



## Oregon Childhood Program Participation and Early-Educational Outcomes: *Part 3- Associations Between Program Participation and Outcomes*

### Methods Summary

## Table of Contents

Introduction.....	3
Methods.....	3
Program Group Pairings .....	3
Study Cohorts.....	4
Pair 1: Medicaid/CHIP + Public Preschool .....	5
Pair 2: Medicaid/CHIP + Disability Services .....	5
Pair 3: Medicaid/CHIP + Home Visiting.....	6
Outcomes .....	8
Covariates.....	10
Use of Race and Ethnicity Data Across OCID Data Sources.....	11
Modelling Approach .....	11
Study Limitations.....	12
Acknowledgements .....	14
Appendix A: ICD-9 Diagnosis Codes for Identifying EI/ECSE-Qualifying Conditions.....	15

## Introduction

The inaugural analyses for the Oregon Child Integrated Dataset (OCID) examines relationships between participation in select public early-childhood programs and subsequent early-educational outcomes through 3 interconnected components. [Part 3 - Associations Between Program Participation and Outcomes](#) first examines whether participation in certain pairings of public programs is associated with improved early-educational outcomes. Then, the analysis looks at whether these associations are different among children or families with certain characteristics. This summary provides technical documentation of the analysis methods for *Part 3*. The findings from this analysis, as well as more information on the OCID project, are available on the OCID website ([www.oid-cebp.org](http://www.oid-cebp.org)).

*The Center for Health System Effectiveness conducted this analysis in partnership with the Center for Evidence-based Policy, both at Oregon Health & Science University, Portland, OR.*

## Methods

### Program Group Pairings

These analyses focused on combined receipt of Medicaid/Children’s Health Insurance Program (CHIP) and services through 3 additional programs groups:

- Medicaid/CHIP + Public Preschool
- Medicaid/CHIP + Disability Services
- Medicaid/CHIP + Home Visiting

Each program grouping contained one or more individual programs, consistent with the groupings in [Part 1](#) of OCID’s first analysis, which examined patterns of early-childhood program participation. Table 1 describes the individual program(s) that comprise each program grouping.

Table 1. Program Grouping Descriptions

PROGRAM GROUPING	PROGRAM (STATE AGENCY)
Medicaid/CHIP	<b>Medicaid/CHIP (OHA)</b> – Medicaid and the Children’s Health Insurance Program (CHIP) are federal/state partnerships to provide free or low-cost health care coverage for people with low incomes who also meet other eligibility requirements. Oregon’s programs are called the Oregon Health Plan. Please visit the <a href="#">Oregon Health Plan</a> website for additional information.
Public Preschool	<b>Head Start/Oregon Pre-kindergarten (ODE)</b> – Head Start is a federally-funded program for children ages birth to 5 years old from families with low-incomes. Service models depend on the needs of the local community and can be based in centers, schools, child care centers, or family child care homes. Models typically include components of preschool and early childhood development, child health/mental health and nutrition, and parent education and family support. Oregon Pre-kindergarten (OPK) is a state-funded program that partners with Head Start to offer services in all 36 of Oregon’s counties.

	<p>For more information on both programs, please visit the <a href="#">Early Learning Division's</a> website.</p>
Disability Services	<p><b>Early Intervention (ODE)</b> – This program provides services for preschool children with disabilities, from birth to age 3. The program is designed to meet family needs and to support the development of the child, including physical, cognitive, communication, social/emotional, and adaptive. For more information, please visit the <a href="#">Department of Education's</a> website.</p> <p><b>Early Childhood Special Education (ODE)</b> – This program provides specially designed instruction to meet the unique needs of preschool children with a disability, from age 3 until kindergarten eligibility. For more information, please visit the <a href="#">Department of Education's</a> website.</p>
Home Visiting	<p><b>Babies First!/Maternity Care Management (OHA)</b> – Babies First! is a home visiting program for pregnant women and children under age 4 that promotes health and well-being through early childhood. Eligibility is based on risk factors for pregnant women or their children including chronic health conditions, pregnancy complications, inadequate resources, and risks for growth and developmental delays. Originally administered as a distinct program, Maternity Case Management offered expanded perinatal services to include management of health, economic, social and nutritional factors through the end of pregnancy and 2 month postpartum period. Services have since been integrated into current Babies First! program offerings. Please visit the Oregon Health Authority Public Health Division's <a href="#">Babies First! manual</a> for more information.</p> <p><b>Healthy Families Oregon (ELD)</b> – This program targets high-risk families to provide supports to parent(s) and children by cultivating the growth of nurturing, responsive parent-child relationships and promoting healthy childhood growth and development. Services are offered until a child's 3<sup>rd</sup> birthday, and beyond as needed for a transition period. For more information, visit the <a href="#">Oregon Learning Division's</a> website.</p>

Abbreviations. ELD: Early Learning Division; ODE: Oregon Department of Education; OHA: Oregon Health Authority.

