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House Bill 164 – Early Ed Programs; Reading; Virtual Ed

Sponsor Statement

The Alaska Reads Act is a long-term investment in Alaska's children and their future. By further investing in school readiness, Alaska can improve the academic success of students. Academic success gives students the knowledge and skills to succeed in life, which is the goal of Alaska's education system.

The scientific research into early learning empirically proves that every dollar invested in high-quality early education saves the government up to \$7 in the long run. This savings is achieved through improved high school graduation rates and reducing the need for remedial education. Early education also correlates to a reduced need for public assistance as an adult and less involvement in the criminal justice system. A key component of early learning is to improve the reading skills of students. The conclusion reached by thousands of research studies is that learning to read is imperative for future academic success.

Alaska's current pre-kindergarten early education programs give many families access to high-quality early education. However, the Alaska Department of Education and Early Development reports that only 10% of Alaska's 4-year-olds have access to early education programs. House Bill 164 builds on the lessons learned from Alaska's most successfully early education programs and expands early education opportunities to more of Alaska's children.

HB 164 would allow school districts to develop localized and culturally responsive pre-K programs through a six-year grant program. The bill also establishes a new statewide evidence-based reading program and provides intensive reading intervention services from kindergarten through grade three for students experiencing reading deficiencies. The bill calls for reading intervention specialists, funded by the Alaska Department of Education and Early Development, to be available to work with local teachers and support staff to improve reading scores and assessments through evidence-based reading instruction.

Historically, Alaska has made many smart investments. By investing in scientific management, Alaska has the most sustainable fisheries on earth. By wisely investing Alaska's oil and gas royalties, the Permanent Fund has become the envy of every state in the nation. The Alaska Reads Act represents another smart investment for the State of Alaska because early education has the potential to create a generation of Alaskans prepared to make the greatest impact on this state that we have ever seen.

HOUSE BILL NO. 164

IN THE LEGISLATURE OF THE STATE OF ALASKA

THIRTY-SECOND LEGISLATURE - FIRST SESSION

BY REPRESENTATIVES TUCK, Drummond, Story

Introduced: 4/7/21

Referred: Education, Finance

A BILL

FOR AN ACT ENTITLED

1 "An Act relating to early education programs provided by school districts; relating to
2 school age eligibility; relating to early education programs; establishing a parents as
3 teachers program; relating to the duties of the Department of Education and Early
4 Development; relating to certification of teachers; establishing a reading intervention
5 program for public school students enrolled in grades kindergarten through three;
6 establishing a reading program in the Department of Education and Early
7 Development; relating to a virtual education consortium; and providing for an effective
8 date."

9 **BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:**

10 * **Section 1.** The uncodified law of the State of Alaska is amended by adding a new section
11 to read:

12 SHORT TITLE. This Act may be known as the Alaska Reads Act.

1 * **Sec. 2.** AS 14.03.060(e) is amended to read:

2 (e) In addition to the grades enumerated in (a) of this section, an elementary
3 school consists of **an early education** [A PRE-ELEMENTARY] program **approved**
4 **or** supervised by the department under AS 14.07.020(a)(8), **including a program**
5 operated by **a head start agency** [THE DEPARTMENT] as a head start program
6 under **42 U.S.C. 9831 - 9852c** [AS 14.38.010, OR LOCATED IN A PUBLIC
7 SCHOOL FOR FEDERAL FUNDING PURPOSES. EXCEPT FOR A CHILD WITH
8 A DISABILITY WHO IS RECEIVING SPECIAL EDUCATION OR RELATED
9 SERVICES UNDER AS 14.30.180 - 14.30.350, PRE-ELEMENTARY STUDENTS
10 MAY NOT BE COUNTED IN A SCHOOL'S AVERAGE DAILY MEMBERSHIP
11 UNDER AS 14.17].

12 * **Sec. 3.** AS 14.03.072(a) is amended to read:

13 (a) Each school district shall annually provide to parents and guardians of
14 students enrolled in kindergarten through grade three in a public school in the state
15 current information on the importance of early **reading** [LITERACY], including

16 (1) **culturally responsive** intervention strategies **and reading**
17 **intervention services provided under AS 14.30.765;**

18 (2) home **reading** [LITERACY] plans;

19 (3) grade **proficiency** [RETENTION] standards and policies,
20 **including retention,** for the elementary school attended;

21 (4) strategies and resources to help children learn to read.

22 * **Sec. 4.** AS 14.03.078(a) is amended to read:

23 (a) The department shall provide to the legislature by February 15 of each year
24 by electronic means an annual report regarding the progress of each school and school
25 district toward high academic performance by all students. The report required under
26 this section must include

27 (1) information described under **AS 14.03.120** [AS 14.03.120(d)];

28 (2) progress of the department

29 (A) toward implementing the school accountability provisions
30 of AS 14.03.123; and

31 (B) in assisting high schools to become accredited;

(3) a description of the resources provided to each school and school district for coordinated school improvement activities and staff training in each school and school district;

(4) each school district's and each school's progress in aligning curriculum with state education performance standards;

(5) a description of the efforts by the department to assist a public school or district that receives a low performance designation under AS 14.03.123;

(6) a description of intervention efforts by each school district and school for students who are not meeting state performance standards; [AND]

(7) the number and percentage of turnover in certificated personnel and superintendents;

(8) the progress made to implement the reading intervention programs established under AS 14.30.760 - 14.30.775, including data on how school districts are using in-service days for culturally responsive professional development in reading instruction; and

(9) the effectiveness and participation rates of the parents as teachers program established under AS 14.03.420, including measures of efficiency and effectiveness that demonstrate the effects of the program on school readiness.

* Sec. 5. AS 14.03.080(d) is amended to read:

(d) A child who is five years of age on or before September 1 following the beginning of the school year, and who is under school age, may enter a public school kindergarten. **A school district may waive the requirements of this subsection for a child who achieves a passing score on an assessment approved by the department.**

* Sec. 6. AS 14.03.080 is amended by adding a new subsection to read:

(g) A child who is at least four, but not more than five, years of age on or before September 1 following the beginning of the school year and who has not attended a public school kindergarten may enter a public school early education program.

* Sec. 7. AS 14.03.120 is amended by adding a new subsection to read:

(h) To the extent allowable under state and federal privacy laws, each district shall annually report to the department information from the previous school year regarding

(1) the number of students and teaching staff assigned to each classroom in grades kindergarten through three;

(2) the number and percentage of students

(A) in grades kindergarten through three who demonstrated improvement on expected grade-level skills on the statewide screening or assessment tool;

(B) in grades kindergarten through three who performed below expected grade-level skills on the statewide screening or assessment tool, by grade;

(C) retained in grades kindergarten through three and the reasons for retention;

(D) in grade three who demonstrated sufficient reading skills for grade progression based on the statewide screening or assessment tool;

(E) in grade three who demonstrated sufficient reading skills for grade progression based on an alternative standardized reading screening or assessment;

(F) in grade three who demonstrated sufficient reading skills for grade progression based on a student reading portfolio;

(G) in grade three who progressed to grade four based on a good cause exemption under AS 14.30.765(i);

(3) the performance on the statewide screening or assessment tool of students in a grade above grade three who were retained in grade three under AS 14.30.765(g) or who progressed to grade four based on a good cause exemption under AS 14.30.765(i).

* **Sec. 8.** AS 14.03 is amended by adding new sections to read:

Article 4. Early Education.

Sec. 14.03.410. Early education programs; grants. (a) The department shall

(1) provide training and assistance to develop and improve district-

1 wide early education programs that comply with standards adopted by the board under
2 AS 14.07.165(a)(5); and

3 (2) approve district-wide early education programs that comply with
4 the standards adopted by the board under AS 14.07.165(a)(5), subject to the
5 limitations in (d) of this section.

6 (b) The department may award a grant to provide funding for a three-year
7 period for the development or improvement of a district-wide early education program
8 to a district that applies in a format prescribed by the department and that

9 (1) is eligible for a grant during the first fiscal year of the grant period
10 as specified under (c) of this section; or

11 (2) was eligible for a grant in a previous fiscal year under (c) of this
12 section, but did not receive a grant under this section in that fiscal year.

13 (c) The department shall rank the performance of all districts in the state in
14 accordance with the accountability system and performance designations required
15 under AS 14.03.123. The department shall divide all districts into six groups based on
16 performance ranking. Each group of districts is eligible for a grant in the following
17 fiscal years:

18 (1) for the fiscal year beginning July 1, 2021, the lowest performing 10
19 percent of districts;

20 (2) for the fiscal year beginning July 1, 2022, the second lowest
21 performing 15 percent of districts;

22 (3) for the fiscal year beginning July 1, 2023, the third lowest
23 performing 15 percent of districts;

24 (4) for the fiscal year beginning July 1, 2024, the third highest
25 performing 20 percent of districts;

26 (5) for the fiscal year beginning July 1, 2025, the second highest
27 performing 20 percent of districts;

28 (6) for the fiscal year beginning July 1, 2026, the highest performing
29 20 percent of districts.

30 (d) The department may assess at any time a district's early education program
31 and approve the program if the program complies with the standards adopted by the

board under AS 14.07.165(a)(5). The number of district-wide early education programs that the department approves in a fiscal year may not result in a calculation of state aid under AS 14.17.410(b) for all districts that exceeds the amount calculated for the previous fiscal year by more than \$5,000,000. If the number of programs eligible in a fiscal year exceeds the number of programs that the department may approve under this subsection, the department shall prioritize the approval of programs based on the department's ranking of districts under (c) of this section.

(e) If the department does not approve the early education program of a district awarded a grant under (c) of this section by the end of the district's three-year grant period, the department may provide a one-year remediation grant to allow the district one additional fiscal year to meet the early education program standards adopted by the board under AS 14.07.165(a)(5). If the district is unable to meet the early education program standards at the end of that fiscal year, the department may, in the discretion of the commissioner, provide an additional remediation grant to allow the district not more than one additional fiscal year to meet the standards. Nothing in this section prohibits a district from using its own funds to continue the remediation process.

(f) A student in an early education program may not be counted in a district's ADM under AS 14.17.500 or 14.17.905 unless the department has approved the program under (a)(2) of this section.

(g) A grant under this section is subject to appropriation, but may not supplant other early education funding available to districts.

(h) In this section,

(1) "ADM" has the meaning given in AS 14.17.990;

(2) "district" has the meaning given in AS 14.17.990;

(3) "early education program" means a program

(A) for children who are four and five years of age and who have not attended a public school kindergarten; and

(B) the primary function of which is educational.

Sec. 14.03.420. Parents as teachers program. (a) The department shall design and implement a statewide parents as teachers program for the benefit of

1 children who are under five years of age. The program must provide a system of early
2 childhood education that

- 3 (1) is evidence-based;
- 4 (2) involves parents;
- 5 (3) is consistent with available research and best practices for high
6 quality early childhood education;
- 7 (4) incorporates guidelines adopted by the department for early
8 learning that

- 9 (A) enhance school readiness;
- 10 (B) increase parent understanding of child development and
11 developmental milestones;
- 12 (C) reduce the incidence of child abuse and neglect;
- 13 (D) increase identification of health problems and
14 developmental delays through regular screenings;
- 15 (E) improve child health indicators, including immunization
16 rates; and
- 17 (F) increase parental involvement; and
- 18 (5) provides for effective and efficient coordination with or expansion
19 of early education programs operating in the state, to the extent permitted by law.

20 (b) A school district shall, to the extent space is needed and available, provide
21 for the use of a room in a school at no charge to support the program established under
22 this section.

23 (c) The department shall develop and enter into local partnerships to
24 implement the program established under this section.

25 * **Sec. 9.** AS 14.07.020(a) is amended to read:

- 26 (a) The department shall
 - 27 (1) exercise general supervision over the public schools of the state
28 except the University of Alaska;
 - 29 (2) study the conditions and needs of the public schools of the state,
30 adopt or recommend plans, administer and evaluate grants to improve school
31 performance awarded under AS 14.03.125, and adopt regulations for the improvement

1 of the public schools; the department may consult with the University of Alaska to
 2 develop secondary education requirements to improve student achievement in college
 3 preparatory courses;

4 (3) provide advisory and consultative services to all public school
 5 governing bodies and personnel;

6 (4) prescribe by regulation a minimum course of study for the public
 7 schools; the regulations must provide that, if a course in American Sign Language is
 8 given, the course shall be given credit as a course in a foreign language;

9 (5) establish, in coordination with the Department of Health and Social
 10 Services, a program for the continuing education of children who are held in detention
 11 facilities in the state during the period of detention;

12 (6) accredit those public schools that meet accreditation standards
 13 prescribed by regulation by the department; these regulations shall be adopted by the
 14 department and presented to the legislature during the first 10 days of any regular
 15 session, and become effective 45 days after presentation or at the end of the session,
 16 whichever is earlier, unless disapproved by a resolution concurred in by a majority of
 17 the members of each house;

18 (7) prescribe by regulation, after consultation with the state fire
 19 marshal and the state sanitarian, standards that will ensure healthful and safe
 20 conditions in the public and private schools of the state, including a requirement of
 21 physical examinations and immunizations in pre-elementary schools; the standards for
 22 private schools may not be more stringent than those for public schools;

23 (8) exercise general supervision over early education programs
 24 [PRE-ELEMENTARY SCHOOLS] that receive direct state or federal funding,
 25 including early education programs provided by a school district for students
 26 four and five years of age, and approve early education programs provided by a
 27 school district under AS 14.03.410(a)(2);

28 (9) exercise general supervision over elementary and secondary
 29 correspondence study programs offered by municipal school districts or regional
 30 educational attendance areas; the department may also offer and make available to any
 31 Alaskan through a centralized office a correspondence study program;

1 (10) accredit private schools that request accreditation and that meet
2 accreditation standards prescribed by regulation by the department; nothing in this
3 paragraph authorizes the department to require religious or other private schools to be
4 licensed;

5 (11) review plans for construction of new public elementary and
6 secondary schools and for additions to and major rehabilitation of existing public
7 elementary and secondary schools and, in accordance with regulations adopted by the
8 department, determine and approve the extent of eligibility for state aid of a school
9 construction or major maintenance project; for the purposes of this paragraph, "plans"
10 include educational specifications, schematic designs, projected energy consumption
11 and costs, and final contract documents;

12 (12) provide educational opportunities in the areas of vocational
13 education and training, and basic education to individuals over 16 years of age who
14 are no longer attending school; the department may consult with businesses and labor
15 unions to develop a program to prepare students for apprenticeships or internships that
16 will lead to employment opportunities;

17 (13) administer the grants awarded under AS 14.11;

18 (14) establish, in coordination with the Department of Public Safety, a
19 school bus driver training course;

20 (15) require the reporting of information relating to school disciplinary
21 and safety programs under AS 14.33.120 and of incidents of disruptive or violent
22 behavior;

23 (16) establish by regulation criteria, based on low student performance,
24 under which the department may intervene in a school district to improve instructional
25 practices, as described in AS 14.07.030(a)(14) or (15); the regulations must include

26 (A) a notice provision that alerts the district to the deficiencies
27 and the instructional practice changes proposed by the department;

28 (B) an end date for departmental intervention, as described in
29 AS 14.07.030(a)(14)(A) and (B) and (15), after the district demonstrates three
30 consecutive years of improvement consisting of not less than two percent
31 increases in student proficiency on standards-based assessments in language

arts and mathematics, as provided in AS 14.03.123(f)(1)(A); and

(C) a process for districts to petition the department for continuing or discontinuing the department's intervention;

(17) notify the legislative committees having jurisdiction over education before intervening in a school district under AS 14.07.030(a)(14) or redirecting public school funding under AS 14.07.030(a)(15);

(18) establish a reading program to provide direct support for and intervention in the reading intervention programs of participating schools as described in AS 14.30.765 and 14.30.770.

* Sec. 10. AS 14.07.020(c) is amended to read:

(c) In this section, "**early education program**" ["PRE-ELEMENTARY SCHOOL"] means a **program** [SCHOOL] for children ages three through five years if the **program's** [SCHOOL'S] primary function is educational.

* Sec. 11. AS 14.07.050 is amended to read:

Sec. 14.07.050. Selection of textbooks. Textbooks for use in the public schools of the state, including a **district-offered** [DISTRICT OFFERED] statewide correspondence study program, shall be selected by district boards for district schools. Nothing in this section precludes

(1) a correspondence study student, or the parent or guardian of a correspondence study student, from privately obtaining or using textbooks or curriculum material not provided by the school district;

(2) the department from selecting and purchasing supplementary reading textbooks and materials for school districts to support reading intervention services provided under AS 14.30.765 and 14.30.770.

* Sec. 12. AS 14.07.165(a) is amended to read:

(a) The board shall adopt

(1) statewide goals and require each governing body to adopt written goals that are consistent with local needs;

(2) regulations regarding the application for and award of grants under AS 14.03.125;

(3) regulations implementing provisions of AS 14.11.014(b);

(4) regulations requiring approval by the board before a charter school, state boarding school, or a public school may provide domiciliary services;

(5) regulations establishing standards for an early education program provided by a school district for children who are four and five years of age; the regulations must include

(A) standards for a locally designed, evidence-based program that meets federal standards for early education programs and complies with the day-in-session requirements provided under AS 14.03.040;

(B) a requirement that a teacher in charge of a program hold a valid teacher certificate issued under AS 14.20 and

(i) have satisfactorily completed a minimum of six credit hours in early childhood education or completes the minimum credit hours within one year of the date the teacher's employment with the early education program begins; or

(ii) have two or more years of experience teaching kindergarten or another early education program and have completed additional coursework related to reading instruction, as required by the department;

(C) developmentally appropriate objectives for children four and five years of age rather than academic standards appropriate for older children; the objectives must allow school districts to adapt the content of an early education program to be culturally responsive to local communities; and

(D) accommodations for the needs of all early education children and their families regardless of socioeconomic circumstances

[REPEALED].

* Sec. 13. AS 14.07.180(a) is amended to read:

(a) Notwithstanding any other provision of law, the board shall establish standards and a procedure for the review, ranking, and approval of mathematics and English and language arts curricula for school districts to use in each grade level as

provided in this section. The board may include curricula delivered through virtual education in the standards and procedure established under this subsection. **Standards established for the review, ranking, and approval of language arts curricula for early education programs and grades kindergarten through three must be based on the five components of evidence-based reading instruction identified by the National Reading Panel.**

* **Sec. 14.** AS 14.17.500 is amended by adding a new subsection to read:

(d) Except as provided in AS 14.17.905(d), a student in an early education program provided by a school district and approved by the department under AS 14.07.020(a)(8) is counted as one-half of a full-time equivalent student.

* **Sec. 15.** AS 14.17.505(a) is amended to read:

(a) A district may not accumulate in a fiscal year an unreserved portion of its year-end fund balance in its school operating fund, as defined by department regulations, that is greater than **25** [10] percent of its expenditures for that fiscal year, **except that, during the first three fiscal years after a cooperative arrangement grant is awarded under AS 14.14.115, a district may accumulate an additional unreserved portion that is not more than the savings resulting from the grant.**

* **Sec. 16.** AS 14.17.905(a) is amended to read:

(a) For purposes of this chapter, the determination of the number of schools in a district is subject to the following:

(1) a community with an ADM of at least 10, but not more than 100, shall be counted as one school;

(2) a community with an ADM of at least 101, but not more than 425, shall be counted as

(A) one elementary school, which includes those students in grades kindergarten through six **and, except as provided in (d) of this section, in an early education program provided by a school district and approved by the department under AS 14.07.020(a)(8);** and

(B) one secondary school, which includes students in grades seven through 12;

(3) in a community with an ADM of greater than 425, each facility that

is administered as a separate school shall be counted as one school, except that each alternative school with an ADM of less than 175 shall be counted as a part of the school in the district with the highest ADM.

* **Sec. 17.** AS 14.17.905 is amended by adding a new subsection to read:

(d) A school district may not include in a school's ADM students who are four and five years of age if the students are enrolled in an early education program that receives state or federal funding other than funding under this chapter.

* **Sec. 18.** AS 14.20.015(c) is amended to read:

(c) The preliminary teacher certificate issued under this section must contain the same endorsements as those on the current valid teacher certificate issued by the other state. **However, a teacher holding a preliminary teacher certificate issued under this section must complete three credits or the equivalent of coursework, training, or testing requirements in evidence-based reading instruction approved by the board to be eligible for an endorsement in elementary education issued by the department. A teacher may apply coursework, training, or testing requirements completed under this subsection toward continuing education requirements established by the board in regulation. In this subsection, "evidence-based reading instruction" means reading instruction informed by research that supports improved educational outcomes.**

* **Sec. 19.** AS 14.20.020 is amended by adding a new subsection to read:

(l) A teacher certificated under this section must complete three credits or the equivalent of coursework, training, or testing requirements in evidence-based reading instruction approved by the board in regulation to be eligible for an endorsement in elementary education issued by the department. A teacher may apply coursework, training, or testing requirements completed under this subsection toward continuing education requirements established by the board in regulation. In this subsection, "evidence-based reading instruction" means reading instruction informed by research that supports improved educational outcomes.

* **Sec. 20.** AS 14.30 is amended by adding new sections to read:

Article 15. Reading Programs.

Sec. 14.30.760. Statewide assessment. (a) To implement the district reading

1 intervention services established under AS 14.30.765, the department shall

2 (1) adopt a statewide screening or assessment tool to administer to
3 students in grades kindergarten through three to identify students with any reading
4 deficiencies, including students with characteristics of dyslexia; the screening or
5 assessment tool must evaluate

6 (A) phonemic awareness, letter naming fluency, letter sound
7 fluency, and letter word sound fluency of students in kindergarten;

8 (B) letter word sound fluency and oral reading fluency of
9 students in grade one;

10 (C) vocabulary and oral reading fluency of students in grades
11 two and three;

12 (2) support teachers of grades kindergarten through three by

13 (A) administering the statewide screening or assessment tool
14 three times each school year, once in the fall, once in the winter, and once in
15 the spring, to all students in grades kindergarten through three, with the
16 exception of students who demonstrate sufficient reading skills on the first
17 screening or assessment of the school year;

18 (B) providing methods to monitor student progress;

19 (C) providing targeted instruction based on student needs as
20 determined by the results of the screening or assessment tool; and

21 (D) providing additional assistance as determined by the
22 department;

23 (3) provide training to school district staff related to using the results
24 of the statewide screening or assessment tool and understanding evidence-based
25 reading interventions, including explicit and systematic instruction in phonemic
26 awareness, phonics, fluency, vocabulary, and comprehension;

27 (4) establish a process that allows the commissioner to waive, upon
28 request, use of the statewide screening or assessment tool required under this
29 subsection by a school district if the school district has adopted an evidence-based
30 reading screening or assessment tool and the screening or assessment tool is approved
31 by the department;

1 (5) review and approve alternative standardized reading screenings or
2 assessments for use by school districts.

3 (b) In adopting a statewide screening or assessment tool under (a)(1) of this
4 section, the department shall consider the following factors:

5 (1) the amount of time needed to administer the screening or
6 assessment, with the intention of minimizing effects on instructional time;

7 (2) the time frame for reporting screening or assessment results to
8 teachers, administrators, and parents or guardians;

9 (3) the integration of the screening or assessment with student
10 instruction and department support;

11 (4) recommendations from a task force, working group, or committee
12 created by law and charged with studying issues related to reading proficiency and
13 reading deficiencies; and

14 (5) whether the screening or assessment is culturally responsive to the
15 needs of particular communities.

16 **Sec. 14.30.765. District reading intervention services.** (a) Each school
17 district shall offer intensive reading intervention services to students in grades
18 kindergarten through three who exhibit a reading deficiency to assist students in
19 achieving reading proficiency at or above grade level by the end of grade three. The
20 district shall provide the intensive reading intervention services in addition to the core
21 reading instruction that is provided to all students in the general education classroom.
22 If practicable, the intensive reading intervention services must

23 (1) be provided by a reading teacher or a paraprofessional under the
24 supervision of a reading teacher to all students in grades kindergarten through three
25 who are determined to have a reading deficiency based on the statewide screening or
26 assessment tool adopted under AS 14.30.760(a)(1);

27 (2) provide explicit and systematic instruction in phonemic awareness,
28 phonics, fluency, vocabulary, and comprehension, as necessary;

29 (3) use evidence-based reading intervention methods that have shown
30 proven results in accelerating student reading achievement within a single school year;

31 (4) include instruction with detailed explanations, extensive

opportunities for guided practice, and opportunities for error correction and feedback;

(5) incorporate daily targeted small group reading instruction based on student needs, either in person or online;

(6) monitor the reading progress of each student's reading skills throughout the school year and adjust instruction according to student needs;

(7) be implemented during regular school hours through any available method, including in person or through online delivery by teachers or specialty reading coaches;

(8) be implemented outside of regular school hours, as directed in the student's individual reading improvement plan under (b) of this section, for a student who scores at the lowest achievement level on the statewide screening or assessment tool; and

(9) be reviewed based on a department-approved response to intervention or multi-tiered system support models, addressing additional support and services needed to remedy identified needs.

(b) In addition to the reading intervention services provided under (a) of this section, a school district shall provide an individual reading improvement plan for each student in grades kindergarten through three who, based on the statewide screening or assessment tool, is determined to have a reading deficiency. An individual reading improvement plan developed under this section must

(1) be implemented not later than 30 days after identification of the reading deficiency;

(2) be created by the student's reading teacher in consultation with the school principal, the student's parents or guardians, and other pertinent district staff;

(3) describe the evidence-based reading intervention services the student will receive to achieve and demonstrate sufficient reading skills;

(4) provide reading intervention services outside of regular school hours for a student who scores at the lowest achievement level on the statewide screening or assessment tool consistent with (a)(8) of this section;

(5) include a process for monitoring progress and adjusting the plan based on student needs;

(6) require the district or school to provide the student's parents or guardians with updates on the student's progress not fewer than 10 times during the school year; and

(7) be culturally responsive.

(c) If at any time during the school year a student in grades kindergarten through three demonstrates a reading deficiency, the district or school shall notify the student's parents or guardians in writing or during a conference. The initial notification must

(1) be provided to the student's parents or guardians not later than 15 days after identification of the reading deficiency;

(2) state that the district identified the student as having a reading deficiency and that a reading improvement plan will be developed under (b) of this section;

(3) describe current services that the district is providing to the student;

(4) describe the proposed evidence-based reading intervention and supplemental instructional services and supports that the district will provide to the student to address the identified area of reading deficiency;

(5) explain that the district or school will inform the parents or guardians of the student's progress toward grade level reading as outlined in the student's individual reading improvement plan;

(6) identify strategies for the parents or guardians to use at home to help the student succeed in reading;

(7) explain that if the student has a reading deficiency at the end of the school year, unless the student receives an exemption under (i) of this section or has previously been retained in kindergarten, grade one, grade two, or grade three, the student may be prevented from progressing to the next grade level under (e) of this section; and

(8) explain that a student in grade three should demonstrate sufficient reading skills to progress to grade four under (g) of this section, unless the student receives an exemption under (i) of this section or has previously been retained in kindergarten, grade one, grade two, or grade three.

1 (d) If a student does not demonstrate proficiency on the statewide screening or
2 assessment tool administered in the winter, the district or school shall inform the
3 student's parents or guardians about the process and deadline to request a good cause
4 exemption from delayed grade level progression under (j) of this section.

5 (e) If, not later than 45 days before the end of the school year, a teacher
6 determines that a student in grades kindergarten through three has a reading
7 deficiency, the student's teacher and other pertinent district staff shall provide written
8 notification to and meet with the student's parents or guardians to determine whether
9 the student will be able to maintain adequate academic progress at the next grade level
10 and discuss delayed grade level progression as an intervention strategy. School staff
11 shall work with the parents or guardians to schedule a date, time, and place for the
12 meeting and, if no parent or guardian attends the meeting, the teacher and school staff
13 shall determine grade level progression.

14 (f) At the meeting described in (e) of this section, the parents or guardians, the
15 teacher, and the participating staff members shall decide whether the student will
16 advance to the next grade level in the next school year. If the parents or guardians, the
17 teacher, and the participating staff members are not in agreement, the parents or
18 guardians shall decide whether the student will advance to the next grade level unless
19 circumstances exist as specified in the policy adopted by the district that would
20 prevent advancement. Parents or guardians who decide to advance a student without
21 agreement of the teacher and participating staff members shall sign a waiver
22 developed by the district.

