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Experiences and outcomes of Alternative Education participants

An IDI analysis supporting an
evaluation of Alternative
Education



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IDI disclaimer

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI please visit <https://www.stats.govt.nz/integrated-data/>.

The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the *Tax Administration Act 1994* for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

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Executive summary

Key takeaways

- To support a broader evaluation of Alternative Education (AE), we explored participants' past experiences and future outcomes using a large statistical database.
- AE participants have histories of disengagement from education and interactions with government agencies, which provide opportunities to better support them earlier in life.
- Relative to a group of young people with similar past experiences, AE participants initially have higher enrolment in tertiary education at age 17.
- However, this does not appear to translate into higher educational attainment, and participants experience less positive pathways and outcomes up to age 30.
- Improving support for these young people will provide meaningful benefits to their lives, as well as substantially improve the equity and productivity of society.

This report summarises the Social Wellbeing Agency's statistical work examining the past experiences and future outcomes of learners in Alternative Education (AE). AE is a programme that is intended to support secondary-aged students (usually aged between 13-16) who are at risk of disengaging from school. This work is one input into a broader evaluation of AE, through a partnership between the Education Review Office and the Social Wellbeing Agency.¹

In this work, we explored the lives of AE learners using Stats NZ's Integrated Data Infrastructure (IDI). The IDI is a secure research database that brings together data collected by government agencies, including records from the education, health, criminal justice, and care and protection systems. Our work involved three key activities:

1. We described the characteristics, past experiences and whānau and community context of AE participants, compared to the total learner population.
2. We created a matched comparison group of learners with similar past experiences and contexts, but who never enrolled in AE.
3. We tracked AE participants over time to age 30, looking at outcomes relating to education, income and employment, crime, and health. We compared outcomes of AE participants to outcomes for our matched comparison group, as well as the total population.

We found that AE participants tended to have some common characteristics that set them apart from most other learners at school. AE participants tend to have highly disrupted educational pathways, including histories of stand-downs, suspensions, exclusions, school changes, low attendance, and periods of non-enrolment, even in primary school. They are also much more likely to have involvement with Oranga Tamariki or experiences in the youth justice system. At the point of referral to AE, many have evidence of high needs relating to mental health, neurodiversity, and

¹ For the main report that summarises key results from our work and activities by the Education Review Office, and includes more comprehensive recommendations about the future design of AE, see Education Review Office (2023).

a lack of socio-economic resources. These statistics do not adequately describe the strengths and resources these learners have to draw upon (from themselves, their peers, their whānau and wider communities). However, this data describes important context for the role that AE plays in the education system: to support learners with high and complex needs, who have had disrupted and traumatic histories within the education and wider social systems.


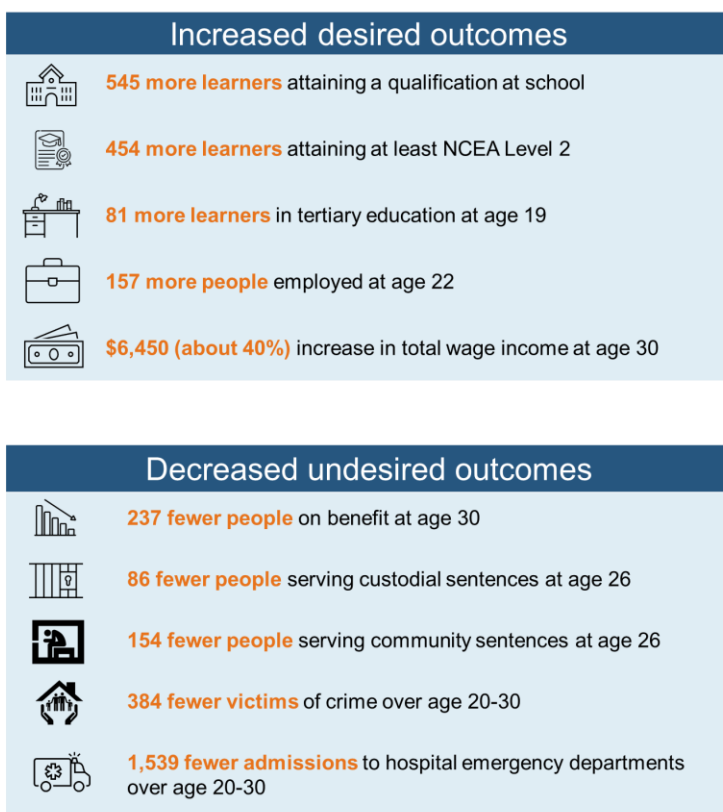
While AE is targeted at learners with very high needs, we could identify many other learners in the school population who had similar characteristics, experiences, and contexts, but who never participated in AE. We created a statistical model with 86 variables that appeared to be capturing the main factors that led to enrolment in AE. The matched comparison group we created was almost identical to AE participants on every one of these variables. However, it is possible that the two groups did differ in ways that we can't observe in IDI data, in particular, relating to unmet or unidentified need, educational progress in primary school, personal traits, the influences of peers, whānau or mentors, and school practices relating to inclusion and engagement.

Tracking outcomes in later life, we find many AE participants do not have strongly positive pathways. Less than one-fifth achieve any qualification in school; only slightly above half are earning salary or wage income in their mid-20s; about 40 percent come to the attention of police at age 17; more than a quarter serve a community sentence and about 13 percent serve a custodial sentence in any particular year.

These outcomes are substantially worse than the total population but also meaningfully worse than the matched comparison group we created, of learners who had the same characteristics. While tertiary enrolment rates are initially positive at age 17, this does not appear to translate into attainment of qualifications or employment outcomes in the longer term. This raises questions about how learners could be better supported in a more sustained way after leaving AE providers.

About 1600 learners first enrol in Alternative Education each year.

Our results imply more effective support for these learners could lead to...

* Based on outcomes of the matched comparison group.

Introduction

This report describes the technical details and results of a recent analysis of the experiences of learners in Alternative Education (AE). This involved statistical analysis of government administrative data held in the Integrated Data Infrastructure (IDI), a secure linked research database.

Our work was one input into a broader evaluation into AE conducted in partnership with the Education Review Office. This report should be read in conjunction with the full report (Education Review Office, 2023), summarising high level findings from our work, as well as other evaluative activities, such as observations, focus groups, surveys and interviews of learners, their whānau, and provider and school staff.

AE is an educational support programme intended to support secondary school-aged learners who are at risk of disengaging, or have already disengaged, from school but are below the minimum school leaving age (Ministry of Education, 2023). It is intended to support these learners to transition back to school, further education, training, or employment. It is structured more flexibly than a traditional school (for example, learners might split their time between AE, other education and training, and employment or care responsibilities), and is intended to promote academic achievement and address barriers to wellbeing.

This paper describes the method and results of three types of statistical analysis we undertook:

1. **Describing AE participants:** Using the data in the IDI to explore the demographic characteristics, prior experiences both within and outside of the education system, and whānau and broader community context of AE participants. Comparing AE participants to the rest of the learner population.
2. **Constructing a matched comparison group:** Building a statistical model to predict the probability of enrolling in AE, using measures from the first descriptive analysis. Using the statistical model to create a group of learners who never participated in AE, but who the model predicts a similar probability of AE enrolment. Testing the validity of the statistical model and the degree to which the matched comparison group is similar to AE participants.
3. **Examining later life outcomes:** Tracking AE participants from age 17 to age 30, measuring a range of outcomes across the domains of education, income and employment, crime, and health. Comparing these outcomes to the total population and the matched comparison group created in the second analysis. Testing whether these results were robust to constructing the statistical model in different ways, or incorporating different data.

How we selected our sample

Key takeaways

- This report is based on 898,000 learners born between 1990 and 2005, of whom 23,000 at some point enrolled in AE.
- The data in the IDI has good coverage for these learners.
- A learner is allocated to our AE group the first time they enrol in an AE provider.