## Study Cohorts

The population for these analyses included 3 unique (but potentially overlapping) cohorts of children, defined separately for each program group pairing. The following steps were used to identify each cohort:

1. Start with children born in Oregon during 2008 to 2010. Study cohorts originated with children born to an Oregon resident mother in 2008 to 2010. The 2008 lower limit corresponded with the first year of available robust administrative data for home visiting programs. The 2010 upper limit ensured children in our cohort were born early enough to observe their school outcomes through 3<sup>rd</sup> grade.
2. Focus on children consistently enrolled in Medicaid/CHIP. All 3 study cohorts were limited to children who received health supports through Medicaid/CHIP during early childhood. These analyses focused on children who received these supports on a “consistent” basis by requiring Medicaid/CHIP enrollment for at least 6 months during at least 3 of their first 5 years of life. By doing so, the analyses excluded, for example,

children whose births were covered by Medicaid, but who did not continue to receive benefits. This requirement had the added benefit of achieving a more homogenous population in terms of socioeconomic status. Figure 1 illustrates the application of these criteria in the context of a hypothetical child. In this example, the child met criteria to be included in the analysis in 3 years.

Figure 1. Application of Medicaid/CHIP Enrollment Criteria

AGE	ENROLLMENT	≥6 MONTHS?
0-11 months	2 months	✗
12-23 months	6 months	✓
24-35 months	0 months	✗
36-47 months	9 months	✓
48-59 months	11 months	✓

Eligibility criteria met:  
Child was enrolled at least 6 months during 3 of their first 5 years of life.

3. Apply eligibility criteria for additional program type. Cohorts of children for each of the 3 program pairings were separately determined to ensure that the individuals in these analyses represented children who likely would have been eligible for the respective services. The ability to predict eligibility was limited to the observable data present in OCID.

#### Pair 1: Medicaid/CHIP + Public Preschool

The standard income eligibility for public preschool is up to the federal poverty level (FPL), however programs can enroll up to 20%, and in certain cases up to 35%, of children from families with higher incomes.<sup>1</sup> OCID does not include specific information on household incomes. For this analysis, all children with consistent enrollment in Medicaid/CHIP were assumed eligible for public preschool. This may create a cohort with a higher average income than typical for families enrolled in public preschool, because income eligibility for Medicaid and CHIP together is 300% FPL.

#### Pair 2: Medicaid/CHIP + Disability Services

Children with the following conditions can be eligible for Early Intervention (EI) services from birth to age 3 and/or Early Childhood Special Education (ECSE) services from ages 3 to 5:<sup>2</sup>

<sup>1</sup> Oregon Department of Education: Early Learning Division. Head Start and Oregon Pre-K faq. n.d. <https://oregonearlylearning.com/head-start-opk#faq>. Accessed February 4, 2021

<sup>2</sup> Oregon Legislature. Oregon revised statute, volume 9 education and culture, chapter 343 special education and other specialized education services, section 035 definitions for chapter. 2019; [https://www.oregonlegislature.gov/bills\\_laws/ors/ors343.html](https://www.oregonlegislature.gov/bills_laws/ors/ors343.html). Accessed March 11, 2020



- Autism Spectrum Disorder
- Emotional behavior
- Developmental delay
- Intellectual delay
- Learning disability
- Blindness/vision
- Deafness
- Speech/language
- Orthopedic
- Traumatic brain injury

This analysis estimated eligibility for EI/ECSE services based on associated medical diagnoses in the child's Medicaid claims history. See Appendix A for a full list of ICD-9 diagnostic codes used to identify qualifying conditions.

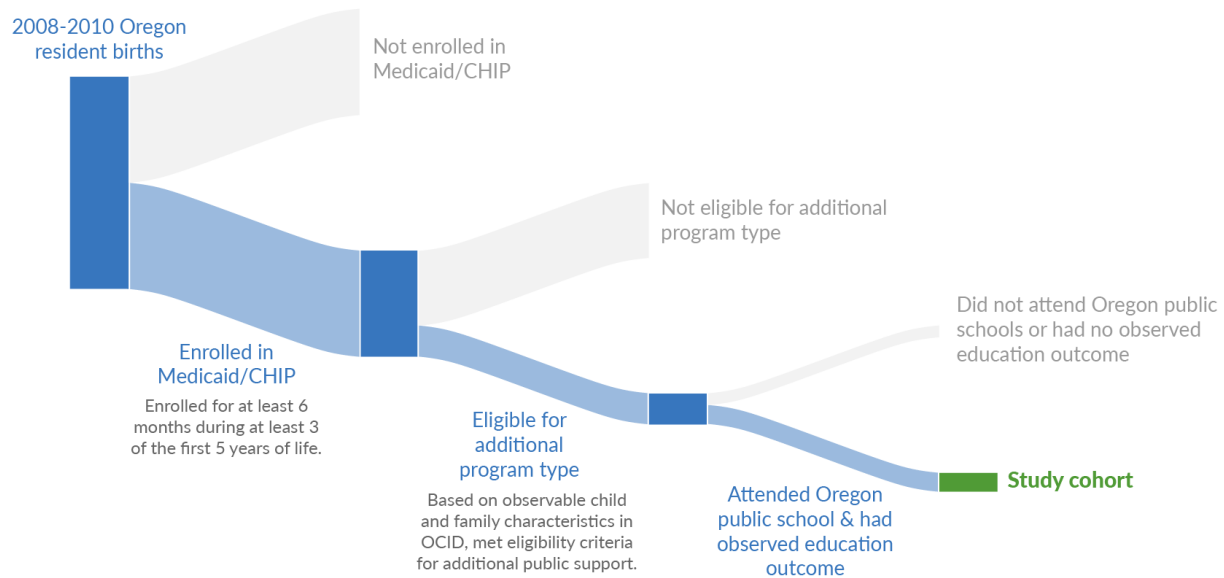
### Pair 3: Medicaid/CHIP + Home Visiting