23 (g) A student in grade three should demonstrate sufficient reading skills to
24 progress to grade four. A student demonstrates sufficient reading skills for progression
25 by

26 (1) scoring at a proficient or higher achievement level on the statewide
27 screening or assessment tool or on the statewide summative assessment;

28 (2) achieving an acceptable score on an alternative standardized
29 reading screening or assessment as determined and approved by the department; or

30 (3) demonstrating mastery of reading standards through a student
31 reading portfolio based on criteria established by the department.

1 (h) The department shall develop a program to provide recognition to districts,
2 schools, school staff, and students for increases in the percentage of students in grade
3 three who demonstrate sufficient reading skills under (g) of this section.

4 (i) A school board may exempt a student from delayed grade level progression
5 for good cause. A good cause exemption is limited to

6 (1) a student with a disability whose individualized education plan
7 under AS 14.30.278 exempts the student from participation in the statewide screening
8 or assessment tool;

9 (2) a student with a disability who participates in the statewide
10 screening or assessment tool and has an individualized education plan under
11 AS 14.30.278 or a plan under 29 U.S.C. 794 that reflects that the student has received
12 intensive reading intervention services for two years or more but still demonstrates a
13 reading deficiency;

14 (3) a student who has received intensive reading intervention services
15 for two or more years but still demonstrates a reading deficiency; or

16 (4) a student whose primary language is other than English and who
17 has had less than two years of instruction in an English language learning program.

18 (j) A student's parents or guardians may request that the student receive a good
19 cause exemption under (i) of this section by submitting documentation to the principal
20 of the school in which the student is enrolled showing that an exemption is
21 appropriate. If the principal determines that the student meets one of the exemptions
22 under (i) of this section, the principal shall recommend to the school board in writing
23 that the school board grant the student a good cause exemption. The school board shall
24 accept or reject the principal's recommendation in writing and provide notice of its
25 decision to the student's parents or guardians and the principal.

26 (k) If a student in grade three does not demonstrate sufficient reading skills for
27 progression to grade four under (g) of this section, the district or school in which the
28 student is enrolled shall provide written notification to the student's parents or
29 guardians not later than 45 days before the end of the school year. The written
30 notification must

31 (1) state that the student did not demonstrate sufficient reading skills to

1 progress to grade four;

2 (2) explain the implementation of intervention or progression
3 strategies;

4 (3) describe the current services being provided to the student; and

5 (4) if the student's parents or guardians requested a good cause
6 exemption under (i) of this section and the school board rejected the request, include a
7 statement that the request for a good cause exemption was rejected and a copy of the
8 written notification the school board provided the parents or guardians under (j) of this
9 section.

10 (l) For a student who does not progress to the next grade level under (e) or (g)
11 of this section, or who progresses to the next grade level with a good cause exemption
12 under (i) of this section, the district in which the student is enrolled shall

13 (1) review the student's individual reading improvement plan;

14 (2) provide intensive reading intervention services to improve the area
15 of reading deficiency using effective instructional strategies to accelerate student
16 progress;

17 (3) provide additional services and support to improve the student's
18 identified area of reading deficiency, including

19 (A) a transitional instructional setting that is designed to
20 produce learning gains;

21 (B) supplemental tutoring offered by a person with specialized
22 reading training;

23 (C) an increase in time dedicated to the reading instruction
24 methods described in (a)(3) - (5) of this section, including more extensive
25 opportunities for guided practice and error correction and feedback;

26 (4) a plan for reading at home outlined in an agreement with the
27 parents or guardians, including parent participation in training workshops and regular
28 parent-guided home reading activities.

29 (m) A district or school may not retain a student under this section who was
30 previously retained in kindergarten, grade one, grade two, or grade three.

31 (n) In this section,

(1) "evidence-based reading intervention" means an intervention based on reliable, trustworthy, and valid evidence that has a demonstrated record of success in adequately increasing a student's reading competency in the areas of phonemic awareness, phonics, vocabulary development, reading fluency, oral language skills, and reading comprehension;

(2) "reading teacher" means a teacher who holds a valid teacher certificate under AS 14.20 and has demonstrated an effectiveness at instructing students to read at or above grade level through student reading performance data and teacher performance evaluations and who meets the requirements established by the state Board of Education and Early Development in regulation.

Sec. 14.30.770. Department reading program. (a) The department shall establish a reading program to provide direct support for and intervention in intensive reading intervention services in the lowest performing 25 percent of schools serving students in grades kindergarten through three as determined under AS 14.03.123, selecting not more than 10 participating schools at a time. State funding provided to participating schools for implementation of the reading program is in addition to the amount of funding provided under AS 14.17. In conducting the program, the department shall

(1) use the accountability system established in AS 14.03.123 to identify low performing schools;

(2) establish an application process for school districts to apply to participate in the program;

(3) select low performing schools from the schools that apply to participate in the program;

(4) employ and assign a reading specialist for each school selected to direct the implementation of the intensive reading intervention services established under AS 14.30.765 by

(A) modeling effective instructional strategies for teachers by working regularly with students as a class, in small groups, or individually;

(B) coaching and mentoring teachers and staff in reading instruction with an emphasis on prioritizing time in a manner that has the

1 greatest positive effects on student achievement;

2 (C) training teachers in data analysis and using data to
3 differentiate instruction;

4 (D) leading and supporting reading leadership teams; and

5 (E) reporting on school and student performance to the
6 department;

7 (5) establish a reporting process for each reading specialist and support
8 reading specialist to submit updates to the department on implementation of the
9 program;

10 (6) work with reading specialists to create specific improvement goals
11 for each school selected, including measures of interim progress;

12 (7) select and purchase additional reading material for each school
13 selected to supplement the intensive reading intervention services;

14 (8) pay travel and associated costs for a reading specialist or support
15 reading specialist to attend relevant training sessions identified by or hosted by the
16 department;

17 (9) periodically review staff development programs for their
18 effectiveness in developing reading skills and, after consultation with school districts
19 and experts, recommend to the board for approval staff development programs that

20 (A) have been proven to assess and accelerate student progress
21 toward reaching reading competency;

22 (B) provide explicit and systematic skill development in the
23 areas of phonemic awareness, phonics, fluency, vocabulary, and
24 comprehension;

25 (C) are evidence-based and reliable;

26 (D) provide initial and ongoing analysis of student progress
27 toward reaching reading competency; and

28 (E) include texts on core academic content to assist students in
29 maintaining or meeting grade-appropriate proficiency in academic subjects in
30 addition to reading;

31 (10) annually convene, either in person or electronically, a panel made

up of teachers of grades kindergarten through three, school administrators, early education advocacy groups, and parents of students in grades kindergarten through three to review and provide commentary on the effectiveness of the reading intervention programs established under AS 14.30.760 - 14.30.775.

(b) The department may employ and assign a support reading specialist for each school selected to participate in the program, as necessary, to support the reading specialist assigned under (a)(4) of this section or serve as a reading specialist for a school's early education program.

(c) A school selected to participate in the reading program established under this section shall

(1) ensure that a reading specialist assigned to the school is not required to perform functions that divert from the duties the department has assigned to the reading specialist;

(2) coordinate with the reading specialist or specialists to redesign the school's daily schedule to dedicate time to reading program activities, including intensive reading intervention services identified in a written agreement between the school and the department;

(3) present on the reading program established under this section and the intensive reading intervention services established under AS 14.30.765 at a public meeting; the presentation must include

(A) the data the department used to identify the school as eligible for the reading program;

(B) a detailed overview of the reading program and intensive reading intervention services;

(C) a timeline for implementing the intensive reading intervention services and meeting reading improvement goals; and

(D) the implications of the program for students, families, and educators;

(4) provide notice of the public meeting required under (3) of this subsection to the parents or guardians of each student at least seven days before the date of the meeting;

1 (5) present an annual update on the school's implementation of the
 2 reading program and intensive reading intervention services at a public meeting with
 3 notice provided to the parents or guardians of each student at least seven days before
 4 the date of the meeting;

5 (6) create partnerships between the school, the families of students,
 6 and the community that focus on promoting reading and increasing the amount of time
 7 that students spend reading.

8 (d) The department shall publish on the department's Internet website and
 9 make available to the public

10 (1) a completed application from each school selected to participate in
 11 the reading program;

12 (2) the reading program and intensive reading intervention services
 13 implemented by each school selected to participate; and

14 (3) a data analysis conducted by an independent contractor of the
 15 success of the reading program and intensive reading intervention services.

16 (e) The department may employ a person as a reading specialist or support
 17 reading specialist under this section if the person

18 (1) holds a valid teacher certificate issued under AS 14.20 and

19 (A) has completed an approved graduate program for the
 20 preparation of reading specialists at an approved institution of higher education
 21 and a supervised practicum or internship as a reading specialist; or

22 (B) has at least three years of full-time, demonstrated
 23 classroom teaching experience where reading instruction was a primary
 24 responsibility;

25 (2) is knowledgeable about and demonstrates competency in reading
 26 instruction, including

27 (A) an understanding of the five components of reading
 28 instruction identified by the National Reading Panel;

29 (B) knowledge of and experience in implementing effective
 30 reading instruction strategies and intervention methods;

31 (C) experience in designing and implementing a school-wide

1 response to intervention program or multi-tiered system support model;

2 (D) an understanding of and experience in reading screenings
3 or assessments and data analyses that inform instruction;

4 (E) knowledge of dyslexia and other learning disorders that
5 affect reading achievement;

6 (F) knowledge of and an ability to effectively articulate the
7 methods, issues, and resources involved in support of student instruction to a
8 wide variety of audiences, including staff, parents, and students whose primary
9 language is other than English; and

10 (3) meets other reading instruction coursework requirements
11 established by the department in regulation.

12 **Sec. 14.30.775. Definitions.** In AS 14.30.760 - 14.30.775,

13 (1) "district" has the meaning given in AS 14.17.990;

14 (2) "parent" or "guardian" includes a natural, adoptive, and foster
15 parent, stepparent, legal guardian, relative, and other adult person with whom the
16 student has resided and who has acted as a parent in providing for the student or has
17 been responsible for the student's welfare for a continuous period of time.

18 **Article 16. Virtual Education.**

19 **Sec. 14.30.800. Virtual education consortium.** (a) The department shall, in
20 cooperation with school districts, establish a virtual education consortium for the
21 purpose of making virtual education and professional development resources available
22 to students and teachers in the state. The department shall establish standards for
23 consortium resources. The consortium shall create and maintain a database of virtual
24 education courses for students, training in virtual instruction for teachers, and
25 professional development courses for teachers of students throughout the state if the
26 coursework curriculum meets the state standards established by the department. The
27 database must be accessible to all school districts that participate in the consortium.

28 (b) For teachers delivering or facilitating virtual coursework to students
29 through the consortium database, the consortium shall provide training and
30 professional development on virtual instruction methods and the differences between
31 virtual instruction and instruction offered in a classroom. A teacher may not provide

1 instruction through a course for students that is in the database unless

2 (1) the teacher has completed the training or professional development
3 provided by the consortium; or

4 (2) the consortium determines that the teacher's previous experience
5 has prepared the teacher to provide virtual instruction and the teacher demonstrates the
6 skills necessary to provide virtual instruction.

7 (c) The consortium shall employ a reading specialist available to school
8 districts to provide virtual intensive reading intervention services. The duties of the
9 reading specialist include

10 (1) modeling effective instructional strategies for teachers by working
11 regularly with students as a class, in small groups, or individually;

12 (2) coaching and mentoring teachers and staff in reading instruction
13 with an emphasis on prioritizing time in a manner that has the greatest positive effects
14 on student achievement;

15 (3) training teachers in data analysis and using data to differentiate
16 instruction;

17 (4) leading and supporting reading leadership teams; and

18 (5) reporting on school and student performance to the department.

19 (d) The department may require a school district that participates in the
20 consortium to pay a fee to the consortium. If the department requires a fee, the
21 department shall establish the fee in regulations, based on a recommendation made by
22 the consortium, and may adjust the fee annually as necessary. The fees must
23 approximately equal the consortium's prorated administrative costs related to
24 reviewing and approving courses and maintaining the database.

25 (e) A school district that provides a course included in the database may
26 charge a fee to the school district in which a student who takes the course is enrolled.
27 The department shall establish the fee in regulations.

28 (f) The consortium may require, as a condition of participation, that school
29 districts that provide courses or have students participating in courses included in the
30 database under (a) of this section adopt the same school term and class schedule for all
31 or part of a school day. The school term must meet the requirements of AS 14.03.030.

(g) In this section, "virtual education" or "virtual instruction" means instruction delivered through telecommunications or another digital or electronic method.

* **Sec. 21.** AS 47.17.290(12) is amended to read:

(12) "organization" means a group or entity that provides care and supervision for compensation to a child not related to the caregiver, and includes a child care facility, pre-elementary school, early education program, head start center, child foster home, residential child care facility, recreation program, children's camp, and children's club;

* **Sec. 22.** AS 14.03.410 is repealed July 1, 2032.

* **Sec. 23.** The uncodified law of the State of Alaska is amended by adding a new section to read:

VIRTUAL EDUCATION AVAILABILITY DEADLINE. The Department of Education and Early Development shall make available virtual education courses and professional development resources under sec. 20 of this Act on or before July 1, 2023.

* **Sec. 24.** The uncodified law of the State of Alaska is amended by adding a new section to read:

APPLICABILITY. Section 19 of this Act applies to endorsements in elementary education issued on or after the effective date of this Act. An endorsement in elementary education issued before the effective date of this Act may not be renewed on or after the effective date of this Act unless the teacher has completed three credits or the equivalent of coursework, training, or testing requirements under sec. 19 of this Act.

* **Sec. 25.** The uncodified law of the State of Alaska is amended by adding a new section to read:

TRANSITION. To determine the lowest performing 10 percent of districts for purposes of grant eligibility under sec. 8 of this Act, in fiscal year 2022, the Department of Education and Early Development shall use school accountability rankings from the 2019-2020 school year.

* **Sec. 26.** This Act takes effect July 1, 2021.



Representative Chris Tuck

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House Bill 164 – Early Ed Programs; Reading; Virtual Ed

Sectional Analysis

"An Act relating to early education programs provided by school districts; relating to school age eligibility; relating to early education programs; establishing a parents as teachers program; relating to the duties of the Department of Education and Early Development; relating to certification of teachers; establishing a reading intervention program for public school students enrolled in grades kindergarten through three; establishing a reading program in the Department of Education and Early Development; relating to a virtual education consortium; and providing for an effective date."

Section 1 – Establishes this Act as the Alaska Reads Act.

Section 2 – Amends AS 14.03.060 by redefining the definition of elementary school to include a Department of Early Education and Development (DEED) approved early education program and a head start program operating under 42 U.S.C. 9831-9852c.

Section 3 – Amends AS 14.03.072 by aligning terminology and by requiring districts to provide information regarding the importance of early reading to parents and guardians of students including information about reading intervention services authorized by Section 18 of this bill.

Section 4 – Amends AS 14.03.078 which directs DEED to include in their annual report to the legislature information collected under AS 14.03.120, Parent as Teachers, and AS 14.30-760 – 14.30.775, the Alaska Reads Act, including how districts use their professional service days for culturally responsive professional development in reading instruction.

Section 5 – Amends AS 14.03.080 by directing school districts to offer a waiver process to parent(s) or guardian(s) who would like their child to start kindergarten at an age earlier than what is currently established in state statute.

Section 6 – Amends AS 14.03.080 by adding new subsection which changes the date a child is eligible to enter a public early education program.

Section 7 – Amends AS 14.03.120 by adding new subsection which establishes annual reporting requirements for school districts to report student performance metrics in grades K-3.

Section 8 – Amends AS 14.03 by establishing a statewide early education grant program to provide a cyclical early education grant program to all school districts. The early education grant program includes financial support, professional training, and technical assistance to school districts to develop or improve their high-quality, locally designed, culturally responsive, universal voluntary pre-K program.

Over six fiscal years, all school districts will be offered the opportunity to participate in the grant program, with the lowest performing 10% of school districts eligible in the first year. At any time, a school district may apply to the DEED to have their pre-K program approved. Once a pre-K program is approved, the school district is authorized to include their pre-K students in their Average Daily Membership (ADM) count.

Participation in the grant program is not required and school districts are not mandated to establish a pre-K program.

AS 14.03.420 codifies the Parents As Teachers (PAT) program as a program of the state within DEED and specifies criteria for PAT to demonstrate its efficacy in supporting school districts with pre-K education.

Section 9 – Amends AS 14.07.020 and directs DEED to supervise all early education programs, approve those early education programs established under AS 14.03.410, establish a new reading program AS 14.07.065, and offer reading intervention programs to participating schools AS 14.30.770.

Section 10 – AS 14.07.020 is amended to define an early education program as a pre-K program for students three to five years old if its primary function is educational.

Section 11 – Amends AS 14.07.050 to permit DEED to purchase supplemental reading textbooks and materials for school districts related to the reading intervention services established AS 14.30.760.

Section 12 – Amends AS 14.07.165 by directing the Alaska State Board of Education and Early Development (state board) to establish regulations for a high-quality, locally designed, evidence-based, culturally responsive early education program (pre-K) for children who are four and five years of age.

Section 13 – Amends AS 14.07.180 by directing the state board to establish standards for reviewing and approving early education through grade 3 language arts curricula based on the five components of evidence-based reading as identified by the National Reading Panel.

Section 14 – Amends AS 14.17.500 by adding new subsection which counts a student participating in a DEED-approved early education program as half (0.5) a student in a school district's Average Daily Membership (ADM) calculations.

Section 15 – Amends AS 14.17. 505 by increasing the limit a school district is allowed to retain in its unreserved fund balance from 10% to 25% of district expenditures. This section also allows for savings realized from a cooperative grant under AS 14.14.115 to not count towards the 25% limit.

Section 16 – Amends AS 14.17.905 to include students in early education programs approved by DEED in the definition of an elementary school.

Section 17 – Amends AS 14.17.905 by adding new subsection to avoid letting school districts count pre-K students twice in Foundation Formula Average Daily Membership (ADM) calculations.

Section 18 – Amends AS 14.20.015 to ensure teaching certificate reciprocity for teachers moving to Alaska and adds that such teachers must complete at least three credits or equivalency in evidence-based reading instruction to be eligible for an Alaska teaching endorsement in elementary education.

Section 19 – Amends AS 14.20.020 by adding new subsection to require all teachers to complete at least three credits or equivalency in evidence-based reading instruction to be eligible for an endorsement in elementary education.

Section 20 – Establishes Article 15, Reading Programs and Article 16, Virtual Education.

Establishes AS 14.30.760, which directs DEED to adopt a culturally responsive statewide reading assessment and screening tool to assist in identifying students with any reading deficiencies based on recommendations from the Dyslexia Task Force or another formalized reading proficiency task force; support early education educators in monitoring student progress in reading proficiency; provide training to early education educators and school district staff in reading intervention tools; and, establish a waiver process for school districts to adopt an alternative evidence-based reading screen or assessment tool.

Establishes AS 14.30.765, which directs school districts to offer culturally responsive intensive reading intervention services to K-3 students who do not meet grade level proficiency requirements on the statewide screening tool or alternative. Intensive reading intervention services must include a high amount of communication between teachers, parents, administrators, and the student. This section contains clear parental notification requirements for if and when a student fails to progress toward reading proficiency that may result in the student not advancing to the next grade level.

Establishes AS 14.30.770, which directs DEED to establish a statewide reading program to assist the lowest performing 25 percent of school districts serving K-3 students in providing reading intervention services. DEED employed reading specialists will assist school districts in implementing their intensive reading intervention services; train and mentor district early education educators; and conduct an independent review of the efficacy and success of the statewide reading program. DEED will also make complementary reading proficiency tools and resources to school districts available.

DEED will convene an annual panel of educators, school administrators, and parents to review the effectiveness of reading intervention programs established under Article 15 Reading Programs.

This section also contains a detailed account of qualifications required for DEED employed reading specialists and support reading specialists and inclusive definitions for “district,” and “parent ‘or’ guardian.”

Establishes AS 14.30.800, a virtual education consortium operated by DEED in collaboration with school districts. The consortium will have a database of virtual education courses available to all districts for students in grades 6-12 and provide training for teachers instructing in virtual settings and professional development for all teachers in the state. New definitions for the terms: “asynchronous”, “base student allocation”, “blended”, “host district”, “synchronous”, and “virtual education” or “virtual instruction” are established under this article.

Section 21 – Directs early education program staff to be included in those organizations required to report evidence of child abuse.

Section 22 – Repeals AS 14.03.410, the early education grant program, in 11 years once all school districts have had the opportunity to participate.

Section 23 – Establishes a July 1, 2023 deadline for when DEED must make virtual education courses available.

Section 24 – Provides applicability language relating to endorsements in elementary education issued on or after the effective date of this act.

Section 25 – Is transition language, directing the department to use 2019-20 school accountability rankings for purposes of determining the first cohort of lowest performing schools, to identify their pre-K grant eligibility for FY 22.

Section 26 – Establishes an effective date of July 1, 2021.

Fiscal Note

State of Alaska
2021 Legislative Session

Bill Version: HB 164
Fiscal Note Number: _____
() Publish Date: _____

Identifier: HB164-EED-ELC-4-15-21
Title: EARLY ED PROGRAMS; READING; VIRTUAL ED
Sponsor: TUCK
Requester: House Education

Department: Department of Education and Early Development
Appropriation: Education Support and Administrative Services
Allocation: Early Learning Coordination
OMB Component Number: 2912

Expenditures/Revenues

Note: Amounts do not include inflation unless otherwise noted below.

(Thousands of Dollars)

	FY2022 Appropriation Requested	Included in Governor's FY2022 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	FY 2022	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Personal Services	322.5		322.5	322.5	322.5	322.5	322.5
Travel							
Services	44.4		32.4	32.4	32.4	32.4	32.4
Commodities	15.0						
Capital Outlay							
Grants & Benefits		474.7	474.7	474.7	474.7	474.7	474.7
Miscellaneous							
Total Operating	381.9	474.7	829.6	829.6	829.6	829.6	829.6

Fund Source (Operating Only)

1004 Gen Fund (UGF)	381.9	474.7	829.6	829.6	829.6	829.6	829.6
Total	381.9	474.7	829.6	829.6	829.6	829.6	829.6

Positions

Full-time	3.0		3.0	3.0	3.0	3.0	3.0
Part-time							
Temporary							

Change in Revenues

None							
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Estimated SUPPLEMENTAL (FY2021) cost: 0.0 (separate supplemental appropriation required)

Estimated CAPITAL (FY2022) cost: 0.0 (separate capital appropriation required)

Does the bill create or modify a new fund or account? No
(Supplemental/Capital/New Fund - discuss reasons and fund source(s) in analysis section)

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? Yes
If yes, by what date are the regulations to be adopted, amended or repealed? 06/30/22

Why this fiscal note differs from previous version/comments:

Not applicable; initial version.

Prepared By: Heidi Teshner, Director
Division: Finance and Support Services
Approved By: Lacey Sanders, Administrative Services Director
Agency: Office of Management and Budget
Phone: (907)465-2875
Date: 04/15/2021
Date: 04/15/21

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2021 LEGISLATIVE SESSION

BILL NO. HB 164

Analysis

This bill creates four new programs: an early education program, a comprehensive reading intervention program, a school improvement reading program, and a virtual education consortium. **This fiscal note addresses the early education program.**

The early education program, created under AS 14.03.135, is approved by the Department of Education and Early Development (DEED) and funded by the state through a three-year grant process. Once those districts have completed the three-year grant cycle and DEED has determined the early education program complies with the adopted standards as created by the State Board of Education and Early Development, then those programs may be eligible for 1/2 the full-time equivalent for average daily membership (ADM) funding under AS 14.17.410. Foundation funding would only be provided to those districts that are not already receiving early education funding by another state or federal program. The early education program is repealed on July 1, 2032.

To operate the early education grant program starting in FY2022 through FY2032, it would require 2 Education Specialist II, Range 21, Step B/C, at \$115.6 each (\$231.2 total); and 1 Education Associate II, Range 15, Step B/C, at \$91.3. In addition, department chargebacks of \$10.8 per position would be needed (\$32.4 total), plus a one-time increment of \$5.0 per position for supplies and equipment (\$15.0 total).

These three positions would be needed in order to develop the early education grant program, including creating the standards for high-quality pre-K programs and seeking the State Board of Education and Early Development's approval of those standards, and providing on-going professional development, training, and support to grantees throughout the life of the early education grant program.

In addition, with the requirement for the State Board of Education and Early Development to adopt regulations establishing standards for an early education program, including teacher certification requirements, developmentally appropriate objectives, and accommodations, included in this fiscal note is a one-time increment of \$12.0 for legal services costs associated with these new regulations.

Total cost to DEED in salary and benefits is \$322.5 with department chargebacks of \$32.4, plus one-time increments for supplies and equipment of \$15.0 and regulations of \$12.0, for a total cost of \$381.9 in FY2022 and \$354.9 per year starting in FY2023.

A total of \$474.7 for the Parents as Teachers program is reflected in the FY2022 Governor's Request. This funding is necessary to continue the program. For purposes of estimating fiscal impact, the current appropriation of \$474.7 has been reflected each year. This estimate will be updated in out years as the program is implemented.

Costs associated with the early education program grants are reflected in the Pre-Kindergarten Grants fiscal note.

The effective date of this bill is July 1, 2021 (FY2022).

Fiscal Note

State of Alaska
2021 Legislative Session

Bill Version: HB 164
Fiscal Note Number: _____
() Publish Date: _____

Identifier: HB164-EED-FP-4-15-21
Title: EARLY ED PROGRAMS; READING; VIRTUAL ED
Sponsor: TUCK
Requester: House Education

Department: Department of Education and Early Development
Appropriation: K-12 Aid to School Districts
Allocation: Foundation Program
OMB Component Number: 141

Expenditures/Revenues

Note: Amounts do not include inflation unless otherwise noted below.

(Thousands of Dollars)

	FY2022 Appropriation Requested	Included in Governor's FY2022 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	FY 2022	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Personal Services							
Travel							
Services							
Commodities							
Capital Outlay							
Grants & Benefits							
Miscellaneous							
Total Operating	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fund Source (Operating Only)

None							
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Positions

Full-time							
Part-time							
Temporary							

Change in Revenues

None							
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Estimated SUPPLEMENTAL (FY2021) cost: 0.0 (separate supplemental appropriation required)

Estimated CAPITAL (FY2022) cost: 0.0 (separate capital appropriation required)

Does the bill create or modify a new fund or account? No
(Supplemental/Capital/New Fund - discuss reasons and fund source(s) in analysis section)

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? No
If yes, by what date are the regulations to be adopted, amended or repealed?

Why this fiscal note differs from previous version/comments:

Not applicable; initial version.

Prepared By: Heidi Teshner, Director
Division: Finance and Support Services
Approved By: Lacey Sanders, Administrative Services Director
Agency: Office of Management and Budget

Phone: (907)465-2875
Date: 04/15/2021
Date: 04/15/21

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2021 LEGISLATIVE SESSION

BILL NO. HB 164

Analysis

This bill creates four new programs: an early education program, a comprehensive reading intervention program, a school improvement reading program, and a virtual education consortium. **This fiscal note addresses the early education program.**

The early education program, created under AS 14.03.135, is approved by the Department of Education and Early Development (DEED) and funded by the state through a three-year grant process. Once those districts have completed the three-year grant cycle and DEED has determined the early education program complies with the adopted standards as created by the State Board of Education and Early Development, then those programs may be eligible for 1/2 the full-time equivalent for average daily membership (ADM) funding under AS 14.17.410. Foundation funding would only be provided to those districts that are not already receiving early education funding by another state or federal program. The early education program is repealed on July 1, 2032.

The current pre-kindergarten grant counts, as provided by the Division of Innovation and Education Excellence, were used in calculating anticipated foundation funding. Half of the average cost per student was used as a multiplier for purposes of this fiscal note. This number was derived by using the final FY2021 State Aid Entitlement of \$1,219,913,567 and dividing it by the total ADM projected at 127,015.30 to arrive at \$9,605. The average per student cost was then divided in half to arrive at \$4,803, so as to be in alignment with the language added in AS 14.17.500(d).

The district's pre-kindergarten students can transition to the foundation formula after completing the three year grant process. Therefore, the first approved pre-kindergarten program to receive state aid through the ADM would be on the fourth year or FY2025. Since those pre-kindergarten student counts cannot be determined, the following calculation of students are based on the cohort used for projecting the grant.