We used the following selection criteria for the population we examined in this analysis²:

- **Born between 1990 and 2005 (inclusive).** These birth cohorts were chosen because data on AE enrolment did not exist for earlier cohorts, and later birth cohorts could not be followed through after age 16.
- **Did not enrol in AE before 13.** Very few learners enrol in AE before the age of 13, and building a statistical model for these few learners was not feasible.
- **Had at least one year as part of the resident New Zealand population³ before they turned 13.** This is so we had information that could be used to describe past experiences.
- **Had at least one year as part of the resident New Zealand population between the ages of 13 and 16.** This is so the learner had some opportunity to receive AE, if appropriate.
- **Had at least one year as part of the resident New Zealand population after they turned 16.** This was so we were able to follow the learner up and examine at least some later life outcomes.

The number of learners in our resulting sample is reported in Table 1. In total, we included 898,072 individual learners, of whom 23,238 (2.6%) at some point enrolled in AE. We aimed for the widest possible selection criteria, to maximise the number of AE participants in our analysis and to track outcomes up to age 30. We also selected these birth cohorts based on data that was available (particularly about their life experiences prior to AE). While almost all the variables (other than school attendance, discussed separately) have relatively good coverage for our sample, more recent data in the IDI tends to have slightly higher coverage and quality. This may mean that rates of missing data are higher for learners born in the early 1990s.⁴ Because the focus of our analysis was to look at relative differences between AE participants and other learners, some degree of missing data is not likely to impact substantially on results. However, it may mean that some measures of prevalence reported here are below the equivalent statistic for more recent cohorts.

² We used the same sample for all analysis described in this report. Where we report performing analysis on a subsample (e.g. a narrower birth cohort), that subsample was drawn from this main sample.

³ We defined someone as a resident using the same definition as Stats NZ uses to construct their Administrative Population Census (Stats NZ, 2022a). For more information about how this population is constructed, see Stats NZ (2022b). Note that this also requires the person is on the IDI spine.

⁴ This appears to be particularly true with respect to data relating to school movements, addresses, mental health referrals, and police data.

Table 1: Number of learners in our sample, by birth year and AE participation

Year of birth	AE participants	AE non-participants	Total learners
1990	570	30,591	31,161
1991	1,413	60,171	61,584
1992	1,767	60,206	61,973
1993	1,803	60,431	62,234
1994	1,665	59,053	60,718
1995	1,794	58,519	60,313
1996	1,686	57,647	59,333
1997	1,680	57,317	58,997
1998	1,566	56,571	58,137
1999	1,575	56,816	58,391
2000	1,461	57,882	59,343
2001	1,491	56,713	58,204
2002	1,464	55,589	57,053
2003	1,398	57,642	59,040
2004	1,317	60,058	61,375
2005	588	29,629	30,217
Total	23,238	874,834	898,072

Eligibility for AE mainly involves the learner being at risk of and already disengaged from school. Requests for enrolment can come from many sources, and enrolment is at the discretion of the holder of the AE contract. For these reasons, it is difficult to outline a clear referral process.⁵

Our measure of participation in AE is whether the Ministry of Education ever recorded an AE enrolment for the learner. According to discussions with Ministry staff, this typically occurs when managing schools advise a start date for the learner. It is possible that some learners do not end up attending the AE provider because something happens in the intervening period. However, there are three reasons in favour of this method accurately identifying AE enrolments for the majority of participants:

- a) the implied number of learners enrolled in AE at any one time is very stable over time, and consistently in line with the number of funded placements;
- b) we were able to validate AE records with subsequent school roll return records that identified the learners as participating in AE⁶; and
- c) according to regional analysts at the Ministry of Education, the situation where students have a defined start date and provider, but do not subsequently attend AE, is relatively rare.

Some learners in AE appear to have multiple periods of enrolment (in the same provider or different providers) or appear to move back to mainstream schooling after a spell in AE. For the purposes of this analysis, a learner was allocated to the 'AE learners' group if they ever participated in AE, and for the purposes of our matching models, they were allocated to the AE group at the youngest age in which they enrolled in an AE provider.

⁵ For more detail on eligibility and referral processes, see ERO (2023).

⁶ We did not use the school roll return (SRR) as our primary means of identifying AE participants because the SRR data in the IDI does not have complete coverage across all birth cohorts and all schools.

Context and prior experiences of AE learners

Key takeaways

- AE participants commonly have highly disrupted educational pathways, and many also had contact with the youth justice and care and protection systems.
- AE participants are more likely to have needs relating to mental health, learning support and neurodiversity. Our data probably understates some of these needs.

Characteristics, experiences and whānau context often differ substantially for AE learners, compared to the rest of the learner population (Table 2-Table 3). The highlighted rows in these tables show characteristics that are particularly common or uncommon among AE participants. Focusing on these rows, this data indicates that AE participants are particularly likely to:

- Be Māori (2.8 times more likely than the rest of the population), unlikely to be Asian (0.1 times as likely), and unlikely to be born overseas (0.2 times as likely). AE participants are slightly more likely (1.4 times) to be Pacific.
- Have a diagnosis of ADHD (3.3 times) or intellectual disability (2.1 times), or evidence of a mental health need (4.1 times). Note the reliance on diagnoses for these definitions is likely to miss many neurodiverse learners or who experience barriers to having their needs recognised, or learners with unmet mental health needs.
- Live in the lowest socio-economic communities (2.8 times more likely) and attend the lowest socio-economic schools (2.9 times).
- Have mothers who were sole parents (3.7 times) or teen parents (3.1 times) at birth.
- Have parents who have lower incomes, lower qualifications, and experiences of the criminal justice system (7.7 times more likely to have a mother who has served a custodial sentence during the learner's lifetime, and 5.2 times more likely to have had a father who has served a custodial sentence).
- Have participated in Māori medium schooling⁷ (3.6 times, although this is related to the fact that AE participants are more likely to be Māori).
- Have had three or more prior non-structural moves between schools (4.9 times).⁸
- Have histories of unjustified absences or non-enrolment (4.5 times as many absences, and 13.2 times more likely to have had three or more referrals to the Attendance Service).
- Have many stand-downs (30.3 times more likely to have five or more stand-downs) and suspensions/exclusions (43.9 times more likely to have three or more).
- Have involvement with Oranga Tamariki (4 times more likely to be the subject of a report of concern or investigation; 9 times more likely to be care experienced; and 24.8 times more likely to have had a family group conference in the youth justice system).

⁷ Māori medium schooling is defined as a school enrolment where it is reported that the student receives more than 50% of their learning instruction in te reo Māori.

⁸ A non-structural move is a move between schools that is not likely to be due to the natural transition of students between school types. A structural move includes, for example, students moving from primary to intermediate schools, or intermediate to secondary schools.

Table 2: Characteristics of AE participants compared to the rest of the learner population

Variable	AE participants	Rest of the population	Ratio
Gender/ethnicity			
Male	63%	51%	1.23
Māori	68%	24%	2.78
Māori (and no other ethnicity)	36%	8%	4.54
Māori or Pacific	77%	34%	2.29
European	50%	72%	0.69
Pacific	17%	12%	1.41
Asian	2%	13%	0.14
MELAA	1%	2%	0.69
Other ethnicity	1%	2%	0.45
Migrant			
Born overseas	4%	19%	0.19
Ever received ESOL	6%	11%	0.56
Education region (of first school)			
Tai Tokerau	6%	4%	1.64
Auckland	28%	34%	0.80
Waikato	11%	9%	1.29
Bay of Plenty-Wairariki	10%	8%	1.38
Hawke's Bay-Tairāwhiti	8%	5%	1.51
Taranaki-Whanganui-Manawatū	8%	7%	1.23
Wellington	9%	12%	0.79
Nelson-Marlborough-West Coast	3%	4%	0.87
Canterbury-Chatham Islands	10%	12%	0.83
Otago-Southland	6%	6%	0.96
Disability/neurodiversity/health			
Disabled (WGSS)	4%	4%	1.19
ADHD	10%	3%	3.31
ASD	1%	1%	0.87
Intellectual disability	2%	1%	2.11
Ever received ORS	0%	1%	0.15
Evidence of mental health need	31%	7%	4.09
Evidence of traumatic brain injury	6%	4%	1.63
Birth year			
1990-1992	16%	17%	0.94
1993-1995	23%	20%	1.11
1996-1998	21%	20%	1.08
1999-2001	19%	20%	0.99
2002-2005	21%	23%	0.88
Deprivation index (NZDep)			
1 (low deprivation)	1%	7%	0.12
2	2%	7%	0.23
3	2%	8%	0.32
4	3%	8%	0.41
5	12%	18%	0.67
6	6%	9%	0.64
7	8%	9%	0.84
8	12%	10%	1.18
9	17%	11%	1.59
10 (high deprivation)	37%	13%	2.77
School decile (of first school)			