Children and families can qualify for home visits through Babies First!/Maternity Case Management (BF/MCM) and Healthy Families Oregon (HFO) based on a wide range of personal characteristics and environmental circumstances. The following qualifying risk factors were observable in OCID and were used to select the cohort of children for this program pairing:

- Pregnant woman with chronic diabetes or hypertension
  - Pregnant woman with less than a high school education
  - Pregnant woman <20 years
  - Inadequate food resources (identified via enrollment in the Women, Infants, and Children [WIC] nutrition program)
  - Inadequate prenatal care (<5 visits)
  - Prenatal tobacco exposure
  - Infant who is very low birth weight (<1,500 grams), premature (<37 weeks' gestation), or small for gestational age (birth weight less than national 10th percentile, controlling for gestational age and sex)
4. Include children who attended Oregon public school and had observed outcome(s). This final inclusion criteria limited each cohort to children with an observed education outcome. Because OCID only includes education data from Oregon public schools, children who were home schooled or attended private school are not included. Additionally, some outcomes have unique business rules that might prevent the outcome from being observed or measured for a particular student. As a result, it was possible for a student to be included in the analysis of some outcomes, but not others.

Figure 2 illustrates the approach for constructing cohorts of children, described in Steps 1 through 4 above.

Figure 2. Steps for Identifying Study Cohorts



Concentrated validation efforts and conversations with agency and program staff established that eligibility was sufficiently captured for each program pairing. Figure 3 displays estimated eligibility for the additional program type, among children who received Medicaid/CHIP during early childhood, compared with actual participation in the additional program type. Study cohorts included children estimated to have been eligible for additional program services (“YES” column for estimated eligibility). Whether children actually received services or not determined their assignment to treatment and comparison groups, respectively.

The 1,049 children (Disability Services) and 413 children (Home Visiting) in the upper right cells of Figure 3 represent children who participated in the additional program type but were not estimated to be eligible for the program, based on the data available in OCID. For Disability Services, this might include children whose referral for services did not result in a medical diagnosis captured in Medicaid claims data. For Home Visiting, this might include, e.g., children born to mothers experiencing intimate partner violence or unstable housing. These children were not included in the analysis; nor were the 39,680 children (Disability Services) and 7,330 children (Home Visiting) in the lower right cells who were not estimated to be eligible and did not participate in the programs.

For all 3 programs, the 42,887 children (Public Preschool), 15,275 children (Disability Services) and 45,094 children (Home Visiting) in the lower left cells of Figure 3 represent children who were estimated to be eligible for program participation, but did not receive services. These yield

program participation rates of 32.1% (Public Preschool), 32.0% (Disability Services) and 18.7% (Home Visiting) among children estimated to be eligible for services. These rates mirror state agency estimates, suggesting a potential excess demand for program services as opposed to overestimating eligibility for this analysis.

Figure 3. Estimated Program Eligibility versus Actual Program Participation, Among Children Who Received Medicaid/CHIP

Public Preschool			Disability Services			Home Visiting					
		ESTIMATED ELIGIBILITY				ESTIMATED ELIGIBILITY					
		YES	NO			YES	NO				
ACTUAL PARTICIPATION	YES	<b>20,345</b>	N/A	ACTUAL PARTICIPATION	YES	<b>7,228</b>	1,049	ACTUAL PARTICIPATION	YES	<b>10,395</b>	413
	NO	<b>42,887</b>	N/A		NO	<b>15,275</b>	39,680		NO	<b>45,094</b>	7,330

Notes. Population includes Oregon public school children born to an Oregon resident in 2008-2010 with consistent receipt of Medicaid/CHIP in early childhood. Bolded values indicate children included our 3 study cohorts. The Public Preschool cohort did not incorporate program-specific eligibility criteria, since receipt of Medicaid/CHIP was assumed to serve as a reasonable proxy for eligibility.

## Outcomes

The majority of outcomes in these analyses were binary, meaning that a student either experienced the outcome or did not experience it. For example, a child might or might not have been chronically absent from school (i.e., missed 10% or more of instructional days), or might or might not have met grade-level reading standards.

In contrast, the 4 components of the Oregon Kindergarten Assessment (OKA) were reported on an interval scale. Approaches to Learning was measured along a continuum of 1 to 5, with higher scores representing teacher ratings of more advanced interpersonal skills, self-regulation, and approaches to learning. The Letter Names and Letter Sounds early literacy components assumed values between 0 to 100, representing the number of letters correctly named or sounded out during a timed 60-second trial. Early Math results were measured as the number of responses correctly verbalized or selected from a multiple choice response menu, for 16 items covering counting, simple addition and subtraction, and recognizing number patterns.<sup>3</sup> Table 2 provides detailed information about each outcome.