FY2025 = 368 students x \$4,803 = \$1,767,504

FY2026 = 919 students x \$4,803 = \$4,413,957

FY2027 = 1,470 students x \$4,803 = \$7,060,410

FY2028 = 2,205 students x \$4,803 = \$10,590,615

FY2029 = 2,940 students x \$4,803 = \$14,120,820

FY2030 = 3,675 students x \$4,803 = \$17,651,025

This bill also includes transition language that increases the amount available under the foundation formula for distribution by approximately \$5 million each year (\$5 million in the first fiscal year, \$10 million in the second fiscal year, and \$15 million in the third fiscal year) for existing Pre-K programs that get approved by the State Board of Education and Early Development.

The effective date of this bill is July 1, 2021 (FY2022).

The funding mechanism is a general fund transfer to the Public Education Fund (PEF). The fiscal note effect for FY2022 through FY2027 is reported in the fiscal note for the PEF, as the funding is deposited to the PEF, not into the Foundation Program funding component. The above analysis is presented here for explanation purposes only.

Fiscal Note

State of Alaska
2021 Legislative Session

Bill Version: HB 164
Fiscal Note Number: _____
() Publish Date: _____

Identifier: HB164-EED-PEF-4-15-21

Title: EARLY ED PROGRAMS; READING; VIRTUAL ED

Sponsor: TUCK

Requester: House Education

Department: Fund Capitalization

Appropriation: No Further Appropriation Required

Allocation: Public Education Fund

OMB Component Number: 2804

Expenditures/Revenues

Note: Amounts do not include inflation unless otherwise noted below.

(Thousands of Dollars)

	FY2022 Appropriation Requested	Included in Governor's FY2022 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	FY 2022	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Personal Services							
Travel							
Services							
Commodities							
Capital Outlay							
Grants & Benefits	5,000.0		10,000.0	15,000.0	16,767.5	19,414.0	22,060.4
Miscellaneous							
Total Operating	5,000.0	0.0	10,000.0	15,000.0	16,767.5	19,414.0	22,060.4

Fund Source (Operating Only)

1004 Gen Fund (UGF)	5,000.0		10,000.0	15,000.0	16,767.5	19,414.0	22,060.4
Total	5,000.0	0.0	10,000.0	15,000.0	16,767.5	19,414.0	22,060.4

Positions

Full-time							
Part-time							
Temporary							

Change in Revenues

None							
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Estimated SUPPLEMENTAL (FY2021) cost: 0.0 (separate supplemental appropriation required)

Estimated CAPITAL (FY2022) cost: 0.0 (separate capital appropriation required)

Does the bill create or modify a new fund or account? No
(Supplemental/Capital/New Fund - discuss reasons and fund source(s) in analysis section)

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? No
If yes, by what date are the regulations to be adopted, amended or repealed?

Why this fiscal note differs from previous version/comments:

Not applicable; initial version.

Prepared By: Heidi Teshner, Director

Division: Finance and Support Services

Approved By: Lacey Sanders Administrative Services Director

Agency: Office of Management and Budget

Phone: (907)465-2875

Date: 04/15/2021

Date: 04/15/21

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2021 LEGISLATIVE SESSION

BILL NO. HB 164

Analysis

This bill creates four new programs: an early education program, a comprehensive reading intervention program, a school improvement reading program, and a virtual education consortium. **This fiscal note addresses the early education program.**

The early education program, created under AS 14.03.135, is approved by the Department of Education and Early Development (DEED) and funded by the state through a three-year grant process. Once those districts have completed the three-year grant cycle and DEED has determined the early education program complies with the adopted standards as created by the State Board of Education and Early Development, then those programs may be eligible for 1/2 the full-time equivalent for average daily membership (ADM) funding under AS 14.17.410. Foundation funding would only be provided to those districts that are not already receiving early education funding by another state or federal program. The grant program and ADM funding are repealed on July 1, 2032.

The current pre-kindergarten grant counts, as provided by the Division of Innovation and Education Excellence, were used in calculating anticipated foundation funding. Half of the average cost per student was used as a multiplier for purposes of this fiscal note. This number was derived by using the final FY2021 State Aid Entitlement of \$1,219,913,567 and dividing it by the total ADM projected at 127,015.30 to arrive at \$9,605. The average per student cost was then divided in half to arrive at \$4,803, so as to be in alignment with the language added in AS 14.17.500(d).

The district's pre-kindergarten students can transition to the foundation formula after completing the three year grant process. Therefore, the first approved pre-kindergarten program to receive state aid through the ADM would be on the fourth year or FY2025. Since those pre-kindergarten student counts cannot be determined, the following calculation of students are based on the cohort used for projecting the grant.

FY2025 = 368 students x \$4,803 = \$1,767,504

FY2026 = 919 students x \$4,803 = \$4,413,957

FY2027 = 1,470 students x \$4,803 = \$7,060,410

FY2028 = 2,205 students x \$4,803 = \$10,590,615

FY2029 = 2,940 students x \$4,803 = \$14,120,820

FY2030 = 3,675 students x \$4,803 = \$17,651,025

This bill also includes transition language that increases the amount available under the foundation formula for distribution by approximately \$5 million each year (\$5 million in the first fiscal year, \$10 million in the second fiscal year, and \$15 million in the third fiscal year) for existing Pre-K programs that get approved by the State Board of Education and Early Development.

The effective date of this bill is July 1, 2021 (FY2022).

Fiscal Note

State of Alaska
2021 Legislative Session

Bill Version: HB 164
Fiscal Note Number: _____
() Publish Date: _____

Identifier: HB164-EED-PK-4-15-21
Title: EARLY ED PROGRAMS; READING; VIRTUAL ED
Sponsor: TUCK
Requester: House Education

Department: Department of Education and Early Development
Appropriation: Education Support and Administrative Services
Allocation: Pre-Kindergarten Grants
OMB Component Number: 3028

Expenditures/Revenues

Note: Amounts do not include inflation unless otherwise noted below.

(Thousands of Dollars)

	FY2022 Appropriation Requested	Included in Governor's FY2022 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	FY 2022	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Personal Services							
Travel							
Services							
Commodities							
Capital Outlay							
Grants & Benefits	1,767.5		4,414.0	7,060.4	8,823.1	9,706.9	10,590.6
Miscellaneous							
Total Operating	1,767.5	0.0	4,414.0	7,060.4	8,823.1	9,706.9	10,590.6

Fund Source (Operating Only)

1004 Gen Fund (UGF)	1,767.5		4,414.0	7,060.4	8,823.1	9,706.9	10,590.6
Total	1,767.5	0.0	4,414.0	7,060.4	8,823.1	9,706.9	10,590.6

Positions

Full-time							
Part-time							
Temporary							

Change in Revenues

None							
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Estimated SUPPLEMENTAL (FY2021) cost: 0.0 (separate supplemental appropriation required)

Estimated CAPITAL (FY2022) cost: 0.0 (separate capital appropriation required)

Does the bill create or modify a new fund or account? No
(Supplemental/Capital/New Fund - discuss reasons and fund source(s) in analysis section)

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? Yes
If yes, by what date are the regulations to be adopted, amended or repealed? 06/30/22

Why this fiscal note differs from previous version/comments:

Not applicable; initial version.

Prepared By: Heidi Teshner, Director
Division: Finance and Support Services
Approved By: Lacey Sanders, Administrative Services Director
Agency: Office of Management and Budget
Phone: (907)465-2875
Date: 04/15/2021
Date: 04/15/21

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2021 LEGISLATIVE SESSION

BILL NO. HB 164

Analysis

This bill creates four new programs: an early education program, a comprehensive reading intervention program, a school improvement reading program, and a virtual education consortium. **This fiscal note addresses the early education program.**

The early education program, created under AS 14.03.135, is approved by the Department of Education and Early Development (DEED) and funded by the state through a three-year grant process. Once those districts have completed the three-year grant cycle and DEED has determined the early education program complies with the adopted standards as created by the State Board of Education and Early Development, then those programs may be eligible for 1/2 the full-time equivalent for average daily membership (ADM) funding under AS 14.17.410. Foundation funding would only be provided to those districts that are not already receiving early education funding by another state or federal program. The early education program is repealed on July 1, 2032.

Page 3 of this fiscal note provides the funding breakdown by fiscal year for the three-year grant program.

Costs associated with the operation of the early education program grants are reflected in the Early Learning Coordination fiscal note.

The effective date of this bill is July 1, 2021 (FY2022).

Table 1	
Current Number of Districts operating a Pre-Kindergarten program	26
(26 districts registered in 2019-20)	
4 year old cohort*	10,000
Current District reported Pre-K Served*	3,590
Head Start*	1,580
Number students served by this legislation	3,675
	8,845
Percent of 4 year old students served*	88.45%
* estimated	
Foundation Component / Public Education Fund	
1/2 the average per student cost =	\$ 4,803.00

Table 3	
Pre-Kindergarten Grant Component	(Table 2)
3-year Early Education Grant cycle	Number of Students
Year 1 - FY2022 (District Cohort 1)	368
Year 2 - FY2023 (District Cohorts 1 & 2)	919
Year 3 - FY2024 (District Cohorts 1, 2, 3)	1,470
Year 4 - FY2025 (District Cohorts 2, 3, 4)	1,837
Year 5 - FY2026 (District Cohorts 3, 4, 5)	2,021
Year 6 - FY2027 (District Cohorts 4, 5, 6)	2,205
Year 7 - FY2028 (District Cohorts 5 & 6)	1,470
Year 8 - FY2029 (District Cohort 6)	735

Table 2			
3-Year Early Education Grant cycle - district eligibility			
District Cohort	Fiscal Year	District Performance	Number of Students
1	2022	lowest 10%	368
2	2023	2nd lowest 15%	551
3	2024	3rd lowest 15%	551
4	2025	3rd highest 20%	735
5	2026	2nd highest 20%	735
6	2027	highest 20%	735
Total			3,675

Table 4		
Foundation Component / Public Education Fund		
1/2 the average per student cost = \$4,803	Fiscal Year	Number of Students
	Moved to ADM	
Year 1 FY2022 grant program- students served	FY2025	368
Year 2 FY2023 grant program- students served	FY2026	919
Year 3 FY2024 grant program- students served	FY2027	1,470
Year 4 FY2025 grant program- students served	FY2028	2,205
Year 5 FY2026 grant program- students served	FY2029	2,940
Year 6 FY2027 grant program- students served	FY2030	3,675
Total		3,675

3-year Early Education Grant cycle (Table 3)									
	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027			
		FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY2028		
			FY 2024	FY 2025	FY 2026	FY 2027	FY2028	FY 2029	FY 2030
	\$1,767,504	\$4,413,957	\$7,060,410	\$8,823,111	\$9,706,863	\$10,590,615	\$7,060,410	\$3,530,205	\$0
			Moved to ADM/State Aid	\$1,767,504	\$4,413,957	\$7,060,410	\$10,590,615	\$14,120,820	\$17,651,025
								Total ADM/State Aid	\$17,651,025
								Total Grant	\$52,953,075

Fiscal Note

State of Alaska
2021 Legislative Session

Bill Version: HB 164
Fiscal Note Number: _____
() Publish Date: _____

Identifier: HB164-EED-SSA-4-15-21
Title: EARLY ED PROGRAMS; READING; VIRTUAL ED
Sponsor: TUCK
Requester: House Education

Department: Department of Education and Early Development
Appropriation: Education Support and Administrative Services
Allocation: Student and School Achievement
OMB Component Number: 2796

Expenditures/Revenues

Note: Amounts do not include inflation unless otherwise noted below.

(Thousands of Dollars)

	FY2022 Appropriation Requested	Included in Governor's FY2022 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	FY 2022	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Personal Services	2,739.4		3,333.4	4,277.4	4,871.4	5,465.4	5,465.4
Travel	21.0		26.0	31.0	36.0	41.0	41.0
Services	340.4		352.4	1,499.4	1,553.4	1,607.4	1,607.4
Commodities	690.0		600.0	600.0	600.0	600.0	575.0
Capital Outlay							
Grants & Benefits							
Miscellaneous							
Total Operating	3,790.8	0.0	4,311.8	6,407.8	7,060.8	7,713.8	7,688.8

Fund Source (Operating Only)

1004 Gen Fund (UGF)	3,790.8		4,311.8	6,407.8	7,060.8	7,713.8	7,688.8
Total	3,790.8	0.0	4,311.8	6,407.8	7,060.8	7,713.8	7,688.8

Positions

Full-time	26.0		31.0	36.0	41.0	46.0	46.0
Part-time							
Temporary							

Change in Revenues

None							
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Estimated SUPPLEMENTAL (FY2021) cost: 0.0 (separate supplemental appropriation required)

Estimated CAPITAL (FY2022) cost: 0.0 (separate capital appropriation required)

Does the bill create or modify a new fund or account? No
(Supplemental/Capital/New Fund - discuss reasons and fund source(s) in analysis section)

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? Yes
If yes, by what date are the regulations to be adopted, amended or repealed? 06/30/22

Why this fiscal note differs from previous version/comments:

Not applicable; initial version.

Prepared By: Heidi Teshner, Director
Division: Finance and Support Services
Approved By: Lacey Sanders, Administrative Services Director
Agency: Office of Management and Budget
Phone: (907)465-2875
Date: 04/15/2021
Date: 04/15/21

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2021 LEGISLATIVE SESSION

BILL NO. HB 164

Analysis

This bill creates four new programs: an early education program, a comprehensive reading intervention program, a school improvement reading program, and a virtual education consortium. **This fiscal note addresses the comprehensive reading intervention program, the school improvement reading program, and the virtual education consortium.**

Comprehensive Reading Intervention Program

The comprehensive reading intervention program is created under AS 14.30.765. To manage and operate this program, provide coursework, training, and testing opportunities related to evidence-based reading instruction, annually solicit and convene stakeholders to receive feedback on program implementation, establish a recognition program, and provide direct support and training for all K-3 teachers on the use of the statewide screening or assessment tool results and on evidence-based reading, DEED would need 1 Education Administrator II Range 22, Step C/D at \$125.8, and 2 Education Specialist II positions at a Range 21, Step C/D, at \$118.8 each (\$363.4 total). In addition, department chargebacks of \$10.8 per position would be needed (\$32.4 total), plus a one-time increment of \$5.0 per position for supplies and equipment (\$15.0 total).

The Education Administrator II will be required to participate and present at statewide professional development conferences. DEED expects virtual participation at conferences and has therefore budgeted for in-person travel to only one conference per year. At \$1.0 per trip X 1 trips X 1 position, total travel each year is \$1.0.

In addition, the comprehensive reading intervention program requires the adoption and administration of a statewide screening or assessment tool to identify students in K-3 with reading deficiencies, and establishment of a waiver process for districts. DEED expects virtual participation by districts to attend the statewide screening or assessment tool training. There are approximately 40,000 students in K-3 in Alaska schools. A statewide screener would cost approximately eight dollars per student. This would result in an annual cost of \$320.0.

In FY2022, a one-time increment of \$18.0 is included for legal services costs associated with producing new regulations to implement this program.

School Improvement Reading Program

The school improvement reading program, created under AS 14.30.770, is established in DEED to provide direct support and intervention in district and school reading programs serving students in grades K-3 and to provide reading support to districts throughout Alaska. During the first year, up to 10 schools identified from the lowest performing 10 percent of schools, would each be served directly by Reading Specialists employed by DEED and up to 20 schools would be served in the second year and beyond. Depending on school size and need, either one or two Reading Specialists would be assigned to each school. DEED anticipates employing from 10 to 20 Reading Specialists in year one and 20 to 40 Reading Specialists in the subsequent years. For purposes of estimating fiscal impact, the maximum number of positions has been reflected in the first year with five additional positions phased in annually over the following four years. These estimates will be updated in out years as the program is implemented.

Reading Specialists are budgeted as Education Specialist II positions at a Range 21, Step C/D, \$118.8 each. In addition, department chargebacks of \$10.8 per position would be needed annually. A one-time increment of \$5.0 per position for supplies and equipment would be needed in the first year the position is budgeted. Reading Specialists would be located in communities across the state and would need to be provided a geographic cost differential, which is not included in this estimate. Each Reading Specialist would be required to participate and present at statewide professional development conferences. DEED expects virtual participation at conferences and has therefore budgeted for in-person travel to only one conference per year. At \$1.0 per trip X 1 trips X 20 positions, total travel for year one is \$20.0. Travel costs for subsequent years would increase with the number of Reading Specialists employed. For purposes of estimation, 5 Reading Specialists are added each year through FY2026 resulting in \$5.0 in additional travel costs annually (1 trips per position X 5 positions).

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2021 LEGISLATIVE SESSION

BILL NO. HB 164

Analysis

Under the school improvement reading program, DEED would purchase supplemental reading textbooks and materials for school districts in connection with reading intervention services. The cost per student when adopting a new reading curriculum is two hundred and fifty dollars (\$.25). With approximately 10,000 students per grade level in Alaska schools, there are a total of 40,000 student in kindergarten to third grade (K-3). During the 2019-2020 school year, 391 schools served K-3 students. $40,000 \text{ students} / 391 \text{ schools} = 102 \text{ K-3 students per school on average}$. For each year of the reading program, $10 \text{ schools} \times 102 \text{ K-3 students/school} \times \$.25/\text{student} = \255.0 .

An annual contract fee of \$50.0 is included for the required independent contractor to conduct the data analysis of the program's effectiveness under AS 14.30.770.

In FY2022, a one-time increment of \$12.0 is included for legal services costs associated with producing new regulations.

Virtual Education Consortium

The virtual education consortium, created under AS 14.30.800, is established in DEED in cooperation with school districts, for the purpose of making virtual education and professional development resources available to students and teachers in the state. To manage and operate this statewide virtual education learning management system (LMS), review all courses and professional development, and provide virtual instruction training, DEED would need 2 Education Specialist II positions at a Range 21, Step B/C, at \$115.6 each (\$231.2 total). In addition, department chargebacks of \$10.8 per position would be needed (\$21.6 total).

A Reading Specialist position is established to provide intensive reading intervention services to districts participating in the virtual education consortium. This position is budgeted as an Education Specialist II position at a Range 21, Step C/D, \$118.8. In addition, department chargebacks of \$10.8 for the position would be needed.

DEED established a statewide virtual education LMS license for districts, teachers, and students in FY2021 in response to the COVID-19 pandemic and plans to continue the license through FY2023 using federal COVID-19 relief funds at a cost of \$1,060.6 annually. The 2 FTE positions needed to manage the LMS, review coursework and professional development, and provide virtual instruction training as outlined in this bill, and the 1 FTE Reading Specialist position, could also be funded through FY2023 with federal COVID-19 relief funding. Starting in FY2024, state funds are needed to support the LMS license (\$1,060.6) and associated positions (\$382.4).

In FY2022, a one-time increment of \$12.0 is included for legal services costs associated with producing new regulations.

The effective date of this bill is July 1, 2021 (FY2022).

As an additional note, neither the FY2022 Governor's Budget or this fiscal note contain any funding related to the one-time cooperative arrangement grants under AS 14.14.115. Further, this fiscal note does not reflect the fiscal impact of the increase in the unreserved portion of a school district's year-end operating fund balance under AS 14.17.505(a).

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2021 LEGISLATIVE SESSION

BILL NO. HB 164

Analysis

	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027
Comprehensive Reading Intervention Program						
Personal Services	363.4	363.4	363.4	363.4	363.4	363.4
Travel	1.0	1.0	1.0	1.0	1.0	1.0
Services	50.4	32.4	32.4	32.4	32.4	32.4
Commodities	335.0	320.0	320.0	320.0	320.0	320.0
Subtotal	749.8	716.8	716.8	716.8	716.8	716.8
School Improvement Reading Program						
Personal Services	2,376.0	2,970.0	3,564.0	4,158.0	4,752.0	4,752.0
Travel	20.0	25.0	30.0	35.0	40.0	40.0
Services	278.0	320.0	374.0	428.0	482.0	482.0
Commodities	355.0	280.0	280.0	280.0	280.0	255.0
Subtotal	3,029.0	3,595.0	4,248.0	4,901.0	5,554.0	5,529.0
Virtual Education Consortium						
Personal Services	-	-	350.0	350.0	350.0	350.0
Services	12.0	-	1,093.0	1,093.0	1,093.0	1,093.0
Commodities	-	-	-	-	-	-
Subtotal	12.0	-	1,443.0	1,443.0	1,443.0	1,443.0
Combined						
Personal Services	2,739.4	3,333.4	4,277.4	4,871.4	5,465.4	5,465.4
Travel	21.0	26.0	31.0	36.0	41.0	41.0
Services	340.4	352.4	1,499.4	1,553.4	1,607.4	1,607.4
Commodities	690.0	600.0	600.0	600.0	600.0	575.0
Total Operating	3,790.8	4,311.8	6,407.8	7,060.8	7,713.8	7,688.8
Comprehensive Reading Intervention Program						
Full-Time Positions	3	3	3	3	3	3
School Improvement Reading Program						
Full-Time Positions	20	25	30	35	40	40
Virtual Education Consortium						
Full-Time Positions	3	3	3	3	3	3
Combined Total FT	26	31	36	41	46	46

Alaska Pre-Elementary Research Compilation



Introduction

This compilation of research will outline include several studies about the positive outcomes for state funded preschool. Included in this compilation are several state studies on the impact preschool has on kindergarten readiness, increased likelihood of long-term academic achievement and the reduction for the need of special education services. This compilation of research will also include reports addressing the concerns that the impact of preschool is not long lasting and “fades out” over time.

Foundational research on the impact of preschool for young children is built on a 40 year study of the High Scope Perry Preschool program. The High Scope Perry Preschool and the Abecedarian Preschool Project are considered the gold standard in pre-k quality. These programs were shown to produce academic benefits, health improvements, reductions in crime, and improved economic outcomes such as higher earnings and reduced need for public benefits. The High Scope Perry Preschool students had an almost 20 percent higher high school graduation rate and children in the Abecedarian Preschool Program were four times more likely to graduate college than students in the control group.

These returns on investment have attracted support for high quality pre-k among Federal Reserve leaders, corporate CEOs, economists such as Nobel Prize winner James J. Heckman, law enforcement and military leaders, and bipartisan policymakers in Texas and across the country, among others.

- Schweinhart, L.J., Montie, J., Zongping, X., et al. (2005) *Lifetime Effects: The HighScope Perry Preschool Study Through Age 40* High Scope Press. Retrieved from: http://www.highscope.org/file/research/perryproject/specialsummary_rev2011_02_2.pdf
- Conti, G., Heckman, J., Pinto, R., (2015) *The Effects of Two Influential Early Childhood Interventions on Health and Healthy Behaviors*. National Bureau of Economic Research. Retrieved from: <http://www.nber.org/papers/w21454.pdf>
- Heckman, J., (2012) *Invest in Early Childhood Development: Reduce Deficits, Strengthen the Economy*. Retrieved from: <https://heckmanequation.org/resource/invest-in-early-childhood-development-reduce-deficits-strengthen-the-economy/>

Increased Kindergarten Readiness

Many evaluations have found state-funded pre-k programs are effective in preparing young children to be successful in kindergarten. Research shows that pre-k promotes the successful acquisition academic skills such as pre-reading and pre-math.

- Isaacs, J. (2008). *State Pre-Kindergarten: Impacts of Early Childhood Programs*. Brookings Institute. Report https://www.brookings.edu/wp-content/uploads/2016/06/09_early_programs_isaacs.pdf

State Studies:

- **Arkansas:** Students who participated in the **Arkansas Better Chance (ABC)** program scored higher on kindergarten measures of vocabulary, math skills, and understanding of print concepts than students who had non-ABC preschool experiences

Jung, K., Barnett, W. S., Hustedt, J. T., & Francis, J. (2013). *Longitudinal effects of the Arkansas Better Chance program: Findings from first grade through fourth grade*. Rutgers University & The University of Delaware. Retrieved from <http://nieer.org/wp-content/uploads/2016/08/Arkansas20Longitudinal20Report20May2013n.pdf>

- **Georgia:** Georgia's Pre-k Program found a significant positive effect for participating children in measures of language and literacy, math, and general knowledge at kindergarten entry when compared to students of a similar age who had not yet participated.

Peisner-Feinberg, E., Schaaf, J., LaForett, D. R., Hildebrandt, L. M., & Sideris, J. (2014). *Effects of Georgia's pre-k program on children's school readiness skills: Findings from the 2013-2013 evaluation study*. University of North Carolina at Chapel Hill. Retrieved from <http://fpg.unc.edu/sites/fpg.unc.edu/files/resources/reports-and-policy-briefs/GAPreKEval2013-2014%20Report.pdf>

- **New Mexico:** Four-year-old children in the New Mexico Pre-K had better outcomes on kindergarten measures of vocabulary, math, and early literacy when compared to students who had not yet attended pre-k.

Hustedt, J. T., Barnett, W. S., Jung, K., & Friedman, A. H. (2010). *The New Mexico PreK evaluation: Impacts from the fourth year (2008- 2009) of New Mexico's state-funded PreK program*. National Institute for Early Education Research. Retrieved from <http://nieer.org/wp-content/uploads/2010/11/NewMexicoRDD1110.pdf>

- **Oklahoma:** An evaluation of Oklahoma's Early Childhood Four-Year-Old Program found large academic benefits for students of differing racial and ethnic groups across socioeconomic backgrounds. Four year old children, who had participated, showed, significantly improved performance on cognitive tests of reading, writing, math reasoning, and problem solving abilities.

Gormley Jr., W. T., Gayer, T., Phillips, D., & Dawson, B. (2005). *The Effects of Universal Pre-k on Cognitive Development*. Journal of Developmental Psychology, 41(6), 872-884. DOI: 10.1037/0012-1649.41.6.872. Retrieved from <http://www.iapsych.com/wj3ewok/LinkedDocuments/Gormley2005.pdf>

Long Term Academic Outcomes.

Participation in high-quality state funded pre-k programs has been found to benefit students. Benefits include improved academic outcomes lasting into elementary, middle, and high school. Several longitudinal studies have examined well-established state pre-k programs. Those studies compared participating students' outcomes on state assessments to those of similar control groups of students who did not participate in state-funded pre-k.

- **Louisiana:** A longitudinal study of **Louisiana's LA 4** public pre-kindergarten program compared the academic outcomes of participating students to non-participating students on the Louisiana Educational Assessment Program (LEAP) test in eighth grade. The study found that at-risk LA 4 students (as determined by family income) outperformed at-risk non-LA 4 students in all eighth-grade measures.

Cecil J Picard Center for Child Development and Lifelong Learning. (2013). *Eighth-grade outcomes for LA4 cohort 1 students*. (Technical brief).

- **New Jersey:** New Jersey's **Abbott Preschool Program Longitudinal Study (APPLES)** has measured the academic outcomes of participating students in kindergarten, second, fourth, and fifth grades. At all levels of measurement, the Abbott preschool program has been shown to improve achievement in literacy, language arts, and math.

Barnett, W. S., Jung, K., Youn, M., & Frede, E. C. (2013). *Abbott Preschool program longitudinal effects study: Fifth grade follow-up*. National Institute for Early Education R Retrieved from: <http://nieer.org/wp-content/uploads/2013/11/APPLES205th20Grade.pdf>

- **Michigan:** More students in the **Michigan Great Start Readiness Program (GSRP)** graduated on time compared to students who had not attended GSRP pre-k (58% vs. 43%). Additionally, more GSRP students of color graduated from high school on time compared to similar students of color who had not attended GSRP (60% vs. 37%).

Schweinhart, L. J., Xiang, Z., Daniel-Echols, M., Browning, K., & Wakabayashi, T. (2012). Michigan Great Start Readiness Program evaluation 2012: High school graduation and grade retention findings. HighScope Educational Research Foundation. Retrieved from http://www.highscope.org/file/Research/state_preschool/MGSRP%20Report%202012.pdf

Decreased Grade Retention and Special Education Referrals

The benefits associated with participating in quality pre-k have been found to not only impact cognitive performance measures like test scores, but also costly educational interventions like special education and grade retention.

- **Pennsylvania:** Typically expected rates of special education placement were significantly reduced for students who participated in the Pennsylvania's Pre-K Counts (PKC) program as they transitioned into kindergarten.

