is uncertain whether participants in educational programs have better employment rates compared to non-participants. It is also uncertain whether participants in educational programs, relative to those in programs focusing on on-the-job training and job search assistance, have better employment and earning probabilities. Findings from Nordic RBs similarly indicated that educational programs may improve employment probabilities for participants with reduced work ability and non-western immigrants.

The findings presented in this systematic review are based primarily on RCTs with serious methodological weaknesses, especially with respect to randomization procedures and incomplete data reporting. These limitations reduced our possibility of drawing informative policy-relevant conclusions. Additionally, most of the RCTs were conducted in USA during the early 1990s, which limits the transferability of the research findings to today's Norwegian context. The closest evidence to the Norwegian context comes from six large registry-based studies (five Norwegian studies and one Danish) of moderate methodological quality. These might be used in evidence-informed policymaking, but such policymaking should take into consideration the limitations of non-randomized studies to draw causal conclusions. A close cooperation between educational institutions and the labor market constitutes a key factor for raising skills in unemployed adults. Further well-conducted experimental studies should be undertaken, as they may improve knowledge about the effects of educational programs for labor market outcomes.

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# Appendix

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## Appendix 1. Types of education programs

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Types of education programs as defined by the ISCED (22).

<b>Education program</b>	<b>Definition</b>
<i>Formal education</i>	“Education that is institutionalized, intentional and planned through public organizations and recognized private bodies, and – in their totality – constitute the formal education system of a country. Formal education programs are recognized as such by the relevant national education or equivalent authorities, e.g. any other institution in cooperation with the national or sub-national education authorities. Formal education consists mostly of initial education. Vocational education, special needs education and some parts of adult education are often recognized as being part of the formal education system” (22).
<i>Informal learning</i>	“Forms of learning that are intentional or deliberate but are not institutionalized. It is consequently less organized and structured than either formal or non-formal education. Informal learning may include learning activities that occur in the family, workplace, local community and daily life, on a self-directed, family-directed or socially-directed basis” (22).
<i>Initial education</i>	“Formal education of individuals before their first entrance to the labor market, i.e. when they will normally be in full-time education. It typically takes place in educational institutions in a system designed as a continuous educational pathway” (22).
<i>Non-formal education</i>	“Education that is institutionalized, intentional and planned by an education provider. The defining characteristic of non-formal education is that it is an addition, alternative and/or complement to formal education within the process of lifelong learning of individuals. It is often provided in order to guarantee the right of access to education for all. It caters to people of all ages but does not necessarily apply a continuous pathway structure; it may be short in duration and/or low-intensity; and it is typically provided in the form of short courses, workshops or seminars. Non-formal education mostly leads to qualifications that are not recognized as formal or equivalent to formal qualifications by the relevant national or sub-national education authorities or to no qualifications at all. Nevertheless, formal, recognized qualifications may be obtained through exclusive participation in specific non-formal education programs; this often happens when the non-formal program completes the competencies obtained in another context” (22).

	Non-formal education can cover programs contributing to adult and youth literacy, as well as programs on life skills, work skills, and social or cultural development. It can include training in a workplace to improve or adapt existing qualifications and skills, training for unemployed or inactive persons, as well as alternative educational pathways to formal education and training in some cases (22).
<i>Vocational education</i>	“Education programs that are designed for learners to acquire the knowledge, skills and competencies specific to a particular occupation, trade, or class of occupations or trades. Such programs may have work-based components (e.g. apprenticeships, dual-system education programs). Successful completion of such programs leads to labour market-relevant, vocational qualifications acknowledged as occupationally-oriented by the relevant national authorities and/or the labour market” (22).
<i>Work-based education</i>	“Educational activities that take place in a work environment, usually in the context of vocational education programs. The aim is to achieve specific learning objectives through practical instruction and participation in work activities under the guidance of experienced workers or trainers” (22).

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## Appendix 2. Glossary

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<b>Word/term</b>	<b>Definition</b>
<i>Controlled before-and-after study</i>	A study in which observations are made before and after the implementation of an intervention, both in a group that receives the intervention and in a control group that does not. In this type of study, decisions about allocation to the different groups are not made by the investigators (44).
<i>Interrupted time series study</i>	A study that uses observations at multiple time points before and after an intervention (the ‘interruption’). The design attempts to detect whether the intervention has had an effect significantly greater than any underlying trend over time (28). There must be at least three measures made both before and after the interruption.
<i>Non-randomized controlled trial</i>	An experimental study in which the researchers allocate people to different interventions using a method that is <i>not</i> random (28). Apart from the allocation to groups being non-random, this design is similar to an RCT. That is, as stated above, one group gets the intervention being tested, the other group gets an alternative intervention, a placebo or no intervention. The groups are followed up to check whether there is a difference between the groups.
<i>Randomized-controlled trials (RCTs)</i>	The National Institute for Care and Excellence (NICE) defines an RCT as “a study in which a number of similar people are randomly assigned to 2 (or more) groups to test a specific drug, treatment or other intervention. One group (the experimental group) has the intervention being tested, the other (the comparison or control group) has an alternative intervention, a dummy intervention (placebo) or no intervention at all. The groups are followed up to see how effective the experimental intervention was. Outcomes are measured at specific times and any difference in response between the groups is assessed statistically” (87).

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### Appendix 3. Search strategies

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**Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily 1946 to October 09, 2018**

**Dato: 10.10.2018**

**Treff: 1599**

#	Searches	Results
1	education/	19953
2	education, special/	8619
3	vocational education/	1873
4	1 or 2 or 3	30081
5	employment/	43246
6	Return to Work/	1805
7	"Salaries and Fringe Benefits"/	15062
8	or/5-7	57980
9	4 and 8	1138
10	((adult or basic or basic-skills or formal or non-formal or nonformal or informal or comprehensive or supported or special or secondary or postsecondary or post-secondary) adj education).ti,ab,kf.	10529
11	((classroom or classroom-based or in-class) adj (training or retraining)) or ((job or workbased or work-based or workplace or non-formal or nonformal or informal) adj learning).ti,ab,kf.	763
12	((education* adj (program* or intervention)) or (education adj2 training)).ti,ab,kf.	56622
13	(vocational and education).ti,ab,kf.	2384
14	10 or 11 or 12 or 13	68636
15	(employment or reemployment or employabilit* or labo?r-market-outcome or work*-participation* or ((job or work) adj1 (acqui* or attain* or outcome*)) or wage or wages or earning* or salar* or back-to-work or return*-to-work* or unemploy*).ti,ab,kf.	91965
16	14 and 15	2311
17	9 or 16	3349
18	Randomized Controlled Trial/	469376
19	Non-randomized controlled trials as topic/	407
20	Controlled Clinical Trial/	92684
21	Controlled Before-After Studies/	355
22	Multicenter Study/	239923
23	Pragmatic Clinical Trial/	882
24	Interrupted Time Series Analysis/	484
25	(random* or trial or intervention? or effect? or impact? or multicenter or multi center or multicentre or multi centre or controlled or control group? or (before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or quasiexperiment* or quasi experiment* or evaluat* or time series or time point? or repeated measur*).ti,ab,kf.	9129781
26	Meta-Analysis/	92941
27	Meta-Analysis as Topic/	16445

- 28 ((systematic\* adj2 (overview or review\* or search\*)) or meta-anal\* or metaanal\* or meta-regression\* or meta-review\* or umbrella review\* or "overview of reviews" or "review of reviews" or (evidence\* adj2 synth\*) or synthesis review\*).ti,ab,kf. 234872
- 29 Review.pt. and (pubmed or medline).tw. 114947
- 30 Registries/ 76410
- 31 (register-based or (regist\* adj2 (study or data)) or (routin\* adj3 data) or (administrative adj (data or regist\*)) or repositor\* or panel-data or propensity-score or record\*-link\*).ti,ab,kf. 70959
- 32 or/18-31 9386264
- 33 17 and 32 1613
- 34 exp animals/ not humans/ 4502274
- 35 (news or editorial or comment).pt. 1242886
- 36 33 not (34 or 35) 1608
- 37 remove duplicates from 36 1599

**Database: PsycINFO 1806 to October Week 1 2018 (OVID)**

**Dato: 10.10.2018**

**Treff: 3332**

- | #  | Searches  | Results |
|----|---|---------|
| 1  | exp ADULT EDUCATION/ or EDUCATION/ or VOCATIONAL EDUCATION/ or SPECIAL EDUCATION/   | 66317   |
| 2  | employment status/ or employability/ or reemployment/ or salaries/  | 20666   |
| 3  | 1 and 2   | 779     |
| 4  | ((adult or basic or basic-skills or formal or non-formal or nonformal or informal or comprehensive or supported or special or secondary or postsecondary or post-secondary) adj education).ti,ab,id.  | 34075   |
| 5  | ((classroom or classroom-based or in-class) adj (training or retraining)) or ((job or workbased or work-based or workplace or non-formal or nonformal or informal) adj learning).ti,ab,id.  | 2380    |
| 6  | ((education* adj (program* or intervention)) or (education adj2 training)).ti,ab,id.  | 43135   |
| 7  | (vocational and education).ti,ab,id.  | 7211    |
| 8  | 4 or 5 or 6 or 7  | 80365   |
| 9  | (employment or reemployment or employabilit* or labor-market-outcome or work*-participation* or ((job or work) adj1 (acqui* or attain* or outcome*)) or wage or wages or earning* or salar* or back-to-work or return*-to-work* or unemploy*).ti,ab,id. | 76049   |
| 10 | 8 and 9   | 3781    |
| 11 | 3 or 10   | 4266    |
| 12 | ("0400" or "0451" or "1800" or "2000").md. [empirical study/ prospective study/ quantitative study/ treatment outcome/clinical trial/]  | 2320868 |
| 13 | Experimental Design/  | 10878   |
| 14 | Between Groups Design/  | 112     |
| 15 | Quantitative Methods/   | 3094    |
| 16 | Quasi Experimental Methods/   | 145     |
| 17 | Experiment Controls/  | 897     |

- 18 Pretesting/ 237  
 19 Posttesting/ 136  
 20 Time Series/ 1935  
 21 Repeated Measures/ 664  
 22 (random\* or trial or intervention? or effect\* or impact? or multicenter or multi  
 center or multicentre or multi centre or controlled or control group? or (before  
 adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post  
 test)) or quasiexperiment\* or quasi experiment\* or evaluat\* or time series or  
 time point? or repeated measur\*).ti,ab,id. 2044382  
 23 Meta Analysis/ 4254  
 24 Systematic Review.md. 19902  
 25 ((systematic\* adj2 (overview or review\* or search\*)) or meta-anal\* or metaanal\*  
 or meta-regression\* or meta-review\* or umbrella review\* or "overview of re-  
 views" or "review of reviews" or (evidence\* adj2 synth\*) or synthesis re-  
 view\*).ti,ab,id. 53782  
 26 (review and (pubmed or medline)).ti,ab. 14745  
 27 (register-based or (regist\* adj2 (study or data)) or (routin\* adj3 data) or (admin-  
 istrative adj (data or regist\*)) or repositor\* or panel-data or propensity-score  
 or record\*-link\*).ti,ab,id. 13562  
 28 or/12-27 3117358  
 29 11 and 28 3335  
 30 remove duplicates from 29 3332