<sup>3</sup> Oregon Department of Education, Office of Learning, Instruction, Standards, Assessment & Accountability Unit. Oregon kindergarten assessment specifications 2015-2016. 2015; [https://www.ode.state.or.us/wma/teachlearn/testing/dev/testspecs/archive/asmtkatestspecs\\_1516.pdf](https://www.ode.state.or.us/wma/teachlearn/testing/dev/testspecs/archive/asmtkatestspecs_1516.pdf) Accessed November 6, 2020.



Table 2. Overview of Examined Education Outcomes

DOMAIN	OUTCOME	SPECIFICATION
<b>ATTENDANCE</b>		
	Chronic Absenteeism	Students who are absent 10% or more of school days during an academic year. Students must be enrolled for at least 75 instructional days in an academic year to be included in the measure, consistent with Oregon Department of Education business rules. In the event of school transfers, present and absent days are summed across enrollment segments. This was a binary outcome; children either had regular attendance or did not.
	Severe Chronic Absenteeism	Students who are absent 20% or more of school days during an academic year. Students must be enrolled for at least 75 instructional days in an academic year to be included in the measure, consistent with Oregon Department of Education business rules. In the event of school transfers, present and absent days are summed across enrollment segments. This was a binary outcome; children either had regular attendance or did not.
<b>ASSESSMENTS</b>		
	OKA: Approaches to Learning	Teacher-rated kindergarten Approaches to Learning is measured along a development continuum from 1 to 5, with higher scores representing a more advanced demonstration of interpersonal skills, self-regulation, and approaches to learning. This and the other 3 OKA components are the only outcomes measured on a continuous scale, in this study.
	OKA: Letter Names	Letter Names is scored between 0 to 100, representing the number of uppercase and lowercase letters correctly named during a timed 60-second trial. This component has since been split into separate uppercase and lowercase sub-components. This and the other 3 OKA components are the only outcomes measured on a continuous scale, in this study.
	OKA: Letter Sounds	Letter Sounds is scored between 0 to 100, representing the number of individual letters and letter combinations correctly pronounced during a timed 60-second trial. This and the other 3 OKA components are the only outcomes measured on a continuous scale, in this study.
	OKA: Math Concepts	Early Math results are measured as the number of responses correctly verbalized or selected from a multiple choice menu, for 16 items that include counting, simple addition and subtraction, and recognizing number patterns. This and the other 3 OKA components are the only outcomes measured on a continuous scale, in this study.
	3 <sup>rd</sup> Grade Reading Comprehension	Students who meet or exceed grade-level reading standards. During the time frame of this study, these thresholds correspond to achievement of level 3 (“meets”) or level 4 (“exceeds”) on the Oregon Smarter Balanced Assessment. This was a binary outcome; children either met/exceeded grade-level reading standards or did not.
	3 <sup>rd</sup> Grade Math	Students who meet or exceed grade-level math standards. During the time frame of this study, these thresholds correspond to achievement of level 3 (“meets”) or level 4 (“exceeds”) on the Oregon Smarter Balanced Assessment. This was a binary outcome; children either met/exceeded grade-level reading standards or did not.



DOMAIN	OUTCOME	SPECIFICATION
<b>DISCIPLINE</b>		
	School Suspensions	Students who are suspended one or more times during the school year. Includes in-school and out-of-school suspensions. This was a binary outcome; children were either suspended or were not.
<b>HOUSING</b>		
	Student Homelessness	Students who are determined to be McKinney-Vento eligible for any duration of an academic year. This designation includes several living situations: Shared housing (“doubled up”); Shelter; Motel/hotel; and Unsheltered. This was a binary outcome; children either experienced homelessness or did not.

## Covariates

This analysis controlled for a variety of child characteristics (i.e., sex and race/ethnicity), birth characteristics (i.e., year of birth, birth weight, estimated gestation, prenatal tobacco use, and geography), family characteristics (i.e., mother’s age and education at the time of the child’s birth), and contacts with state programs during early childhood (i.e., enrollment in Medicaid/CHIP, Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), various forms of maltreatment substantiated by Oregon Child Welfare, and foster care placements). See the following subsection for more detailed information on OCID’s current approach and use of race/ethnicity.

The duration and timing of participation in state programs were controlled for by creating indicators for each 12-month period in the first 5 years of life for enrollment in Medicaid/CHIP, SNAP, and TANF and foster care involvement. When assessing differences by child and family participant, SNAP and TANF participation was aggregated and indicators of “consistent participation” were used, defined as at least 6 months of enrollment in at least 3 of the first 5 years of life. Substantiated maltreatment and foster care participation were also aggregated into 2 binary variables to represent whether either occurred at any point during the first 5 years of life.

Additional covariates were added for 2 program pair models. For the model that investigated Medicaid/CHIP and disability services, we included covariates to indicate the presence of specific qualifying conditions (e.g., developmental delay, blindness/vision impairment). For the Medicaid/CHIP and home visiting model, covariates were included that represented which characteristics were used to predict eligibility (e.g., multiple births, maternal chronic health conditions).

Covariates identifying students who were English Learners and who participated in an Individualized Education Program/Individual Family Service Plan (IEP/IFSP) were included in outcome models, but not propensity score models. The use of these covariates were restricted because these characteristics would not have been known prior to school enrollment, when program eligibility would have been determined.