Bagnato, S., Salaway, J., & Suen, H. (2012). *Pre-k counts in Pennsylvania for youngsters' early school success*. Early Childhood Partnerships- Specs Research. Retrieved from <http://www.heinz.org/UserFiles/Library/SPECS%20for%20PKC%202009%20Final%20Research%20Report%20113009.pdf>

Results Demonstrated by Alaska School Districts

Two School districts receiving state funds to provide preschool since 2008, have been able to track the progress of young children into 2nd and 3rd grade. Lower Kuskokwim School District provided documentation of student progress on MAPS testing for 3rd grade. The results showed an increase in scores for those children who attended preschool versus children who did not. Nome Public School, used MAPS testing to show 2nd grade outcomes. Results of testing showed higher scores for young children who attended preschool versus children who did not.

Addressing Reports of Preschool Fade Out

A common argument against investing in early childhood education, is based on a highly selective read of research findings found in Head Start evaluations and, to a lesser extent, the Perry Preschool project.

Critics argue that gains made through early childhood education disappear by the third grade. They acknowledge that disadvantaged children who received early education arrive at kindergarten ahead of peers who did not, but use third grade evaluations to claim there is no lasting effect to justify the investment. The fade out argument may come from an incomplete read of data and a narrowed view of what constitutes success.

For example, the Perry Preschool Project has been criticized for not permanently increasing IQ among the treatment group. Studies showed IQ gains that are evident at kindergarten among the treatment group tend to equalize with the control group during schooling years. However, IQ is not the only one measure of success in an individual. Other child development skills are equally important. Nobel Laureate Economist James Heckman found that the social and emotional skills learned through early childhood education were the major drivers of success in school, career and life among the Perry treatment group, who far outperform the control group in adult outcomes.

- Video: [No Fade Out: Lasting Effects](#)

A major, well-designed project is called the **Head Start Impact Study**. It found that Head Start produces educational gains that fade away. By third grade, when the research ended, there was little detectable difference between those assigned to Head Start and those in control groups. However, early education has always had an impact not through cognitive gains but through long-term improvements in life outcomes. There are often long-term improvements on things that matter even more, such as arrest rates and high school graduation rates. The **Head Start**

Impact Study couldn't examine those outcomes. James Heckman says that using the Head Start Impact Study to claim that early childhood education is ineffective is "a generalized conclusion that is neither thoughtful nor accurate."

- Garces, E., Thomas, D., Currie, J. (2000) Long Term Effects of Head Start. Retrieved from:
http://www.princeton.edu/~jcurrie/publications/Longer_Term_Effects_HeadSt.pdf

A 2015 study reviewed the outcome results of the Tennessee Voluntary Pre-K program. The study, found no evidence of lasting academic or social gains for elementary students who had participated in Tennessee's pre-K program, and some point to this as evidence that pre-K gains fade-out over time. However, these results are more complex and need further review. There are several key points about the outcomes of this study.

First, this is only one study and does not take into account multiple factors of child development. Nor does the study consider the longer term results the preschoolers involved in the study. The Tennessee study only looked at kindergarten performance.

Second, the released results were only a portion of the full study. The full study will follow over 3000 preschool-aged Tennesseans and will analyze the results of the third grade state test.

Finally, the early learning community learned an important lesson from this study, quality matters. The study found that many of the preschool children attended programs that lacked quality and there was no measure of quality in those study programs. The study showed that focus must be on more than access and quality is the critical component of preschool success as is ensuring young children continue into early grade classrooms of high quality.

- Snow, K. & Hogan, L. (2015) *Making Sense of the Tennessee Voluntary Pre-k Study*. Retrieved from: <http://www.naeyc.org/blogs/making-sense-tennessee-voluntary-pre-k-study>

Early childhood education strengthens families and can break the cycle of poverty.

Professor Heckman's newest research looks at the life outcomes of Perry Preschool participants at midlife, as well as the outcomes of their own children. After putting the data through a series of rigorous tests, Heckman and his co-author find that the original participants of the program had significant gains in personal and family life outcomes that provided their children with positive second-generation effects on education, health, employment and civic life. Early childhood education resulted in stronger families and significantly contributed to upward mobility in the next generation—an indication that early childhood education can be an effective way to break the cycle of poverty.

Perry: the program that inspired modern early childhood

education. Originally developed as a randomized-controlled trial to determine whether quality early childhood education could increase the IQ of at-risk children from low-income families, Perry's components became the model for high-quality early childhood education today. Parental education and partnership, home visiting and child-centric early learning are now accepted best practices in birth-to-five early development and learning. Therefore, the treatment effects on Perry participants and their children have wide-ranging applications for more fully understanding the social benefits of early childhood education, especially when the results are seen in context with studies of more comprehensive programs inspired by Perry, such as the North Carolina Abecedarian Project.

A critical look at the data and effects on the next generation.

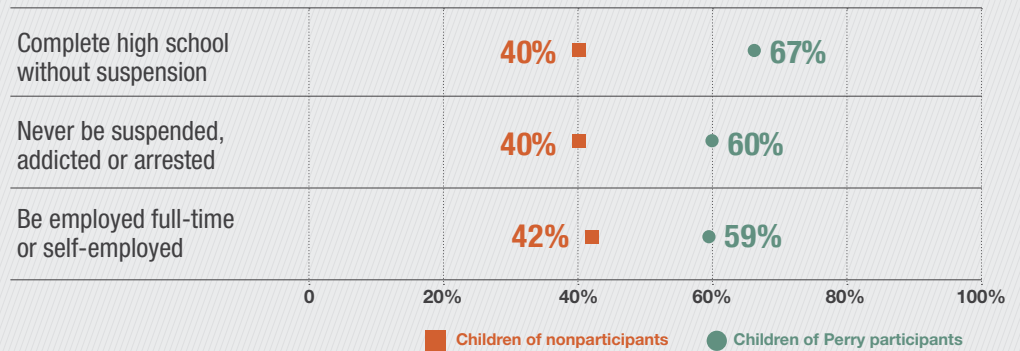
New data on outcomes after midlife provided the Heckman research team with the opportunity to understand the program's impact on the participants over their life course while addressing critics' concerns, such as the small sample size and compromises in the randomization of the treatment and control groups. After accounting for these and putting the data through a number of rigorous tests, this new analysis validates the return on investment in early childhood education for disadvantaged children. The latest data also allowed a first deep look into the

possible intergenerational effects of early childhood education on achievement, economic gains and upward mobility.

Strong gains among the original participants. While Perry failed to permanently increase a crude IQ measure of the treated, simplistic measures of cognitive achievement prove to be poor indicators of life success. Children treated with early childhood education have significantly better life outcomes than the untreated children. Treatment in Perry significantly increased the participants' employment, health, cognitive and socioemotional skills and reduced the male participants' criminal activity, especially violent crime. Improvements in childhood home environments and parental attachment are seen as an important source of the long-term benefits of the program.

Positive multigenerational effects. Heckman and his co-author found substantial second-generation effects on education, employment, crime, school suspensions and health. The children of participants were less likely to be suspended from school, and more likely to complete regular or any other form of high school and to be employed full-time with some college experience. While present for both male and female children of participants, the wide range of beneficial effects are particularly strong for the male children of participants, especially those of male participants.

Children of Perry Preschool participants are more likely than children of non-participants to:



High-quality early learning positively impacts later family life.

This latest analysis shows that effective early childhood development leads to better adult family lives. Perry participants had more stable marriages and were more likely to provide their children a more stable two-parent home in which to grow up. They tended to have children slightly later in life and remain stably married by the time their children turned 18, all of which afforded parents the ability to provide more resources and attention to the successful development of their children.



All children of Perry Preschool participants **spend 3 times more time with stably married parents before age 18** compared to children of nonparticipants.

Male children of male Perry Preschool participants **spend 15 times more time with stably married parents before age 18** compared to children of nonparticipants.



High-quality early childhood education can break the cycle of poverty.

These new findings indicate that high-quality early childhood programs have the potential to lift multiple generations out of poverty. Those treated in Perry were able to build the foundations for stronger family lives that resulted in larger gains for their children, despite living in similar or worse neighborhoods than the untreated families. The children of Perry participants are more educated, healthy, gainfully employed citizens who are more productive members of society.

Starting earlier can produce greater gains. The elements and approach of the Perry program continue to inspire high-quality early development programs and supports that begin at birth. The Abecedarian/CARE program modeled after Perry served children from birth to five and produced similar results and a higher return, particularly in the health of recipients and the economic gains of mothers. The highest returns are achieved when investments start at birth—13% for every dollar invested in children who could otherwise not attend a high-quality program. Findings from the study of Perry participants at midlife also show no fadeout in terms of life outcomes, suggesting that success of the program is reflected not by measuring IQ or academic achievement, but by life-course gains in employment, health and other life achievements, as well as the reduction of persistent crime.

Applications for policymaking. This research on the Perry Preschoolers is yet further evidence that investing in high-quality early childhood education can produce gains for disadvantaged children and deliver better outcomes for society. It also shows strong intergenerational effects not only in achievement but also in family life that build greater personal and social gains spanning multiple generations. As a result, high-quality early childhood education emerges as an effective tool for fighting intergenerational poverty.

Sources:

Heckman, James, and Ganesh Karapakula. "The Perry Preschoolers at Late Midlife: A Study in Design-Specific Inference." (2019)

Heckman, James, and Ganesh Karapakula. "Intergenerational and Intragenerational Externalities of the Perry Preschool Project." (2019)



James J. Heckman is the Henry Schultz Distinguished Service Professor of Economics and Director of the Center for the Economics of Human Development at the University of Chicago, a Nobel Laureate in economics and an expert in the economics of human development.



Early Learning Coordination

Early Learning Coordination is made up of the following components:

Grant	Funding Amount
Head Start and Early Head Start All federally funded Head Start programs in Alaska currently receive state grant funds. The annual state grant award is a straight percentage based upon each program's federal award.	\$ 6,853,000
Parents as Teachers Parents as Teachers is a collaboration with the Department of Health & Social Services Maternal Infant Early Childhood Home Visiting (MIECHV) program that provides support for early learners (birth to 5) by empowering caregivers through personal and group visits. Grants are awarded through a competitive application process.	\$474,700
Best Beginnings Best Beginnings is a public-private partnership that mobilizes people and resources to ensure all Alaska children begin school ready to succeed.	\$320,000

Pre-Kindergarten Grants

Pre-Kindergarten Grants is made up of the following components:

Grant	Funding Amount
Pre-Kindergarten Grants Pre-kindergarten grants support voluntary, comprehensive, half-day preschool programs for four- and five-year old's through school districts, based on the guiding principles and goals set forth in the Alaska Early Learning Guidelines.	\$3,200,000

Program Information

Head Start Grants

Head Start is a federal program that promotes school readiness of children ages birth to five from low-income families by supporting the development of the whole child through comprehensive services such as health, nutrition, and parent involvement. Head Start programs receive 80% of their funding from federal resources and are required to provide a 20% non-federal share, which state funding can be used towards, unless a waiver has been granted. In FY2021, all Alaska Head Start programs received 13.36% of their FY2019 federal funding allocation for their non-federal share. Prior to implementation of the state's [new equitable funding formula](#) in FY2021, programs received a range of non-federal funding from 0.01% to 30%.

Included at the end of this document is an attachment that provides a historical overview of State Head Start allocations, including federal allocation information as it relates to the new equitable funding formula.



Parents as Teachers

The purpose of Parents as Teachers (PAT) is to offer children and their parents/caregivers home-based services during the early years of child development. PAT offers parents and caregivers research-based information on how children grow and develop; types of activities and toys that will foster learning and nurture development; methods of positive discipline; new techniques for problem solving; realistic expectations of child behavior; and attitudes that will raise children's self-esteem.

The PAT philosophy is guided by the following principles:

- Parents are their children's first and most influential teachers.
- The early years of a child's life are critical for optimal development and provide the foundation for success in school and life.
- Established and emerging research should be the foundation of parent education and family support curricula, training, materials, and services.
- All young children and their families deserve the same opportunities to succeed, regardless of any demographic, geographic, or economic considerations.
- An understanding and appreciation of the history and traditions of diverse cultures is essential in serving families.

Grantee	Locations	Children Served 7/1/2020 - 1/31/2021	State Award
Alaska Family Services	Mat-Su Valley	1	\$60,000
Kid's Corps	Anchorage	20	\$120,000
RurAL CAP	Haines and Kodiak	29	\$145,000
SEA-AEYC	Juneau	114	\$109,000
DHSS (Administrative)			\$40,000
Total:		164	\$474,000

Since FY2018, DHSS Public Health has provided assistance for the PAT program through a reimbursable services agreement with DEED.

Best Beginnings

Best Beginnings' mission is to mobilize people and resources to ensure all Alaska children begin school ready to succeed. Through a partnership between DEED and Best Beginnings, Best Beginnings provides activities called for in **Sec. 14.03.072. Early literacy information.** (b) In partnership with local media outlets, the department shall create and implement a communications campaign to educate parents and guardians about the importance of early literacy. The campaign shall include an Internet website that provides access to current research on early literacy, book recommendations, and vocabulary-building exercises.

As of December 31, 2020, Best Beginnings has accomplished the following:

- Bethel and Mountain Village started new Imagination Libraries
- 29 Imagination Library affiliates provided books to 17,450 children, under the age of 5, in 113 communities
- 34 percent of all eligible Alaska children are enrolled in the Imagination Library
- 107,420 free books have been mailed to enrolled children



Alaska Department of Education and Early Development, Early Childhood Programs 2021

- 2,678 people receive Best Beginnings monthly e-newsletter
- 11,975 recipients of the weekly parent e-newsletter
- 8 Best Beginnings family engagement events, virtual or in-person, with 457 attendees. The following is a comment from an attendee:
 - “My child really enjoyed the activities and videos from his Little Learners Camp. It was a great option for hosting camp at home during these times. We both learned more about bears and bear safety, enjoyed the activities together and I, as a parent, enjoyed the flexible and simplicity of each days format. We are excited to attend our next virtual Little Learners Camp!”

Pre-Kindergarten Grants

This year is the first year of a three-year cohort of state pre-kindergarten grants. Any Alaskan public school district was eligible to apply for the FY2021-2023 Alaska Pre-Elementary Grant with the purpose of planning for, beginning implementation of, or supporting existing programs to meet Alaska Pre-Elementary Goals. Pre-Elementary programs include children ages 3-5 years and 5-year-old children who missed the age cut-off date for kindergarten enrollment. Through a competitive application process, 17 school districts were awarded funds. The total allocation for FY2021 was \$3.2 million. Grantees projected student enrollment at the beginning of the school year to include 700 students. This is a 50 percent decrease in enrollment with a 43 percent decrease in pre-kindergarten funds when compared to FY2020.

School District	Projected Number of Students	FY2021 Funding
Alaska Gateway School District	40	\$149,735
Aleutians East Borough School District	30	\$150,000
Anchorage School District	82	\$872,095
Bristol Bay Borough School District	12	\$149,659
Chatham School District	24	\$149,997
Chugach School District	13	\$86,612
Fairbanks North Star Borough School District	180	\$150,000
Hydaburg City School District	11	\$149,987
Juneau Borough School District	50	\$150,000
Kake City School District	20	\$149,412
Kenai Peninsula Borough School District	11	\$143,484
Kodiak Island Borough School District	100	\$150,000
Lower Kuskokwim School District	11	\$150,000
Sitka School District	36	\$150,000
Southeast Island School District	25	\$149,019
Southwest Region School District	37	\$150,000
Yukon-Koyukuk School District	18	\$150,000
Total	700	\$3,200,000



Alaska Pre-Elementary Program Goals and Activities

Goal 1	Promote school readiness on positive outcomes in all areas of child development addressed in the <i>Alaska Early Learning Guidelines</i> , build strong early childhood literacy by incorporating the appropriate areas of the <i>Alaska Literacy Blueprint</i> , and align with the goals of their districts.
Goal 2	Identify and provide support for Alaska's children who are most in need of support.
Goal 3	Maximize parental choice and continuity of care, by encouraging community based collaboration from a mixed delivery system of early learning support which includes, state, federally funded, private, and non-profit early learning environments.
Goal 4	Support the use of child reliable and valid assessment systems and tools to ensure programs are effectively measuring children's progress across all the domains in the <i>Alaska Early Learning Guidelines</i> and using assessment information to inform practice and inform policy decisions.
Goal 5	Support the transition of pre-elementary children to kindergarten through partnership and strong school and family relationships. Programs will build ongoing, long lasting, trusting relationships with parents, including them in decision making concerning curriculum and other aspects of their child's education and development.
Goal 6	Ensure that early childhood professionals have excellent preparation, ongoing professional development, and compensation commensurate with their qualifications and experience to provide the most effective teacher/child interactions.

Alaska Pre-Elementary Grant Outcome Measures

Child Pre-Elementary Growth during School Year 2019-2020

Teaching Strategies GOLD® is ongoing authentic, observational assessment for all areas of development and learning with performance-assessment tasks selected as predictors of school success. It is designed for use within meaningful everyday experiences that occur in the early childhood classroom or program setting. Teaching Strategies **GOLD®** may be used across classrooms and is not linked to a particular curriculum. The Teaching Strategies **GOLD®** assessment is aligned to the *Alaska Early Learning Guidelines* and has been cross walked with the *Alaska English/Language Arts and Mathematics Standards*.

The data for school year (SY) 2019-2020 includes only the fall assessment data. The spring data requirement was suspended due to school closures from March 2020 through the end of the school year. The most current developmental growth data is from SY 2018-2019.

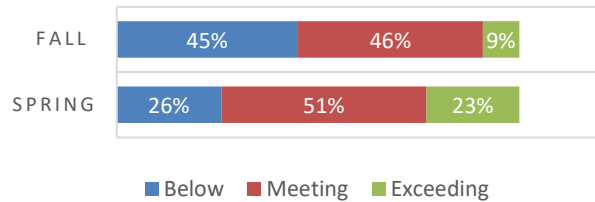
Teachers observed children based on "Widely Held Expectations". Widely Held Expectations is a term from **Teaching Strategies GOLD®** that defines a set of expectations that are criterion referenced and research-based for where we typically see children's skills, knowledge, and behaviors for each grade/class. A student is recorded as meeting, exceeding, or below "widely held expectations" for a child their age. DEED requires pre-elementary grantees submit data on the following five developmental areas: social emotional, cognitive, language, literacy, and mathematics.



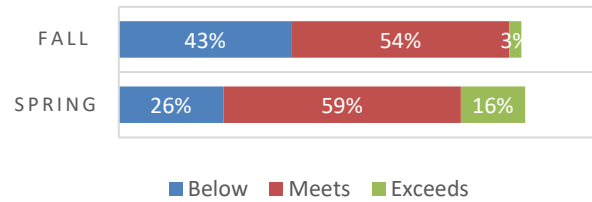
Alaska Department of Education and Early Development, Early Childhood Programs 2021

The following graphs show data during two checkpoint periods, Fall of 2018 and Spring of 2019. Four-year-old and three-year-old students from school districts and Head Starts receiving state funds are represented.

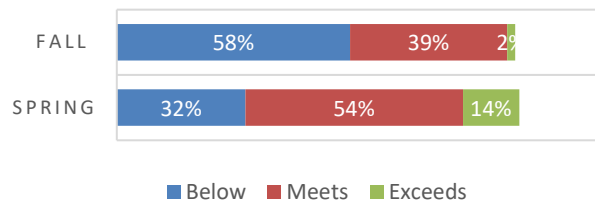
SOCIAL EMOTIONAL



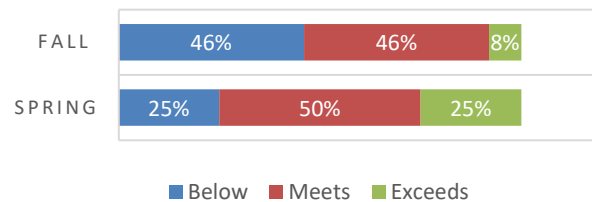
LANGUAGE



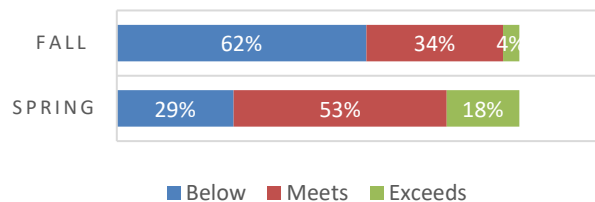
LITERACY



COGNITIVE



MATHEMATICS



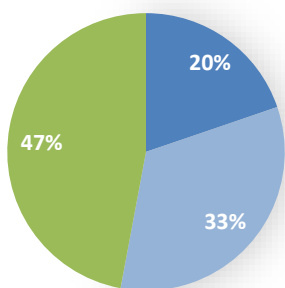
Alaska Developmental Profile (ADP)

The ADP is an observational tool administered by teachers to all kindergarten students during the first four weeks of the school year. Teachers provide a rating for each student for 13 goals within five domain areas. There are 3 possible ratings:

- 0 = Student does not demonstrate the goal
- 1 = Student demonstrates the goal at least 50 percent of the time
- 2 = Student demonstrates the goal consistently or at least 80 percent of the time

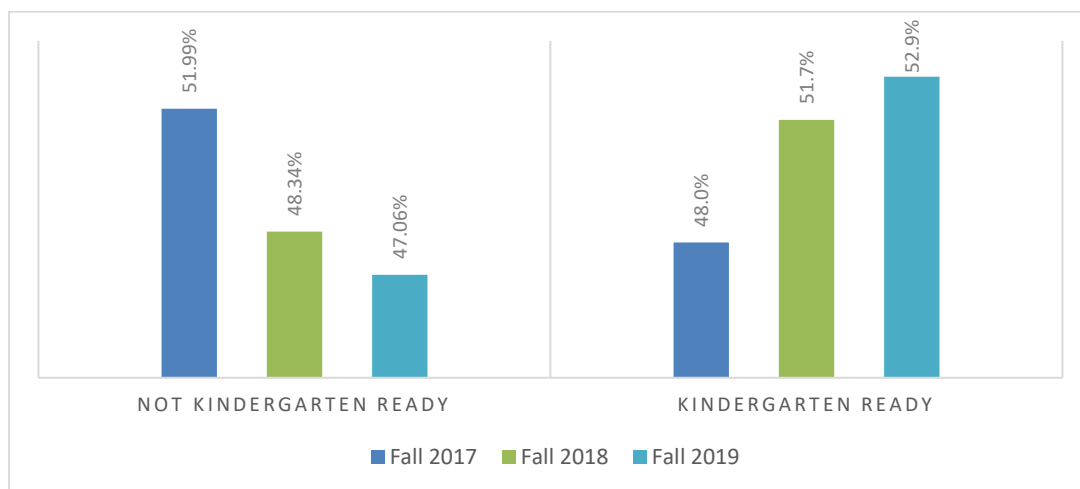
A student who receives a **2** on at least **11 out of 13 goals** is determined to be demonstrating kindergarten readiness skills.

During the Fall of 2019, 9,401 kindergarten students were assessed with the Alaska Developmental Profiles. Results show 53 percent of students entering kindergarten were kindergarten ready while 47 percent were not.



- Students Demonstrating Kindergarten Readiness in All 13 Goals
- Students Demonstrating Kindergarten Readiness in At Least 11 of the 13 Goals
- Students Demonstrating Kindergarten Readiness in 10 or Fewer Goals

When comparing ADP data over the last three years, there is an annual increase in the number of students entering kindergarten with readiness skills. Additionally, there was an annual decrease in students assessed during the three-year period.



Head Start State & Federal Funding Allocations (FY2016-FY2022)

Grantee	# of Students Served	# of Staff	# of Communities Served	FY2016 State Allocation	FY2017 State Allocation	FY2018 State Allocation	FY2019 State Allocation	FY2020 State Allocation	% of FY2020 State Allocation	FY2021 State Allocation (New Formula Enacted)	% of FY2021 State Allocation	FY2019 Federal Allocation (minus one- time funding)	FY2022 PROJECTED State Allocation	% of PROJECTED FY2022 State Allocation	FY2020 Federal Allocation
ALEUTIAN PRIBILOF ISLANDS ASSOCIATION	58	9	3	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	0.4%	\$ 191,137.35	2.8%	\$ 1,430,196.00	\$ 183,196.66	2.7%	\$ 1,550,589.00
ASSOCIATION OF VILLAGE COUNCIL PRESIDENTS	234	38	11	\$ 357,948.00	\$ 357,948.00	\$ 357,948.00	\$ 357,948.00	\$ 357,948.00	5.3%	\$ 255,984.17	3.7%	\$ 1,915,416.00	\$ 349,667.56	5.1%	\$ 2,959,610.00
BRISTOL BAY NATIVE ASSOCIATION	89	30	3	\$ 73,934.00	\$ 73,934.00	\$ 73,934.00	\$ 73,934.00	\$ 73,934.00	1.1%	\$ 200,711.21	2.9%	\$ 1,501,833.00	\$ 195,748.07	2.9%	\$ 1,656,825.00
CCS EARLY LEARNING	307	112	4	\$ 567,099.00	\$ 567,099.00	\$ 567,099.00	\$ 567,099.00	\$ 567,099.00	8.4%	\$ 712,715.23	10.4%	\$ 5,332,932.00	\$ 665,885.02	9.7%	\$ 5,636,096.00
CHUGACHMIUT	26	12	2	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	0.4%	\$ 108,841.41	1.6%	\$ 814,412.00	\$ 104,540.04	1.5%	\$ 884,834.00
COOK INLET NATIVE HEAD START	227	67	1	\$ 95,000.00	\$ 95,000.00	\$ 95,000.00	\$ 95,000.00	\$ 95,000.00	1.4%	\$ 574,419.05	8.4%	\$ 4,298,123.00	\$ 667,634.65	9.7%	\$ 5,650,905.00
COOK INLET TRIBAL COUNCIL, INC **	72	49	1	\$ -	\$ -	\$ -	\$ -	\$ -	0.0%	\$ 260,929.80	3.8%	\$ 1,952,422.00	\$ 246,791.03	3.6%	\$ 2,088,856.00
COUNCIL OF ATHABASCAN TRIBAL GOVERNMENTS ***	30	6	4	\$ 57,460.00	\$ 57,460.00	\$ 57,460.00	\$ 57,460.00	\$ -	0.0%	\$ 71,098.03	1.0%	\$ 531,995.00	\$ 71,332.13	1.0%	\$ 603,760.00
TANANA CHIEFS CONFERENCE	229	52	18	\$ 583,238.00	\$ 583,238.00	\$ 583,238.00	\$ 583,238.00	\$ 583,238.00	8.6%	\$ 380,684.73	5.6%	\$ 2,848,495.00	\$ 374,045.56	5.5%	\$ 3,165,947.00
FAIRBANKS NATIVE ASSOCIATION, INC	303	66	1	\$ 107,293.00	\$ 107,293.00	\$ 107,293.00	\$ 107,293.00	\$ 107,293.00	1.6%	\$ 752,971.79	11.0%	\$ 5,634,154.00	\$ 667,634.65	9.7%	\$ 5,650,905.00
METLAKATLA	238	116	1	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	\$ 30,000.00	0.4%	\$ 272,890.42	4.0%	\$ 2,041,918.00	\$ 218,345.25	3.2%	\$ 1,848,089.00
KENAITZE INDIAN TRIBE	57	19	1	\$ 30,549.00	\$ 30,549.00	\$ 30,549.00	\$ 30,549.00	\$ 30,549.00	0.5%	\$ 285,473.82	4.2%	\$ 2,136,074.00	\$ 276,506.29	4.0%	\$ 2,340,368.00
KIDS' CORPS, INC	248	111	1	\$ 818,699.00	\$ 818,699.00	\$ 818,699.00	\$ 818,699.00	\$ 818,699.00	12.1%	\$ 443,646.36	6.5%	\$ 3,319,609.00	\$ 485,181.95	7.1%	\$ 4,106,613.00
KAWERAK INC	79	36	10	\$ 569,386.00	\$ 569,386.00	\$ 569,386.00	\$ 569,386.00	\$ 569,386.00	8.4%	\$ 590,624.87	8.6%	\$ 4,419,384.00	\$ 555,768.11	8.1%	\$ 4,704,059.00
PLAY N LEARN INC (THRIVALASKA)	142	22	1	\$ 439,596.00	\$ 439,596.00	\$ 439,596.00	\$ 439,596.00	\$ 439,596.00	6.5%	\$ 242,408.33	3.5%	\$ 1,813,834.00	\$ 237,898.97	3.5%	\$ 2,013,593.00
RURAL ALASKA COMMUNITY ACTION PROGRAM, INC.	684	228	24	\$ 2,589,143.00	\$ 2,589,143.00	\$ 2,589,143.00	\$ 2,589,143.00	\$ 2,589,143.00	38.3%	\$ 1,088,714.79	15.9%	\$ 8,146,370.00	\$ 1,071,058.04	15.6%	\$ 9,065,508.00
TLINGIT & HAIDA TRIBES CENTRAL COUNCIL	288	65	10	\$ 441,170.00	\$ 441,170.00	\$ 441,170.00	\$ 441,170.00	\$ 441,170.00	6.5%	\$ 419,748.65	6.1%	\$ 3,140,793.00	\$ 481,763.97	7.0%	\$ 4,077,683.00
Total	3,311	1,038	96	\$ 6,820,515.00	\$ 6,820,515.00	\$ 6,820,515.00	\$ 6,820,515.00	\$ 6,763,055.00		\$ 6,853,000.00		\$ 51,277,960.00	\$ 6,852,997.94		\$ 58,004,240.00

NOTES:

Head Start programs receive 80% of their funding from the Federal Head Start Office. Each Head Start is on a different funding cycle, so programs receive their federal funding at different times. Programs are required to provide a 20% non-federal share, which state funding can be used towards.