Variable	AE participants	Rest of the population	Ratio
1 (high deprivation)	26%	9%	2.93
2	18%	8%	2.16
3	13%	8%	1.63
4	11%	9%	1.15
5	9%	10%	0.90
6	7%	9%	0.83
7	6%	10%	0.55
8	4%	11%	0.40
9	3%	12%	0.30
10 (low deprivation)	2%	14%	0.15
Mother's characteristics			
Sole parent at birth	17%	5%	3.65
Teen parent	15%	5%	3.12
Receive benefit income	65%	19%	3.35
Average income	\$24,135	\$36,965	0.65
Evidence of mental health need	41%	21%	1.94
Police proceeding – any offence	22%	5%	4.88
Police proceeding – violent offence	11%	2%	4.98
Served community sentence	39%	7%	5.41
Served custodial sentence	10%	1%	7.68
Mother's highest qualification			
None	29%	11%	2.55
School qual	40%	27%	1.50
Diploma	15%	13%	1.11
Degree	4%	14%	0.30
Post-graduate qual	1%	5%	0.12
Unknown	11%	29%	0.39
Father's characteristics			
Missing father (in all data)	7%	10%	0.67
Receive benefit income	41%	11%	3.71
Average income	\$32,598	\$66,792	0.49
Evidence of mental health need	40%	18%	2.29
Police proceeding – any offence	28%	8%	3.35
Police proceeding – violent offence	18%	5%	3.83
Served community sentence	62%	18%	3.49
Served custodial sentence	37%	7%	5.21
Father's highest qualification			
None	35%	14%	2.44
School qual	33%	24%	1.38
Diploma	11%	17%	0.65
Degree	1%	8%	0.17
Post-graduate qual	0%	4%	0.09
Unknown	19%	32%	0.60

Note: See appendix for the definition of each indicator. 'Ratio' column describes the ratio of this indicator among AE participants compared to the rest of the population. Rows have been highlighted in blue where the ratio is particularly small/large (<0.3 or >3).

* Attendance rate data is only available for some birth cohorts (1999-2005).

Table 3: Characteristics of AE participants compared to the rest of the learner population

Variable	AE participants	Rest of the population	Ratio
Number of addresses lived at			
1 address	13%	27%	0.48
2 addresses	15%	23%	0.64
3 addresses	14%	16%	0.87
4 addresses	12%	11%	1.10
5+ addresses	46%	23%	2.00
Age first enrolled in AE			
Year turned 13	8%	–	
Year turned 14	33%	–	
Year turned 15	44%	–	
Year turned 16	15%	–	
Educational experiences			
Māori medium schooling (ever)	6%	2%	3.65
Sibling in AE	21%	2%	8.72
0 non-structural school moves	49%	74%	0.65
1 non-structural school moves	19%	16%	1.18
2 non-structural school moves	12%	5%	2.19
3+ non-structural school moves	21%	4%	4.87
Attendance/non-enrolment			
% attendance rate*	71%	90%	0.79
% justified absence rate*	11%	6%	1.97
% unjustified absence rate*	17%	4%	4.54
0 Attendance Service referrals	62%	94%	0.66
1 Attendance Service referral	21%	5%	4.39
2 Attendance Service referrals	9%	1%	9.29
3+ Attendance Service referrals	9%	1%	13.23
Stand-downs/suspensions/exclusions			
0 stand-downs	42%	94%	0.45
1 stand-down	22%	4%	6.08
2 stand-downs	14%	1%	13.03
3 stand-downs	9%	0%	20.03
4 stand-downs	5%	0%	23.51
5+ stand-downs	8%	0%	30.35
0 suspensions/exclusions	73%	99%	0.74
1 suspension/exclusion	19%	1%	18.86
2 suspensions/exclusions	6%	0%	32.53
3+ suspensions/exclusions	3%	0%	43.88
Youth justice/care			
Youth justice family group conference	8%	0%	24.83
Ever had report of concern	73%	18%	4.07
Ever had OT investigation	64%	14%	4.69
Ever placed in care	17%	2%	9.05

Note: See appendix for the definition of each indicator. 'Ratio' column describes the ratio of this indicator among AE participants compared to the rest of the population. Rows have been highlighted in blue where the ratio is particularly small/large (<0.3 or >3).

* Attendance rate data is only available for some birth cohorts (1999-2005).

These primarily negative statistics are not representative of the worth or aspirations of learners who enrol in AE, and fail to capture all the resources and sources of strength these learners have, within their homes and in their schools and broader communities. For example, in surveys conducted by the Education Review Office (2023), almost all acknowledged education as being important for their future. AE participants reported a range of career aspirations, including nurses, mechanics, builders and ECE teachers. In an older study interviewing AE participants (Brooking, Gardiner & Calvert, 2009), learners acknowledged the same histories of disrupted and traumatic pathways described above, but also reported that:

- Many were aware of their learning needs and proactive in asking support from their teachers before arriving at AE, but reported not receiving it.
- Almost all enjoyed learning at primary school and had achieved reasonably well there.
- They had great strength and resilience in negotiating their personal circumstances, and now that they were with AE tutors who worked with them as people first, and learners secondly, they described how they have turned their previously negative attitudes around.

However, in the context of an examination of the role that AE plays in the education system, it is crucial to recognise that learners arrive at AE with multiple and complex needs. These statistics are evidence that AE learners often reach AE in crisis; have experienced substantial trauma; have histories of exclusion and disruption inside and outside the education system; have needs that have not been adequately met; and that many of those in the learners' whānau are often similarly dealing with histories of trauma, exclusion, and socio-economic disadvantage.

This resonates with recent analysis undertaken by the Social Wellbeing Agency (2022) on young people and serious youth offending. We grouped young people into four levels of need:⁹

- **Very high need:** The 1% of the population of young people with characteristics that are most associated with serious offending by age 18.
- **High need:** The next 9% of the population (so very high + high need is equivalent to 10% of the population).
- **Moderate need:** The next 10% of the population (so very high + high + moderate need is equivalent to 20% of the population).
- **Low need:** The 80% of the population of young people with characteristics that are least associated with serious offending.

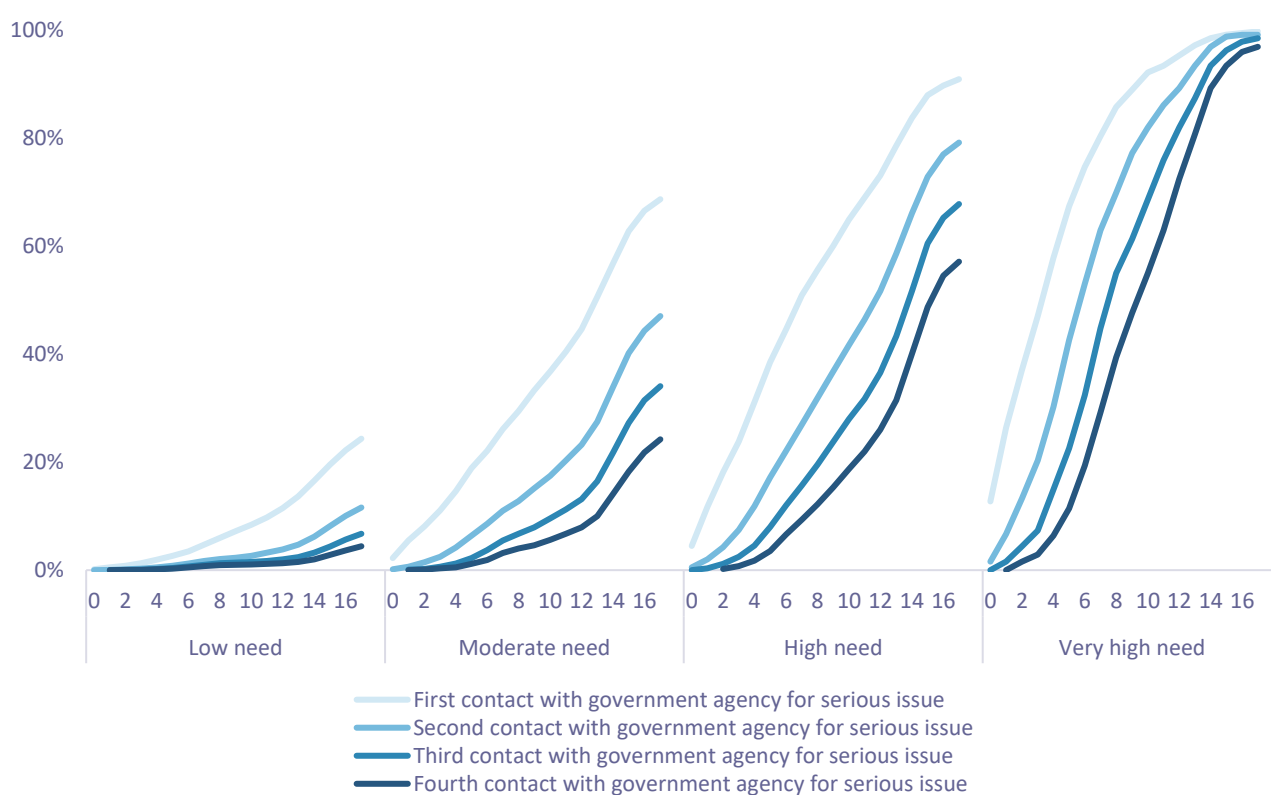
We examined the histories of each of these groups (from age 0 to 17), in terms of specific interactions with the education (non-enrolment notifications), care and protection (report of concern) and health (referral for acute mental health support). These interactions with government agencies record visible signs of potential crisis in the life of a child or young person. The resulting counts of these events over the life of each group are summarised in Figure 1. This graph indicates several insights that are also applicable to the lives of AE participants:¹⁰