## Use of Race and Ethnicity Data Across OCID Data Sources

Assigning a race and ethnicity to individuals when there are multiple sources of information across integrated datasets such as OCID is an evolving area of development. Inconsistencies across and within agencies pre-existed OCID in terms of data sources for race and ethnicity information, how agencies collected the data, which categories were available on enrollment and administrative forms, and who responded on behalf of the children for whom there is information. Therefore, the OCID team has been working with state partners to develop a methodology for determining race and ethnicity attributions when there are multiple options within and across points in time. The initial methodology is incorporated in all 3 components of this OCID Analysis. More information on the calculations can be found in the [technical dictionary](#) on the OCID website.

OCID uses race and ethnicity information in dashboards and analyses to describe disparities in outcomes among groups of individuals living in Oregon. Any association between race and ethnicity and outcomes does not imply that the social constructs of race and ethnicity caused that outcome or that there is a biological basis for differences between groups. Personal characteristics such as race and ethnicity often serve as proxies for experiences that are associated with different outcomes for subgroups, such as systemic racism, stress, poverty, or housing instability.

## Modelling Approach

For each outcome, our analysis calculated the average treatment effect corresponding to layered program participation (Medicaid/CHIP and an additional program grouping), while controlling for observed child and family characteristics. In particular, we reported the average treatment effect on the treated group (ATT), which represents the change in the outcome associated with participating in the additional program grouping, among children who received both types of services.

ATTs in this analysis were modelled using Causal Forests, an extension of Random Forests. This is a statistical approach particularly well-suited for high-dimensional data with complicated relationships between variables, and that can accommodate missing covariate values. Analysis methods were “doubly-robust” because the likelihood of participation in the additional program grouping (“propensity score”) was estimated first, and then the association between that participation and the outcome was also estimated. This approach yields more accurate (i.e., less biased) results than other common modelling approaches.<sup>4</sup> Models were clustered at the school level to control for correlation in student outcomes between children attending the same school.

For each program pairing and educational outcome, the analysis then modelled a regression tree on the estimated child-level conditional treatment effects. In this context, “conditional” refers to the fact that the estimated treatment effect is adjusted for the observed characteristics of a

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<sup>4</sup> McConnell KJ, Lindner S. Estimating treatment effects with machine learning. *Health Serv Res.* 2019;54(6):1273-1282. doi: 10.1111/1475-6773.13212.

particular child. 80% of the study cohort was used as a training set to grow the trees, and the remaining 20% as a test set to assess/refine the trees. This is standard practice to avoid “overfitting” the trees to the observed data, and helps to maximize the generalizability of our results. The first “split” in the resulting trees identified the child or family characteristic that explained the greatest variation in the outcome, associated with dual-program participation.

All analyses were performed using R, version 3.6.2.<sup>5</sup> In particular, this analysis leveraged the R package “grf,” version 1.2.0, and the “rpart” package, version 4.1-15.<sup>6</sup>

### Study Limitations

This analysis is subject to a number of limitations, including:

- Results rely on the accuracy and availability of administrative data, which were not collected for the purposes of conducting this analysis.
- When assessing family characteristics, children are linked to the parents identified on their birth record; these parents might not be the residential or legal guardians of the child.
- Our ability to determine program eligibility was limited by the observable data in OCID; thus, our analysis excludes potentially eligible children if their eligibility for the program(s) was based solely on factors not represented in OCID data. For Disability Services, this might include children whose referral for services did not result in a medical diagnosis captured in Medicaid claims data. For Home Visiting, this might include, e.g., children born to mothers experiencing intimate partner violence or unstable housing.
- Our results might obscure the benefits of participation in a given individual program, since our counterfactual (comparison population) is composed of children receiving services through at least one additional program (Medicaid/CHIP). In other words, participation in a given program might be positively associated with education outcomes, but those benefits might not be evident from our results if receipt of health supports yielded similar benefits.
- Unmeasured factors (e.g., environmental, societal) that are not accounted for in this analyses might help explain an outcome of interest (i.e., residual confounding). Our modelling approach aims to mitigate the bias of these unmeasured factors.
- Although this analysis features a variety of key early education outcomes, it does not account for the full complexity of student achievement or well-being.
- Some of outcomes rely on subjective ratings of student abilities (e.g., Kindergarten Approaches to Learning) and behaviors (e.g., School Suspensions). Use of school-level clusters did not adjust for correlation among outcomes driven by a particular individual (e.g., teacher or principal).
- This analysis is limited to children that were born to Oregon residents, because the OCID population is anchored to Oregon birth records. This dataset structure allowed us to examine

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<sup>5</sup> R Core Team. R: A language and environment for statistical computing. *R Foundation for Statistical Computing*. 2020; [www.R-project.org/](http://www.R-project.org/). Accessed December 2, 2020.

<sup>6</sup> Tibshirani J, Athey S, Friedberg R, et al. Generalized random forest. 2018; <https://github.com/grf-labs/grf>. Accessed August 19, 2020.



associations between circumstances at birth and early-life educational outcomes but prevented inclusion of Oregon public school students that were born out-of-state. The OCID population includes approximately three-quarters of all enrolled Oregon public school students, although this completeness varies by demographic characteristics (e.g., sex, race/ethnicity, and age-grade-level).<sup>7</sup> Additionally, OCID does not include education information for students who are homeschooled or attend private schools, so the cohort was limited to students who attended Oregon public schools.