**Database: Embase 1974 to 2018 October 09 (OVID)**

**Dato: 10.10.2018**

**Treff: 940**

- # Searches Results
- 1 \*education/ or \*adult education/ or \*vocational education/ or \*special education/  
 74932  
 2 \*employment/ 19784  
 3 \*return to work/ 1140  
 4 \*"salary and fringe benefit"/ 6196  
 5 2 or 3 or 4 26589  
 6 1 and 5 646  
 7 ((adult or basic or basic-skills or formal or non-formal or nonformal or informal  
 or comprehensive or supported or special or secondary or postsecondary or  
 post-secondary) adj education).ti,ab,kw. 13600  
 8 (((classroom or classroom-based or in-class) adj (training or retraining)) or ((job  
 or workbased or work-based or workplace or non-formal or nonformal or in-  
 formal) adj learning)).ti,ab,kw. 923  
 9 ((education\* adj (program\* or intervention)) or (education adj2 train-  
 ing)).ti,ab,kw. 74083  
 10 (vocational and education).ti,ab,kw. 3075  
 11 7 or 8 or 9 or 10 89369  
 12 (employment or reemployment or employabilit\* or labo?r-market-outcome or  
 work\*-participation\* or ((job or work) adj1 (acqui\* or attain\* or outcome\*)) or



- wage or wages or earning\* or salary\* or back-to-work or return\*-to-work\* or un-employ\*).ti,ab,kw. 110294
- 13 11 and 12 2999
- 14 6 or 13 3580
- 15 Meta Analysis/ 149036
- 16 Systematic Review/ 178633
- 17 ((systematic\* adj2 (overview or review\* or search\*)) or meta-anal\* or metaanal\* or meta-regression\* or meta-review\* or umbrella review\* or "overview of reviews" or "review of reviews" or (evidence\* adj2 synth\*) or synthesis review\*).ti,ab,kw. 297519
- 18 (review and (pubmed or medline)).ti,ab. 142414
- 19 Randomized Controlled Trial/ 515550
- 20 Controlled Clinical Trial/ 458021
- 21 Quasi Experimental Study/ 4933
- 22 Pretest Posttest Control Group Design/ 351
- 23 Time Series Analysis/ 21301
- 24 Experimental Design/ 15846
- 25 Multicenter Study/ 195410
- 26 Pretest Posttest Design/ 3172
- 27 (random\* or trial or intervention? or effect\* or impact? or multicenter or multicenter or multicentre or multi centre or controlled or control group? or (before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or quasiexperiment\* or quasi experiment\* or evaluat\* or time series or time point? or repeated measur\*).ti,ab,kw. 12274373
- 28 Registries/ 66749
- 29 (register-based or (regist\* adj2 (study or data)) or (routin\* adj3 data) or (administrative adj (data or regist\*)) or reposit\* or panel-data or propensity-score or record\*-link\*).ti,ab,kw. 101331
- 30 or/15-29 12548676
- 31 14 and 30 2014
- 32 exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/ 24858462
- 33 human/ or normal human/ or human cell/ 18901122
- 34 32 not (32 and 33) 6007797
- 35 (news or editorial or comment).pt. 578170
- 36 31 not (34 or 35) 2012
- 37 limit 36 to embase 950
- 38 remove duplicates from 37 940

**Database: ERIC (EBSCO)**

**Dato: 10.10.2018**

**Treff: 8649**

- S1 DE "Education" OR DE "Adult Basic Education" OR DE "Adult Vocational Education" OR DE "Special Education" OR DE "Postsecondary Education" OR DE "Adult Education" OR DE "Secondary Education" OR DE "Vocational Education" OR DE "Workplace Learning" OR DE "Nonformal Education" OR DE "Informal Education" 332,559

- S2 DE "Employment" OR DE "Youth Employment" OR DE "Salaries" OR DE "Wages"  
OR DE "Employment Potential" 18,829
- S3 S1 AND S2 6,820
- S4 TI ( ((adult or basic or basic-skills or formal or non-formal or nonformal or infor-  
mal or comprehensive or supported or special or secondary or postsecondary  
or post-secondary) W0 education) ) OR AB ( ((adult or basic or basic-skills or  
formal or non-formal or nonformal or informal or comprehensive or supported  
or special or secondary or postsecondary or post-secondary) W0 education) )  
66,725
- S5 TI ( ((classroom or classroom-based or in-class) W0 (training or retraining)) or  
((job or workbased or work-based or workplace or non-formal or nonformal or  
informal) W0 learning) ) OR AB ( ((classroom or classroom-based or in-class)  
W0 (training or retraining)) or ((job or workbased or work-based or workplace  
or non-formal or nonformal or informal) W0 learning) ) 3,729
- S6 TI ( (education\* W0 (program\* or intervention\*)) ) OR AB ( (education\* W0 (pro-  
gram\* or intervention\*)) ) 62,192
- S7 TI ( vocational and education ) OR AB ( vocational and education ) 30,322
- S8 TI education N1 training OR AB education N1 training 14,386
- S9 S4 OR S5 OR S6 OR S7 OR S8 149,624
- S10 TI ( (employment or reemployment or employabilit\* or labo#r-market-outcome  
or work\*-participation\* or ((job or work) N0 (acqui\* or attain\* or outcome\*))  
or wage or wages or earning\* or salar\* or back-to-work or return\*-to-work\* or  
unemploy\*) ) OR AB ( (employment or reemployment or employabilit\* or  
labo#r-market-outcome or work\*-participation\* or ((job or work) N0 (acqui\*  
or attain\* or outcome\*)) or wage or wages or earning\* or salar\* or back-to-  
work or return\*-to-work\* or unemploy\*) ) 65,396
- S11 S9 AND S10 14,098
- S12 S3 OR S11 18,977
- S13 DE "Randomized Controlled Trials" OR DE "Pretests Posttests" OR DE "Control  
Groups" OR DE "Evaluation Research" OR DE "Quasiexperimental Design" OR  
DE "Program Validation" OR DE "Program Effectiveness" OR DE "Program Eval-  
uation" 120,716
- S14 TI ( random\* or trial or intervention# or effect\* or impact# or multicenter or  
multi-center or multicentre or multi-centre or controlled or control group# or  
(before N4 after) or (pre N4 post) or ((pretest or pre-test) and (posttest or  
post-test)) or quasiexperiment\* or quasi-experiment\* or evaluat\* or time-series  
or time point# or repeated-measur\* or register-based or (regist\* N1 (study or  
data)) or (routin\* N2 data) or (administrative W0 (data or regist\*)) or reposi-  
tor\* or panel-data or propensity-score or record\*-link\* ) OR AB ( random\* or  
trial or intervention# or effect\* or impact# or multicenter or multi-center or  
multicentre or multi-centre or controlled or control group# or (before N4 after)  
or (pre N4 post) or ((pretest or pre-test) and (posttest or post-test)) or quasiex-  
periment\* or quasi-experiment\* or evaluat\* or time-series or time point# or re-  
peated-measur\* or register-based or (regist\* N1 (study or data)) or (routin\* N2  
data) or (administrative W0 (data or regist\*)) or repositor\* or panel-data or  
propensity-score or record\*-link\* ) 589,880
- S15 DE "Meta Analysis" OR DE "Literature Reviews" 28,315

S16 TI ( (systematic\* N1 (overview or review\*)) or meta-anal\* or metaanal\* or meta-regression\* or meta-review\* or umbrella-review\* or "overview-of-reviews" or "review-of-reviews" or (evidence\* N1 synth\*) or synthesis-review\* ) OR AB ( (systematic\* N1 (overview or review\*)) or meta-anal\* or metaanal\* or meta-regression\* or meta-review\* or umbrella-review\* or "overview-of-reviews" or "review-of-reviews" or (evidence\* N1 synth\*) or synthesis-review\* ) 6,291

S17 S13 OR S14 OR S15 OR S16 631,008

S18 S12 AND S17 8,649

**Database: Cochrane Library (Wiley)**

**Dato: 10.10.2018**

**Treff: 262**

ID	Search	Hits
#1	MeSH descriptor: [education] explode all trees	28850
#2	MeSH descriptor: ["education, special"] explode all trees	286
#3	MeSH descriptor: ["vocational education"] explode all trees	37
#4	(33-#3)	28850
#5	MeSH descriptor: [employment] explode all trees	1684
#6	MeSH descriptor: ["Return to Work"] explode all trees	188
#7	MeSH descriptor: ["Salaries and Fringe Benefits"] this term only	47
#8	(2-#7)	1715
#9	#4 and #8	491
#10	((adult or basic or basic-skills or formal or non-formal or nonformal or informal or comprehensive or supported or special or secondary or postsecondary or post-secondary) NEXT education):ti,ab,kw	691
#11	((classroom or classroom-based or in-class) NEXT (training or retraining)) or ((job or workbased or work-based or workplace or non-formal or nonformal or informal) NEXT learning):ti,ab,kw	40
#12	((education* NEXT (program* or intervention)) or (education NEAR/2 training)):ti,ab,kw	10907
#13	(vocational and education):ti,ab,kw	325
#14	(or #10 - #13)	11757
#15	(employment or reemployment or employabilit* or labor-market-outcome* or labour-market-outcome* or work* NEXT participation* or ((job or work) NEAR/1 (acqui* or attain* or outcome*)) or wage or wages or earning* or salar* or back-to-work or return* NEXT to NEXT work* or unemploy*):ti,ab,kw	5767
#16	#14 and #15	262 [12 Cochrane reviews, 250 trials]

**Database: Centre for Reviews and Dissemination (DARE; HTA)**

**Dato: 10.10.2018**

**Treff: 38**

1	MeSH DESCRIPTOR Education IN DARE,HTA	36
2	MeSH DESCRIPTOR education, special IN DARE,HTA	8
3	MeSH DESCRIPTOR Vocational Education IN DARE,HTA	1
4	#1 OR #2 OR #3	42
5	MeSH DESCRIPTOR employment IN DARE,HTA	40
6	MeSH DESCRIPTOR return to work IN DARE,HTA	15