⁹ 'Need' was based on experiences including abuse/neglect, victimisation, mental health, and household and community hardship.

¹⁰ While the analysis resulting in Figure 1 did not include a specific focus on AE participants, our preliminary analysis indicates substantial overlap: AE participants are highly concentrated in the top two need groups.

1. The higher the need, the **more likely** the children come into contact with government agencies due to potential crisis events (only 24% of the low need group ever have one of these events, compared to 98% of the highest need group).
2. The higher the need, the **earlier** the children come into contact with government agencies due to potential crisis events (by age 4, more than half of the highest needs group have had one of these events; it takes until age 13 for more than half of the moderate needs group to have had an event).
3. The higher the need, the **more likely** and **more rapidly** subsequent events occur in the lives of children (the lines for the highest needs group are more parallel; on average there are only two years between one event potentially signalling crisis and the subsequent potential crisis event for this group).

Figure 1: Histories of contact with government for serious issues, age 0-17, by need group



Source: Reproduced from Social Wellbeing Agency (2022), p.103.

Note: This is based on a count of three interactions with government agencies in the education, care and protection, and health systems. AE learners are disproportionately in the high and very high needs groups.

This evidence is highly consistent with the description of AE learners' past experiences summarised in Table 2-3. This indicates substantial opportunities for improvement in identifying and responding to the needs of many young people, across the education, health and care and protection systems. While our current analysis focuses on AE as a specific support occurring from age 13 to 16, it is important to recognise that the needs of learners we are focused on may have been more effectively supported (within and outside of the education system) well before they were referred to an AE provider.

Constructing a matched comparison group

Key takeaways

- We constructed statistical models that used characteristics and prior experiences to predict who would enrol in AE at ages 13, 14, 15 and 16.
- Our models were highly accurate: the models could accurately predict who would enrol in AE more than 92-95 percent of the time.
- Using these models, we could identify learners who never enrol in AE but look almost identical to the AE participants on all characteristics for which we have data.

Details of our matching process

We constructed a series of statistical models to match AE participants one-to-one with learners who had similar characteristics and experiences up to the same point in their lives, but who never enrolled in AE (hereafter referred to as the matched comparison group). The steps for this matching process were to:

1. Create four matching datasets summarising the characteristics, contexts, and experiences of all learners in our sample, at the end of the year in which they turned 12, 13, 14 and 15.
2. Define a variable that indicated whether each learner in our sample enrolled in AE for the first time in the year following our matching datasets. We removed the learner from all other matching datasets. That is, if a learner first participated in AE in the year they turned 14, then this variable takes a value of 1 in the age 13 dataset, and this learner is dropped from the age 12, 14 and 15 datasets. If a learner never enrolls in AE, then this variable takes a value of 0 for this learner in all datasets.
3. Undertake four logistic regression models (one for each year of age) predicting the probability of enrolling in AE (according to the variable created in the previous step), using variables in our matching datasets.
4. Match AE participants with counterparts who never enrol in AE based on estimated probabilities from the logistic regression models in the above step. The matching process was one-to-one nearest neighbour using greedy matching, with exact matching on the year of birth (to account for cohort effects in later analysis of follow-up outcomes).¹¹
5. Examine diagnostic characteristics of the underlying models used for matching, as well as analysis to ensure that the resulting matched comparison group is adequately balanced.
6. Follow the outcomes of the AE participants and the matched comparison group from age 17 to age 30.

¹¹ We used the Matchit package in R to perform this matching. For the specific code used to construct the dataset and undertake matching, see the SWA Github page: <https://github.com/nz-social-wellbeing-agency>.

Results of predictive models

The results of each of the four age-specific ('standard') predictive models are summarised in Table A2 in the appendix. We also undertook a separate version of each of these models that incorporated data on prior attendance rates ('attendance' model, with results also reported in the same appendix table). Because attendance rate data is not available for older cohorts, this attendance model was run only for learners born between 1999 and 2005.¹²

Broadly, the factors that are most associated with the probability of AE enrolment in these predictive models line up with the factors with the biggest unadjusted differences shown in Table 1. For example, prior stand-downs and suspensions are associated with very high odds ratios in the models, indicating they are much more common in AE participants, even accounting for other factors.

However, the odds ratios reported in Table A2 tend to be much smaller than the ratios in Table 1, because they take into account the influence of the other factors. For example, many young people in the youth justice system have parents with prior experience of the criminal justice system. After accounting for the effect of having a parent with criminal justice system experience, the remaining relationship between youth justice experience by itself and AE participation is less strong (but still positive).

The exceptions where adjusted effects from the predicted models were different to the unadjusted statistics in Table 1 were:

- Indicators of ADHD, intellectual disability and mental health need, which were all more common in AE participants. However, once we accounted for other factors in the predictive models, ADHD and mental health need tended not to be significantly related to AE participation. After accounting for other factors, diagnosis of intellectual disability was associated with lower probabilities of participating in AE.
- Māori medium schooling, which was more common in AE participants, was not significantly related to AE enrolment in most models after adjusting for other factors (particularly ethnicity). There is substantial existing evidence that Māori medium schooling is a positive factor relating to the inclusion and engagement of Māori students, which might have predicted Māori medium participation as being associated with lower probabilities of AE enrolment. This trend might be due to most referrals into AE occurring in secondary school years, and a large proportion of students who participate in Māori medium primary schools move into English medium at secondary school (Ministry of Education, 2022). This could then be an average effect between a protective factor for the students who remain in Māori medium secondary schools, and difficulties experienced by learners who transition between languages of instruction over this period.
- Having a placement into care, which was more common in AE participants, was associated in many of the predictive models with *lower* probabilities of AE enrolment, after taking account of other factors. This could potentially point to the role Oranga Tamariki youth