*Each program received 13.36% of their FY2019 federal funding allocation.

*Some Head Start programs are eligible for additional 'one-time' federal funding for capital projects, pending annual appropriation. When establishing the State's new equitable funding formula, programs agreed that this one-time funding should be removed from the formula calculation.

*Each program is projected to receive 11.81% of their FY2020 federal funding allocation.

FY2021 State Head Start Equitable Funding Formula

Step 1: Legislative allotment divided by the total federal Head Start allocation = Straight percentage
Step 2: Straight percentage multiplied by the previous federal Head Start award(s) = Head Start Program State Award

FY2021 State Head Start Equitable Funding Formula Overview: <https://education.alaska.gov/headstart/Head%20Start%20and%20Early%20Head%20Start%20Grants%20&%20Allocations%20as%20of%208.14.2020.pdf>

** Cook Inlet Tribal Council was a newer grantee and did not receive funding until FY2021

*** Council of Athabascan Tribal Governance did not receive funding in FY2020 since they only served EHS (Birth to 3) and Pre-Elementary was defined as 3 to 5 years of age

NBER WORKING PAPER SERIES

THE EFFECTS OF TWO INFLUENTIAL EARLY CHILDHOOD INTERVENTIONS
ON HEALTH AND HEALTHY BEHAVIORS

Gabriella Conti
James J. Heckman
Rodrigo Pinto

Working Paper 21454
<http://www.nber.org/papers/w21454>

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The Effects of Two Influential Early Childhood Interventions on Health and Healthy Behaviors
Gabriella Conti, James J. Heckman, and Rodrigo Pinto
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ABSTRACT

This paper examines the long-term impacts on health and healthy behaviors of two of the oldest and most widely cited U.S. early childhood interventions evaluated by the method of randomization with long-term follow-up: the Perry Preschool Project (PPP) and the Carolina Abecedarian Project (ABC). There are pronounced gender effects strongly favoring boys, although there are also effects for girls. Dynamic mediation analyses show a significant role played by improved childhood traits, above and beyond the effects of experimentally enhanced adult socioeconomic status. These results show the potential of early life interventions for promoting health.

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Abstract

A growing literature establishes that high-quality early childhood interventions that enrich the environments of disadvantaged children have substantial long-run impacts on a variety of social and economic outcomes. Much less is known about their effects on health and healthy behaviors. This paper examines the long-term impacts on health and healthy behaviors of two of the oldest and most widely cited U.S. early childhood interventions evaluated by the method of randomization with long-term follow-up: the Perry Preschool Project (PPP) and the Carolina Abecedarian Project (ABC). We present evidence of pronounced gender effects of the programs. Boys randomly assigned to the treatment group of PPP have significantly lower prevalence of behavioral risk factors in adulthood compared to those randomized to the control condition, while those who received the ABC intervention enjoy better physical health. The impact on girls is considerably weaker for both programs, although there are beneficial effects for them as well. Many treatment effects across programs are not comparable because different outcomes are measured, different survey instruments are used, and different ages are sampled. Where outcome measures are comparable, the estimated treatment effects are stronger for ABC males compared to PPP males. The imprecise estimates for women found for each program translate into imprecise estimates of differences in female treatment effects across programs. Our permutation-based inference procedure recognizes the small sample sizes of the ABC and PPP interventions, adjusts for the multiplicity of the hypotheses tested, accounts for non-random attrition from the panel follow-ups, and adjusts for departures from randomization protocols in implementation when doing so is appropriate. We conduct dynamic mediation analyses to shed light on the mechanisms producing the estimated treatment effects. We document a significant role played by improved childhood traits, above and beyond the effects of experimentally enhanced adult socioeconomic status. Overall, our results show the potential of early life interventions for preventing disease and promoting health.

Keywords: Health, early childhood intervention, social experiment, randomized trial, Abecedarian Project, Perry Preschool Project.

JEL codes: C12, C93, I12, I13, J13, J24.

1 Introduction

Discussions of ways to control the soaring costs of the health care system in the US and elsewhere largely focus on the provision of health care (see, e.g., Emanuel, 2012; Jamison *et al.*, 2013). However, treatment of disease is only part of the story. Prevention has a substantial role to play. Most medical care costs in developed countries like the United States arise from a minority of individuals with multiple chronic conditions, like cardiovascular and metabolic diseases, and cancer (see Cohen and Yu, 2012).^{1,2} Such conditions are the main causes of premature death, and managing them effectively requires that patients make lifestyle changes by adhering to healthy behaviors (Ford *et al.*, 2012; Kontis *et al.*, 2014; Mokdad *et al.*, 2004). While prevention holds the key for lifelong health, changing behavior in adulthood is challenging (Marteau *et al.*, 2012).³

A substantial body of evidence shows that adult illnesses are more prevalent and more problematic among those who have experienced adverse early life conditions (Danese *et al.*, 2007; Galobardes *et al.*, 2008). At present, the exact pathways through which early life experiences translate into health over the life cycle are not fully known, although there is increasing understanding of the role that might be played by biological embedding of social and economic adversity.⁴ The evidence on the social determinants of health (Marmot and Wilkinson, 2006) suggests that a strategy of prevention rather than later life treatment may be more effective. Such an approach recognizes the dynamic nature of health capital formation, and views policies that shape early life environments as effective tools for promoting health (Conti and Heckman, 2014). Following this path, a recent interdisciplinary literature points to the role that might be played by early childhood interventions targeted to disadvantaged children in promoting adult health (Black and Hurley, 2014; Campbell *et al.*, 2014; Di Cesare *et al.*, 2013).

This paper contributes to this literature by examining the effects on health and healthy behaviors

¹In the United States, in 2008, 1% of the population accounted for 20% of total health care expenditures. These are older patients with cancer, diabetes, heart disease, and other multiple chronic conditions. In contrast, the bottom half of the expenditure distribution accounted for 3.1% of spending.

²The United Nations in 2011 has set a goal of reducing the probability of premature mortality due to these diseases by 25% by the year 2025.

³One potentially promising approach uses insights from behavioral economics to design effective programs implemented by employers, insurers, and health care providers, to increase patient engagement and to encourage individuals to take better care of themselves (Loewenstein *et al.*, 2013, 2007). These chronic conditions can indeed be prevented, or, at least, their onset can be substantially delayed (Ezzati and Riboli, 2012; Sherwin *et al.*, 2004).

⁴Committee on Psychosocial Aspects of Child and Family Health *et al.* (2011); Entringer *et al.* (2012); Gluckman *et al.* (2009); Heijmans *et al.* (2008); Hertzman (1999); Knudsen *et al.* (2006).

of the two most influential, high-quality, U.S.-based early childhood interventions – the Perry Preschool Project (PPP) and the Abecedarian Project (ABC). Both interventions used the method of randomization to assign enriched environments to disadvantaged children. Participants are followed into adulthood. PPP was conducted in Ypsilanti, Michigan, starting in 1962; ABC in Chapel Hill, North Carolina, starting in 1972. PPP provided preschool education at ages 3-5 and home-based parenting guidance; ABC also included a health care and a nutritional component, and lasted from birth until age 8.⁵ Data from PPP and ABC enable analysts to learn about the health benefits of early life interventions for disadvantaged populations. Since children are generally in good health, and reliable early life biomarkers predictive of later disease have yet to be discovered, it is challenging to demonstrate health effects of early life interventions in the absence of long-term follow-ups.

The PPP data have rich information on behavior but not health. ABC has a survey of health at age 34 in addition to measures of healthy behaviors. For both studies, we perform analyses by gender and find substantial differences in the effects of treatment between males and females. We present evidence that both the Perry and the Abecedarian interventions have statistically and substantively significant effects on the health and healthy behaviors of their participants. The specific outcomes affected vary across studies, although for both interventions, treatment effects are much stronger and more precisely determined for males. The Perry male participants have significantly fewer behavioral risk factors (in particular smoking) by the time they have reached age 40, while the Abecedarian male participants are in better physical health by their mid 30s. We document the important role played by enhancements in childhood traits, above and beyond educational attainment and adult socioeconomic status, as mechanisms producing treatment effects.

We use robust statistical methods and apply the frameworks developed in Heckman *et al.* (2010) and Campbell *et al.* (2014) to systematically account for small sample sizes of the experiments, the effects of multiple hypothesis testing, and non-random panel attrition to analyze these studies. We adjust for departures from randomization protocols when appropriate. We show that accounting for small sample sizes and multiple hypotheses affects inference from these studies.

⁵The Abecedarian Project had a second-stage intervention at ages 5–8 via another randomized experimental design. Campbell *et al.* (2008) show that the early educational intervention had far stronger effects than the school-age treatment on the majority of the outcomes studied. Campbell *et al.* (2014) also show that the second-stage intervention had no effects on health. Hence, in this paper we only analyze the first-stage intervention.

Rather than using arbitrarily constructed aggregates of health indicators as employed in previous analyses of these experiments, we use more interpretable disaggregated measures. We examine the mechanisms through which treatment effects arise using dynamic mediation analyses. We use as mediators both early child developmental traits and adult socioeconomic outcomes.

We address the challenges that analysts face when comparing results across experiments. The baseline characteristics of the populations treated differ. Treatments vary. Follow-up periods and questions asked are not strictly comparable. Many treatment effects across programs are not comparable because different outcomes are measured, different survey instruments are used, and different ages are sampled. Where outcome measures are comparable, estimated treatment effects are stronger for ABC males compared to PPP males. The imprecise estimates for women found in each program translate into imprecise estimates of differences in female program effects. Our analysis suggests that simple comparisons of treatment effects across programs as featured in commonly reported meta-analyses (see, e.g., [Camilli *et al.*, 2010](#); [Karoly *et al.*, 2005](#)) are potentially very misleading guides to policy.

The paper proceeds as follows. Section 2 describes the ABC and PPP interventions. Section 3 discusses the statistical challenges addressed in this paper and presents our econometric procedures. Section 4 presents and discusses our estimates of treatment effects and the results of our mediation analyses. Section 5 concludes.

2 The ABC and PPP Interventions

Both the ABC and the PPP interventions were center-based small-scale programs designed to enrich the early environments of disadvantaged children. The main characteristics of both interventions are displayed in Table 1. The Perry Preschool Project (PPP) took place in the mid-1960s in the district of the Perry Elementary School, a public school in Ypsilanti, Michigan (a small city near Detroit). The Carolina Abecedarian Project (ABC) took place one decade later at the Frank Porter Graham Child Development Institute at the University of North Carolina’s Chapel Hill campus. Eligibility was based on weighted scales which included multiple indicators of socioeconomic disadvantage, although the specific items and weights differed across the two interventions.⁶ ABC enrolled children

⁶The specific ABC and PPP items and the PPP weights are reported in Table 1; the weights used for the ABC scale are reported in Table 1 of [Ramey *et al.* \(2000\)](#).

soon after birth⁷ until 5 years of age⁸ for a very intensive 6.5 to 10 hours per day program. PPP enrolled children at 3 years of age for 2 years⁹ for a less intensive 2.5-3 hours per day program.¹⁰ Details of the randomization protocol are presented in Section 1 of the Web Appendix. In this section we report: (a) the background characteristics of the two populations (subsection 2.1); (b) the interventions administered (subsection 2.2); and (c) the data collections carried out (subsection 2.3).

[Table 1 about here.]

2.1 The background characteristics of the two populations

While both ABC and PPP targeted disadvantaged populations, the background characteristics of the participants differed. We summarize them in Table 2 and Figures 1 and 2.¹¹

The first substantial difference that emerges is in the IQs of participants. While the average Stanford-Binet score at 3 years of age is 79 points in PPP, it is 14 points higher at the same age in the control group of ABC.¹² This difference is also visible in Panel A of Figure 1, which shows that the region of common support is limited to the bottom half of the density of ABC. The partial overlap in the IQ distributions across the two interventions arises because PPP required an IQ smaller than 85 to be eligible to participate in the program.

There is no significant difference in average health at birth (Table 2). However, more ABC participants are born at low ($< 2,500$ grams) or high birthweight ($> 4,000$ grams), as shown in Panel B of Figure 1.¹³

Turning to the parental demographic characteristics, we see that the parents in PPP are older than those in ABC, with the age difference amounting to six years for the mothers and to nine years for the fathers (when fathers are present). The density reported in Panel D of Figure 1

⁷The average age at entry for the treated was 8.8 weeks, and it ranged between 6 and 21 weeks.

⁸As mentioned, the intervention consisted of a two-stage treatment: a preschool stage (0-5) and a school-age stage (5-8). In this paper we only study the effects of the preschool treatment, both for comparability with PPP, and because previous work has reported negligible or no effects from the second-stage treatment.

⁹The first cohort experienced only one year of treatment, starting at age 4.

¹⁰Note that, if we compute the hourly cost per child, the PPP intervention was more expensive than the ABC.

¹¹See [Hojman *et al.* \(2013\)](#) for a comparison of the background characteristics of the ABC, PPP, CARE (Carolina Approach to Responsive Education), IHDP (the Infant Health and Development Program) and ETP (Early Training Project).

¹²We only use data from the control group for ABC, since it started at birth, hence by age 3 the treatment group would have already received three years of the program.

¹³Parentetically, the median birthweight for PPP was 3.14 kg, compared to a national population average of 3.29 kg in 1964. For ABC, the median birthweight was 3.24, compared to a national population average of 3.34.

shows that the region of common support for paternal age only extends between the ages 20-45. In line with the older parental age, the participants of the PPP intervention also have, on average, a greater number of siblings (4, up to a maximum of 12, as shown in Panel C of Figure 2), while ABC children are more likely to be first born. Additionally, ABC participants are more likely to be born to single mothers, with the father being present almost twice as often in PPP households than in ABC households (53% vs. 29%, Table 2). Finally, the parents of ABC participants have higher socioeconomic backgrounds, higher levels of education, and are more likely to be employed (as shown in Table 2 and Panels A-B and D-E of Figure 2, respectively).

In sum, while more children in Perry are from two-parent homes,¹⁴ many other socioeconomic characteristics are more favorable for ABC participants, especially for those with fathers present.¹⁵ However, as shown in Table 1 of the Web Appendix, controlling for these background characteristics does not substantially change estimated treatment effects.

[Table 2 and Figures 1 and 2 about here]

2.2 The Interventions¹⁶

Intervention Strategies From 1962 to 1967, the Perry Preschool Project (PPP) recruited disadvantaged children three to four years of age on the basis of two selection criteria: “cultural deprivation” and evidence of being “educably mentally retarded” based on the Stanford-Binet Intelligence score (mean = 79). Mid-intervention and follow-up summaries describe a program that operated for 2.5 to 3 hours each morning, 5 days per week over the course of a school year (Weikart, 1966, 1967, 1970). Except for the first treatment group that participated for one year only, four treatment groups experienced two years of the instructional program. In addition to a monthly parent group meeting hosted by social work staff, PPP further incorporated a 60-90-minute weekly home visit, designed to offer individualized instruction as needed, establish teacher-primary caregiver relationship, and involve the latter in their child’s development (Weikart, 1964, 1967, 1970).

Weikart’s descriptions of the program change significantly throughout the course of the intervention, including its length and format for both children and parents, the intervention method-

¹⁴See, e.g., Lopoo and DeLeire (2014) for a recent study on the long-term outcomes of children born to single mothers.

¹⁵See, e.g., Carneiro *et al.* (2013) and Dickson *et al.* (2015) on the intergenerational effects of maternal education on cognitive and behavioural outcomes for a sample of children from US and UK, respectively.

¹⁶See Heckman *et al.* (2014b) for a more detailed description of the ABC and PPP interventions.

ologies and learning activities, the role of the teacher, the role of the child as a learner, and even his/her understanding of cognitive development (Weikart, 1964, 1967, 1970). This reflects both experimentation within the program and the changed framing of it as the literature on child development evolved while the program was being implemented. What remains consistent, however, are Weikart’s stated primary goals of cognitive development with an emphasis on language development, the use of developmental theory in guiding curriculum framework and intervention methods, and a combined approach of a morning center-based preschool program and a weekly afternoon home visit by the child’s teacher (Weikart, 1964, 1967, 1970). The learning program implemented in PPP from 1962 to early 1965 included unit-based instruction, intentional adult-child interactive language, and a rich set of learning materials including Montessori tools, movement/dancing, and an emphasis on caregiver-planned large- and small-group activities. In the final year of PPP, the learning program more closely resembled the later developed HighScope curriculum including “Plan, Do, Review.” Individual instruction was not a specific feature of the Perry center-based program (see Weikart *et al.*, 1978 and Kuperman, 2014a), whereas in ABC, it was a key component of the learning program.

Ten years after PPP began, ABC recruited four cohorts of infants born between 1972 and 1977 at hospitals near Chapel Hill, NC, for an intensive early childhood intervention designed to prevent retardation for low-income multi-risk populations. Treated children were transported by program staff from their homes to the newly built Frank Porter Graham Center (FPGC) for up to 9 hours each day for 50 weeks/year (Ramey *et al.*, 1976).

What is now known as the “Abecedarian Approach” emerged from a process of distinctive curriculum development. The number of teaching and learning activities expanded through formal testing and evaluation with each successive ABC cohort. The *Learninggames for the First Three Years* were designed by both Joseph Sparling and Isabelle Lewis as play-based adult-child activities for the expressed purposes of minimizing infants’ maladaptive, high-risk behaviors, and enhancing adult-infant interactions that support children’s language, motor, and cognitive development and socio-emotional competence, including task orientation (Sparling and Lewis, 1979). Influenced by Piaget’s theory of developmental stages, each individual activity included a stated learning objective thought to be developmentally appropriate, specification of needed materials, directions for teacher behavior, and expected child outcome. In addition to tracking and dating activity assign-

ments, these records enabled staff to prescribe a specific instructional program every 2 to 3 weeks for each child by rotating learning activities and to note developmental progress or its lack thereof from program entry to approximately age 36 months (Ramey *et al.*, 1976). During preschool, ABC supplemented the original *Learninggames* with a program for three and four year olds, thought to be developmentally appropriate and developed together by staff and caregiving professionals with assistance from outside consultants. The *Abecedarian Approach to Social Competence* encouraged cognitive development, sociolinguistic and communicative competence, and reinforced socially adaptive behaviors involved in task orientation, peer-peer relations, adult-child relationships, and emotional self-awareness (Ramey *et al.*, 1976, 1982). Language intervention remained the critical ABC vehicle for supporting cognition and social skills (McGinness and Ramey, 1981).

The two randomized controlled trials share many features in common, including an emphasis on language and cognitive development in the intervention for disadvantaged children, the background influence of developmental theory on the design of the curriculum but with plenty of room for individual adaptation, and general similarities such as the use of field trips as a learning tool, organization of the learning environment during preschool years, and ongoing professional development for staff. However, a comparison of reports drafted by the directors of PPP and ABC concurrently with their own interventions also reveals some key differences.

The programs differed in the way they perceived their treated children and designed their intervention goals and conceptual approaches. Perry was motivated by a “deficits” model, and the intervention was perceived as *remediating* cultural deprivation and mental retardation. PPP was launched in an era when cognitive psychology was in ascendance and shaped educational policy.¹⁷ This conceptual approach initially led Weikart to prioritize cognitive over socio-emotional learning in his reporting of the Perry program, which he described as a key feature of a traditional middle class nursery school. However, in practice, PPP teachers modified this agenda and intentionally fostered the child’s socio-emotional development, including self-regulation and the capacity of making judgments.¹⁸ The middle class teachers who initiated the program did for the disadvantaged children in Perry what middle class parents do for their own children (Heckman *et al.*, 2014b) and effectively prevented the program from being focused solely on cognition. Indeed, in reporting the

¹⁷See Heckman and Kautz (2014).

¹⁸Source: Meeting held at the University of Chicago in date 26 July 2013 with the former Perry teachers Louise Derman-Sparks, Constance Kamii and Evelyn Moore (Heckman *et al.*, 2014b).

first findings from the study, [Weikart \(1967\)](#) wrote

“Preschool must demonstrate ability to affect the general development of children in three areas. These are intellectual growth, academic achievement, and school behavior.”

In contrast, ABC aspired to *prevent* retardation and thus recruited their sample from birth. By the time it was launched, the literature on child development had evolved beyond a sole focus on cognition. It benefitted from an enhanced understanding of the work of child development psychologists Piaget and Vygotsky. For ABC, socio-emotional learning and cognitive development were intertwined and embedded within adult-child interactions and adult-mediated activities that incorporated an intentional use of language as a teaching tool to elicit children’s emerging social competence and ability to reason.

ABC and PPP differ on a number of program elements. In addition to the difference in intensity and duration, ABC and PPP involved the family in different ways. PPP incorporated weekly home visits, designed to offer opportunities for individualized instruction as needed, to establish a relationship between the child’s center-based teacher and the mother/primary caregiver, and to involve her in the child’s education. Weekly home visits lasted approximately 60-90 minutes ([Weikart, 1964, 1970](#)). In addition, PPP offered an opportunity for parents to participate in monthly group meetings hosted by social work staff ([Weikart, 1964, 1967](#)). In ABC, while there were no home visits, parents were invited to be actively involved in preschool classrooms and to participate in parent-teacher conferences to share updates about the treated child. Both treatment and control groups in ABC received family support in the form of social work services on a request basis to obtain family planning and legal help.

Early reports of parental involvement in ABC suggest that each nursery and classroom staff member was assigned four treatment families to contact in order to establish individualized and open communication between parents and the center. Teachers were directed to plan an afternoon for each family to visit FPGC, observe their child, and to meet other teachers and medical staff. Families were provided photographs of their child engaging in program activities that served to further strengthen the connection between home and school. Reports indicate that family holiday parties were well attended ([Ramey et al., 1977](#)).

The health care and nutritional components ABC differed significantly from PPP because it also included health care and nutritional components. Table 3 displays the treatments and exams included in the health care component of the ABC. Free pediatric care was provided to all the treated children who attended the Frank Porter Graham (FPG) center (Ramey *et al.*, 1982). The on-site medical staff had two pediatricians, a family nurse practitioner, and a licensed practical nurse.¹⁹ The *well child care* component included assessments at ages 2, 4, 6, 9, 12, 18 and 24 months, and yearly thereafter, in which a complete physical exam was performed and parents of the treated children were counseled about child health care, nutrition, growth and development.²⁰ The *ill child care* component included daily surveillance of all the treated children in the FPG center for illness.²¹

When ill, children were examined by a member of the health care staff, laboratory tests were performed, the appropriate treatment was given, and the child was followed until recovery (Ramey *et al.*, 1982). The cost of medicines was not covered; the parents were responsible for buying them, but the staff on-site ensured they were taken. If children were referred to a hospital, hospitalization costs were not covered. Only the treated children received the free pediatric care. Free medical care for the control children had been initially offered at the FPG center and two university-affiliated hospitals. However, this incentive was discontinued after the first year (Heckman *et al.*, 2014b; Ramey *et al.*, 1976), and the control families were left with the other sources of health care that were available at the time: community clinics for visits (mostly crowded and with rotating doctors), the local office of the health department for well-baby checkups and immunizations, and the hospital E.R. for emergencies.²² Hence, an important difference was the continuity of early health care provided to the treated as compared to the control group.

In addition to primary pediatric care, the treated children also received breakfast, lunch, and an afternoon snack at the center. Food was prepared in kitchens approved by the local health department. A nutritionist who planned the local public school menus consulted with the kitchen service to plan menus for breakfast, lunch, and daily snacks. On the other hand, PPP did not

¹⁹Active research on respiratory tract infections in children was also ongoing (Roberts *et al.*, 1986; Sanyal *et al.*, 1980).

²⁰Apart from this health counseling, there was no parenting component in the ABC intervention.

²¹The licensed practical nurse visited the classroom daily to review the health status of the children and receive reports from the parents (Sanyal *et al.*, 1980).

²²Source: Campbell (2014).

provide any form of health care or nutrition. ABC utilized meal times as educational experiences, complementing the rest of the learning program for promoting self-help, motor skill development, social cognition and social behavior, self-regulation, language development, and specifically, for knowledge of healthy eating behaviors. Not only were meals and snacks at ABC prepared according to state nutritional guidelines, but a formal educational structure was in place for meals and eating at FPGC before ABC started collecting data. In contrast, in Perry, there was no formal activity supporting healthy nutrition or eating behaviors. The teachers provided healthy snacks in the form of crackers and juice. Perry used snack time to support language and social development.²³

[Table 3 goes here]

Child care experiences of the control group The PPP was launched before Head Start and the push for early childhood interventions. The control group was in home care or in neighborhood home-care settings with neighbors, friends, and relatives. Things had changed ten years later. Children in the control group of the ABC intervention attended various types of out-of-home care before age 5, for periods of time varying between 0 and 60 months (Pungello *et al.*, 2010). This paper does not account for control contamination, which is dealt with extensively in García *et al.* (2014). They find that doing so enhances estimated program effects. Thus, our estimates are conservative.

2.3 The Data Collected

Both the ABC and PPP interventions followed participants over time and collected a substantial amount of information about their lives. In PPP, data were collected annually from age 3 (the entry age) until the fourth grade (measures of intelligence and academic aptitude, achievement tests, assessments of socio-emotional development and information from school records starting at kindergarten through secondary education). We know if participants went to post-secondary education but do not know teacher ratings or performance there, apart from information on graduation. Four follow-ups with interviews were conducted at ages 15, 19, 27, and 40. The retention rate has been high throughout: 91% of the original participants were re-interviewed at age 40.²⁴ Information on

²³See Hall and Holmberg (1974); Kuperman (2014a,b); Moore *et al.* (1965); Ramey *et al.* (1977).

²⁴Among those lost at follow-up, 5 controls and 2 treated were dead, 2 controls and 2 treated had gone missing.

the health of the subjects was collected only at ages 27 and 40, all based on self-reports.²⁵

Richer data were collected for the Abecedarian intervention than for the Perry intervention. Background characteristics were collected at the beginning of the program, and include parental attributes, family structure, socioeconomic status, and the health of the mother and of the baby. Anthropometric measures were collected and a wide variety of assessments of the cognitive and socio-emotional development of the child and of both the family and the classroom environment were conducted, from soon after the start of the preschool program until the end of the school year. Four follow-ups with interviews were carried out at ages 12, 15, 21, and 30. A biomedical sweep was conducted when the participants were in their mid-30s, for the purpose of collecting indicators of cardiovascular and metabolic disease risk (Campbell *et al.*, 2014).

Many measures taken are not strictly comparable across programs. Section 3 in the Web Appendix gives details on the exact survey questions asked and on the construction of the variables examined. Table 2 in the Web Appendix summarizes their comparability. The lack of comparability poses several challenges for meta-analyses, commonly reported in the literature and child development.

We focus our empirical analysis on a set of outcomes of public health relevance according to the following categories: (1) Physical Health; (2) Health Insurance and Demand for Health Care; (3) Behavioral Risk Factors/Lifestyles (diet and physical activity, smoking and drinking).