- 7 MeSH DESCRIPTOR Salaries and Fringe Benefits IN DARE,HTA 3
- 8 #5 OR #6 OR #7 56
- 9 #4 AND #8 2
- 10 (((adult or basic or basic-skills or formal or non-formal or nonformal or informal or comprehensive or supported or special or secondary or postsecondary or post-secondary) adj education)) IN DARE, HTA 109
- 11 (((((classroom or classroom-based or in-class) adj (training or retraining)) or ((job or workbased or work-based or workplace or non-formal or nonformal or informal) adj learning))) IN DARE, HTA 11
- 12 (((education\* adj (program\* or intervention)) or (education adj2 training))) IN DARE, HTA 708
- 13 (vocational AND education) IN DARE, HTA 28
- 14 #10 OR #11 OR #12 OR #13 804
- 15 (employment or reemployment or employabilit\* or labor-market-outcome\* or labour-market-outcome\* or work\* adj participation\* or ((job or work) NEAR1 (acqui\* or attain\* or outcome\*)) or wage or wages or earning\* or salar\* or back-to-work or return\* adj to adj work\* or unemploy\*) IN DARE, HTA 545
- 16 #14 AND #15 38
- 17 #9 OR #16 38

**Database: Web Of Science Core Collection [SCI-EXPANDED & SSCI] (Clarivate)**

**Dato: 11.10.2018**

**Treff: 2315**

- # 1 TOPIC: (Adult-education or basic-education or basic-skills-education or formal-education or non-formal-education or nonformal-education or informal-education or comprehensive-education or supported-education or special-education or secondary-education or postsecondary-education or post-secondary-education) 26,893
- # 2 TOPIC: (classroom-training or classroom-based-training or in-class-training job-learning or workbased-learning or work-based-learning or workplace-learning or non-formal-learning or nonformal-learning or informal-learning) 2,715
- # 3 TOPIC: (education\*-program\* or education\*-intervention or (education NEAR/1 training 53,761
- # 4 TOPIC: (vocational and education) 5,995
- # 5 #4 OR #3 OR #2 OR #1 86,043
- # 6 TOPIC: (employment or reemployment or employabilit\* or labor-market-outcome or work\*-participation\* or ((job or work) NEAR/0 (acqui\* or attain\* or outcome\*)) or wage or wages or earning\* or salar\* or back-to-work or return\*-to-work\* or unemploy\*) 201,854
- # 7 #6 AND #5 3,212
- # 8 TOPIC: ((systematic\* NEAR/1 ("overview" or review\* or search\*)) or meta-anal\* or metaanal\* or meta-regression\* or umbrella-review\* or "overview of reviews" or "review of reviews" or (evidence\* NEAR/1 synth\*) or synthesis-review\* or random\* or "trial" or intervention\$ or effect\* or impact\$ or "multicenter" or "multi-center" or "multicentre" or "multi-centre" or "controlled" or control-group\$ or ("before" NEAR/4 "after") or ("pre" NEAR/4 "post") or (("pretest" or

"pre-test") and ("posttest" or "post-test")) or quasiexperiment\* or quasi-experiment\* or evaluat\* or "time-series" or time-point\$ or repeated-measur\* or register-based or (regist\* NEAR/1 (study or data)) or (routin\* NEAR/2 data) or administrative-data or administrative-regist\* or repositor\* or panel-data or propensity-score or record\*-link\*) 4,092,489

# 9 #8 AND #7 [Indexes=SCI-EXPANDED, SSCI Timespan=1987-2018] 2,315

**Database: Sociological Abstracts & Social Services Abstracts (ProQuest)**

**Dato: 11.10.2018**

**Treff: 788**

((Ti,AB,SU(Adult-education or basic-education or basic-skills-education or formal-education or non-formal-education or nonformal-education or informal-education or comprehensive-education or supported-education or special-education or secondary-education or postsecondary-education or post-secondary-education or classroom-training or classroom-based-training or in-class-training job-learning or workbased-learning or work-based-learning or workplace-learning or non-formal-learning or nonformal-learning or informal-learning or education\*-program\* or education\*-intervention or (education NEAR/0 training) or (vocational and education)) AND Ti,AB,SU(employment or reemployment or employabilit\* or labor-market-outcome or work\*-participation\* or ((job or work) NEAR/0 (acqui\* or attain\* or outcome\*)) or wage or wages or earning\* or salar\* or back-to-work or return\*-to-work\* or unemploy\*)) OR ((MAINSUBJECT.EXACT("Adult Education") OR MAINSUBJECT.EXACT("Vocational Education") OR MAINSUBJECT.EXACT("Education") OR MAINSUBJECT.EXACT("Special Education") OR MAINSUBJECT.EXACT("Secondary Education")) AND (MAINSUBJECT.EXACT("Employment") OR MAINSUBJECT.EXACT("Wages") OR MAINSUBJECT.EXACT("Salaries") OR MAINSUBJECT.EXACT("Employability")))) AND TI,AB((systematic\* NEAR/2 (review\* OR overview OR search\*)) OR meta-anal\* OR metaanal\* OR meta-regression\* OR meta-review\* OR umbrella-review\* OR "overview of reviews" OR "review of reviews" OR (evidence\* NEAR/1 synth\*) OR synthesis-review\* OR randomis\* OR randomiz\* OR "random" OR "randomly" OR "trial" OR intervention[\*1] OR effect\* OR impact[\*1] OR "multicenter" OR "multi-center" OR "multicentre" OR "multi-centre" OR "controlled" OR control-group[\*1] OR ("before" NEAR/4 "after") OR ("pre" NEAR/4 "post") OR (("pre-test" OR "pre-test") AND ("posttest" OR "post-test")) OR quasiexperiment\* OR quasi-experiment\* OR evaluat\* OR "time-series" OR time-point[\*1] OR repeated-measur\* OR register-based or (regist\* NEAR/1 (study or data)) or (routin\* NEAR/2 data) or (administrative PRE/0 (data or regist\*)) or repositor\* or panel-data or propensity-score or record\*-link\*) 919 (f r automatisk de-duplisering)

**Database: SveMed+**

**Dato: 11.10.2018**

**Treff: 152**

- |   |                              |     |
|---|------------------------------|-----|
| 1 | noexp:"education"            | 99  |
| 2 | noexp:"education, special"   | 90  |
| 3 | noexp:"vocational education" | 13  |
| 4 | #1 OR #2 OR #3               | 197 |
| 5 | noexp:"Employment"           | 668 |
| 6 | noexp:"return to work"       | 65  |

- 7 noexp:"Salaries and Fringe Benefits" 156  
 8 #5 OR #6 OR #7 855  
 9 #4 AND #8 6  
 10 adult-education OR basic-education OR basic-skills-education OR formal-education OR non-formal-education OR nonformal-education OR informal-education OR comprehensive-education OR supported-education OR special-education OR secondary-education OR postsecondary-education OR post-secondary-education 2656  
 11 classroom-training OR classroom-based-training OR in-class-training OR job-learning OR workbased-learning OR work-based-learning OR workplace-learning OR non-formal-learning OR nonformal-learning OR informal-learning 83  
 12 education\*-program\* OR education\*-intervention\* OR education-and-training OR "training and education" 512  
 13 vocational AND education 70  
 14 #10 OR #11 OR #12 OR #13 3165  
 15 employment OR reemployment OR employabilit\* OR labor-market-outcome\* OR labour-market-outcome\* OR work\*-participation\* OR job-acqui\* OR job-attain\* OR job-outcome\* OR work-acqui\* OR work-attain\* OR work-outcome\* OR wage OR wages OR earning\* OR salar\* OR back-to-work OR return\*-to-work\* OR unemploy\* 2955  
 16 #14 AND #15 149  
 17 #9 OR #16 152  
 18 (arbeid\* OR arbet\* OR arbejd\*) AND (utdann\* OR utbildning\* OR uddannelse\*) 220  
 19 #18 OR #17 318

**Database: Epistemonikos**

**Dato: 11.10.2018**

**Treff: 5**

[Title/Abstract:] ("Adult education" OR "basic education" OR "basic skills education" OR "formal education" OR non "formal education" OR "nonformal education" OR "informal education" OR "comprehensive education" OR "supported education" OR "special education" OR "secondary education" OR "postsecondary education" OR "post secondary education" OR "classroom training" or "classroom based training" or "in class training" OR "job learning" or "workbased learning" or "work based learning" or "workplace learning" or "non formal learning" or "nonformal learning" or "informal learning" or "education program" OR "educational program" OR "education programs" OR "educational programs" OR "education programme" OR "education programmes" OR "educational programme" OR "educational programmes" OR "educationan and training" OR "vocational education") AND [Title/Abstract:] (employment or reemployment or employabilit\* or "labor market outcome" or "work participation" OR "work participations" or "job acquisition" or "job acquisitions" OR "job attainment" OR "job attainments" OR "job outcome" OR "job outcomes" OR "work acquisition" or "work acquisitions" OR "work attainment" OR "work attainments" OR "work outcome" OR "work outcomes" or wage or wages or earning\* or salar\* or "back to work" or "return to work" OR "returning to work" OR "returning to working" OR "return to working" or unemploy\*) 16 (fØr filter)

[Filters > Publication type: Systematic Reivew, Broad Synthesis and Structured Summary]

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#### Appendix 4. Excluded studies

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Reference (First author, year)	Main reason for exclusion
Akkermans, 2015 (88)	Intervention
Albrecht, 2009 (89)	Intervention
Andersen, 2010 (90)	Intervention
Andren, 2002b (91)	Intervention
Arbesman, 2011 (92)	Intervention
Arriagada, 1990 (93)	Intervention
Arvidson, 1991(94)	Study design
Asplund, 2004 (95)	Study design
Beemster, 2015 (96)	Intervention
Bethge, 2015 (97)	Study design
Bevelander, 2016 (98)	Study design
Bloom, 2001 (99)	Secondary and non-experimental analysis derived from the NEWWS study. Most of the data are already contained in the primary publications from the NEWWS study.
Bloom, 2003 (100)	Secondary and non-experimental analysis derived from the NEWWS study. Most of the data are already contained in the primary publications from the NEWWS study.
Bockerman, 2017 (101)	Population
Bouffard, 2000 (102)	Outcome
Bozzer, 1999 (103)	Intervention
Brunello, 2017 (104)	Intervention
Burghardt, 2001 (105)	Population
Canals, 1997 (106)	Intervention
Cawthon, 2016 (107)	Population
Christensen, 2015 (108)	Intervention
Dahl, 2007 (109)	Study design
Dean, 1992 (110)	Intervention
Dieckhoff, 2007 (111)	Intervention
Eck, 1993 (112)	Study design
Ellis, 2010(113)	Population and intervention
Fein, 1994 (114)	Secondary and non-experimental analysis derived from the NEWWS study. Most of the data are already contained in the primary publications from the NEWWS study.
Foley, 2010 (115)	Intervention
Ganzglass, 1994 (116)	Study design
GAO, 1994 (117)	Study design
Georgia state, 1995 (118)	Study design
Gerber, 1995 (119)	Study design
Ghasemi, 2018 (120)	Intervention