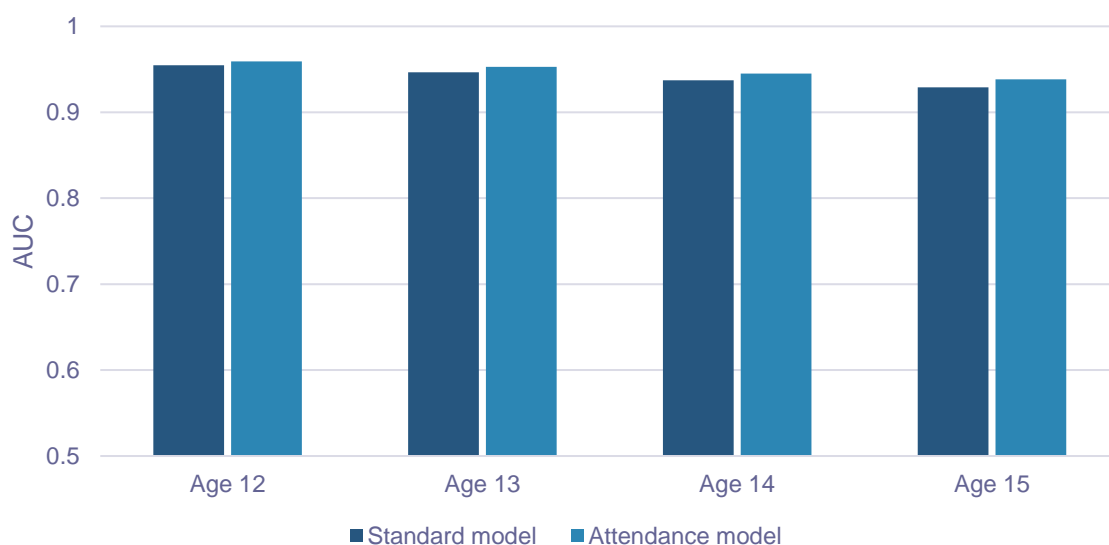
¹² We experimented with using these models that incorporate attendance data as a basis for constructing our matching groups. For the results of this, see the sensitivity analysis section later in this report.

service workers play in supporting engagement in education and identifying the needs of learners before the point of AE referral.

The other important consideration of the predictive models is how well they can predict who enrolls in AE. If the models have strong predictive power, this tells us that we have captured all of the most important factors that are related to AE enrolment.¹³ A common metric used by researchers to assess the predictive power of the sort of models we are using is the area under the receiver operating characteristic curve (AUC).¹⁴ This is a score between 0 and 1 that summarises the extent to which the model is able to accurately distinguish between a randomly selected AE participant and a randomly selected student who never enrolls in AE. A score of 1 indicates that the model will always be able to distinguish between these learners, while a score of 0.5 indicates the model gets it right only half of the time – no better than chance. A common threshold for the acceptability of predictive models in the research literature is to have an AUC of at least 0.7.

The predictive models used in this analysis all show incredibly high predictive power, with AUCs ranging from 0.9291 to 0.9591 (Figure 2). This means that the models can accurately distinguish between AE participants and non-participants selected at random between 92.9 percent and 95.9 percent of the time. This is strong evidence that the factors included in our models capture (or adequately proxy for) the factors that are most important in the decision to refer a learner to AE.

Figure 2: Area under the receiver operating characteristic curve for predictive models



The AUCs also do not substantially improve with the addition of attendance rates into the predictive models. Given that AE is targeted at learners who have disengaged from or been alienated by schooling, there are strong conceptual reasons to think that the precise level of attendance (and types of absence) in the previous year would be strongly predictive of who subsequently enrolls in AE. Yet adding attendance rate data makes only a negligible difference to the AUCs of the models – between 0.004 and 0.009 (or 0.4–0.9 percent improvement in how often

¹³ Or, to the extent that our model excludes some factors that are important, those excluded factors are sufficiently related to factors that are in our model that we can consider them accounted for by proxy.

¹⁴ For an explanation about AUC and how to calculate it, see Allwright (2022).

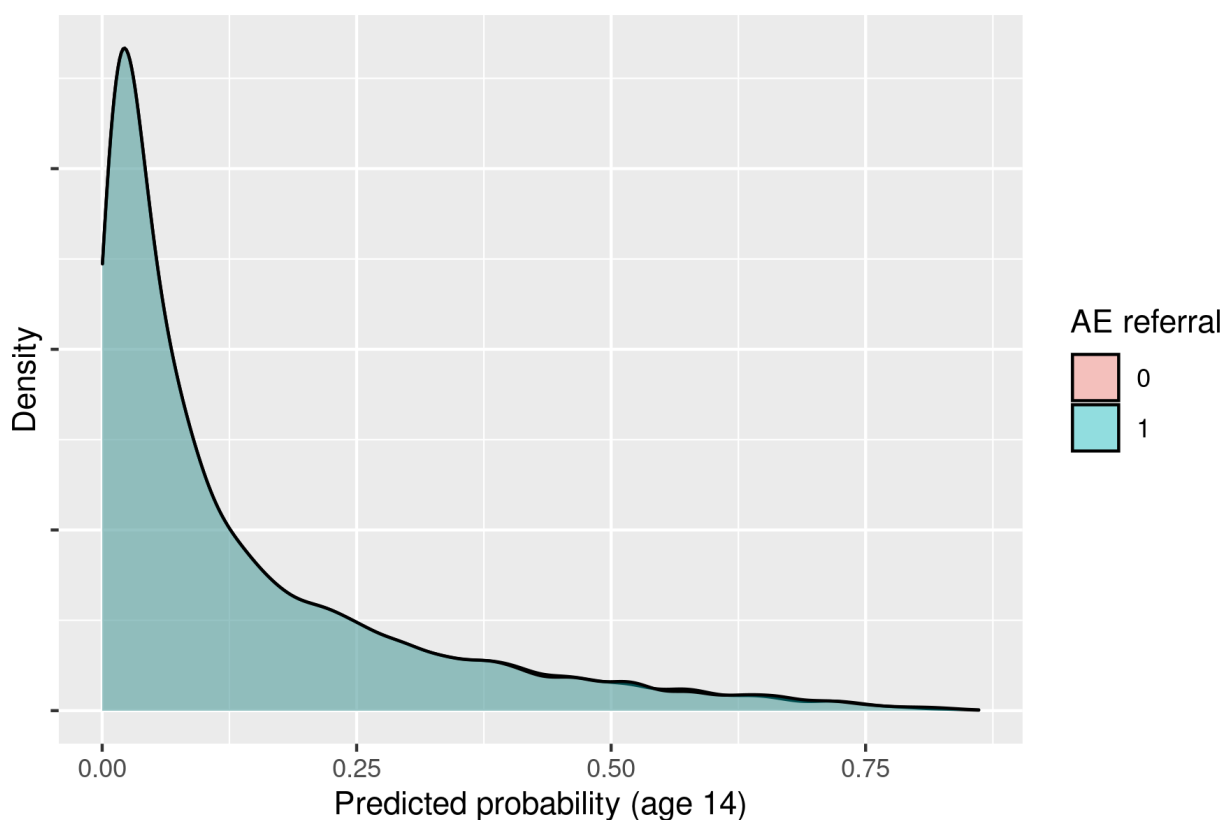
the model correctly distinguishes AE participants from non-participants). This is also potential evidence there are relatively few factors left unaccounted for – the addition of a conceptually extremely important variable to the model made relatively little difference to the accuracy of its predictions.

Robustness of matching process

One way of assessing how the success of our matching process is to look at the distribution of estimated probabilities among the AE participants and the comparison group of students they were matched to. If the AE learners are systematically more disengaged than all other students in the population based on our measures, then AE participants who our model assigns high probabilities of entering AE will only be able to be matched with relatively low probability counterparts, and then distribution of estimated probabilities between the AE and matched comparisons will look very different.

In fact, the distributions between these groups are completely overlapping for all models (Figure 3 for age 14 model; see Figures A1-3 in the Appendix for comparable graphs from other models). This is strong evidence for ‘common support’ – that there are enough people in the overall population who look just like AE participants, but who never enrol in AE.

Figure 3: Distribution of propensities, age 14 model



Note: The green shaded area denotes the distribution of propensities for AE participants, and the red shaded area denotes the distribution for the matched comparison group. The red shaded area is not visible because it completely overlaps the green shaded area.

However, this degree of overlap raises a puzzling question: given that AE is targeted at the most disengaged and alienated learners, how are there just as many learners in schools who are similarly disengaged but who never enrol in AE? There are three possibilities:

1. Capacity constraints in AE

AE placements are capped nationally, and our analysis of AE data in the IDI indicated a very stable number of learners in AE at any one time, implying these caps are binding. The Education Review Office (2023) found many AE providers had waitlists of students wanting to attend AE.¹⁵ Although we do not have the data to directly identify these students, the extent to which they exist in the general population (and are likely to have similar characteristics and past experiences to AE participants) implies that there might be a natural comparison group for the AE population.