- Results indicate associations between exposures and outcomes, but do not identify causal relationships or pathways. Furthermore, associated effects of risk and protective factors do not indicate how to intervene, or whether existing intervention is effective.
- This analysis included multiple statistical tests. Through sequential testing of each (outcome, exposure) pair, the probability of falsely identifying an association as significant increases.

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<sup>7</sup> Center for Evidence-based Policy. Explore the OCID population. 2020; <https://www.oid-cebp.org/about-oid/explore-oid/>. Accessed August 26, 2020.



## Acknowledgements

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TAP members included:

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## Appendix A: ICD-9 Diagnosis Codes for Identifying EI/ECSE-Qualifying Conditions

The diagnosis codes in Table A1 were compiled by linking EI/ECSE qualifying condition categories with related ICD-9 diagnostic codes as identified by McDermott et al.<sup>8</sup> (for intellectual disabilities) and the Agency for Healthcare Research and Quality’s (AHRQ) Clinic Classifications Software<sup>9</sup> (CCS) for ICD-9-CM (other conditions).

**Table A1. ICD-9 Diagnosis Codes for Identifying EI/ECSE-Qualifying Conditions**

CONDITION	ICD-9 DIAGNOSIS CODE	ICD-9 DIAGNOSIS DESCRIPTION
Autism Spectrum Disorder	2990	Autistic Disorder
Autism Spectrum Disorder	29901	Infantile Autism-Resid
Autism Spectrum Disorder	29900	Infantile Autism-Active
Deafness	38802	Trans Ischemic Deafness
Deafness	3897	Deaf Mutism Nec
Developmental delay	V401	Problems With Communication
Developmental delay	31535	Chldhd Onset Flncy Disor (Begin 2010)
Developmental delay	3079	Special Symptom Necnos
Developmental delay	31501	Alexia
Developmental delay	31509	Reading Disorder Nec
Developmental delay	3151	Arithmetical Disorder
Developmental delay	317	Mild Mental Retardation
Developmental delay	319	-Mental Retardation Nos-
Developmental delay	31502	Developmental Dyslexia
Developmental delay	31500	Reading Disorder Nos
Developmental delay	3180	Mod Mental Retardation
Developmental delay	V400	Problems With Learning
Developmental delay	3182	Profound Mental Retardat
Developmental delay	3181	Severe Mental Retardat
Developmental delay	3070	Stammering & Stuttering
Developmental delay	3152	Oth Learning Difficulty
Developmental delay	31534	Speech Del D/T Hear Loss (Begin 2007)

<sup>8</sup> McDermott S, Royer J, Cope T, et al. Using Medicaid data to characterize persons with intellectual and developmental disabilities in five U.S. states. *Am J Intellect Dev Disabil.* 2018;123(4):371-381. doi:10.1352/1944-7558-123.4.371

<sup>9</sup> U.S. Department of Health & Human Services, Agency for Healthcare Research and Quality. Clinical classifications software (CCS) for ICD-9-CM. n.d.; <https://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp#download>. Accessed February 5, 2021.



CONDITION	ICD-9 DIAGNOSIS CODE	ICD-9 DIAGNOSIS DESCRIPTION
Developmental delay	3155	Mixed Development Dis
Developmental delay	3154	Coordination Disorder
Developmental delay	3158	Development Delays Nec
Developmental delay	3159	Development Delay Nos
Developmental delay	31532	Receptive Lang Dis Oct96--
Developmental delay	31531	Development Language Dis
Developmental delay	31539	Speechlanguage Dis Nec
Emotional behavior	79929	Emotional State Sym Nec (Begin 2009)
Emotional behavior	31289	Other Conduct Disorder Oct94--
Emotional behavior	3139	Emotional Dis Child Nos
Emotional behavior	31200	Unsocial Aggress-Unspec
Emotional behavior	30989	Adjustment Reaction Nec
Emotional behavior	31400	Attn Defic Nonhyperact
Emotional behavior	30002	Generalized Anxiety Dis
Emotional behavior	30921	Separation Anxiety
Emotional behavior	31210	Unsocial Unaggress-Unsp
Emotional behavior	3149	-Hyperkinetic Synd Nos-
Emotional behavior	31281	Conduct Disorder/ Child Onset Oct94--
Emotional behavior	30928	Adj React-Mixed Emotion
Emotional behavior	31381	Oppositional Disorder
Emotional behavior	3093	Adjust React-Conduct Dis
Emotional behavior	30981	Prolong Posttraum Stress
Emotional behavior	30000	Anxiety State Nos
Emotional behavior	30924	Adj React-Anxious Mood
Emotional behavior	3099	Adjustment Reaction Nos
Emotional behavior	31401	Attn Deficit W Hyperact
Emotional behavior	3094	Adj React-Emotionconduc
Emotional behavior	3129	Conduct Disturbance Nos
Emotional behavior	30922	Emancipation Disorder
Emotional behavior	30923	Academicwork Inhibition
Emotional behavior	30983	Adjust React-Withdrawal
Emotional behavior	30021	Agoraphobia With Panic
Emotional behavior	30022	Agoraphobia Wo Panic
Emotional behavior	3005	Neurasthenia
Emotional behavior	30089	Neurotic Disorders Nec
Emotional behavior	3131	Misery & Unhappiness Dis
Emotional behavior	3124	Mix Dis Conductemotion
Emotional behavior	3128	Other Conduct Disturb