Gill, 1990 (121)	Study design, intervention and population
Gitter, 1992(122)	Study design
Goldstein, 2012 (123)	Intervention
Gorgoglione, 1991 (124)	Population
Greenberg, 2005 (125)	Study design
Gutman, 2008 (126)	Intervention
Gutman, 2009 (126)	Intervention
Haelermans, 2011 (127)	Study design
Hallsten, 2012, (128)	Population
Hartman, 1996 (129)	Population
Hebbar 2006 (130),	Intervention
Hedley, 2017 (131)	Intervention
Hill, 1995(132)	Intervention
Hirshleifer, 2014 (133)	Setting (country)
Hlobil, 2005 (134)	Intervention
Horn, 2016 (135)	Population
Hornbostel, 1979(136)	Intervention
Høgelund 2005 (137)	No full-text available
Jakobsson 2010, (138)	Intervention
Jenkins 2006 (139)	Intervention
Kaida, 2013 (140)	Intervention
Kang, 2006 (141)	Intervention
Kemple 1993 (142)	Study design
Kemple, 1995 (143)	Intervention
Khan, 2009 (144)	Intervention
Kluve, 2006(145)	Study design
Koffarnus, 2013 (146)	Intervention
Koivisto, 2007 (147)	Intervention
Kuoppala, 2008 (148)	Intervention
Lee 2010 (149)	Population
Lidz, 2004 (150)	Intervention
Magnussen, 2007 (151)	Intervention
Maitra 2012 (152)	Setting (country) and intervention
Malamud 2010 (153),	Intervention
Mandell, 2015 (154)	Intervention and outcomes
Marks, 2017 (155)	Population
Martinson, 1994 (156)	Outcomes
Matkovic, 2012 (157)	Intervention
Mayer, 2016 (158)	Intervention
Mayombe, 2015 (159)	Outcomes
Millenky, 2011 (160)	Population
Miller, 2017 (161)	Intervention
Murray, 2005 (162)	Intervention
National Centre for Vocational Education Research, 1999 (163)	Intervention
Neuman, 2005 (164)	Population
Nevala, 2015 (165)	Intervention



Nightingale, 1997 (166)	Intervention
Oliver, 2014 (167)	Intervention
Peralesa, 2017 (168)	Intervention
Poortman, 2012 (169)	Population and intervention
Pruett, 2008 (170)	Study design
Pungello, 2010 (171)	Population and intervention
Riphahn, 2015 (172)	Population
Romero, 1994 (173)	Intervention
Rosenheck, 2017(174)	Intervention
Ruber, 2017 (175)	Population
Røed, 2006 (176)	Intervention
Rønsen, 2007 (177)	Intervention
Sakellariou, 2006(178)	Population
Sannicandro, 2017 (179)	Intervention
Sansone, 1994 (180)	Intervention
Schochet, 2000 (181)	Duplicate
Schochet, 2001 (182)	Population
Schwerdt, 2011 (183)	Population
Schwerdt, 2012(184)	Population
Stenberg, 2015 (185)	Population
Stenberg, 2010 (186)	Population
Svikis, 2012 (187)	Intervention
Tan, 1991 (188)	Outcomes
Tremblay, 2006 (189)	Intervention
Twamley, 2005 (190)	Population
Varekamp, 2006 (191)	Intervention
Veira, 2018 (192)	Study design
Vignoles, 2004 (193)	Population and intervention
Vuori, 2012 (194)	Intervention
Wehman, 2017 (195)	Intervention

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## Appendix 5. Registry-based studies (n=26)

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Country	Study ID	Population	Intervention	Control	Outcomes	Main finding
Denmark	Holm 1995 (196)	Unemployed adults N= 88,948	General adult education	No program	Employment Earnings	Participants in general education had higher employment and earnings compared to those in the control group. The effect was larger among long-term unemployed adults.
Denmark	Holm 2017 (56)	Employees coming from ordinary employment and receiving sickness benefits. N= 28,104	Ordinary education	Non-formal education; subsidized internships; wage-subsidized; job training	Employment	Ordinary education had a significant positive effect on employment duration but no effect on the transition into employment. This effect was the result of two opposing effects, a large positive effect of having completed education and a large negative lock-in effect, with low re-employment chances during program participation.
Denmark	Høgelund 2002 (137)	Long-term sick-listed employees N= 433	Educational programs	No program	Employment	Participation in educational programs did not significantly help employees back to work.
Denmark	Jespersen 2008 (197)	Adults receiving unemployment insurance N= 16,018	Classroom training	Private job training; public job-training; residual program	Employment Earnings	Classroom training did not significantly improve employment or earnings compared to the other groups in the long run.
France	Ferrari 2007 (198)	Unemployed adults N= 10,601	Human capital intensive programs: labor market training in general, manufacturing/agricul-	On-the-job training	Employment	Human capital intensive training raised the transition rate out from unemployment by 60%, while on-the-job training programs increased this transition by 23%.

			ture, business support tertiary domains			
Norway	Aavik 2003 (46)	Partially disabled employees who completed vocational rehabilitation N= 1,506	Educational programs (i.e., ordinary classes in public school system, or occupational classroom training)	No training	Employment	Participants in the educational programs had around eight times higher employment rates compared to nonparticipants.
Norway	Dahl 2005 (51)	Social assistance recipients N= 55,604	Training programs aiming to provide the participants with labor market skills	Employment programs; no program	Earnings	Training programs were associated with higher overall earnings, whereas employment programs produced no significant effects.
Norway	Hardoy 2005 (50)	Unemployed adults N= 92,154	Classroom courses covering a wide range of subjects, from carpentry to language courses and computers.	Vocational programs: work experience and training  Employment programs: temporary employment in the public sector, and wage subsidies.	Employment	None of the programs showed positive effects on employment. Employment programs increased full-time employment of females but not of males, and for the younger age group, but not of those over 20 years of age.

				No program		
Norway	Hauan 2015 (199)	Adults with reduced work ability, receiving work assessment allowance N= 32,924	Education/Training (mainly ordinary public or private education)	Work practice; assistance	Employment	All programs increased employment. Education showed the largest effects, followed by assistance, whereas work practice had the smallest effects.
Norway	Kvinge 2006 (49)	First generation non-western immigrants N= 89,661	Education	Work practice; wage support	Employment	The proportion of non-western immigrants employed was higher in participants who received educational services relative to the other groups.
Norway	Raaum 2002 (52)	Unemployed adults N= 1,506	Labor market training programs	No program	Earnings	Average training effects were positive and persistent over the post-training period of 5 years. Participants without recent work experience, prior to the training, gained less.
Norway	Westlie 2008 (47)	Adults in vocational rehabilitation services N= 177,353	Education provided by the local employment service, and public education	Work training in ordinary firms; work training in protected firms; wage subsidies.	Employment Disability	Educational programs increased the employment probability by 11.7 and 15.4 percent compared to work training programs in adults in vocational rehabilitation services. Wage subsidies showed the largest effects on employment relative to the other groups. Educational programs showed the largest favorable effects on disability prevention. Participants with the worst initial employment prospect benefited most from program participation.
Spain	Corrales 2016 (200)	Adults both employed and unemployed N= 12,905	Adult formal education (leading to a degree/certificate recognized by the National System of Education)	Adult non-formal education (occurs outside the formal school system,	Employment	The participation in adult non-formal education had a positive employment effects; however, these effects varied in terms of gender, age and level of initial education. Participating in formal education yielded negative non-significant results.

				and is less structured)		
Sweden	Albrecht 2005 (201)	Low-skilled workers N= 38,895	The Swedish adult education program, "Knowledge Lift"	No program	Employment Earnings	Knowledge Lift program resulted in a positive employment effect only for young men. The program did not improve average annual earnings.
Sweden	Andren 2002 (202)	Unemployed adults N= 4,377	Labor market training (classroom courses)	No program	Employment	The participation in training increased employment probability by around 18% in Swedish-born participants, while smaller effects were observed in foreign-born participants. Negative effects were observed during the first year.
Sweden	Carling 2004 (203)	Unemployed adults N= 25,280	Classroom vocational training	On-the-job training programs	Employment	On-the-job training programs showed better results on employment than classroom vocational training.
Sweden	Frolich 2004 (204)	Long-term sick-listed employees N= 6,287	Educational rehabilitation: educational training towards a new occupation	Workplace rehabilitation: vocational work training; medical rehabilitation; no rehabilitation	Employment	No rehabilitation appeared to be superior to all other programs. Workplace rehabilitation had larger effects on employment probability than educational rehabilitation and medical rehabilitation.
Sweden	Regner 2002 (205)	Unemployed adults N= 4,531	Labor market training (classroom courses)	No program	Earnings	Labor market training resulted in no effects or significantly negative earnings effects on earnings.
Sweden	Richardson 2013 (206)	Unemployed adults N= 28,451	Labor market training (classroom courses)	No program	Employment	Labor market training showed positive employment effects shortly after exiting the program. The effects on unemployment duration were small when the time spent in the program was taken into account.
Sweden	Stenberg 2003 (207)	Unemployed adults N= 26,988	Comprehensive education: adult education initiative	Vocational training	Employment Earnings	Participants in the educational initiative had better employment prospects but longer duration in unemployment. Both programs demonstrated negative earning effects.

Sweden	Stenberg 2007 (208)	Unemployed adults N= 43,058	Comprehensive education: adult education initiative	Vocational training	Earnings	The results showed small benefits of comprehensive education relative to vocational training on earnings.
Sweden	Stenberg 2008 (209)	Unemployed adults N = 32,235	Comprehensive education: adult education initiative (upper secondary level and compulsory level)	Vocational training; no program	Earnings	Participants with more than one semester at upper secondary level of the comprehensive adult education programs had higher earnings compared to those who did not attend any program, whereas no effects were found for participants at the compulsory level. Vocational training resulted in larger increases in earnings relative to comprehensive education.
Sweden	Stenberg 2015 (185)	Unemployed adults N = 15,129	Comprehensive education: adult education initiative	Vocational training; no program	Earnings	Both programs showed positive earnings effects compared to no program in the years following participation, with vocational training associated with relatively larger earnings payoff. Vocational training resulted in higher earnings in the short run, but earnings converged 5–7 years post program.
Switzerland	Lalive 2002 (210)	Unemployed workers N= 13,496	Active labor market programs: classroom training	employment programs; wage subsidy; no program	Employment	No important differences on employment were seen across the programs, except for temporary wage subsidies, which was associated with lower unemployment rates, but only for foreign workers.
USA	Dyke 2005 (211)	Women, welfare recipients N=869,276	Intensive training (basic education and vocational skills training)	Job readiness or job search; no program	Earnings	Participants in intensive training had higher earnings than those in the other groups. Intensive training led to negative results in the short-term but these results became positive around the fourth quarter after program enrollment.
USA	Pena 2015 (212)	Employed US farmworkers (both US born and immigrants) N= 43,339	Continuing education (National Farmworker Jobs Program): College/University	No program	Earnings Weeks worked	Continuing education participation was associated with higher earnings and more weeks employed relative to no participation. Effect estimates varied across both program types and genders.