2. Idiosyncratic differences in the AE referral decision by region, by school, or by student

The decision to refer a student to AE is often subjective, based on the needs of the student and the practices of the referring school. The student might live too far away from the nearest provider, for example. Many AE providers have specific kaupapa (for example, marae-based providers, or providers with particular vocational focuses) that may be deemed not a good fit for the student. We have heard anecdotally that some schools attempt to avoid referring students to AE, while others see it as the best pathway of support.¹⁶ These differences might result in two students who are identical in background and experiences being subject to different referral decisions about AE. To the extent that the reasons for these different decisions do not themselves impact on later life outcomes, this represents a 'natural experiment' that might predict a valid comparison group.

3. Modelling and data constraints

AE participants and matched comparisons do substantially differ in meaningful ways, just not in ways that can be detected by our model, with the data available to it. These pre-existing (but unobserved) differences might also cause differences in later life outcomes.

We examined other aspects of robustness of the matching process. We undertook a separate matching process allowing future AE participants to be part of the matched comparison group (for example, we made it possible for learners who first enrol in AE at age 15 to be part of the comparison group for the age 13 AE entrants). If, after making this change, the comparison group was dominated by AE participants, this would indicate that the AE participants and comparison groups were substantially different from one another. In fact, almost no future AE participants ended up in the comparison groups, which is future evidence for common support in our matching process.

If our matching method (propensity score matching) is carried out in ideal circumstances, then conceptually it should simulate a randomised controlled trial: there should be no systematic

¹⁵ ERO (2023) also found that 64% of school leaders they surveyed reported not having enough AE places in their region. Eight (of 128) schools they surveyed reported not using Alternative Education at all, and in five of those cases, this was due to a lack of places.

¹⁶ Note that to the extent that these different school attitudes towards AE correlate with other school practices that matter to life outcomes, this will result in the 'treatment effect' estimated in our analysis being a combination of the effect of the AE programme itself and the effect of other practices by the referring schools.

differences between AE participants and the matched comparison group. To test whether our matching process was consistent with this being the case, we re-ran our matching process on only the AE participants and matched comparison group, to see if our model could tell which is which. We then undertook 100 repetitions of a process where we did allocate treatment randomly and then ran a predictive model, to see what results we would get if selection was truly random. The AUCs of the models we ran in this check are summarised in Table 4.¹⁷ The AUCs we get are well below the original 0.93–0.95, and well below the standard acceptability threshold of 0.7 for prediction models. However, with the exception of the Age 12 model, they are slightly outside of the range we would expect if we had a real randomised controlled trial determining AE participation. This provides some evidence that there are some remaining systematic differences between the AE participants and their matched comparison group.

Table 4: Results of robustness check

Model	AUC we get	AUC if allocation was random
Age 12	0.5803	0.5589 – 0.5989
Age 13	0.5788	0.5320 – 0.5517
Age 14	0.5825	0.5284 – 0.5480
Age 15	0.5940	0.5497 – 0.5762

Characteristics of AE participants vs matched comparison group

Summaries of the characteristics of the AE participants relative to the rest of the population (left-hand side), and relative to the characteristics of the eventual matched comparison group (right-hand side), are shown in Figure 4. While there are often large differences on the left-hand side, after the matching process has been undertaken, all remaining differences between AE participants and the matched comparison group are extremely small.¹⁸ The degree to which these two groups are similar across all attributes after matching is known as ‘balance’. A common metric for balance used by researchers is whether the mean standardised difference between the two groups after matching is less than 0.1. This was true for all the variables used in our matching models, with most standardised mean differences being well below 0.05. This is a strong indication that the comparison group that the AE participants have been matched up to are extremely similar across all characteristics for which we have data.

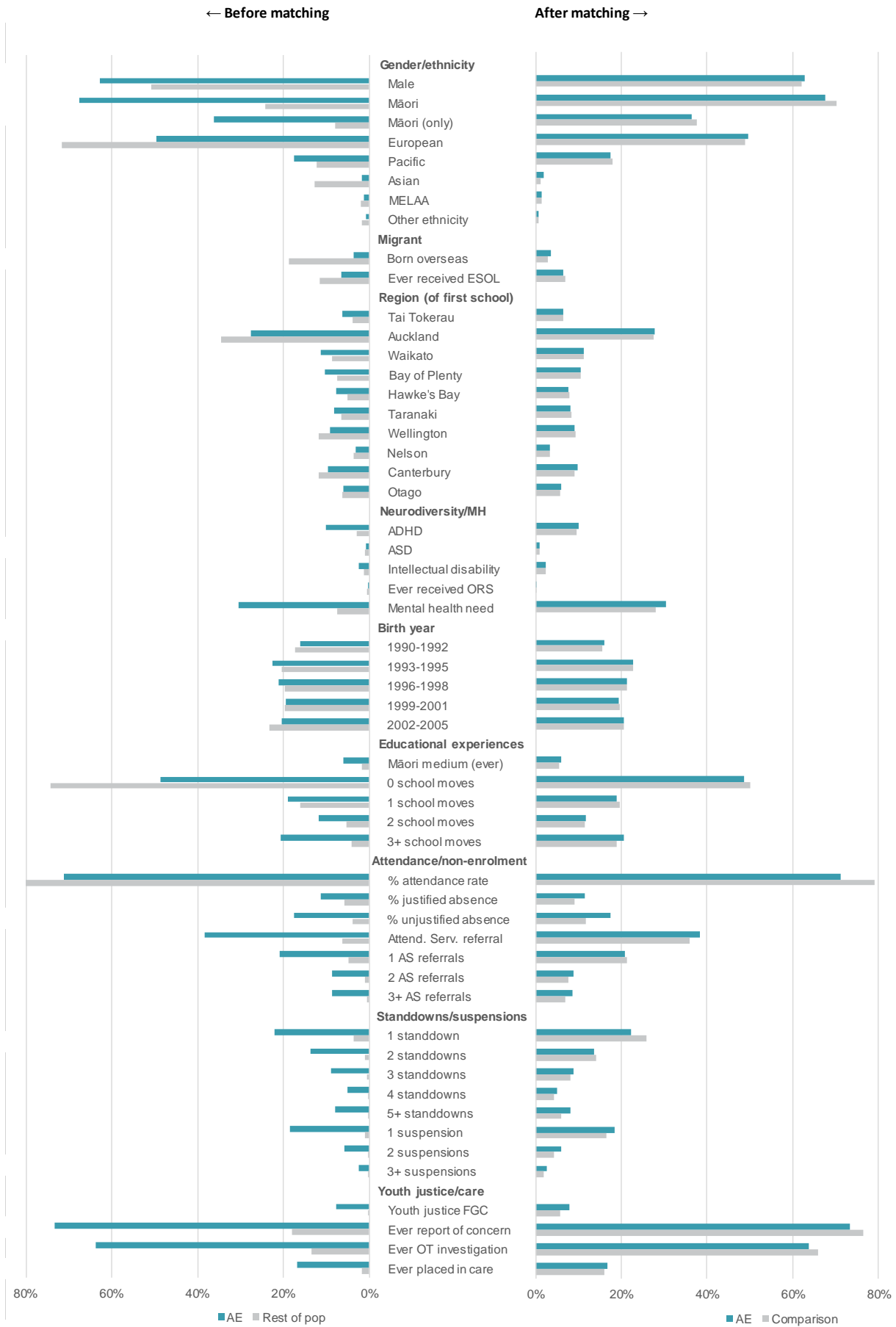
There are two potential exceptions to this finding of strong balance between the AE participants and matched comparison group, which prompted the exploration of different matching techniques:

¹⁷ See Figures A4-5 in the Appendix for a comparison of receiver operating characteristic curves from an age 14 model that distinguishes between AE participants and the rest of the population (with an AUC of 0.937), and an age 14 model that distinguishes between AE participants and the matched comparison group (with a much lower AUC of 0.583).