3 Methodology

Randomized Controlled Trials (RCTs) are often touted as the “gold standard” of program evaluation (see, e.g., Ludwig *et al.*, 2011). A major benefit of randomization is that, when properly executed, it solves the problem of selection bias for mean outcomes. RCTs can render treatment assignments statistically independent of unobserved characteristics that affect the choice of participation in a program and that might also affect outcomes. As a consequence, a perfectly implemented randomized experiment enables analysts to evaluate mean treatment effects by using simple differences-in-means between treatment and control groups.²⁶

²⁵An age 50 follow-up has almost been completed, which includes collection of an extensive set of biomarkers.

²⁶As noted by Heckman (1992), experiments only identify means and not distributions and so do not directly address many important policy questions without making assumptions beyond the validity of randomization. See also Heckman *et al.* (1997).

In spite of their potential benefits, RCTs are often plagued by a range of statistical problems that require careful attention. They often have small sample sizes and many outcomes. They are often implemented through complex randomization protocols that depart from an idealized random experiment (see, e.g., [Heckman *et al.*, 2010](#)). A compromised randomization protocol is not an issue for the ABC experiment. It is a substantial issue in PPP. [Heckman *et al.* \(2010\)](#) discuss this point in detail. We apply their method in this paper and refer the reader to that paper for details of the procedure and how it effects estimated treatment effects.

In addition to these challenges, the small sample sizes of the PPP and ABC interventions suggest that standard applications of large sample statistical inference procedures, which rely on the asymptotic behavior of test statistics, may be inappropriate. The large number of outcomes poses the danger of arbitrarily selecting “statistically significant” treatment effects for which high values of test statistics arise by chance. Indeed, for any particular treatment parameter, the probability of rejecting a true null hypothesis of no treatment effect, i.e., the type-I error, grows exponentially as the number of tested outcomes increases. This phenomenon leads to “cherry picking” of “significant” results. Finally, non-random attrition can generate spurious inferences.

We account for all of these issues in our statistical analysis. We address the common criticism of analyses of the Perry and Abecedarian data regarding the validity of large sample inferential procedures. We examine if statistically significant results survive after accounting for small sample sizes, multiple hypothesis testing, non-random attrition, and departures from the intended randomization protocols. For many outcomes, we find a gain in statistical significance when we analyze the PPP data using permutation tests valid in small samples. However, for a similar proportion of outcomes, when we analyze the ABC data with the same methods, we lose statistical significance. Additionally, adjusting for multiple hypothesis testing affects inference in both PPP and ABC. Hence, our more careful statistical analyses make a substantial difference in the inference about the effectiveness of early childhood programs that is often not fully appreciated in the advocacy-driven early childhood literature. Adjustments for attrition and compromised randomization are implemented but not discussed in this paper.²⁷

The rest of this section is organized as follows. We discuss our method for inference in sub-

²⁷We refer the reader to [Campbell *et al.* \(2014\)](#) for a discussion of attrition in the health wave of ABC and to [Heckman *et al.* \(2010\)](#) for compromised randomization in PPP. Attrition is not an issue for PPP, nor is compromised randomization an issue for ABC.

section 3.1. Subsection 3.2 explains how we address the problem of multiple-hypothesis testing. Subsection 3.3 describes our correction for attrition. Subsection 3.4 describes our method for decomposing statistically significant adult treatment effects into interpretable components associated with inputs that are enhanced by the treatment.²⁸ A more detailed description of our methodology is presented in Section 3 of the Web Appendix.

3.1 Small Sample Inference

We address the problem of small sample size by using exact permutation tests which are tailored to the randomization protocol implemented in each intervention, following the analysis of Heckman *et al.* (2010). Permutation tests are distribution free. They are valid in small samples since they do not rely on the asymptotic behavior of the test statistics. Permutation-based inference gives accurate p -values even when the sampling distribution is skewed (see, e.g., Lehmann and Romano, 2005). It is often used when sample sizes are small and sample statistics are unlikely to be normal. In order to discuss our methodology more formally, we first introduce some notation.

Let $Y = (Y_i : i \in \mathcal{I})$ denote the vector of outcomes Y_i for participant i in sample \mathcal{I} . Let $D = (D_i : i \in \mathcal{I})$ be the binary vector of treatment assignments, $D_i = 1$ if participant i is assigned to the treatment group, and $D_i = 0$ otherwise. We use $X = (X_i : i \in \mathcal{I})$ for the set of covariates used in the randomization protocol. Our method exploits the invariance of the joint distribution (Y, D) under permutations that swap the elements of the vector of treatment status D .

The invariance of the joint distribution (Y, D) stems from two statistical properties. First, randomized trials guarantee that D is exchangeable for the set of permutations that swap elements in D within the strata formed by the values taken by X (see Heckman *et al.*, 2010 for a discussion). This *exchangeability property* comes from the fact that under the null hypothesis of no treatment effect, scrambling the treatment status of the participants sharing the same values of X does not change the underlying distribution of the vector of treatment assignments D . Second, the hypothesis of no treatment effect implies that the *joint* distribution of (Y, D) is invariant under these selected permutations of the vector D . As a consequence, a statistic based on assignments D and outcomes Y is distribution-invariant under reassignments based on the class of admissible permutations. Lehmann and Romano (2005) show that under the null hypothesis and conditional on the data,

²⁸This approach is called “mediation analysis” in the applied statistics literature.

the exact distribution of such statistics is given by the collection of its values generated by all admissible permutations.

An important feature of the exchangeability property is that it relies on limited information on the randomization protocol. It does not require a full specification of the distribution D nor of the assignment mechanism, but only the knowledge of which variables are used as covariates X in implementing the randomization protocol. Moreover, the exchangeability property remains valid under compromises of the randomization protocol that are based on the information contained in observed variables X . In PPP, the assignment variables X used in the randomization protocol are cohort, gender, child IQ, socio-economic status (SES, as measured by the cultural deprivation scale) and maternal employment status. Treatment assignment was randomized for each family on the basis of strata defined by these variables. In the ABC study, the assignment variables X are cohort, gender, maternal IQ, High Risk Index and number of siblings. The participants were matched in pairs on the basis of strata defined by the X variables.

3.2 Correcting for Multiple Hypothesis Testing

The presence of multiple outcomes in these studies creates the potential problem of *cherry picking* by analysts who report “significant” estimates. This generates a downward-biased inference with p -values smaller than the true ones. To see why, suppose that a single-hypothesis test statistic rejects a true null hypothesis at significance level α . Thus, the probability of rejecting a single null hypothesis out of K null hypotheses is $1 - (1 - \alpha)^K$ even if there are no significant treatment effects. As the number of outcomes K increases without bound, the likelihood of rejecting a null hypothesis becomes 1.

One approach that avoids these problems is to form arbitrarily equally weighted indices of outcomes (see, e.g., [Muennig et al., 2011, 2009](#)). Doing so, however, produces estimates that are difficult to interpret. Instead, we analyze disaggregated outcomes. We correct for the possibility of arbitrarily selecting statistically significant treatment effects by conducting tests of multiple hypotheses. We adopt the *familywise error rate* (FWER) as the Type-I error. FWER is the probability of rejecting any true null hypothesis in a joint test of a set of hypotheses. The stepdown algorithm of [Lehmann and Romano \(2005\)](#) exhibits *strong FWER control*, that is to say that FWER is held at or below a specified level regardless of which individual hypotheses are true within a set

of hypotheses.

The [Lehmann and Romano \(2005\)](#) stepdown method achieves better statistical properties than traditional Bonferroni and Holm methods by exploiting the statistical dependence of the distributions of test statistics. By accounting for the correlation among single hypothesis p -values, we are able to create less conservative multiple hypothesis tests. In addition, the stepdown method generates as many adjusted p -values as there are hypotheses, which facilitates examination of which sets of hypotheses are rejected. There is some arbitrariness in defining the blocks of hypotheses that are jointly tested in a multiple-hypothesis testing procedure. In an effort to avoid this arbitrariness, we define blocks of independent interest that are selected on interpretable *a priori* grounds (for example, unhealthy lifestyles such as smoking and drinking). We also report the p -values obtained with the traditional Bonferroni method to compare it with the stepdown results.

3.3 Correcting for Attrition

Non-random attrition is also a potential source of bias in the estimation and inference of treatment effects. While the treatment status D and preprogram variables X are observed for all participants, outcomes Y are not observed for some participants due to panel attrition. As a consequence, this may induce correlation between the treatment status and the unobserved characteristics that affect sample retention.

We address this issue by implementing an Inverse Probability Weighting (IPW) procedure that identifies features of the full outcome distribution by reweighting non-missing observations by their probability of being non-attrited, which is modelled as function of observed covariates.²⁹ The IPW method relies on matching on observed variables to generate weights that are used to adjust the treatment effects for the probability of retention. These probability weights are estimated using a logit model, following the approach used in [Campbell *et al.* \(2014\)](#).³⁰ Small sample IPW inference is performed by recalculating these probabilities for each draw used to construct permutations. In PPP, attrition rates are below 10% at age 30 follow-up. For ABC, attrition rates are lower – roughly 6%. However, for the health component, there was substantial attrition, and we replicate

²⁹For a recent review, see [Huber \(2012\)](#).

³⁰We use a logit specification that models attrition as function of pre-program variables for PPP and for ABC at ages 21 and 30, and also as function of variables collected in the previous sweep for ABC at mid 30s, given the severity of attrition in the biomedical sweep. We follow the procedure applied in [Campbell *et al.* \(2014\)](#), which is described in greater detail there.

the analysis of [Campbell *et al.* \(2014\)](#) to correct for it.

3.4 Mediation Analysis

We also conduct a dynamic mediation analysis to decompose the effects of the treatment into components associated with the experimentally induced enhancement of inputs at different ages in the production of health.³¹ Recall that the observed outcome is:

$$Y = DY_1 + (1 - D)Y_0, \quad (1)$$

where D denotes treatment assignment ($D = 1$ if treated and $D = 0$ otherwise), and Y_1 and Y_0 are the counterfactual outcomes when D is fixed at 1 and 0, respectively. Our analysis is based on the following linear health production function:

$$Y_d = \kappa_d + \boldsymbol{\alpha}_d \mathbf{I}_d + \boldsymbol{\beta}_d \mathbf{X} + \tilde{\epsilon}_d, \quad d \in \{0, 1\}, \quad (2)$$

where κ_d is an intercept; $\boldsymbol{\alpha}_d$ and $\boldsymbol{\beta}_d$ are vectors of parameters; \mathbf{X} are pre-program variables assumed not to be affected by the treatment; $\tilde{\epsilon}_d$ is a zero-mean error term; \mathbf{I}_d are inputs in the production of health that can be changed by the intervention, so that $\mathbf{I} = D\mathbf{I}_1 + (1 - D)\mathbf{I}_0$. Let \mathcal{J} be the index set of all inputs $\mathcal{J}_M = \{1, \dots, \mathcal{J}_M\}$ and $\mathcal{J} \setminus \mathcal{J}_M$. Following [Heckman *et al.* \(2013\)](#), we decompose the term $\boldsymbol{\alpha}_d \mathbf{I}_d$ in equation (2) into components due to the \mathcal{J}_M inputs we measure and the $\mathcal{J} \setminus \mathcal{J}_M$ inputs we do not:

$$Y_d = \kappa_d + \sum_{j \in \mathcal{J}^M} \alpha_d^j I_d^j + \sum_{j \in \mathcal{J} \setminus \mathcal{J}^M} \alpha_d^j I_d^j + \boldsymbol{\beta}_d \mathbf{X} + \tilde{\epsilon}_d \quad (3)$$

$$= \tau_d + \sum_{j \in \mathcal{J}^M} \alpha_d^j I_d^j + \boldsymbol{\beta}_d \mathbf{X} + \epsilon_d, \quad (4)$$

where $\tau_d = \kappa_d + \sum_{j \in \mathcal{J} \setminus \mathcal{J}^M} \alpha_d^j E(I)_d^j$ and $\epsilon_d = \tilde{\epsilon}_d + \sum_{j \in \mathcal{J} \setminus \mathcal{J}^M} \alpha_d^j (I_d^j - E(I)_d^j)$.

Our aim is to decompose treatment effects into components attributable to changes in measur-

³¹We thank an anonymous referee for suggesting this analysis. A full comparable mediation analysis for both the ABC sample and the PPP sample is difficult. Different measurements have been collected in the two interventions (for example, the Pupil Behavior Inventory has only been used in PPP, while height and weight have only been measured in ABC), and the data collection was carried out at different ages.

able inputs. The decomposition is as follows:

$$E(Y_1 - Y_0|\mathbf{X}) = (\tau_1 - \tau_0) + E\left(\sum_{j \in \mathcal{J}^M} (\Delta\alpha^j + \alpha_0^j) E(\Delta I^j) + (\Delta\alpha^j) E(I_0^j)\right) + (\beta_1 - \beta_0) \mathbf{X} \quad (5)$$

where $\Delta\alpha^j$ is a change in the parameters, and ΔI^j is a change in the inputs. Clearly, unobserved inputs may also be changed by the experiment. Those changes may be correlated with the observed input changes. Heckman *et al.* (2013) discuss these issues and propose and implement methods for addressing this potential endogeneity problem. Under assumptions specified in that paper, they test and do not reject the null hypothesis that increments in unobservables are independent of increments of observables. We apply their test for both interventions and we also fail to reject this null hypothesis.³²

Thus, we can safely simplify the notation and write equation (4) as:

$$Y_d = \tau_d + \sum_{j \in \mathcal{J}^M} \alpha^j I_d^j + \beta \mathbf{X} + \epsilon_d. \quad (6)$$

Equation (1) can thus be rewritten as:

$$Y = \tau_0 + \tau D + \sum_{j \in \mathcal{J}^M} \alpha^j I^j + \beta \mathbf{X} + \epsilon, \quad (7)$$

where $\tau = \tau_1 - \tau_0$ is the contribution of unmeasured inputs to mean treatment effects, $\epsilon = D\epsilon_1 + (1 - D)\epsilon_0$ is a zero-mean error term, and $\mathbf{I} = D\mathbf{I}_1 + (1 - D)\mathbf{I}_0$ are the measured inputs. On the basis of equation (7), we can decompose the effects of the intervention on health as:

$$E(Y_1 - Y_0) = (\tau_1 - \tau_0) + \sum_{j \in \mathcal{J}^M} \alpha^j E(I_1^j - I_0^j), \quad (8)$$

where the second term on the right hand side is the contribution of measured inputs to the treatment effect.

We next expand this framework to consider two sets of inputs: childhood (indexed by C) and adulthood (indexed by A) inputs, so that the vector \mathbf{I} can be partitioned into two subvectors

³²The results are displayed in Tables 8 and 11 of the Web Appendix.

$[I^C \quad I^A]$, and equation (7) can be rewritten as:

$$Y = \tau_0 + \tau D + \sum_{j \in \mathcal{J}_M^C} \alpha_C^j I_C^j + \sum_{j \in \mathcal{J}_M^A} \alpha_A^j I_A^j + \beta \mathbf{X} + \epsilon. \quad (9)$$

The adult inputs are produced according to the following linear production function:

$$I_A = \mu_0 + \mu D + \sum_{j \in \mathcal{J}_M^C} \gamma^j I_C^j + \delta \mathbf{X} + \eta, \quad (10)$$

where $\mu = \mu_1 - \mu_0$, $\eta = D\eta_1 + (1 - D)\eta_0$, and $I_C^j = DI_{C,1}^j + (1 - D)I_{C,0}^j$. On the basis of equations (9) and (10), the effect of the intervention on health can be then decomposed as:

$$E(Y_1 - Y_0) = \underbrace{(\tau_1 - \tau_0)}_{\text{treatment effect due to unmeasured inputs}} + \underbrace{\sum_{j \in \mathcal{J}_M^C} \alpha_C^j E(I_{C,1}^j - I_{C,0}^j)}_{\text{treatment effect due to early inputs (direct effect)}} + \quad (11)$$

$$\underbrace{\sum_{j \in \mathcal{J}_M^A} \alpha_A^j E(I_{A,1}^j - I_{A,0}^j)}_{\text{treatment effect due to late inputs}} + \underbrace{\sum_{j \in \mathcal{J}_M^C} \sum_{j \in \mathcal{J}_M^A} \alpha_A^j \gamma^j E(I_{C,1}^j - I_{C,0}^j)}_{\text{treatment effect due to early inputs through late inputs (indirect effect)}}. \quad (12)$$

We denote this mediation analysis as “dynamic,” since we consider inputs at different ages, where the early inputs can have both direct effects on the health outcomes, and indirect effects operating through the late stage inputs. In our empirical application, we also compare it with the results obtained from two “static” mediation analyses, i.e., a first one based on the following health production function in which only early inputs are included:

$$Y = \tau_0 + \tau D + \sum_{j \in \mathcal{J}_M^C} \alpha_C^j I_C^j + \beta_C \mathbf{X} + \epsilon, \quad (13)$$

as done for example in Heckman *et al.* (2013) - and a second one based on the following health production function in which only late inputs are included:

$$Y = \tau_0 + \tau D + \sum_{j \in \mathcal{J}_M^A} \alpha_A^j I_A^j + \beta_A \mathbf{X} + \epsilon. \quad (14)$$

as done for example in [Muennig *et al.* \(2009\)](#).³³ As we will see, accounting for both early and late inputs and for the dynamics in the process of formation of human capital makes a substantial difference. Excluding early inputs leads to an overestimation of the role played by late ones in explaining the mechanisms through which the ABC and PPP interventions produced health impacts.

4 Empirical Results

This section presents the results of our empirical analysis. We discuss the mean treatment effects in subsection 4.1, and the dynamic mediation analysis results in subsection 4.2.

Departing from the previous literature in child development,³⁴ we conduct our analysis by gender. The rationale for this choice is based on both biological and behavioral considerations. It is well-established in both animal and human studies that males are more greatly affected by stressful environments ([Kudielka and Kirschbaum, 2005](#)). Gender differences in growth, health, and mortality have been reported in the medical literature, starting *in utero* (see, e.g., [Case and Paxson, 2005](#); [Eriksson *et al.*, 2009](#)). In addition, differences between men and women in the propensity to engage in unhealthy behaviors and in developing cardiovascular disease in the presence of common risk factors have been well documented. These behavioral differences have led some scholars to propose gender-based interventions (see, e.g., [Courtenay *et al.*, 2002](#); [Juutilainen *et al.*, 2004](#); [Marino *et al.*, 2011](#); [Wardle *et al.*, 2004](#)). Despite the large body of interdisciplinary evidence, substantial gaps remain in our understanding of the sources of gender differences, especially in relation to the interconnections between social and biological processes ([Rieker and Bird, 2005](#); [Short *et al.*, 2013](#)). The magnitude of, and explanations for, gender differences likely vary depending on the specific stage of the life cycle and the particular health measure considered ([Matthews *et al.*, 1999](#)). The existing literature does not provide a definitive answer as to why men and women have differential responses to environments. Nonetheless, our analysis confirms the importance of taking the gender dimension into account when analyzing the impacts of interventions. For the outcomes we study, we find much stronger effects of these programs for boys than for girls.

³³However, they do not control for omitted inputs.

³⁴[Heckman *et al.* \(2010\)](#) and [Campbell *et al.* \(2014\)](#) are exceptions.

4.1 Estimates and Inference

Our main results are displayed in Tables 4 (for PPP) and 5 (for ABC). A complete set of results is displayed in Web Appendix Section 5. The general pattern reported there is that for most blocks of outcomes, there are few statistically significant health and/or health lifestyle outcomes for girls, although there are numerous statistically significant health and/or health lifestyle outcomes for boys. For each table, we present simple differences in means between the treatment and control groups, and different p -values. These range from the traditional large-sample p -value for the one-sided single hypothesis that treatment had a positive effect to the constrained permutation p -value based on the Inverse Probability Weighting (IPW) t -statistic associated with the difference in means between the treatment groups, and its corresponding multiple hypothesis testing (stepdown) p -value. Column (11) of each table reports p -values which account for all the statistical challenges addressed in this paper. Finally, column (13) reports conservative Bonferroni p -values that adjust for multiple hypothesis testing for comparison. We find statistically significant health effects for males in both interventions. PPP promoted healthy behaviors. ABC improved biomarkers for cardiovascular and metabolic health.

We first examine the treatment effects for the PPP. It is evident from Table 4 that there is a substantial and significant reduction in both smoking prevalence and intensity among the males in the treatment group, with effects already present at age 27 and sustained through age 40. [Muennig et al. \(2009\)](#) also examine the impact of the intervention on smoking, but were unable to detect any impact, since they pool male and female samples. A separate analysis by gender is justified on a priori grounds, on the basis of the interdisciplinary literature documenting differences in both determinants of smoking behavior ([Hamilton et al., 2006](#); [Waldron, 1991](#)) and responses to interventions ([Bjornson et al., 1995](#); [McKee et al., 2005](#)).

Males in the treatment group have a lower lifetime prevalence (0.40 versus 0.56 in the control group). They also have significantly lower rates of daily smoking than the controls, with the proportion of daily smokers declining from 0.42 to 0.33 between age 27 and the age 40 follow-up for the treated, while remaining stable at just above 50% for the controls, so that the difference between the treated and the controls doubles in a decade. This difference - 20 percentage points (p.p.) - amounts to the gap in smoking prevalence between men with an undergraduate degree

(11.9%) and those with low education (29.5%) in the US in 2005 (CDC, [U.S. Department of Health and Human Services, 2010](#)). Additionally, while the smoking prevalence among the treated aligns with US-wide figures for men below the poverty level in 2005 (34.3%, CDC), the one among the controls is 20 p.p. higher. Another finding is that the biggest difference between the two groups emerges in relation to the intensity of smoking, which is only partly reduced between the ages 27 and 40 due to a decline in intensity among the controls: the average number of cigarettes smoked per day falls from 8.7 at age 27 to 6.5 at age 40.³⁵ This is consistent with the decreasing trend in smoking behavior which has been experienced in US after the release of the Surgeon’s General Report in 1964, as documented in the literature (see, e.g., [Fiore *et al.*, 1989](#)) – an opposite to the trend documented for obesity.

These estimates have substantial relevance for public health. Tobacco use is considered the leading preventable cause of early death in the United States, and about half of all long-term smokers are expected to die from a smoking-related illness ([U.S. Department of Health and Human Services, 2010](#)). In two major studies carried out for the U.S., one estimated that lifetime male smokers have a reduced life expectancy of 11 years as compared to nonsmokers, and that, although male smokers who quit at younger ages have greater gains in life expectancy (by 6.9 to 8.5 years for those who quit by age 35), even those who quit much later in life gain some benefits ([Taylor *et al.*, 2002](#)). Typical male smokers at age 24 have a reduced lifetime expectancy of up to 6 years as compared to nonsmokers ([Sloan *et al.*, 2004](#)); this includes those who subsequently quit. Hence, we would expect this reduction in smoking to translate into improved health among the treated participants relative to the controls as they age.

Additionally, the treated males at age 40 in the PPP are more likely than the controls to report having made dietary changes in the last 15 years for health reasons (38% versus 23%, see Table 4): most of these changes are related to reductions in the amount of fat and salt in the diet, and in the intake of junk food. Hence, we would expect these changes in dietary habits to also translate into substantial health improvements (see, e.g., [Sacks *et al.*, 2001](#) for the effects of diet on blood

³⁵Instead, the ABC intervention seems not to have affected smoking behavior to the same extent. The only statistically significant impact is a delay in the age of onset of smoking by approximately three years, from 17 years old for the controls to 20 years old for the treated males (Table 5 in the Web Appendix). However, this effect loses statistical significance once we account for multiple hypothesis testing. One plausible explanation for the lack of impact of the ABC on smoking could be the much lower smoking prevalence experienced by the two cohorts, who lived at two different phases of the smoking epidemics.

pressure).

Finally, the PPP intervention also substantially improved the healthy habits of the women who were randomized to the treatment group: by age 40, they are 33 percentage points more likely to engage in regular physical activity than those randomly assigned to the control group (Table 4); they also report to drink significantly less frequently in the age 27 sweep, although this difference is no longer significant by the time they reach age 40.

We next turn to analyze the impacts of the Abecedarian intervention, where anthropometric and cardiovascular biomarkers have been collected during a physician’s visit when the subjects were in their mid-30s. We first examine three outcomes not previously reported: weight, height and BMI. For each of them, the treated males perform better than the controls: they are on average 7 kilograms lighter, 5 cm taller, and with a BMI 4 points lower - just below the obesity threshold. However, the statistical significance of these differences vanishes once we account for multiple hypothesis testing. A comparison with nation-wide figures for 2011-2012 (Ogden *et al.*, 2014) reveals that ABC male participants are more likely to be both overweight and obese than 20-39 year old African-Americans: the prevalence of being overweight is 72% for the treated and 75% for the controls, against a nationwide figure of 63%, while that of obesity is 56% for the treated and 62.5% for the controls, against a US average of 35%.

Substantial differences are also found for all the reported outcomes related to blood pressure. Treated males have on average lower values of both systolic and diastolic blood pressure, and are less likely to fall into the Stage I hypertension category, according to the definition of the American Heart Association.³⁶ The magnitude of these impacts is both statistically and medically significant. These estimated reductions in blood pressure are at least twice as large as those obtained from the most successful multiple behaviors change risk factors randomized controlled trials (Ebrahim *et al.*, 2011). For example, the greatest reduction reported in their meta-analysis is -8.5 and -10 for diastolic and systolic blood pressure, respectively (Cakir and Pinar, 2006), against the -13.5 and -17.5 reported in the ABC.

The superior health status of the males in the ABC treatment group is confirmed when we analyze the use of health care (Table 5). The treated are significantly less likely to have ever been hospitalized (21% versus 56% in the control group), and also to have had a scheduled treatment or

³⁶A more extensive set of health outcomes from the biomedical sweep is analyzed in Campbell *et al.* (2014).

exam in the past 12 months (22% versus 48% in the control group). They also enjoy higher health insurance coverage than those in the control group, especially if provided by the employer.

Finally, although they do not appear to be in better health than the controls, the females in ABC benefit from the treatment in terms of improved healthy habits. Interestingly, we find an improvement in healthy behavior for PPP and ABC. For example, the treated females in ABC and PPP are more likely to engage in physical activity, although the measures are not strictly comparable. ABC treatment women are more likely to eat fresh fruit than controls. They start drinking alcohol later. Perry treatment women are less likely to drink than controls.

For the outcomes with high comparability we find significant differences in the effects of the treatment between the ABC and PPP interventions for males. For females, reflecting the imprecision of estimates for them within each program, there are no sharp differences in treatment effect across programs.³⁷ Table 7 reports tests of equality of comparably measured treatment effects by gender across the two studies. The relatively stronger effects found in ABC are consistent with (but do not definitively establish) the efficacy of the early health care given to participants in that program.

Methodological Issues As noted in Section 3, both the ABC and PPP studies are plagued by several problems. We deal with these problems using methods tailored to the characteristics of each intervention. They make a substantial difference in inference, especially in case of the PPP. For many outcomes in that intervention, statistical significance is gained (e.g., for the probability of never being a smoker by age 40) or increases as we move from a large-sample analysis to a permutation-based analysis. In contrast is the effect of applying more refined methods to the Abecedarian sample. In that sample, no outcome is a gain seen in statistical significance. For a few outcomes the treatment effects do not survive the multiple hypothesis testing correction (height and BMI). This suggests that using large-sample methods does no harm in analyzing the Abecedarian sample. However, accounting for multiple hypotheses makes a difference. This is evident when we compare the stepdown p -values with the more conservative ones obtained using the Bonferroni method (column 13). The analysis of the Perry intervention requires more sophisticated methods to obtain reliable inference due, in part, to the greater complexity – and compromise – in its

³⁷Table 2 of the Web Appendix summarizes the comparability of the measures available in PPP and ABC.

randomization protocol.³⁸ As reported in [Campbell *et al.* \(2014\)](#), adjusting for attrition from ABC makes a difference.

4.2 Mechanisms Producing the Treatment Effects

We next investigate the mechanisms through which estimated treatment effects arise using the mediation analysis described in Section 3.4. The literature suggests both direct and indirect mechanisms through which early childhood experiences might affect later health. Inadequate levels of stimulation and nutrition, the lack of a nurturing environment and of a secure attachment relationship, are all inputs which have been shown to play important roles in retarding development, by altering the stress response and metabolic systems, and leading to changes in brain architecture ([Taylor, 2010](#)).³⁹ On the one hand, child development might directly affect adult health, both because early health conditions are quite persistent throughout the lifecycle (as for example in the case of obesity, see [Millimet and Tchernis, 2013](#)), and because early traits are determinants of lifestyles ([Conti and Heckman, 2010](#)).⁴⁰ On the other hand, child development might also affect adult health indirectly, by improving socioeconomic determinants such as education, employment and income ([Heckman *et al.*, 2010](#)) - factors which might also have an independent effect on health, as documented in a large interdisciplinary literature ([Deaton, 2001](#); [Heckman *et al.*, 2014a](#); [Lochner, 2011](#); [Marmot, 2002](#); [Smith, 1999](#)).