		English/ESL Citizenship Job training General educational development (GED)/high school Other US classes			
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## Appendix 6. Characteristics of the participants in the included studies

Characteristics of the participants	GAIN study (41) Alameda	GAIN study (41) Butte	GAIN study (41) Los Angeles	GAIN study (41) Riverside	GAIN study (41) San Diego	GAIN study (41) Tulare	ILA study (61)	JTPA study Treatment group-adult women (57)	JTPA study Control group-adult women (57)
Age (years)	35	34	38	34	34	35	38	33	33
N (Treatment group)	602	987	3036	4557	7073	1596	457	2883	3591
N (Control group)	603	247	1419	1069	1151	652	434	-	-
Sex (% female)	NR	NR	NR	NR	NR	NR	30%	55 %	NR
White, non-hispanic	18 %	86 %	12 %	51 %	42 %	52 %	NR	NR	NR
Hispanic	7 %	6 %	32 %	28 %	25 %	39 %	NR	NR	NR
Black, non-hispanic	69 %	3 %	45 %	15 %	22 %	4 %	NR	NR	NR
Never married	NR	NR	NR	NR	NR	NR	NR	NR	NR
Currently married	NR	NR	NR	NR	NR	NR	70%	NR	NR
Number of children: 1	NR	NR	NR	NR	NR	NR	NR	NR	NR
Number of children: 2 or more	NR	NR	NR	NR	NR	NR	NR	NR	NR
Disability status	NR	NR	NR	NR	NR	NR	NR	NR	NR
Participants with low skills	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Received high school diploma or GED (%)	59%	56%	35%	51%	56%	44%	43%	74%	70%
Technical/2-year college	NR	NR	NR	NR	NR	NR	NR	NR	NR
4-year (or more) college	NR	NR	NR	NR	NR	NR	NR	NR	NR
Welfare benefits	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Welfare benefits (%)	NR	NR	NR	NR	NR	NR	No	38 %	40 %
Currently employed	6%	8%	6%	5 %	11 %	8 %	100%	15 %	15 %
Ever employed	NR	NR	NR	NR	NR	NR	100%	86 %	85 %



Employed within past 2 years	24 %	57 %	16 %	49 %	59 %	49 %	NR	NR	NR
Previous occupational training	NR	NR	NR	NR	NR	NR	NR	47%	45 %

Characteristics of the participants	JTPA study Treatment group-adult men (57)	JTPA study Control group-adult men (57)	MFSP study (58)	New Visions Study (59)	NEWWS study <sup>1</sup> (42) Atlanta (HCD)	NEWWS study (42) Grand Rapids (HCD)	NEWWS study (42) Riverside (HCD)	NEWWS study (42) Columbus (Integrated)	NEWWS study (42) Detroit
Age (years)	33	33	27	NR	33	28	32	32	30
N (Treatment group)	2286	2133	346	528	1935	1542	1596	2513	2226
N (Control group)	-	-	163	515	1946	1455	3342	2159	2233
Sex (% female)	45 %	NR	100%	94%	97%	96%	89%	93%	97%
White, non-hispanic	NR	NR	NR	37%	NR	NR	NR	NR	NR
Hispanic	NR	NR	29%	31%	NR	NR	NR	NR	NR
Black, non-hispanic	NR	NR	60%	31%	NR	NR	NR	NR	NR
Never married	NR	NR	NR	NR	NR	NR	NR	NR	NR
Currently married	NR	NR	NR	NR	NR	NR	NR	NR	NR
Number of children: 1	NR	NR	NR	34%	NR	NR	NR	NR	NR
Number of children: 2 or more	NR	NR	NR	35%	NR	NR	NR	NR	NR
Disability status	NR	NR	NR	NR	NR	NR	NR	NR	NR
Participants with low skills	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Received high school diploma or GED (%)	70%	69%	NR	71%	61%	59%	56%	57%	56%
Technical/2-year college	NR	NR	NR	NR	7%	4%	4%	5%	8%
4-year (or more) college	NR	NR	NR	NR	2%	0.9%	1%	2%	1%
Welfare benefits	Yes	Yes	Yes	NR	Yes	Yes	Yes	Yes	Yes
Welfare benefits (%)	14 %	14 %	85%	NR	NR	NR	NR	NR	NR

Currently employed	13 %	14 %	NR	87%	7%	11%	11%	4%	7%
Ever employed	91 %	92 %	NR	NR	NR	NR	NR	NR	NR
Employed within past 2 years	NR	NR	33%	NR	28%	46%	41%	28%	21%
Previous occupational training	48 %	44 %	NR	NR	NR	NR	NR	NR	NR

Characteristics of the participants	NEWWS study (42) Oklahoma	NEWWS study (42) Portland	WASC study Dayton (60)	WASC study San Diego (60)	WASC study Bridgeport (60)
Age (years)	NR	30	30	36	34
N (Intervention group)	4309	3529	595	397	351
N (Control group)	4368	2018	589	396	354
Sex (% female)	93%	93%	81%	72%	67%
White, non-hispanic	NR	NR	27%	10%	8%
Hispanic	NR	NR	1%	70%	23%
Black, non-hispanic	NR	NR	68%	11%	61%
Never married	NR	NR	70	46	72
Currently married	NR	NR	16%	35%	19%
Number of children: 1	NR	NR	63%	65%	56%
Number of children: 2 or more	NR	NR	NR	NR	NR
Disability status <sup>2</sup>	NR	NR	4%	8%	4%
Participants with low skills	Yes	Yes	Yes	Yes	Yes
Received high school diploma or GED (%)	55%	66%	32%	22%	47%
Technical/AA/2-year college	4%	9%	NR	NR	NR
4-year (or more) college	2%	2%	5%	8%	4%
Welfare benefits (Y/N)	Yes	Yes	No	No	No
Welfare benefits (%)	NR	NR	No	No	No
Currently employed	9%	9%	100%	100%	100%
Ever employed	NR	NR	100%	100%	100%
Employed within past 2 years	69%	39%	NR	NR	NR
Previous occupational training	NR	NR	48%	38%	30%

GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

<sup>1</sup> The study reports only data for the intervention group (i.e., educational services).

<sup>2</sup> Physical or mental health problem that limited work

**Appendix 7. Description of the services provided in the included studies**

Study ID	Educational intervention	Objective	Duration	Length	Number of classes/week	Number of participants per classroom	Intervention components
GAIN study (41)	Job search assistance	NR	NR	0.7 to 1 month	NR	NR	NR
	Adult Basic Education (ABE)	NR	NR	1.1 to 4.3 months	NR	NR	ABE, GED and ESL
	Vocational training and post-secondary education	NR	NR	1.9 to 4.5 months	NR	NR	NR
	Unpaid work experience	NR	NR	0.5 months	NR	NR	NR

ABE, Adult Basic Education; GED, General Educational Development (GED) test; ESL, English as a Second Language.

Study ID	Educational intervention	Objective	Duration	Length	Number of classes/week	Number of participants per classroom	Intervention components
ILA study (61)	Education and training vouchers (Individual Learning Account (ILA)) given to low-skilled workers	The ILA as policy had the following objectives: - broadening the interest in continue learning, and raising the motivation to continue learning; - make it possible to choose personal learning objectives in relation to one's own career;	190 hours on average	17 weeks.	NR	NR	Courses components: 75% of the courses were related to the current job (80% in control group and 71% in treatment group).  For both groups, the course followed resulted in a diploma (77%).

		- strengthening the demand-led nature of the training market.					
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Study ID	Educational intervention	Objective	Duration	Length	Number of classes/week	Number of participants per classroom	Intervention components
JTPA study (57)	Classroom training in occupational skills	NR	53 hours in average	5.6 months in women and 3.8 months in men	NR	NR	In-class instruction teaching specific job skills, such as word processing, electronics repair, and home health care
	Adult Basic Education (ABE)	NR	13 hours in average	5.6 months in women and 3.8 months in men	NR	NR	ABE, high school or GED preparation, and ESL
	On-the-job training	NR	107 hours in average	1.9 months in women and 2.1 months in men	NR	NR	Subsidized training that took place as part of a paying job, often in a private sector firm (JTPA usually paid half of the wages for the training subsidy up to six months, but the jobs were supposed to be permanent)
	Job search assistance	NR	NR	1.9 months in women and 2.1 months in men	NR	NR	Assessment of participants' job skills and interests, along with training in job-finding techniques and help in locating job openings
	Work experience	NR	13 hours in average	2.4 months in women and 1.7 months in men	NR	NR	Temporary entry-level jobs designed to provide basic employment skills and instill effective work habits (the jobs may

							be subsidized by JTPA if they are in the public sector)
	Miscellaneous services	NR	NR	2.4 months in women and 1.7 months in men	NR	NR	Assessment, job-readiness training, customized training, vocational exploration, job shadowing, and tryout employment, among a variety of other services

ABE, Adult Basic Education; GED, General Educational Development (GED) test; ESL, English as a Second Language.

Study ID	Educational intervention	Objective	Duration	Length	Number of classes/week	Number of participants per classroom	Intervention components
MFSP study (58)	Adult Basic Education (ABE) Job skill training	To enhance the self-sufficiency of minority single mothers and reduce their dependence on welfare.	NR	6 to 9 months	NR	NR	The study adopted a “sequential” strategy in which women with poor reading, writing and math skills were placed in classroom course, and were offered job training only after they had met certain academic standards.  Full-time programs in adult basic education, ESL, and GED preparation Generally required GED before skill training

ABE, Adult Basic Education; GED, General Educational Development (GED) test; ESL, English as a Second Language.