CONDITION	ICD-9 DIAGNOSIS CODE	ICD-9 DIAGNOSIS DESCRIPTION
Emotional behavior	30010	Hysteria Nos
Emotional behavior	31382	Identity Disorder
Emotional behavior	31203	Unsocial Aggress-Severe
Emotional behavior	31213	Unsocial Unaggr-Severe
Emotional behavior	31222	Social Conduct Dis-Mod
Emotional behavior	31223	Social Conduct Dis-Sev
Emotional behavior	79925	Demoralization & Apathy (Begin 2009)
Emotional behavior	31282	Conduct Disorder/ Adolesc Onset Oct94--
Emotional behavior	3091	Prolong Depressive React
Emotional behavior	3081	Stress Reaction/ Fugue
Emotional behavior	3082	Stress React/ Psychomot
Emotional behavior	31202	Unsocial Aggression-Mod
Emotional behavior	31212	Unsocial Unaggress-Mod
Emotional behavior	31220	Social Conduct Dis-Unsp
Emotional behavior	31383	Academic Underachievement
Emotional behavior	31221	Social Conduct Dis-Mild
Emotional behavior	3148	Other Hyperkinetic Synd
Emotional behavior	79924	Emotional Lability (Begin 2009)
Emotional behavior	30982	Adjust React-Phys Sympt
Emotional behavior	29384	Organic Anxiety Synd Oct96--
Emotional behavior	3084	Stress React/ Mixed Dis
Emotional behavior	31322	Introverted Dis-Child
Emotional behavior	30023	Social Phobia
Emotional behavior	3142	Hyperkinetic Conduct Dis
Emotional behavior	30001	Panic Disorder
Emotional behavior	3141	Hyperkinet W Devel Delay
Emotional behavior	30929	Adj React-Emotion Nec
Emotional behavior	30020	Phobia Nos
Emotional behavior	31201	Unsocial Aggression-Mild
Emotional behavior	3133	Relationship Problems
Emotional behavior	31321	Shyness Disorder-Child
Emotional behavior	3009	Neurotic Disorder Nos
Emotional behavior	31211	Unsocial Unaggress-Mild
Emotional behavior	3003	Obsessive-Compulsive Dis
Emotional behavior	3130	Overanxious Disorder
Emotional behavior	30029	Isolated Phobias Nec
Emotional behavior	31389	Emotional Dis Child Nec
Intellectual	758	Down Syndrome

CONDITION	ICD-9 DIAGNOSIS CODE	ICD-9 DIAGNOSIS DESCRIPTION
Intellectual	3180	Moderate To Profound Intellectual Disabilities
Intellectual	3182	Moderate To Profound Intellectual Disabilities
Intellectual	3181	Moderate To Profound Intellectual Disabilities
Intellectual	317	Mild Intellectual Disabilities
Intellectual	319	Unspecified Intellectual Disabilities
Learning disability	V400	Problems With Learning
Learning disability	3152	Oth Learning Difficulty
Orthopedic	V548	Orthopedic Aftercare Nec (End 2002)
Orthopedic	V549	Orthopedic Aftercare Nos
Speech/language	31535	Chldhd Onset Flncy Disor (Begin 2010)
Speech/language	7845	Speech Disturbance Nec (End 2009)
Speech/language	31534	Speech Del D/T Hear Loss (Begin 2007)
Speech/language	V573	Speech Therapy
Speech/language	78459	Speech Disturbance Nec (Begin 2009)
Speech/language	31539	Speechlanguage Dis Nec
Traumatic Brain Injury	85300	Traumatic Brain Hem Nec
Traumatic Brain Injury	8540	Brain (Traumatic) Nec
Visual	36810	Subj Visual Disturb Nos
Visual	3674	Presbyopia
Visual	V410	Problems With Sight
Visual	3688	Visual Disturbances Nec
Visual	36802	Deprivation Amblyopia
Visual	36731	Anisometropia
Visual	3699	Visual Loss Nos
Visual	3689	Visual Disturbance Nos
Visual	36801	Strabismic Amblyopia
Visual	36803	Refractive Amblyopia
Visual	36720	Astigmatism Nos
Visual	36800	Amblyopia Nos
Visual	3671	Myopia
Visual	3679	Refraction Disorder Nos
Visual	36721	Regular Astigmatism
Visual	3670	Hypermetropia
Visual	36732	Aniseikonia
Visual	36752	Tot Intern Ophthalmopleg
Visual	36781	Transient Refract Change
Visual	36812	Transient Visual Loss
Visual	36832	Visual Percept W/O Fusn