As described in Section 3.4, we use a dynamic mediation analysis to examine the role of childhood and adult inputs in explaining treatment effects. We allow early childhood developmental traits to have both a direct impact on outcomes, and an indirect one through educational attainment and adult socioeconomic status. We then compare the results obtained from a dynamic mediation analysis with those obtained by performing two static mediation analyses, where only childhood and adulthood inputs in turn are included in the health capital production function. The rationale for this exercise is to show the bias researchers might encounter by not considering a dynamic model of human capital formation.

Differences in both the timing and the content of the data collected do not allow us to use

³⁸See [Heckman *et al.* \(2010\)](#), where this is discussed in depth.

³⁹Given the lack of brain scans and measures of cortisol, we use proxies related to the underlying biological systems, such as cognitive and behavioral test scores.

⁴⁰See also [D'Onise *et al.* \(2010\)](#) for a review of the literature on the health effects of ECIs.

exactly the same childhood mediators. Nonetheless, we can analyze the role played by cognitive and behavioral traits for both interventions. Additionally, we include comparable mediators for educational attainment and adult socioeconomic status. In particular, for PPP, as early childhood mediators we consider (following Heckman *et al.*, 2013): IQ (the Stanford-Binet scale), reduced externalizing behavior (reduced aggression) and academic motivation (constructed from selected items of the Pupil Behavior Inventory available in Perry). All are measured at ages 7-9. Heckman *et al.* (2013) show the powerful role of reduced externalizing behavior in producing a variety of beneficial behaviors in PPP. For adult inputs, we use high school graduation as a measure of educational attainment, unemployment (number of months unemployed in the last two years) and monthly income at age 27 as measures of socioeconomic status. Heckman *et al.* (2010) show that these measures were significantly affected by treatment. For the ABC, the childhood mediators represent the three different domains of development of the child: the Bayley Mental Development and the Stanford-Binet Scales for cognition, the Infant Behavior Record (IBR) Task Orientation Scale for behavioral development,⁴¹ and the Body Mass Index of the child for physical health. All are averages of standardized measurements taken at ages 1-2. All of these measures have been shown in previous work to be significantly affected by the treatment (Burchinal *et al.*, 1997; Campbell *et al.*, 2014). For adult inputs, we use college graduation as a measure of educational attainment, and employment status and earnings at age 30 as measures of socioeconomic status. García *et al.* (2014) document a significant impact of the intervention on these outcomes.

Complete results on mediation analyses are reported in the Web Appendix, Section 6. The main results for the PPP are displayed in Figure 3. We decompose the treatment effects for the outcomes which survive the multiple hypothesis testing correction, and display the results for those for which we find that the mediators explain statistically significant shares of the treatment effects. Consistent with the evidence in Heckman *et al.* (2013), we find that externalizing behavior is the main mediator of the effect of the intervention on smoking for males. Its mediating role survives even when later educational attainment or socioeconomic status is entered, and its effects on adult behaviors are accounted for. It accounts for shares of the treatment effects ranging between 17% and 48%. For example, it explains almost half of the treatment effect on the probability of not being

⁴¹As seen in subsection 2.2, task orientation was one of the adaptive behaviors emphasized in the Abecedarian curriculum.

a daily smoker at 27 years ($p=0.084$), and 43% on the number of cigarettes smoked per day at age 40 ($p=0.052$). The contribution of later life mediators is much smaller and fails to reach statistical significance. The role played by childhood behavioral traits is consistent with evidence reported in [Conti and Heckman \(2010\)](#), who show that improvements in child self-regulation are associated with a significantly lower probability of being a daily smoker at age 30, above and beyond its effect on education and the effect of boosts in education attainment on outcomes. This finding also contributes to the recent but flourishing literature on the importance of personality and preferences for healthy behaviors ([Cobb-Clark et al., 2014](#); [Conti and Hansman, 2013](#); [Heckman et al., 2014a](#); [Moffitt et al., 2011](#)). For females, we find that enhancements in cognition are the main mediators of the effect of the intervention on physical activity. This is in line with the evidence reported in [Conti and Heckman \(2010\)](#), who show that improvements in cognition are associated with better health for women but not for men.

Figure 4 compares the results from the dynamic mediation analysis with those obtained from the two static mediation analyses, including, respectively, those using only childhood mediators (panel (a)) and those using only adult mediators (panel (b)). They show that the decomposition components for the childhood mediators are unchanged in the static and dynamic mediation analysis (both in case of externalizing behaviors for males, and of cognition for females). However, only including adult socioeconomic factors as inputs overestimates their importance. Indeed, while the shares explained by income are large and statistically significant in the static model, they are substantially reduced in magnitude and driven to insignificance when childhood factors are accounted for. Childhood factors have an impact on health behaviors *above and beyond* their effects on socioeconomic status in adulthood.

We now turn to the results for the Abecedarian Program, which are displayed in Figure 5.⁴² We only report the results for men. Analysis of the female data from ABC shows few treatment effects. The mediators are clearly not comparable with those used in the analysis of Perry. We confirm the PPP results that early childhood traits mediate the health effects of the treatment,

⁴²We only report mediation results for the males in case of the ABC, since the dynamic mediation analysis and the static mediation analysis with late inputs cannot be performed for females, since the only statistically significant outcomes for this sample are those at age 21, and the late mediators are measured at age 30. The results for the static mediation analysis with early inputs for the ABC are shown in the lower panel of Table 14 in the Web Appendix. Differently from the case for males, no mediator appears to explain a statistically significant share of the treatment effect. IQ explains 42% of the effect of the treatment on physical activity — a mechanisms similar to the one uncovered for the PPP — although it fails to achieve statistical significance at conventional levels

above and beyond any induced improvement in adult socioeconomic status. The shares explained by task orientation and the body mass index of the child range between 17% and 28% for blood pressure, and between 20% and 31% for hypertension. Together, they explain half of the treatment effect. This is consistent with existing evidence on both the role of child temperament⁴³ and that of physical development in the early years as key predictors for the risk of later obesity.⁴⁴ Interventions to fight the obesity epidemic starting in the childhood years are increasingly being advocated, both to promote healthy dietary and exercise patterns (Deckelbaum and Williams, 2001), and to improve parental knowledge of proper nutrition and recognition of the child being overweight.⁴⁵ As described in Section 2, the Abecedarian intervention included all these components. Treated children enjoyed better nutrition and time for exercise while they were in the childcare center. These features of the intervention could have had both a direct effect on their fat mass composition, and an indirect effect through a change in their preferences and behaviors. Additionally, participants were not allowed to eat outside meals and had to clean up the table once they were finished. This feature might have further contributed to the development of their self-regulatory skills. Finally, the counseling provided to the parents during the child well-care visits might have also improved the eating environment at home. Unfortunately, the data at our disposal do not allow us to disentangle the roles of these different channels.

On the other hand, the role of childhood traits in explaining the effect of the treatment on the greater availability of health insurance is much reduced when adult mediators are introduced. Consistent with the fact that the provision of health insurance is tied to a job, we find that employment status is the main mediator of the effect of treatment, with explained shares of 39% in case of health care coverage and 26% in case of employment-provided health insurance, respectively. Additionally, we also uncover evidence of a dynamic interaction between child and adult factors, with 20% and 13% of the effect of the treatment on the health insurance outcomes being mediated by the indirect effect of child BMI on adult employment.⁴⁶

We also compare the dynamic mediation analysis results with those obtained from the two

⁴³Specifically, task orientation has been associated with increased physical activity (Boyd *et al.*, 2002); this seems a plausible mechanism through which this trait might have by itself affected obesity, although data limitations prevent us from testing this formally.

⁴⁴Conti and Heckman (2010); Park *et al.* (2012); Pulkki-Råback *et al.* (2005).

⁴⁵Etelson *et al.* (2003).

⁴⁶As expected, higher child BMI at ages 1-2 is associated with a lower probability of being employed at age 30.

static mediation analyses (Figure 6). As for the PPP, we find that the shares explained by the childhood mediators are comparable in the static and in the dynamic model for the physical health outcomes. However, for health insurance outcomes they are substantially reduced in the dynamic model (from 25% to 0% in the case of BMI) and driven to insignificance. In other words, the effects of early traits on health care coverage work entirely through their impact on adult socioeconomic status. Conversely, the small and insignificant shares of the treatment effects on the physical health outcomes explained by employment in the static model are reduced to zero in the dynamic model. Employment status still explains a significant share of the treatment effect on the health insurance outcomes in the dynamic model (Panel (b) of Figure 6).⁴⁷ For females, income appears to explain half of the treatment effect on alcohol consumption in the static mediation model. This share is reduced to 12% and driven to insignificance in the dynamic model (as shown in Panel (b) of Figure 4).

In sum, our analysis shows the powerful role of enhanced early childhood traits in explaining the effect of the treatment on adult health and health behaviors, *above and beyond* any effects of adult socioeconomic status. This is consistent with the framework of Cunha and Heckman (2009) and Cunha *et al.* (2010), as reviewed and extended by Heckman and Mosso (2014), in which early investments promote later life skills by boosting the base of capabilities that shape performance on a variety of tasks. Our analysis shows the importance of developing the child in her entirety, going beyond purely cognitive traits, within an integrated approach which also promotes behavioral and health development.

5 Conclusions

This paper analyzes the long-term impacts on healthy behaviors and health of two of the oldest and most cited U.S. early childhood interventions: the Ypsilanti Perry Preschool Program and the Carolina Abecedarian Project. We address some of the major limitations of previous work analyzing these data. That research does not account for the variety of statistical challenges that arise in

⁴⁷It should also be noticed that in the case of the static mediation analysis we do not pass the specification test we apply following Heckman *et al.* (2013). See Table 11 in the Web Appendix.

analyzing these studies.⁴⁸ For many outcomes, these corrections make a substantial difference.⁴⁹ We also demonstrate differences across interventions in: (a) characteristics of the treated populations; (b) the nature of the treatment; and (c) the data collected. These differences create serious challenges for the meta-analyses routinely conducted in the literature on child development.

There are strong differences in the impact of the interventions by gender. Treatment effects are particularly strong for men. Both the Perry and the Abecedarian interventions have statistically significant effects on the healthy behavior and health of their participants. The specific health outcomes affected vary by intervention. The Perry participants have significantly fewer behavioral risk factors (in particular smoking) by the time they reach age 40. The Abecedarian participants are in better physical health in their mid-30s. When strictly comparable outcomes are compared across program, including people of the same gender, estimated treatment effects are stronger for male ABC participants. This is broadly consistent with the emphasis on early health found for ABC. We find no statistically significant differences across program for women.

In an attempt to shed light on the mechanisms through which these treatment effects emerge, we conduct dynamic mediation analyses. Despite the lack of overlap in the measurements taken in the two interventions, the outcomes significantly affected by them, and the imperfect comparability of the mediators, we have uncovered an important role of enhanced early childhood traits as sources of adult treatment effects, above and beyond adult enhancements in socioeconomic status. This evidence is broadly consistent with the models of dynamic capability formation reviewed in Heckman and Mosso (2014). Skills developed early in life enhance the capabilities of persons to effectively perform a variety of lifetime tasks.

As the cohorts we have studied age and diseases start becoming more prevalent and manifest, it will be valuable to assess the contribution of behavioral risk factors and health insurance as additional mechanisms explaining the health effects of early childhood interventions. Our results contribute to an emerging body of evidence that shows the potential of early life interventions for preventing disease and promoting health.

⁴⁸Compromised randomization is not an issue with the ABC program. For Perry, where it is an issue, we apply the methods discussed in Heckman *et al.* (2010), where they make a difference in the reported estimates.

⁴⁹Heckman *et al.* (2010) show that correcting for compromised randomization in Perry as we do in this paper makes a difference. Correcting for attrition from the medical wave of ABC has substantial impacts on estimates. (See Campbell *et al.*, 2014.)

Table 1: ABC and PPP: Main Characteristics and Eligibility Criteria

Abecedarian	Perry
Main Characteristics	
<i>Location:</i> Chapel Hill, NC <i>Racial Composition:</i> 98% African American <i>Age of Child:</i> 0-5 <i>Sample Size:</i> 111 (57T, 54C) <i>Intervention Year:</i> 1972 – 1982 <i>Follow-up:</i> Through Mid 30s (2010-2012) <i>Intensity:</i> 40 hrs/week (8 hrs/day for 5 days/week) for 50 weeks/year <i>Number of years:</i> 5 years at ages 0-5 <i>Cost per child/year:</i> 12,955 (2010\$)*	<i>Location:</i> Ypsilanti, MI <i>Racial Composition:</i> All African American <i>Age of Child:</i> 3-5 <i>Sample Size:</i> 123 (58T, 65C) <i>Intervention Year:</i> 1962 – 1967 <i>Follow-up:</i> Through Age 40 (2000-2002) <i>Intensity:</i> 12.5 to 15 hrs/week (2.5 to 3 hrs/day for 5 days/week) for 30 weeks/year (mid-Oct. through May) + 1.5 hrs/week of home visits + 1 monthly parent group meeting <i>Number of years:</i> 2 yrs at ages 3-5 for cohorts 1-4; 1 yr for first cohort <i>Cost per child/year:</i> 9,604 (2010\$)
Eligibility Criteria	
<i>Requirement:</i> No apparent biological conditions <i>Weighted Scale:</i> High Risk Index:† (1) mother’s educational level (last grade completed) (2) father’s educational level (last grade completed) (3) family income (dollars per year) (4) father absent for reasons other than health or death (5) absence of maternal relatives in local area (6) siblings of school age one or more grades behind age-appropriate level or with equivalently low scores on school-administered achievement tests (7) payments received from welfare agencies in past 3 yrs (8) record of father’s work indicates unstable or unskilled semiskilled labor (9) mother’s or father’s IQ ≤ 90 (10) sibling’s IQ ≤ 90 (11) relevant social agencies in the community indicate the family is in need of assistance (12) one or more members of the family has sought counseling or professional help the past 3 yrs (13) special circumstances not included in any of the above likely contributors to cultural or social disadvantage	<i>Requirement:</i> Child IQ <85 (“educably mentally retarded”) <i>Weighted Scale:</i> Cultural Deprivation Scale:‡ parents’ average years of schooling at entry/2 + father’s occupational status at entry*2 + 2*(rooms/persons in home at entry)

Notes: *This figure is inclusive of the health care costs (the figure reported in [Barnett and Masse \(2007\)](#) is not). Estimated from cost-benefit analysis conducted on both PPP and ABC projects. † See [Ramey et al. \(2000\)](#). ‡ See [Weikart et al. \(1978\)](#).

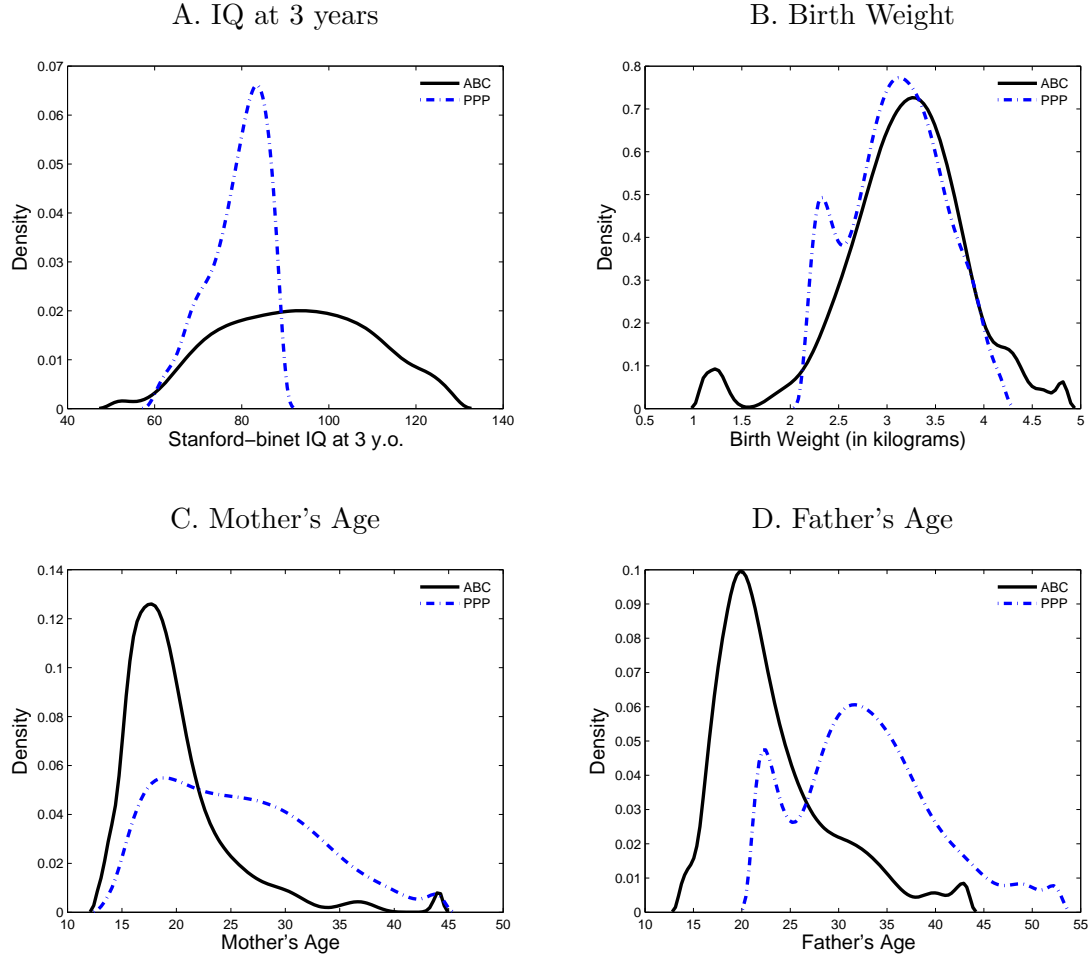
Table 2: Descriptive Statistics of ABC and PPP Pre-program Variables

IQ at 3 years			Birth Weight		Mother's Age		Father's Age	
	ABC	PPP	ABC	PPP	ABC	PPP	ABC	PPP
Mean	92.65	79.02	3.19	3.10	19.78	25.56	23.21	32.81
Std. Dev.	15.95	6.44	0.61	0.47	4.77	6.53	5.84	6.88
Skewness	0.04	-0.76	-0.59	-0.05	2.16	0.52	1.29	0.52
Mother's Education			Father's Education		Number of Siblings			
	ABC	PPP	ABC	PPP	ABC	PPP		
Mean	10.17	9.42	10.89	8.60	0.64	4.28		
Std. Dev.	1.84	2.20	1.78	2.40	1.09	2.59		
Skewness	-0.28	-0.78	-0.38	-0.32	2.15	0.90		
Mother's Working Status			Father's Working Status		Father Presence			
	ABC	PPP	ABC	PPP	ABC	PPP		
Mean	0.36	0.20	0.73	0.14	0.29	0.53		
Std. Dev.	0.48	0.40	0.45	0.35	0.45	0.50		
Skewness	0.58	1.47	-1.03	2.09	0.94	-0.11		

Notes: This table provides some descriptive statistics of the ten pre-program variables which were collected in both the Abecedarian and Perry interventions: (1) the Stanford-Binet IQ score at 3 years of age (we only use data from the control group for the ABC intervention, since it started at birth); (2) weight at birth in kilograms; (3) mother's and father's age at the time of the participant's birth; (4) mother's and father's last grade completed; (5) number of participant's siblings; (6) mother's and father's working status (this variable takes value 1 if the parent is employed and 0 otherwise); (7) presence of the father (a binary indicator which takes value 1 if the participant's father is a current resident of the household). The descriptive statistics reported are the arithmetic mean, the standard deviation and the skewness. Those are respectively measured by

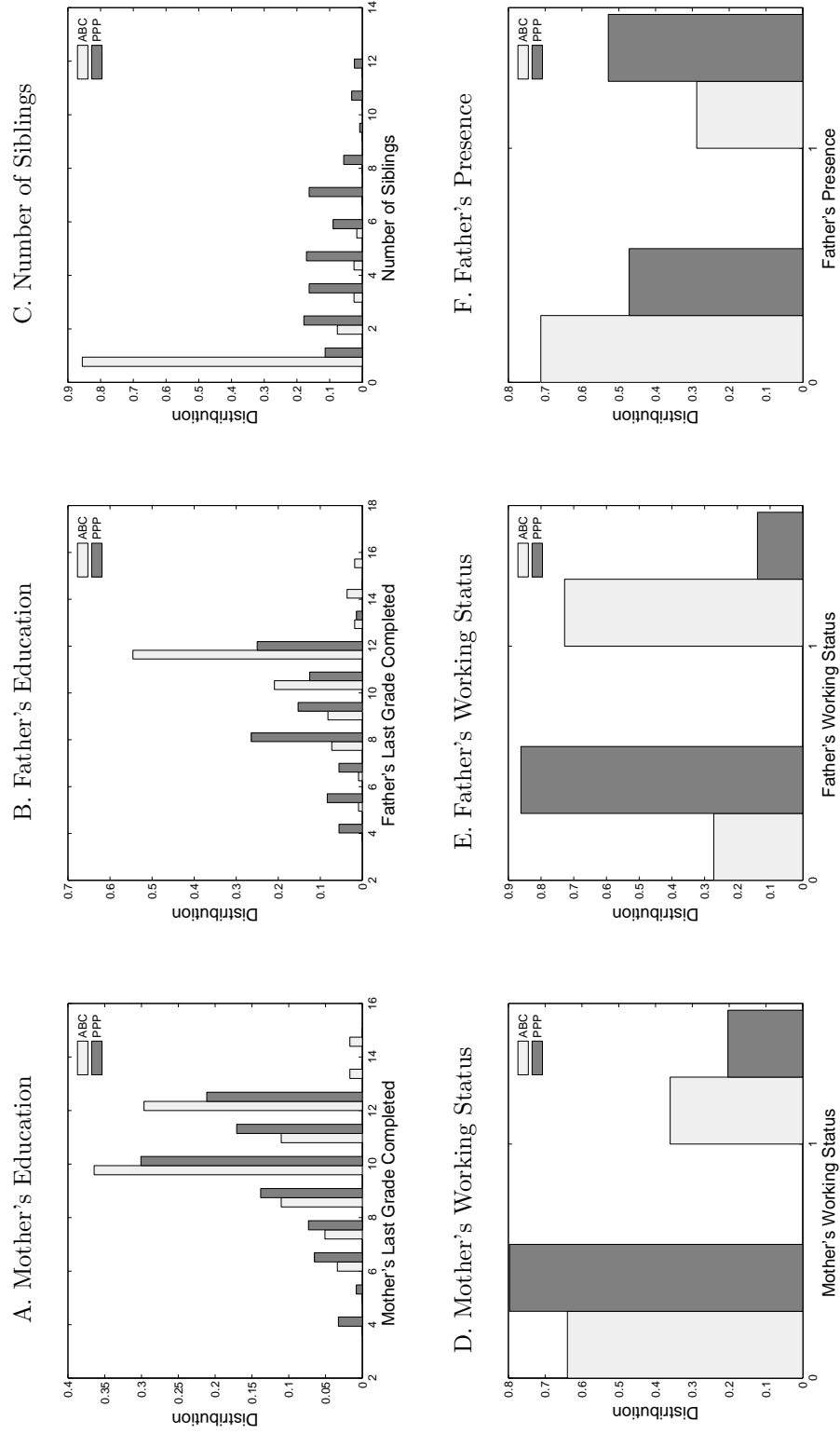
$$\bar{Y} = \frac{\sum_{i=1}^N Y_i}{N}, \hat{\sigma} = \sqrt{\frac{\sum_{i=1}^N (Y_i - \bar{Y})^2}{N}} \text{ and } \hat{s} = \frac{\sum_{i=1}^N (Y_i - \bar{Y})^3}{N} \cdot \frac{1}{\hat{\sigma}^3}, \text{ where } N \text{ denotes sample size and } Y_i \text{ denotes the outcome for participant } i.$$

Figure 1: Comparison Between Pre-program Variables of ABC and PPP



Notes: These figures present the density estimation of four pre-program variables collected in both the Perry and Abecedarian interventions. Panel A plots the Stanford-Binet IQ score at 3 years of age (we only use data for the control group for the ABC intervention, since it started at birth). Panel B plots the weight at birth in kilograms. Panel C and D plot the mother's and father's age at the time of the participant's birth. These estimates are based on a normal kernel function with optimal bandwidth for normal densities.

Figure 2: Comparison Between the Baseline Variables of ABC and PPP



Notes: These figures present estimates of the empirical distributions of three categorical and three binary variables collected in both the Perry and Abecedarian interventions. All variables were collected at the onset of each intervention. Panels A and B: mother's and father's last grade completed. Panel C: the number of participant's siblings. Panel D and E: mother's and father's working status (a binary indicator which takes value 1 if the parent is employed and 0 otherwise). Panel F: presence of the father (a binary indicator which takes value 1 if the participant's father is a current resident of the household).

Table 3: The Health Care Components of ABC for the Treated Children

Component	Content
Well-Child Care	
Well-Child Visits	Assessments were made at 2, 4, 6, 9, 12, 18, and 24 months, and yearly thereafter.
Immunizations	A health history and a social history were obtained and a complete physical examination was performed. Appropriate immunizations (diphtheria, pertussis, tetanus, polio, measles, mumps, and rubella) as recommended by the <i>American Academy of Pediatrics</i> were given.
Lab Tests	A sickle cell preparation was obtained at 9 and 12 months from all black children. A skin test for tuberculosis was given yearly, and a hematocrit was done at 9 and 18 months and yearly thereafter. During symptom-free periods, the children were cultured for bacteria at two-week intervals, and for viruses and mycoplasmas every four weeks.
Health Education	The parents were present at the child well-care visits. They were taught and counseled in the areas of: feeding and nutrition, weaning, cleanliness, skin care, child growth and development, behavior, toilet training, accident prevention, and dental hygiene. They were also encouraged to express their concerns and to discuss the problems that they were facing.
Vision Hearing	Routine screening for vision was provided annually. During symptom-free periods, the children underwent pneumatic otoscopy and tympanometry once a month. If any tympanogram was abnormal, the child was seen for repeat otoscopy and tympanometry after two weeks.
Ill-Child Care (for Treated Children Only after the First Year)	
Sick-care	Daily surveillance of all children in the center for illness: the licensed practical nurse visited the classroom daily to review the health status of the children and receive reports from the parents. Children who were unwell were promptly seen by a member of the health care staff. A history was obtained and a physical examination done; appropriate laboratory tests and cultures were performed. Children had their upper respiratory secretions cultured by throat swab and a saline nasal wash for isolation of viruses and bacteria. A computer form was completed each time the child was examined, listing pertinent history, physical findings, diagnosis, and culture results. Parents were informed of the nature of the child's ailment, and given prescriptions, but were responsible for buying medicines. The family nurse practitioner made sure that half of the prescriptions were sent home and half to the center. The children were followed through the illness to recovery. They were allowed to attend the center when ill except in case of chickenpox. These referrals were made to specialists and hospitals but specialized visits and hospitalizations were not paid for.

Notes: Sources: [Campbell \(2014\)](#); [Ramey et al. \(1982\)](#); [Sanyal et al. \(1980\)](#).

* In the first year of the study, the control children received medical care from the FPG center. After the first year, they were left on their own.

Free medical care for the control children was offered by FPGC and 2 university-affiliated hospitals to control families, and reports suggest that this incentive was discontinued after the first year ([Heckman et al., 2014a](#); [Ramey et al., 1976](#)).