Study ID	Educational intervention	Objective	Duration	Length	Number of classes/week	Number of participants per classroom	Intervention components
<b>NEWWS study: Labor Force Attachment (LFA) approach (42)</b>							
Atlanta LFA	Job Club (classroom component)	To equip participants with job-seeking and psychological skills needed to obtain work	15-30 h/wk	1-3 weeks	NR	20	-Finding job leads -Completing job applications -Wearing appropriate attire and impressing employers -Practicing interviewing skills -Writing resumes and cover letters -Building motivation and self-esteem -Identifying interest, and aptitude for various fields -Comparing financial benefits of work over welfare
Grand Rapids LFA	Job Club (classroom component)	Same as Atlanta LFA	30 h/wk	2 weeks	NR	20	Same as Atlanta LFA
Riverside LFA	Job Club (classroom component)	Same as Atlanta LFA	16-30 h/wk	1 week	NR	20-30	Same as Atlanta but "Identifying interest, and aptitude for various fields"
Atlanta LFA	Job club (Phone rooms)	To have clients apply their job-seeking skills by calling employers, arranging interviews, and submitting job applications.	15 h/wk	1-3 weeks	NR	NR	No component to teach, this is more about practice (calling employers). See objective.
Grand Rapids LFA	Job club (Phone rooms)	Same as Atlanta LFA	30 h/wk	3 weeks	NR	NR	Same as Atlanta LFA
Riverside LFA	Job club (Phone rooms)	Same as Atlanta LFA	16-30 h/wk	2 weeks	NR	NR	Same as Atlanta LFA

All sites LFA	Individual job search	NR	NR	Max eight weeks per year	NR	NR	Participants were required to look for employment on their own, to call employers, and to register all information. Program staff did verify all information for accuracy. A minimum number of contacts was established in some cases.
<b>NEWS study: Human Capital Development (HCD) approach (42)</b>							
Atlanta HCD	Adult Basic Education (ABE)	NR	16 h/wk	NR	4	25-4,125	<p>Adult Basic Education (ABE): These classes usually comprise reading and mathematics lessons to participants whose achievement levels are lower than is required for high school completion or GED classes, typically at the 8th grade level or lower.</p> <p>General Educational Development (GED): These classes prepare participants to take the GED test in social studies, literature, science, mathematics, and writing. Those who pass the test receive a state high school equivalency certificate. Participants enrolling GED programs usually must prove language and mathematics skills at a 9th grade level or higher in order to use the GED instructional materials.</p>
Grand Rapids HCD	Adult Basic Education (ABE)		9 h/wk		3	50 - 5,900	<p>ABE, GED, ESL</p> <p>High school completion (only offered in Grand Rapids): programs that replicate a high school curriculum in an adult school setting. Participants follow the curriculum, courses, credits and meet the same requirements as other high school students in the state. A regular high school diploma was given upon</p>



							completion. Participants must prove certain language and math skills to enroll this program.
Riverside HCD	Adult Basic Education (ABE)		16 h/wk		4	120 - 15,000	ABE, GED and ESL
Atlanta HCD	Vocational training	NR	NR	These programs could take one to two years to complete.	NR	NR	Automotive repair, business and clerical occupations, cabinet and furniture making, computer programming, cosmetology, electronics, nursing, refrigerator repair, and truck driving were the most common services provided in Atlanta and Grand Rapids.
Grand Rapids HCD	Vocational training	NR	NR	These programs could take one to two years to complete.	NR	NR	Same as above
All sites HCD	College	NR	NR	NR	NR	NR	The HCD program used mainly public institutions: community colleges, state colleges and universities. Very few participants attended private institutions. Graduate degree programs were rarely allowed in Atlanta and Grand Rapids, and never in Riverside.  Similar to vocational training, participants did not enroll due to the lack of educational attainment,

							strict schedules, and because they could not qualify for college grants or loans.
All sites HCD	Work experience	NR	NR	NR	NR	NR	Three positions were offered: unpaid work in the public or private nonprofit sectors; subsidized on-the-job training in the private sector; and paid work, usually in the form of college work-study positions. None of these programs were often used; unpaid work experience was the most common offer.

ABE, Adult Basic Education; GED, General Educational Development (GED) test; ESL, English as a Second Language.

Study ID	Educational intervention	Objective	Duration	Length	Number of classes/week	Number of participants per classroom	Intervention components
New Visions (59)	New Vision Core program	The program aimed to prepare welfare recipients for community college occupational training programs, foster lifelong learning, and promote job advancement and self-sufficiency.	24 weeks	12 h/wk	4	NR  "New vision education included small classes, a flexible schedule, and highly individualized instruction."	The core program consisted of the following five courses: -English (basic communication skills in writing and speech) -Math (provided a bridge between arithmetic and algebra) -Reading (This course emphasized developing, expanding and improving vocabulary, and mastering spelling rules using contextual, structural and phonetic analysis. -Office (Office administration course, covered computer basics) -Guidance (Innovative courses in the core curriculum)

<b>Study ID</b>	<b>Educational inter-vention</b>	<b>Objective</b>	<b>Duration</b>	<b>Length</b>	<b>Number of classes/week</b>	<b>Number of par-ticipants per classroom</b>	<b>Intervention com-ponents</b>
WASC study (60)	Job search activi-ties and on-the-job training	To help participants to stabilize their employment, find better-pay-ing jobs, improve their skills through education and training, and increase their access to key work supports, such as food stamps and health insurance for adults and children.	NR	9 weeks in Dayton and 13 weeks in San Diego	NR	NR	NR
	Adult Basic Educa-tion (ABE) and Col-lege courses		NR	32 weeks in aver-age in all sites	NR	NR	NR

GAIN study, The California's Greater Avenues for Independence study; ILA study, Individual Learning Accounts study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

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## Appendix 8. Participation rates in education programs in the included studies

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We present only data for those studies whose interventions comprised other components than classroom training or education; hence, data from Hidalgo 2014 (ILA study) (61) and The New Vision (59) study are not presented. Around 85% of the participants in the experimental group of the MFSP study (58) participated in Job skill training and/or basic education (as reported in the main publication from the study).

GAIN study	Study sites	Adult Basic Education (ABE) (%)	Post-Secondary Education or Vocational training (%)	Job search (%)	Work Experience (%)
GAIN study Total sample Riccio 1994 (2-3 years) (41)	Alameda	42	28	32	2
	Los Angeles	27	13	14	0
	Riverside	21	27	38	0
	San Diego	18	35	34	2
	Tulare	37	29	24	1
Subgroup: In-need to ABE Riccio 1994 (2-3 years) (41)					
	Alameda	60.5	18.5	19.6	1.5
	Los Angeles	32.8	10.7	11.2	0
	Riverside	30.8	18.6	32	0
	San Diego	32.6	24.3	27.4	0.7
GAIN study Total sample Hotz 2000 (9 years) (40)					
	Alameda	38	32	19	Not offered
	Los Angeles	58	24	15	Not offered
	Riverside	22	19	55	Not offered
	San Diego	36	19	27	Not offered

ABE, Adult Basic Education. Participants “in need to ABE” were those who at enrollment lacked a high school diploma or GED test, who proved low skills on math or reading or who required English remediation.

JTPA study (57)	Classroom training (%)	OJT/JSA (%)	Miscellaneous
Total sample			
Experimental Women	73	55	62
Experimental Men	71	57	59

Adult Basic Education (ABE) included basic education, high school, GED, and ESL

Miscellaneous services included assessment, job-readiness training, customized training, vocational exploration, job shadowing, and tryout employment, others.

OJT, On-the-job training; JSA, Job search assistance

#### Classroom training; OJT/JSA; and Other services subgroups

JTPA study (57)	Classroom training in occupational skills (%)	Adult Basic Education (ABE) (%)	On-the-job training (%)	Work Experience (%)	Job search assistance (%)	Miscellaneous services (%)
<i>Classroom training subgroup</i>						
Experimental Women	49	11	3	4	17	11
Control Women	29	7	0	0	0	0
Experimental Men	40	10	5	2	12	10
Control Men	24	5	0	0	0	0
<i>On-the-job training/ Job search assistance subgroup</i>						

Experimental Women	12	4	28	3	26	6
Control Women	12	4	1	0	0	0
Experimental Men	9	4	27	2	30	7
Control Men	9	4	0	0	0	0
<i>Other services subgroup</i>						
Experimental Women	19	11	5	3	23	31
Control Women	17	8	0	0	0	0
Experimental Men	12	6	5	1	26	29
Control Men	10	4	0	0	0	0

Adult Basic Education (ABE) included basic education, high school, GED, and ESL

Miscellaneous services included assessment, job-readiness training, customized training, vocational exploration, job shadowing, and tryout employment, others.

NEWWS study Freedman 2000 (2 years follow-up) (42)	Study site	Adult Basic Education (ABE) (%)	Post-Secondary Edu- cation or Vocational Training (%)	Job search (%)	Work Experience (%)
	Atlanta HCD	42.8	6.3	10.8	1.8
	Atlanta LFA	21.9	7.1	33.4	4
	Atlanta control	8.6	5.1	3.6	1.1
	Grand Rapids HCD	57.9	21.5	21	2.2
	Grand Rapids LFA	29.5	10.9	27.6	3.3
	Grand Rapids control	32.2	11.8	6.1	1.2
	Riverside HCD	49.7	13.3	26.7	1.8
	Riverside LFA	9.9	11.7	39.3	2.1
	Riverside control	11.6	12	5.6	1
	Columbus integrated	39.6	5.9	9.4	6.2

	Columbus traditional	41.9	11.1	7.3	7.3
	Columbus control	16.8	5.3	0.5	3.8
	Detroit experimental	35.3	24.4	12.3	1.3
	Detroit control	31.8	13.9	4.4	0.1
	Oklahoma experimental	42.6	19.5	10.1	4.1
	Oklahoma control	24.8	15.5	6.1	1
	Portland experimental	37.1	23.6	33.4	11.7
	Portland control	30.9	10.8	7.5	3.7

NEWWS study	Study site	Adult Basic Education (ABE) (%)	Post-Secondary Education (%)	Job search (%)	Vocational training (%)	Work Experience (%)
Total sample Hamilton 2001 (5 years follow-up) (43)						
	Atlanta HCD	29.9	11.5	43.7	33	12.2
	Atlanta LFA	20.4	7.5	59.2	24	17.2
	Atlanta control	11.4	8.7	30	23	7.6
	Grand Rapids HCD	32.1	29.6	40	29	7.6
	Grand Rapids LFA	20	27	51.6	23	10.5
	Grand Rapids control	18.9	26.2	21	24	5.2
	Riverside HCD	59	13.1	49.6	21	6.3
	Riverside LFA	17.1	24.5	53.5	24	7.8
	Riverside control	28	15	20	21	3
	Portland experimental	27.2	42.4	65.2	25	14.7
Portland control	20.9	26	35.4	29	13.7	
Subgroup: In-need to ABE (43)						
	Atlanta HCD	59.8	2.5	NR	15.2	8.4
	Atlanta LFA	34.5	1.2	NR	14	14.5
	Atlanta control	18.5	0.8	NR	16.3	7.2
	Grand Rapids HCD	68.8	11.1	NR	20.6	4.7
	Grand Rapids LFA	44.8	9.3	NR	19.9	9.7
	Grand Rapids control	41.8	6.4	NR	18.9	5.5
	Riverside HCD	59	13.1	NR	21.2	6.3
	Riverside LFA	24.9	12.6	NR	21.5	7.3
	Riverside control	28	15.5	NR	20.9	2.2
Portland experimental	59.3	21.6	NR	20.4	17.8	
Portland control	49.5	13.8	NR	29.6	7.9	
Not in need to ABE (43)						
	Atlanta HCD	11.1	16.8	NR	43.7	14.8
	Atlanta LFA	11.4	11.5	NR	30.7	18.7