CONDITION	ICD-9 DIAGNOSIS CODE	ICD-9 DIAGNOSIS DESCRIPTION
Visual	36841	Central Scotoma
Visual	36842	Scotoma Of Blind Spot
Visual	36843	Sector Or Arcuate Defect
Visual	36851	Protan Defect
Visual	36852	Deutan Defect
Visual	36853	Tritan Defect
Visual	36855	Acq Color Deficiency
Visual	36862	Acquired Night Blindness
Visual	36863	Abn Dark Adaptat Curve
Visual	36869	Night Blindness Nec
Visual	36903	One Eye-Near Tot/Oth-Tot
Visual	36905	One Eye-Profound/Oth-Nos
Visual	36906	One Eye-Profound/Oth-Tot
Visual	36907	One Eye-Prfnd/Oth-Nr Tot
Visual	36911	1 Eye-Sev/Oth-Blind Nos
Visual	36912	One Eye-Severe/Oth-Total
Visual	36913	One Eye-Sev/Oth-Near Tot
Visual	36915	One Eye-Mod/Oth-Blind
Visual	36916	One Eye-Moderate/Oth-Tot
Visual	36921	One Eye-Severe/Oth-Nos
Visual	36923	One Eye-Moderate/Oth-Nos
Visual	36924	One Eye-Moderate/Oth-Sev
Visual	36961	One Eye-Total/Oth-Unknwn
Visual	36962	One Eye-Tot/Oth-Near Nor
Visual	36964	One Eye-Near Tot/Oth-Nos
Visual	36965	Near-Tot Imp/Near-Normal
Visual	36966	Near-Total Impair/Normal
Visual	36967	One Eye-Prfound/Oth-Unkn
Visual	36968	Profnd Impair/Near Norm
Visual	36969	Profound Impair/Normal
Visual	36971	One Eye-Severe/Oth-Unknw
Visual	36973	One Eye-Severe/Oth-Norm
Visual	36974	One Eye-Mod/Other-Unknwn
Visual	36975	One Eye-Mod/Oth-Nr Norm
Visual	36845	Gen Visual Contraction
Visual	36847	Heteronymous Hemianopsia
Visual	36854	Achromatopsia
Visual	36901	Tot Impairment-Both Eyes



CONDITION	ICD-9 DIAGNOSIS CODE	ICD-9 DIAGNOSIS DESCRIPTION
Visual	36902	One Eye-Near Tot/Oth-Nos
Visual	36904	Near-Tot Impair-Both Eye
Visual	36910	Blindness/Low Vision
Visual	36914	One Eye-Sev/Oth-Prfnd
Visual	36917	One Eye-Mod/Oth-Near Tot
Visual	36922	Severe Impair-Both Eyes
Visual	36963	One Eye-Total/Oth-Normal
Visual	36972	One Eye-Sev/Oth-Nr Norm
Visual	36976	One Eye-Mod/Oth Normal
Visual	36834	Abn Retina Correspond
Visual	36918	One Eye-Mod/Oth-Profound
Visual	36860	Night Blindness Nos
Visual	36908	Profound Impair Both Eye
Visual	36970	Low Vision- One Eye
Visual	36861	Congen Night Blindness
Visual	36789	Refraction Disorder Nec
Visual	36814	Distortion Of Shape/Size
Visual	36815	Visual Distortions Nec
Visual	36844	Visual Field Defect Nec
Visual	36846	Homonymous Hemianopsia
Visual	36925	Moderate Impair-Both Eye
Visual	36811	Sudden Visual Loss
Visual	36831	Binocular Vis Suppress
Visual	3698	Visual Loss- One Eye Nos
Visual	36859	Color Deficiency Nec
Visual	36960	Blindness- One Eye
Visual	36751	Paresis Of Accommodation
Visual	36753	Spasm Of Accommodation
Visual	36816	Psychophysics Visual Dist
Visual	36722	Irregular Astigmatism
Visual	3694	Legal Blindness-Usa Def
Visual	3693	Blindness Nos- Both Eyes
Visual	36840	Visual Field Defect Nos
Visual	3682	Diplopia
Visual	36833	Fusion W Def Stereopsis
Visual	36830	Binocular Vision Dis Nos
Visual	36900	Both Eyes Blind-Who Def
Visual	36920	Low Vision- 2 Eyes Nos

CONDITION	ICD-9 DIAGNOSIS CODE	ICD-9 DIAGNOSIS DESCRIPTION
Additional pervasive developmental disorders	3139	Emotional Dis Child Nos
Additional pervasive developmental disorders	3073	Stereotyped Movements
Additional pervasive developmental disorders	30921	Separation Anxiety
Additional pervasive developmental disorders	3077	Encopresis
Additional pervasive developmental disorders	29911	Disintegr Psych-Residual
Additional pervasive developmental disorders	29991	-Child Psychos Nos-Resid-
Additional pervasive developmental disorders	29981	Child Psychos Nec-Resid
Additional pervasive developmental disorders	29910	Disintegr Psych-Active
Additional pervasive developmental disorders	30722	Chronic Motor Tic Dis
Additional pervasive developmental disorders	30723	Gilles Tourette Disorder
Additional pervasive developmental disorders	30721	Transient Tic/ Childhood
Additional pervasive developmental disorders	31323	Elective Mutism
Additional pervasive developmental disorders	29990	Child Psychos Nos-Active
Additional pervasive developmental disorders	31389	Emotional Dis Child Nec
Additional pervasive developmental disorders	29980	Child Psychos Nec-Active