Table 4: Inference Results: Perry Preschool Intervention

Variable	# C	# T	Ctr. M.	Treat. M.	Diff. Ms.	Asy. <i>p</i> -val.	Naive <i>p</i> -val.	Blk. Per. <i>p</i> -val. S.D.	Blk. IPW P. <i>p</i> -val. S.D.	Bonf. <i>p</i> -val.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Lifestyles: Diet and Physical Activity at 40 y.o. - Males											
Physical activity	35	30	0.457	0.367	0.090	0.766	0.779	0.584 0.584	0.545 0.545	1.000		
Healthy Diet	35	29	0.229	0.379	0.151	0.097	0.113	0.015 0.033	0.020 0.072	0.040		
	Lifestyles: Smoking at 27 y.o. - Males											
Not a daily smoker	39	31	0.462	0.581	0.119	0.164	0.160	0.092 0.092	0.089 0.089	0.267		
Not a heavy smoker	39	31	0.615	0.903	0.288	0.003	0.002	0.004 0.005	0.004 0.005	0.012		
No. of cigarettes	39	31	8.744	4.291	4.453	0.011	0.010	0.008 0.009	0.006 0.011	0.018		
	Lifestyles: Smoking at 40 y.o. - Males											
Never smoker	36	30	0.444	0.600	0.156	0.107	0.109	0.042 0.042	0.040 0.040	0.160		
Not a daily smoker	36	30	0.472	0.667	0.194	0.058	0.063	0.014 0.042	0.010 0.035	0.040		
Not a heavy smoker	35	28	0.743	0.929	0.186	0.027	0.027	0.013 0.023	0.011 0.021	0.044		
No. of cigarettes	35	28	6.543	3.714	2.829	0.080	0.082	0.043 0.057	0.035 0.049	0.140		
	Lifestyles: Diet and Physical Activity at 40 y.o. - Females											
Physical activity	22	24	0.045	0.375	0.330	0.003	0.003	0.002 0.005	0.002 0.012	0.004		
Healthy Diet	22	24	0.227	0.375	0.148	0.143	0.144	0.238 0.238	0.283 0.283	0.566		
	Lifestyles: Drinking at 27 y.o. - Females											
Not a frequent drinker	22	25	0.773	0.880	0.107	0.169	0.193	0.004 0.019	0.015 0.028	0.030		
Alcohol consumption	22	25	3.818	3.200	0.618	0.314	0.320	0.085 0.085	0.094 0.094	0.188		
	Lifestyles: Drinking at 40 y.o. - Females											
Not a frequent drinker	22	23	0.909	0.870	0.040	0.659	0.663	0.600 0.600	0.698 0.698	1.000		
Alcohol consumption	22	23	4.227	2.826	1.401	0.248	0.256	0.406 0.406	0.467 0.469	0.920		

Notes: This table presents the inference results for selected outcomes of the Perry Intervention. The columns present the following information: (1) describes the variable of interest; (2) displays the sample size for the control group; (3) displays the sample size for the treatment group; (4) displays the control mean; (5) displays the treatment mean; (6) displays the unconditional difference in means between treatment and control groups (absolute value); (7) displays the asymptotic *p*-value for the one-sided single hypothesis based on the *t*-statistic associated with the unconditional difference in means. The remaining columns present permutation *p*-values based on 30,000 draws. (8) displays the single hypothesis one-sided naive permutation *p*-value (by naive we mean based on an unconstrained permutation scheme); (9) displays the one-sided single hypothesis constrained permutation *p*-value based on the *t*-statistic associated with the difference in means between treatment groups (by constrained permutation we mean that permutations are done within strata defined by the pre-program variables used in the randomization protocol: gender, cohort indicator, the median of the cultural deprivation scale, child IQ at entry and mother employment status. More specifically, we simulate the pairwise matching defined in the randomization protocol using these variables and permute the treatment status within matched participants). (10) displays the multiple hypothesis testing (step-down) *p*-values associated with (9). The multiple hypothesis testing is applied to blocks of outcomes indicated by horizontal lines. (11) displays the one-sided single hypothesis constrained permutation *p*-value based on the IPW (Inverse Probability Weighting) *t*-statistic associated with the difference in means between treatment groups. Probabilities of IPW are estimated using the following variables: gender, presence of the father in the home at entry, cultural deprivation scale, child IQ at entry (Stanford-Binet), number of siblings and maternal employment status. (12) displays the multiple hypothesis testing (stepdown) *p*-values associated with (11). The multiple hypothesis testing is applied to block of outcomes indicated by horizontal lines. (13) displays the Bonferroni *p*-value= $m \times p_{IPW}$, where p_{IPW} is the unadjusted *p*-value in col. (11) and m is the number of hypotheses to test in the block.

Ctr. or C=Control; Treat. or T=Treatment; M.=Mean; Ms.=Means; Diff.=Difference; Asy.=Asymptotic; Blk.=Block; Per.=Permutation; *p*-val.=*p*-value; S.D.=Stepdown; y.o.=years old; IPW=Inverse Probability Weighting; Bonf.=Bonferroni.

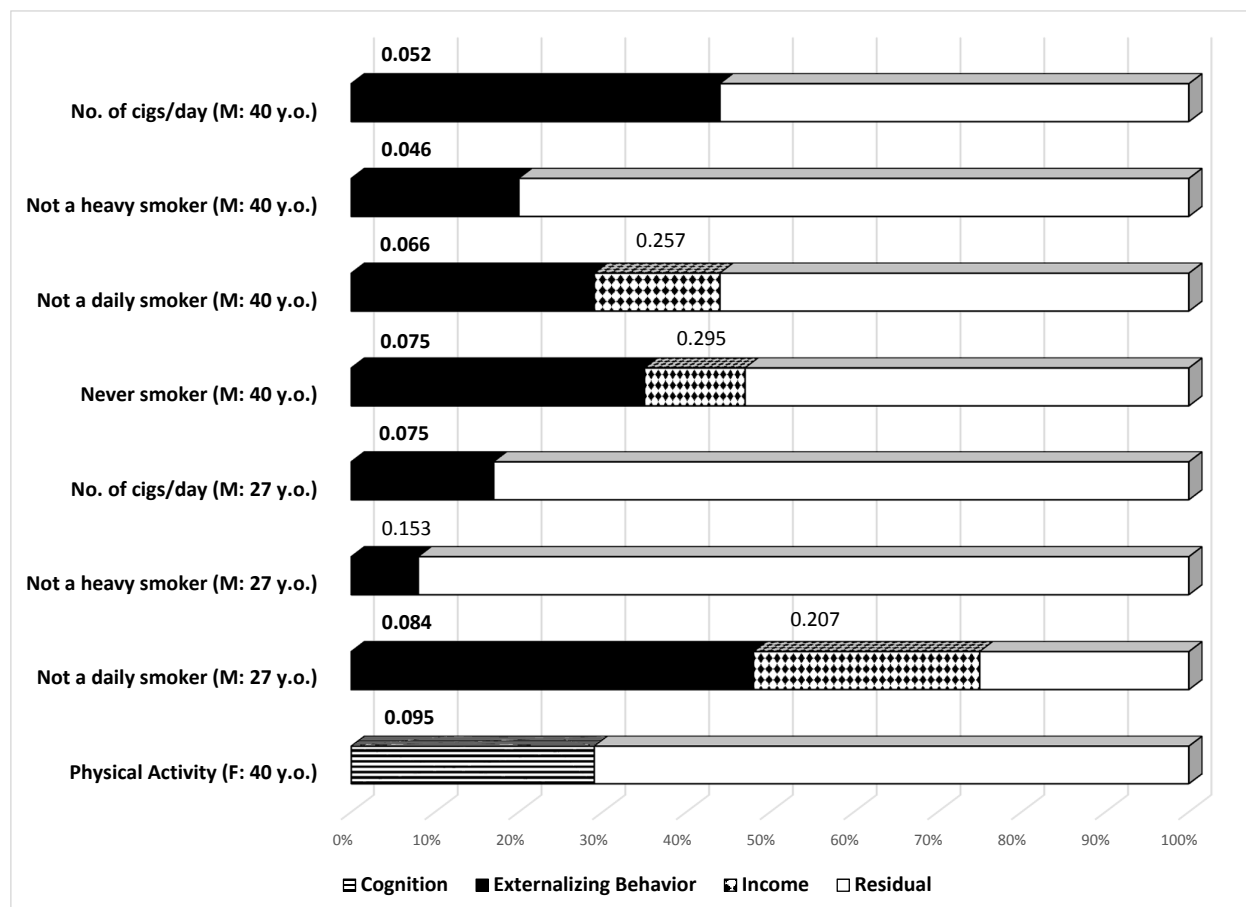
Table 5: Inference Results: Abecedarian Intervention

Variable	# C	# T	Ctr. M.	Treat. M.	Diff. Ms.	Asy. <i>p</i> -val.	Naive <i>p</i> -val.	Blk. Per. <i>p</i> -val. S.D.	Blk. IPW P. <i>p</i> -val. S.D.	Bonf. <i>p</i> -val.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Physical Health in the 30s - Males											
Measured weight	9	18	100.6	93.80	6.850	0.242	0.274	0.320 0.320	0.154 0.303	0.462		
Measured height	9	18	1.739	1.790	0.050	0.044	0.061	0.083 0.187	0.215 0.215	0.645		
BMI	8	18	33.29	29.22	4.075	0.076	0.108	0.141 0.175	0.093 0.204	0.279		
Overweight (BMI≥25)	8	18	0.750	0.722	0.028	0.444	0.455	0.391 0.466	0.234 0.234	0.468		
Obese (BMI≥30)	8	18	0.625	0.556	0.069	0.376	0.378	0.448 0.448	0.227 0.335	0.454		
Diastolic blood pressure	9	19	92.00	78.53	13.47	0.017	0.046	0.075 0.075	0.025 0.025	0.050		
Systolic blood pressure	9	19	143.3	125.8	17.54	0.022	0.059	0.057 0.085	0.019 0.031	0.038		
Hypertension I	9	19	0.444	0.105	0.339	0.019	0.043	0.063 0.063	0.010 0.018	0.020		
Hypertension II	9	19	0.556	0.211	0.345	0.033	0.049	0.061 0.095	0.037 0.037	0.074		
	Health Insurance at 30 y.o. - Males											
Health care coverage	21	27	0.476	0.704	0.228	0.057	0.062	0.080 0.080	0.040 0.040	0.080		
Employer-provided/bought	21	27	0.333	0.444	0.296	0.021	0.018	0.034 0.048	0.035 0.055	0.070		
	Demand for Health Care in the 30s - Males											
Hospitalized	9	19	0.556	0.211	0.345	0.033	0.039	0.042 0.042	0.100 0.100	0.200		
Scheduled treatment/exam	21	27	0.476	0.222	0.254	0.033	0.040	0.026 0.051	0.043 0.080	0.086		
	Lifestyles: Diet and Physical Activity at 21 y.o. - Females											
Physical activity	28	25	0.071	0.320	0.249	0.010	0.013	0.009 0.009	0.004 0.004	0.008		
# Fruit servings	28	25	0.286	0.800	0.514	0.005	0.009	0.002 0.004	0.003 0.006	0.006		
	Lifestyles: Drinking at 30 y.o. - Females											
Not a frequent drinker	28	25	0.857	0.880	0.023	0.405	0.414	0.493 0.586	0.547 0.547	1.000		
Alcohol consumption	28	25	3.536	3.180	0.356	0.422	0.430	0.536 0.536	0.516 0.586	1.000		
Age of onset < 17	28	25	0.571	0.280	0.291	0.016	0.018	0.023 0.061	0.009 0.023	0.018		

Notes: This table presents the inference results for selected outcomes of the Abecedarian Intervention. The columns present the following information: (1) describes the variable of interest; (2) displays the sample size for the control group; (3) displays the sample size for the treatment group; (4) displays the control mean; (5) displays the treatment mean; (6) displays the unconditional difference in means between treatment and control groups (absolute value); (7) displays the asymptotic *p*-value for the one-sided single hypothesis based on the *t*-statistic associated with the unconditional difference in means. The remaining columns present permutation *p*-values based on 30,000 draws. (8) displays the single hypothesis one-sided naive permutation *p*-value (by naive we mean based on an unconstrained permutation scheme); (9) displays the one-sided single hypothesis constrained permutation *p*-value based on the *t*-statistic associated with the difference in means between treatment groups (by constrained permutation we mean that permutations are done within strata defined by the pre-program variables used in the randomization protocol: gender, cohort indicator, number of siblings, high risk index at birth, and mother WAIS full IQ score. More specifically, we simulate the pairwise matching defined in the randomization protocol using these variables and permute the treatment status within matched participants). (10) displays the multiple hypothesis testing (stepdown) *p*-values associated with (9). The multiple hypothesis testing is applied to blocks of outcomes indicated by horizontal lines. (11) displays the one-sided single hypothesis constrained permutation *p*-value based on the IPW (Inverse Probability Weighting) *t*-statistic associated with the difference in means between treatment groups. Probabilities of IPW are estimated using gender- and wave-specific covariates. See [Campbell et al. \(2014\)](#) for details. (12) displays the multiple hypothesis testing (stepdown) *p*-values associated with (11). The multiple hypothesis testing is applied to block of outcomes indicated by horizontal lines. (13) displays the Bonferroni *p*-value= $m \times p_{IPW}$, where p_{IPW} is the unadjusted *p*-value in col. (11) and m is the number of hypotheses to test in the block.

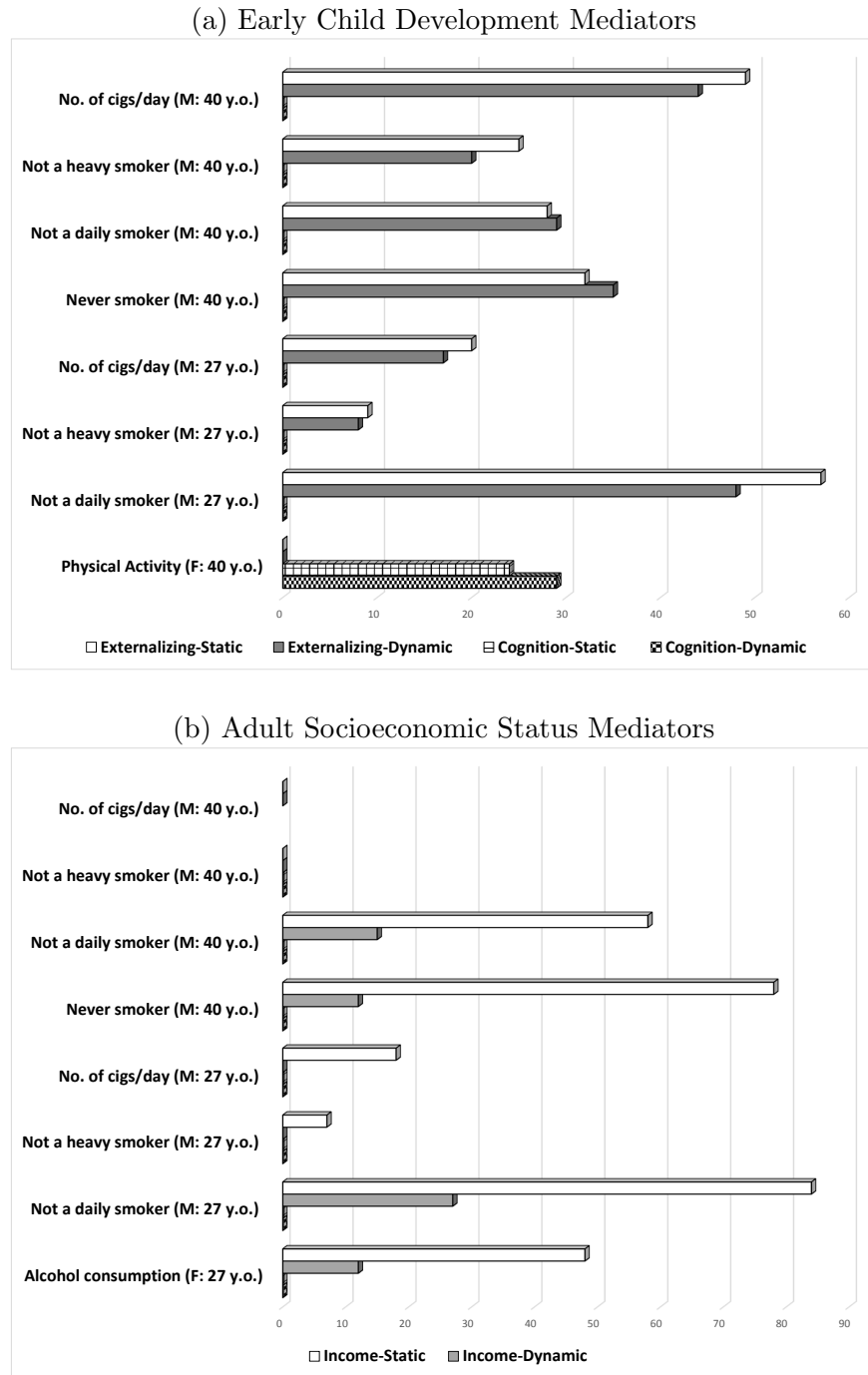
Ctr. or C=Control; Treat. or T=Treatment; M.=Mean; Ms.=Means; Diff.=Difference; Asy.=Asymptotic; Blk.=Block; Per.=Permutation; *p*-val.=*p*-value; S.D.=Stepdown; y.o.=years old; IPW=Inverse Probability Weighting; Bonf.=Bonferroni.

Figure 3: PPP Dynamic Mediation Analysis of Treatment Effects on Male Outcomes



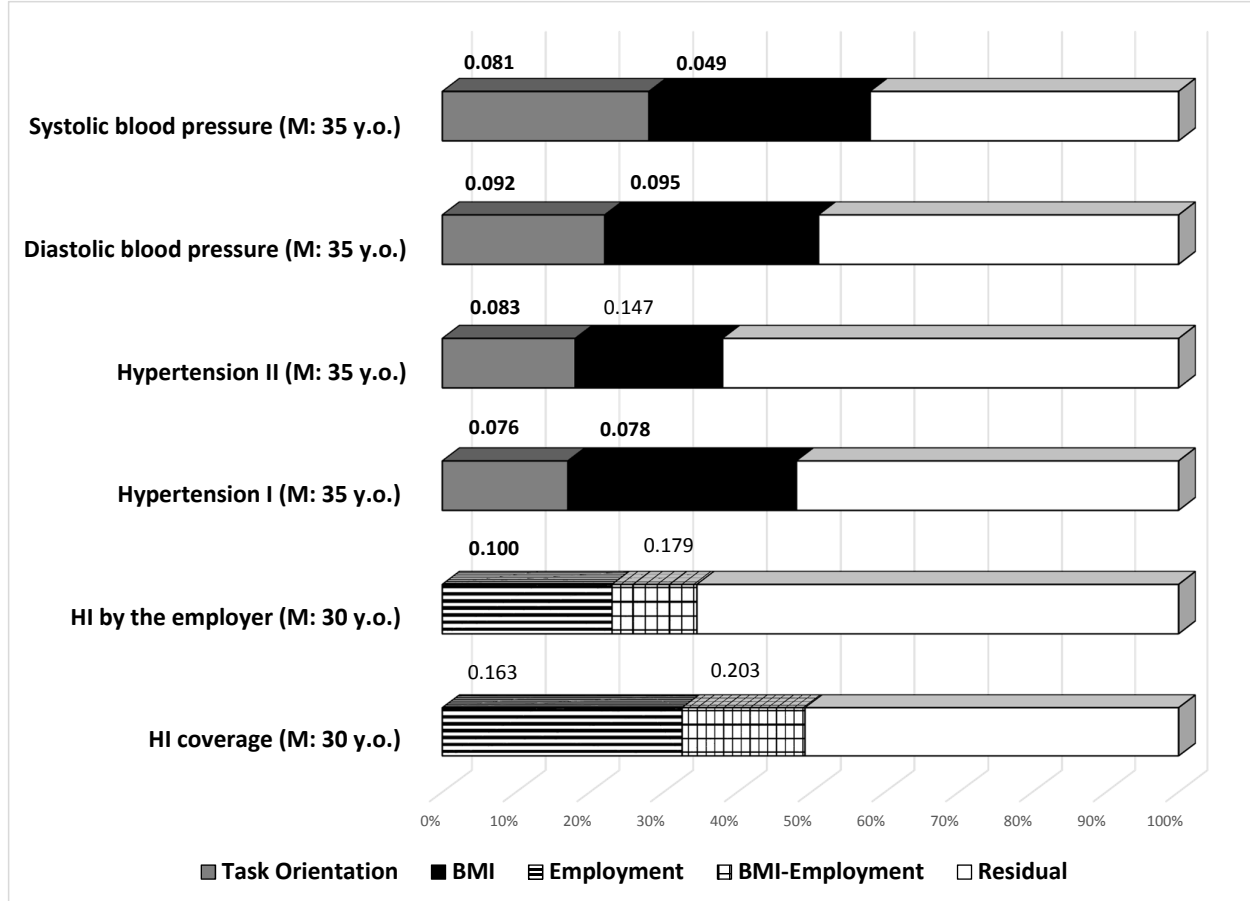
Notes: This graph provides a simplified representation of the results of the dynamic mediation analysis of the statistically significant outcomes for the PPP intervention. Each bar represents the total treatment effect normalized to 100%. One-sided p -values that test if the share is statistically significantly different from zero are shown above each component of the decomposition. The mediators displayed are: externalizing behavior, as in Heckman *et al.* (2013) among the early childhood inputs; and income as in Heckman *et al.* (2010) among the adult inputs. The complete mediation results are reported in Tables 2 and 3 in the Web Appendix. The definition of each outcome is reported in Section 3 of the Web Appendix. The sample the outcomes refer to (M = males; F = females) and the age at which they have been measured (y.o. = years old) are shown in parentheses to the left of each bar, after the description of the variable of interest. ***: significant at the 1 percent level; **: significant at the 5 percent level; *: significant at the 10 percent level.

Figure 4: PPP: Static versus Dynamic Mediation Analysis of Treatment Effects on Statistically Significant Male and Female Outcomes



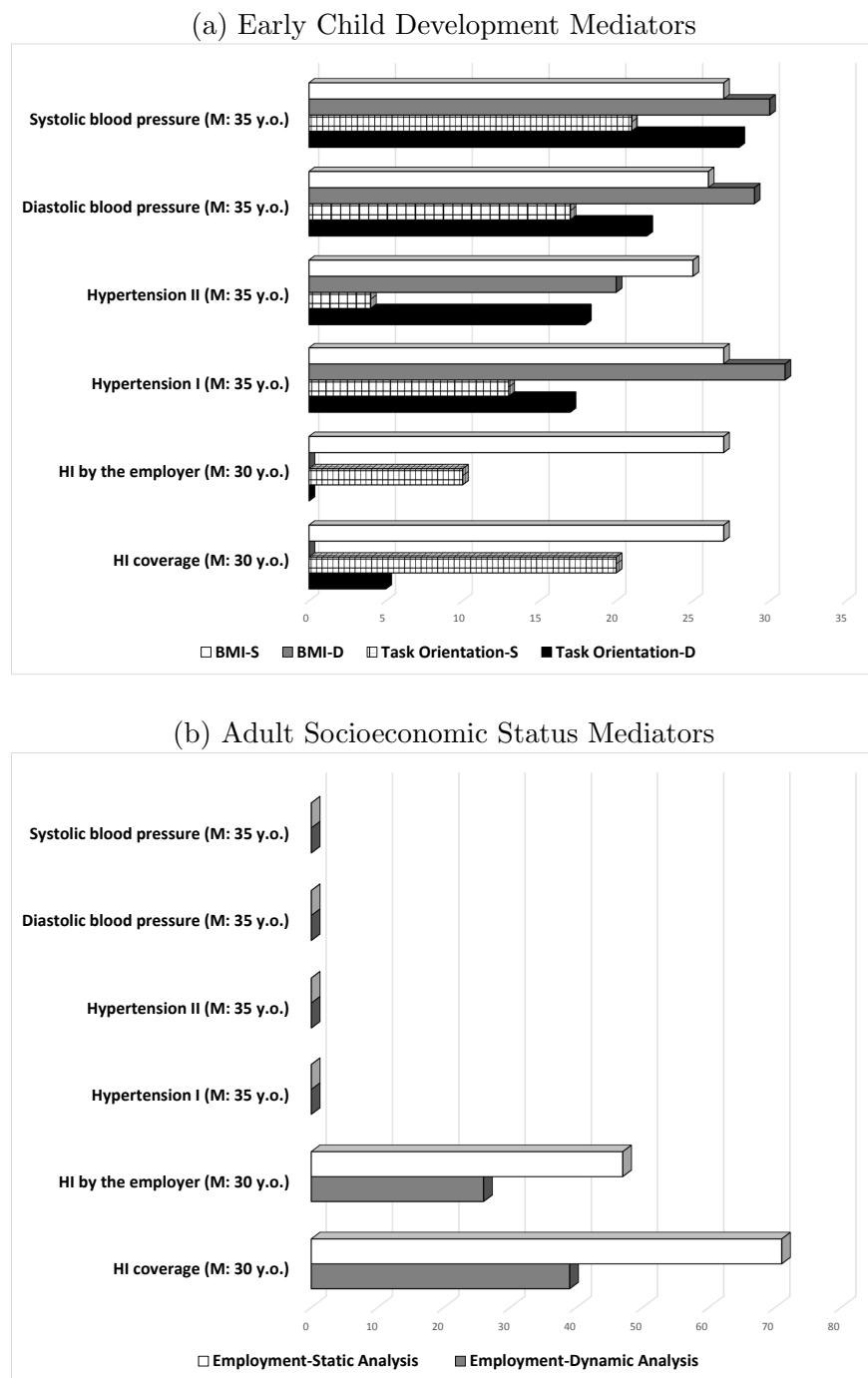
Notes: This figure consists of two panels. Each panel compares the decomposition obtained from using the childhood (a) or adult (b) mediators alone (static) and the effects when both are used together (dynamic) for the results of the statistically significant outcomes for the PPP intervention. For each outcome and mediator, the lighter-colored bars display the static mediation analysis results, while the darker-colored bars display the dynamic mediation analysis results (as shown in Figure 3). Complete mediation results are reported in Tables 2, 3 and 4 in the Web Appendix. The definition of each outcome is reported in Section 3 of the Web Appendix. The sample the outcomes refer to (M = males; F = females) and the age at which they have been measured (y.o. = years old) are shown in parentheses to the left of each bar, after the description of the variable of interest. S=static mediation analysis; D=dynamic mediation analysis.

Figure 5: ABC Dynamic Mediation Analysis of Treatment Effects on Outcomes for Males



Notes: This graph provides a simplified representation of the results of the dynamic mediation analysis of the statistically significant outcomes for the ABC intervention. Each bar represents the total treatment effect normalized to 100%. One-sided p -values that test if the share is statistically significantly different from zero are shown above each component of the decomposition. The mediators displayed are: task orientation as in [Burchinal *et al.* \(1997\)](#) and BMI as in [Campbell *et al.* \(2014\)](#) among the early childhood inputs; and employment as in [García *et al.* \(2014\)](#) among the adult inputs. The complete mediation results are reported in Table 5 in the Web Appendix. The definition of each outcome is reported in Section 3 of the Web Appendix. The sample refers to males and the age at which they have been measured (y.o. = years old) are shown in parentheses to the left of each bar, after the description of the variable of interest (HI=Health Insurance). BMI-Employment is the share of the treatment effect which can be attributed to the indirect effect of experimentally induced changes in BMI affecting health insurance coverage through its impact on employment (see equation 12). ***: significant at the 1 percent level; **: significant at the 5 percent level; *: significant at the 10 percent level.

Figure 6: ABC: Static (S) versus Dynamic (D) Mediation Analysis of Treatment Effects on Outcomes for Males



Notes: This figure is comprised of two panels. Each panel provides a simplified representation of the results of the static and of the dynamic mediation analyses of the statistically significant outcomes for the ABC intervention, respectively by comparing the results for the early child development mediators task orientation and BMI (panel (a)) and for the adult socioeconomic input employment (panel (b)). For each outcome and mediator, the lighter-colored bars display the static mediation analysis results, while the darker-colored bars display the dynamic mediation analysis results (as shown in Figure 5). The complete mediation results are reported in Tables 5 and 6 in the Web Appendix. The definition of each outcome is reported in Section 3 of the Web Appendix. The sample is for males and the age at which outcomes have been measured (y.o. = years old) are shown in parentheses, to the left of each bar, after the description of the variable of interest. The term BMI-Employment in Figure 5 does not appear here since the static mediation analyses do not account for the indirect effects of early inputs affecting health outcomes through their impacts on late inputs. S=static mediation analysis; D=dynamic mediation analysis.

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