	Atlanta control	6.9	13.7	NR	27.1	7.8
	Grand Rapids HCD	12.9	39.4	NR	32.5	9.2
	Grand Rapids LFA	6.3	36.7	NR	25.4	11
	Grand Rapids control	6.6	37.1	NR	27.1	4.9
	Riverside HCD	59	13.1	NR	21.2	6.3
	Riverside LFA	6.7	40.5	NR	26.6	8.4
	Riverside control	4.7	37.7	NR	29.2	4.4
	Portland experimental	12.2	52.6	NR	27.7	12.9
	Portland control	6.8	31.7	NR	29.1	15.7

ABE, Adult Basic Education. Participants “in need to basic education” were those who at enrollment lacked a high school diploma or GED test, who proved low skills on math or reading, or who required English remediation. Conversely, participants who at enrollment had a high school diploma or a GED certificate, proved high literacy in math or reading, and were fluent in English were categorized as “not in need to ABE”.

WASC study (60)	Adult Basic Education (ABE) (%)	College courses (%)	Job search (%)	On-the-job training (%)	Vocational training (%)
Dayton experimental	7	56	38	18	33
Dayton control	6	39	32	18	20
San Diego experimental	9	19	43	14	19
San Diego control	9	20	32	10	15
Bridgeport experimental	8.7	20.6	NR	NR	37.3
Bridgeport control	6.2	16.8	NR	NR	19.7

GAIN study, The California's Greater Avenues for Independence study; JTPA study, The Job Training Partnership Act study; MFSP study, The Minority Female Single Parent study; NEWWS study, The National Evaluation of Welfare-to-Work Strategies study; WASC study, The Work Advancement and Support Center study.

Adult Basic Education (ABE) included basic education, high school, GED, and ESL

## Appendix 9. Quality appraisal of the included studies

### The California's Greater Avenues for Independence (GAIN) study

(Riccio 1994 (41), Freedman 1996 (39), Hotz 2000(40))

Risk of bias criteria	Judgment	Support for the judgment
Selection bias: Random sequence generation	High	Participants were randomly allocated to the groups "by chance" and no further details are provided.
Selection bias: Allocation concealment	Unclear	Insufficient information to permit judgment
Performance bias: Blinding (participants and personnel)	Unclear	Insufficient information to permit judgment
Detection bias: Blinding (outcome assessment)	Unclear	Insufficient information to permit judgment Some data are retrieved from administrative registries.
Attrition bias: Incomplete outcome data	Unclear	Insufficient reporting of attrition/exclusions to permit judgment (no reasons for missing data provided)
Reporting bias: Selective reporting	High	Protocol was not available Outcome data for certain subgroups were reported incompletely (e.g., adults in need to basic education).

### Individual Learning Accounts (ILA) study (61)

Risk of bias criteria	Judgment	Support for the judgment
Selection bias: Random sequence generation	Low	Assignment to study groups was done through lotteries between August 31 and December 1 of 2006. The lotteries were stratified by sectoral fund.
Selection bias: Allocation concealment	High	Authors stated, "There was no attempt to hide that the issuing of vouchers and the collection of data were part of an experiment to study the effects of vouchers. The reason is that since participants are working in the same narrowly defined sectors or in the same companies, they may get informed about the issuing (or not) of the vouchers. This openness implies that Hawthorne effects cannot be excluded. If there were such effects, they would probably bias the estimates upwards. This would be the case if participants want to show the usefulness of the intervention."
Performance bias: Blinding (participants and personnel)	Unclear	Insufficient information to permit judgment
Detection bias: Blinding (outcome assessment)	Unclear	Insufficient information to permit judgment Some data are retrieved from administrative registries.
Attrition bias:	High	"As-treated" analysis was undertaken.

Incomplete outcome data		Attrition rate in 2007 reached 26%.
Reporting bias: Selective reporting	Unclear	Protocol was not available

### The Job Training Partnership Act (JTPA) study (57)

Risk of bias criteria	Judgment	Support for the judgment
Selection bias: Random sequence generation	High	Project staff member telephoned a random assignment clerk from the study team, who randomly assigned each participant to treatment or control group. No further details were provided.
Selection bias: Allocation concealment	Unclear	Insufficient information to permit judgment
Performance bias: Blinding (participants and personnel)	Unclear	Insufficient information to permit judgment
Detection bias: Blinding (outcome assessment)	Unclear	Insufficient information to permit judgment Some data are retrieved from administrative registries.
Attrition bias: Incomplete outcome data	Unclear	Insufficient reporting of attrition/exclusions to permit judgment (no reasons for missing data provided)
Reporting bias: Selective reporting	Unclear	Protocol was not available

### The Minority Female Single Parent (MFSP) study (58)

Risk of bias criteria	Judgment	Support for the judgment
Selection bias: Random sequence generation	High	Participants were randomly allocated to the groups “by chance” and no further details are provided.
Selection bias: Allocation concealment	Unclear	Insufficient information to permit judgment
Performance bias: Blinding (participants and personnel)	Unclear	Insufficient information to permit judgment
Detection bias: Blinding (outcome assessment)	Unclear	Insufficient information to permit judgment Some data are retrieved from administrative registries.
Attrition bias: Incomplete outcome data	Unclear	Insufficient reporting of attrition/exclusions to permit judgment (no reasons for missing data provided)
Reporting bias: Selective reporting	Unclear	Protocol was not available

### New Visions study (59)

Risk of bias criteria	Judgment	Support for the judgment
Selection bias: Random sequence generation	High	Participants were randomly allocated to the groups “by chance” and no further details are provided.

Selection bias: Allocation concealment	Unclear	Insufficient information to permit judgment
Performance bias: Blinding (participants and personnel)	Unclear	Insufficient information to permit judgment
Detection bias: Blinding (outcome assessment)	Unclear	Insufficient information to permit judgment Some data are retrieved from administrative registries.
Attrition bias: Incomplete outcome data	Low	Intention-to-Treat (ITT) and Treatment on the Treated (TOT) analyses were undertaken.
Reporting bias: Selective reporting	Unclear	Protocol was not available

### **The National Evaluation of Welfare-to-Work Strategies (NEWWS) study**

(Freedman 2000 (42); Hamilton 2001 (43); Hamilton 2016 (62))

<b>Risk of bias criteria</b>	<b>Judgment</b>	<b>Support for the judgment</b>
Selection bias: Random sequence generation	High	Participants were randomly allocated to the groups “by chance” and no further details are provided.  Authors reported the points at which the allocation occurred (e.g., while attending program orientation). However, not all participants attended the program orientation meetings, and this introduced some variations in randomization.
Selection bias: Allocation concealment	High	There were no attempts to conceal allocation procedures. Administrator and case manager discretion, combined with funding and resource constraints, could affect a participant’s chances of enrolling in the program.
Performance bias: Blinding (participants and personnel)	Unclear	Insufficient information to permit judgment
Detection bias: Blinding (outcome assessment)	Unclear	Insufficient information to permit judgment Some data are retrieved from administrative registries.
Attrition bias: Incomplete outcome data	High	Inappropriate application of imputation methods. Authors imputed some missing data by using mean substitution, especially for earnings. Mean substitution is not generally accepted as a valid method for data imputation, as it may lead to biased estimates in presence of concerns about randomization procedures (213).
Reporting bias:	High	Protocol was not available

Selective reporting		Outcome data for certain subgroups were reported incompletely (e.g., adults in need to basic education). The outcomes reported in the different companion reports vary considerably. The latest report (Hamilton 2016) only includes outcome data for earnings, whereas the earlier reports (Freedman 2000 and Hamilton 2001) provide data for earnings, employment, and other outcome measures.
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### The Work Advancement and Support Center (WASC) study (60;63)

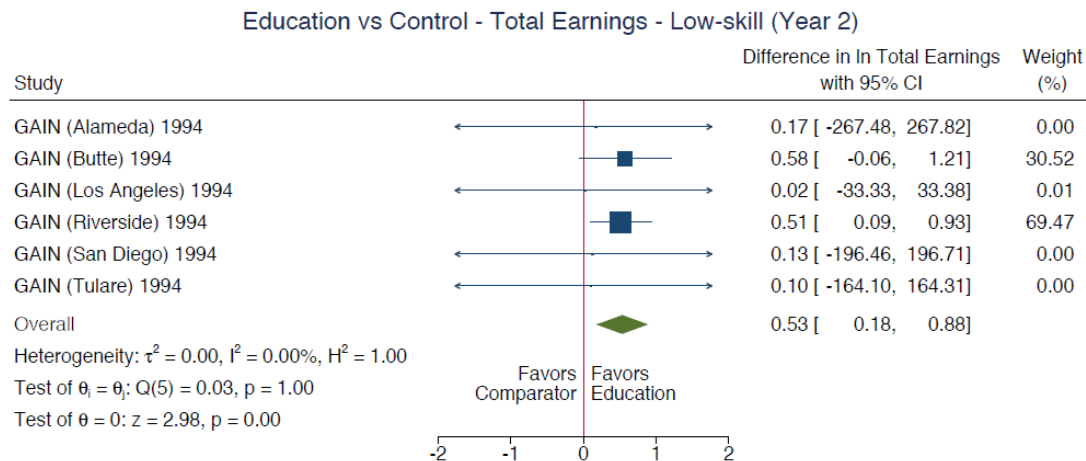
<b>Risk of bias criteria</b>	<b>Judgment</b>	<b>Support for the judgment</b>
Selection bias: Random sequence generation	Low	Participants were randomly allocated to the study groups through a lottery-like process.
Selection bias: Allocation concealment	Unclear	Insufficient information to permit judgment
Performance bias: Blinding (participants and personnel)	Unclear	Insufficient information to permit judgment
Detection bias: Blinding (outcome assessment)	Unclear	Insufficient information to permit judgment Some data are retrieved from administrative registries.
Attrition bias: Incomplete outcome data	Unclear	Insufficient reporting of attrition/exclusions to permit judgment (no reasons for missing data provided)
Reporting bias: Selective reporting	Unclear	Protocol was not available