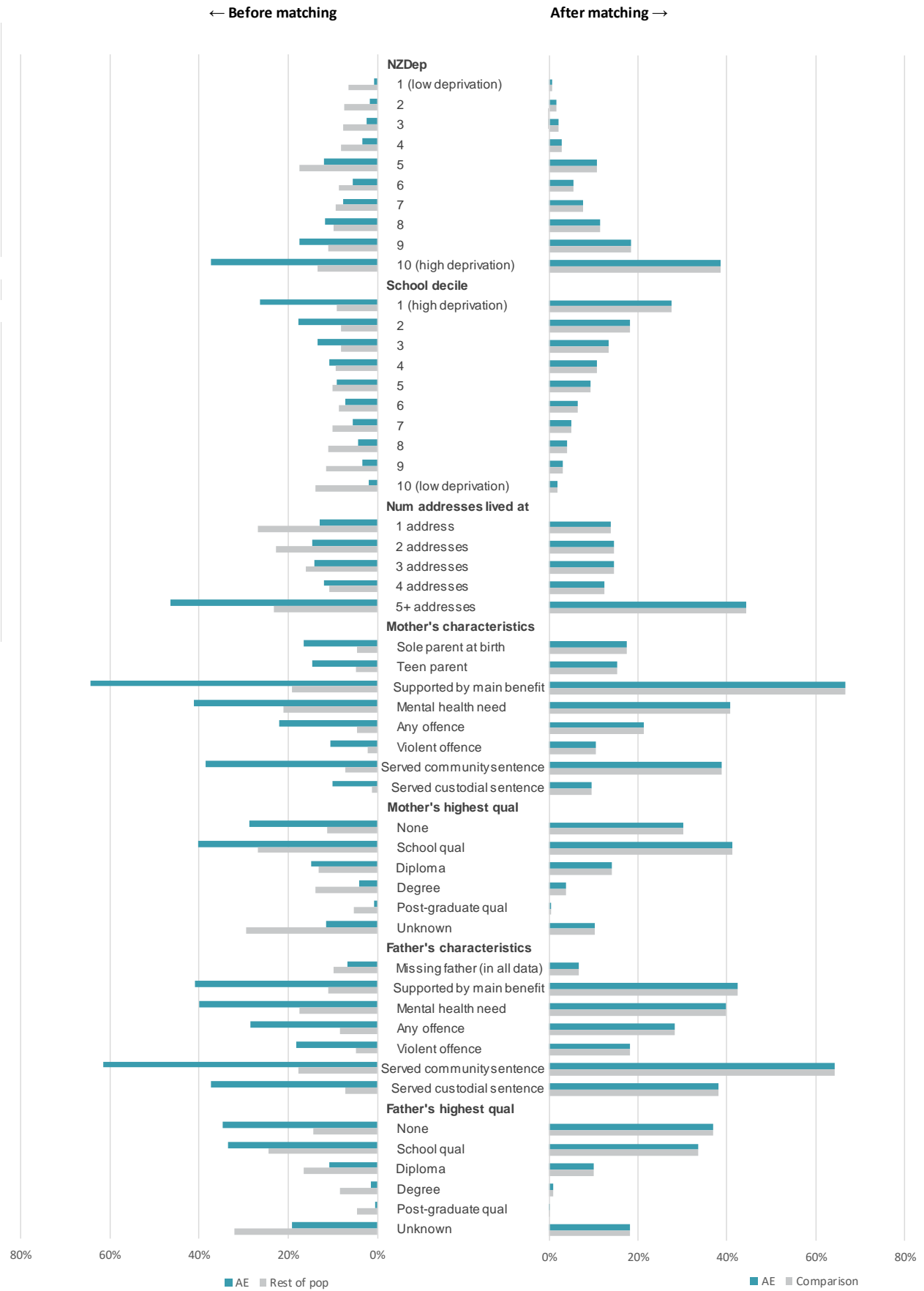
¹⁸ We also looked in more detail at differences in the distributions of mother’s and father’s incomes between AE participants and the matched comparison group – see Figures A6-7 in the Appendix for distributions of income at age 14.

1. Attendance/absence rates were not able to be used for matching in our 'standard' model because they are not available for many birth cohorts. However, when we compared the balance on these variables for the learners who did have this data available, there was a meaningful difference, with AE participants having substantially lower prior attendance rates than their matched comparison counterparts. (See the 'sensitivity analysis – attendance model' section in the Appendix for further exploration of this issue.)
2. Differences in the numbers of stand-downs, suspensions/exclusions, Attendance Service referrals, and whether learners had participated in a youth justice family group conference were all relatively small between the AE participants and matched comparison groups (all with standardised mean differences of less than 0.1). However, the differences in each of these variables were all in the same direction – more of these experiences in the AE participants than the matched comparison group. Given how conceptually important these events are as potential pathways into AE, the collective imbalance across these variables might cause bias in our results. (See the 'sensitivity analysis – exact match' section in the Appendix for further exploration of this issue.)

Figure 4: Comparison of characteristics before and after matching



Note: Bars on the left compare AE participants to the rest of our sample of learners born 1990-2005. Bars on the right compare AE participants to the matched comparison group we constructed.



Note: Bars on the left compare AE participants to the rest of our sample of learners born 1990-2005. Bars on the right compare AE participants to the matched comparison group we constructed.

Later life outcomes

Key takeaways

- AE participants tended to not be enrolled in school at age 17, and few achieved school-based qualifications.
- AE participants initially have higher enrolment rates at tertiary providers at age 17, but this is not sustained and does not lead to a high rate of qualifications.
- Outcomes for AE participants over age 17-30 tended to be worse than both the total population and the matched comparison group, especially employment and crime.

We have followed AE participants in our sample as far into their later lives as possible, tracking 22 different outcomes across four broad domains of wellbeing:

- **Education:** Includes school attainment, tertiary enrolment and highest qualification between school and tertiary.
- **Income and employment:** Includes total income, receipt of any wages, and receipt of government benefits.
- **Crime:** Includes custodial and community sentences, as well as coming in contact with police for being an offender or a victim of crime.
- **Health:** Includes the frequency of avoidable hospitalisations, emergency department admissions, and GP contacts, as well as PHO enrolments and mortality.¹⁹

We were able to track outcomes between ages 17 and 30 for our sample. In this report, we have grouped all outcomes by year of age, since they change considerably over this age range.²⁰ As well as tracking outcomes for the AE participants, we have also reported outcomes for two comparison groups: the total population (born between 1990 and 2005) and the learners in our matched comparison groups.

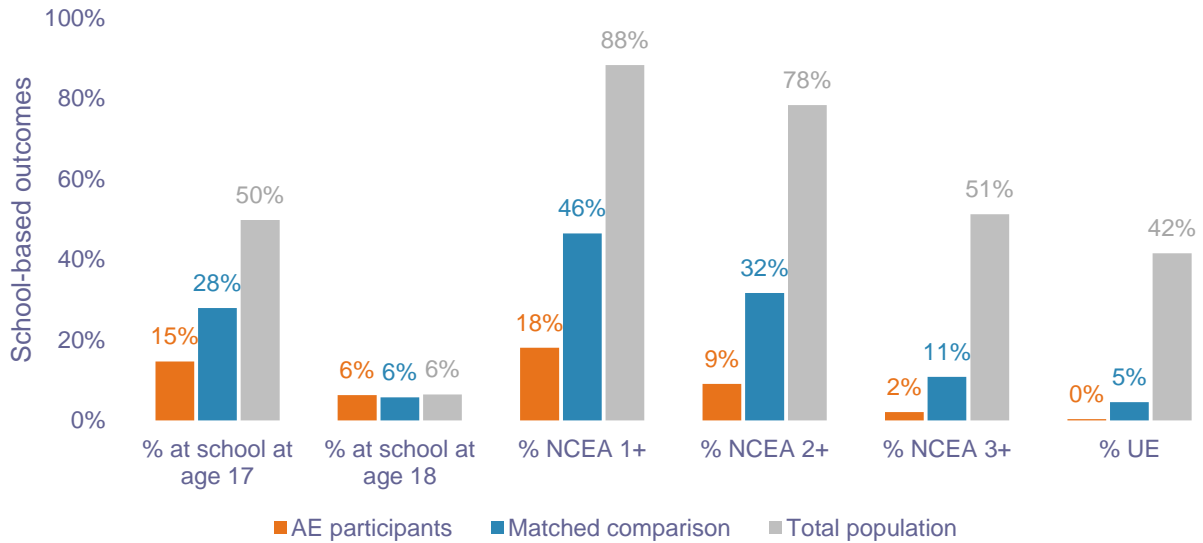
Education

Very few (15 percent) of the AE participants are still enrolled in school in the year they turn 17, compared to 28 percent of the matched comparison group (Figure 5). This is likely to have led to a reduced capacity to earn school-based qualifications (such as NCEA), with AE participants half as likely to attain any qualification at school than the matched comparison group. The matched comparison group itself is made up of highly disengaged learners – only 46 percent leave school with at least a NCEA Level 1 qualification (compared to 88 percent of the total learner population).