## Appendix 10. Effects on total earnings

Effects of educational programs versus no intervention at years 2, 3, and 4 of follow-up

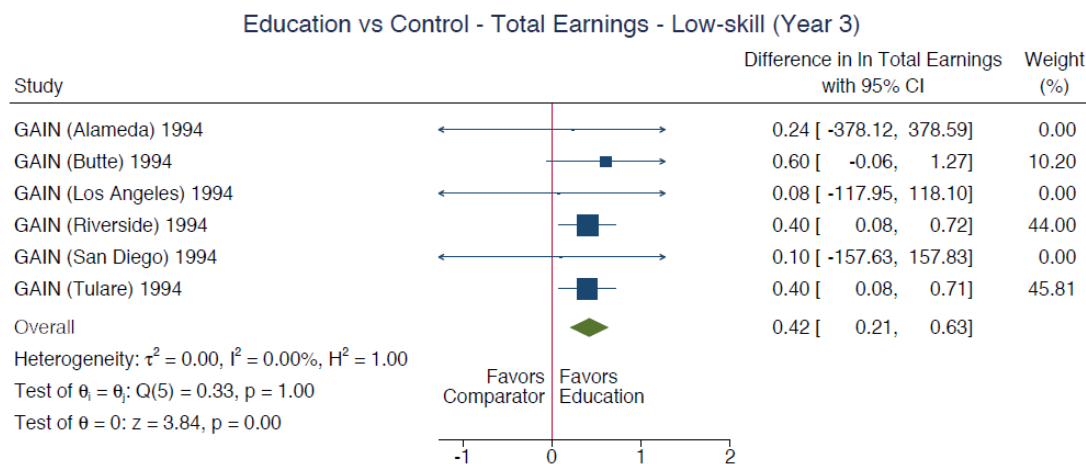
### Participants with low skills (subgroup 1)

Effects of educational programs versus no intervention on total earnings of participants with low skills at year 2



Random-effects REML model

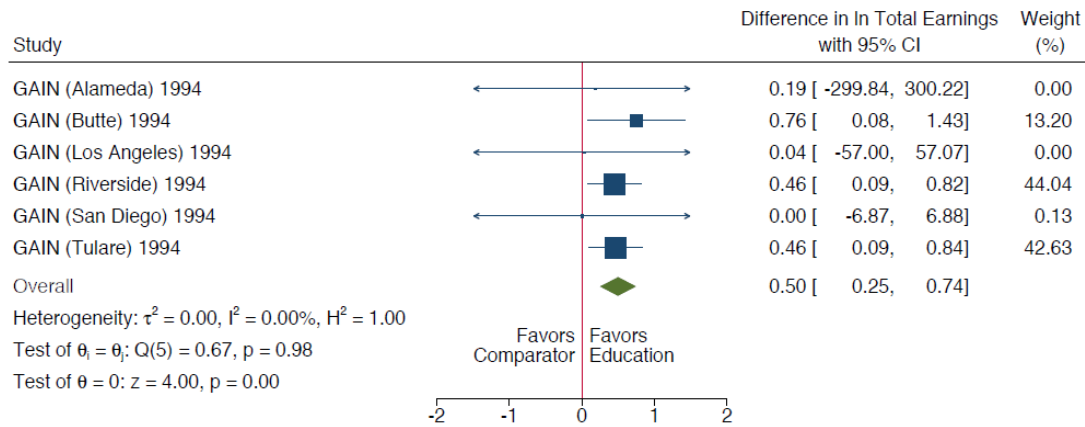
Effects of educational programs versus no intervention on total earnings of participants with low skills at year 3



Random-effects REML model

Effects of educational programs versus no intervention on total earnings of participants with low skills at year 4

Education vs Control - Total Earnings - Low-skill (Year 4)

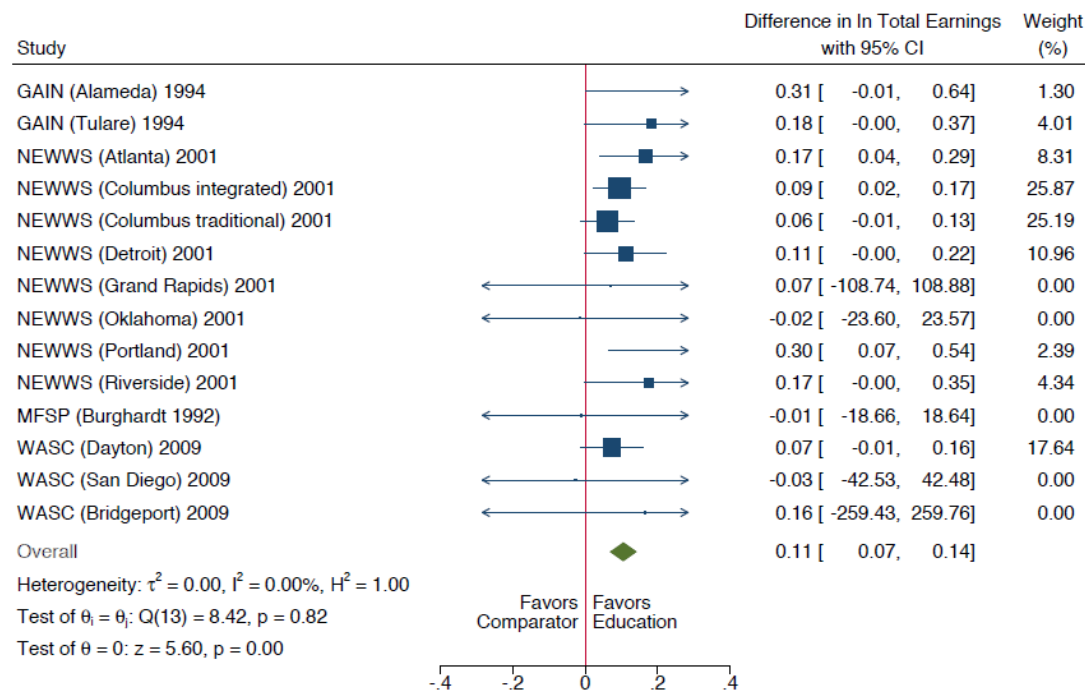


Random-effects REML model

Participants with high skills (subgroup 2)

Effects of educational programs versus no intervention on total earnings of participants with high skills at year 3

Education vs Control - Total Earnings - High-skill (Year 3)

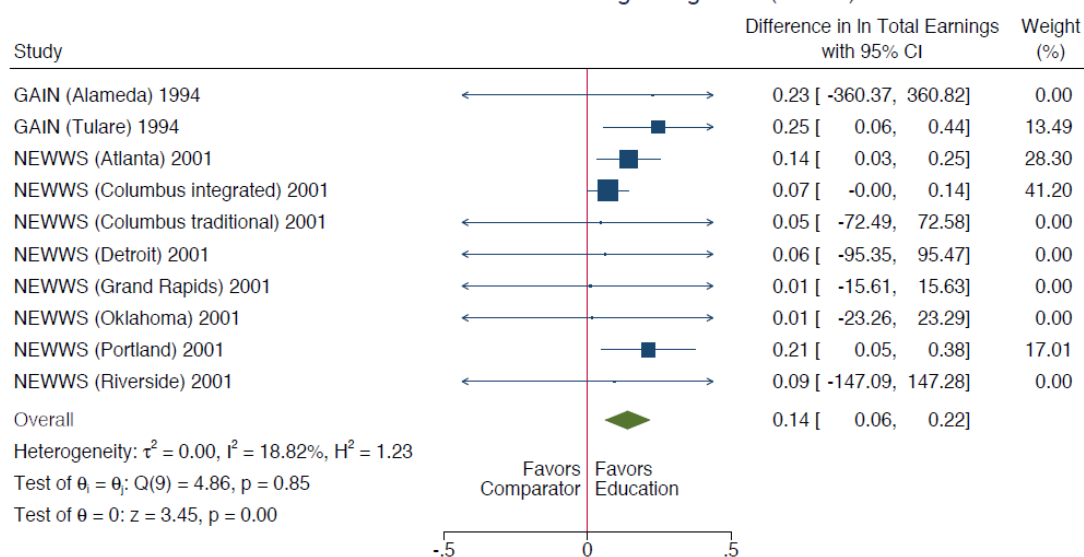


Random-effects REML model

Effects of educational programs versus no intervention on total earnings of participants with high skills at year 4

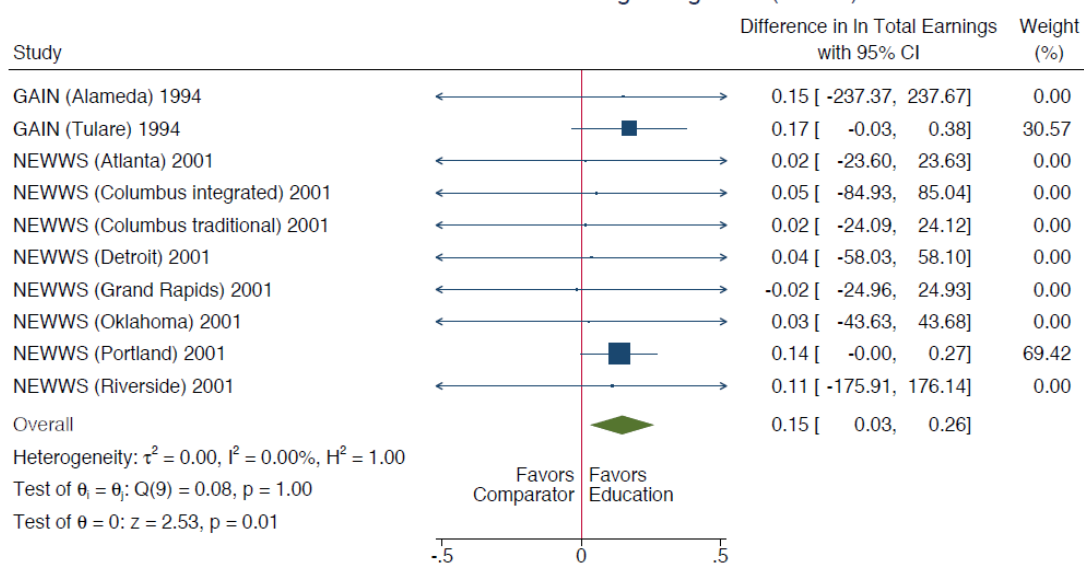


### Education vs Control - Total Earnings - High-skill (Year 4)



### Effects of educational programs versus no intervention on total earnings of participants with high skills at year 5

#### Education vs Control - Total Earnings - High-skill (Year 5)



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NO-0403 Oslo

Phone: + 47-21 07 70 00

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