¹⁹ For precise definitions of each outcome, see Table A1 in the appendix.

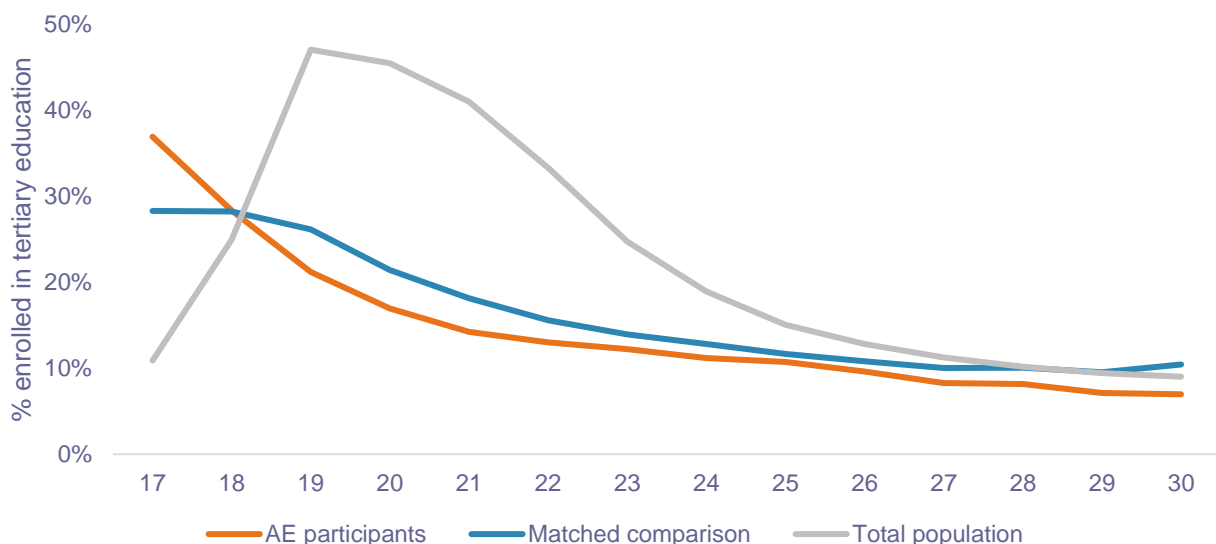
²⁰ Some birth cohorts in our sample have more data than others. For example, people born in 2005 are not yet 30, so we are unable to follow them through across the full age range.

Figure 5: Comparison of school-based outcomes



Examining patterns of tertiary education enrolment provides some context as to why there might be fewer AE participants at school at age 17 (Figure 6). AE participants are more likely to be enrolled in a tertiary provider in the year they turn 17 (37 percent of AE participants, compared to 28 percent of matched comparison group, and 11 percent of the total population). This suggests that encouragement into tertiary education is a core focus for AE providers, and is consistent with AE being targeted at learners who have been alienated from mainstream schooling. However, this increased enrolment in tertiary education appears short-lived – at age 18, all three groups we examined had about the same levels of tertiary participation, and by age 19, AE participants were much less likely to be enrolled in tertiary education (21 percent of AE participants, compared with 26 percent of the matched comparison group, and 47 percent of the total population).

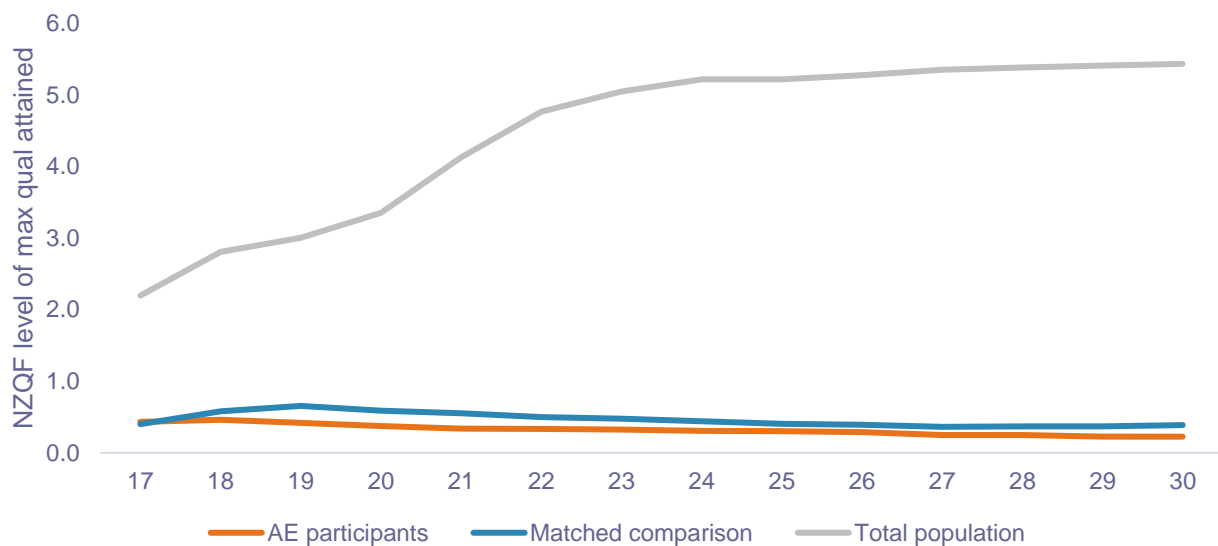
Figure 6: Comparison of tertiary education enrolment, by age



Given AE participants and the other groups appear to be taking different future educational pathways, we examined the maximum qualification that was attained from any source (school or

tertiary).²¹ This indicates that while AE participants have initially a greater participation in tertiary education, this does not appear to translate into a higher achievement of qualifications (Figure 7). By age 21, most AE participants who initially enrolled in tertiary education had left, but, on average, had achieved lower qualifications (average of 0.34 levels on the NZQF, compared with 0.55 levels for the matched comparison group, and 4.1 levels for the total population).²² This finding potentially indicates a barrier to completing courses and attaining qualifications once the support of the AE provider has been withdrawn.

Figure 7: Comparison of attained qualifications, by age



Income and employment

Figure 8-Figure 9 show the proportion of people in each group who report some wage and salary income to IR in the relevant year, and who report some benefit income, respectively.²³ These figures show that consistently across all ages, people in AE were more likely to receive benefit income and less likely to receive wage and salary income than either the people in the matched comparison group or in the general population. These gaps accelerate between the ages of 17 and 19, before remaining constant between the ages of 20 and 30. Between 20 and 30, the proportion of AE participants with wage income stays between 46 percent and 53 percent, and the proportion of AE participants with benefit income stays between 62 percent and 68 percent.

²¹ We measured this using the New Zealand Qualifications Framework (NZQF) level of the maximum qualification that was achieved up until each age – so if a person achieved a level 3 certificate at age 17, and then a bachelor’s degree at age 21, they would have a value of 3 on this measure from age 17 to age 20, and then a value of 7 from age 21 to age 30.

²² Note that while this outcome is a cumulative maximum (and so for individuals should never decrease), the measure for both the AE participants and matched comparison group in Figure 7 declines slightly. This is because of a changing composition of the sample – we have data for fewer birth cohorts at age 21 than age 20. Because there is a slight tendency for older birth cohorts to be less qualified, this produces a slight decline across our group. However, these effects are minor – our analysis indicates that the differences between AE participants, matched comparison group and the total population are broadly the same even when following only one birth cohort over time.

²³ Some people may receive both across the same year, or neither, so these two measures do not necessarily sum to 100%.

Figure 8: Comparison of wage earners, by age

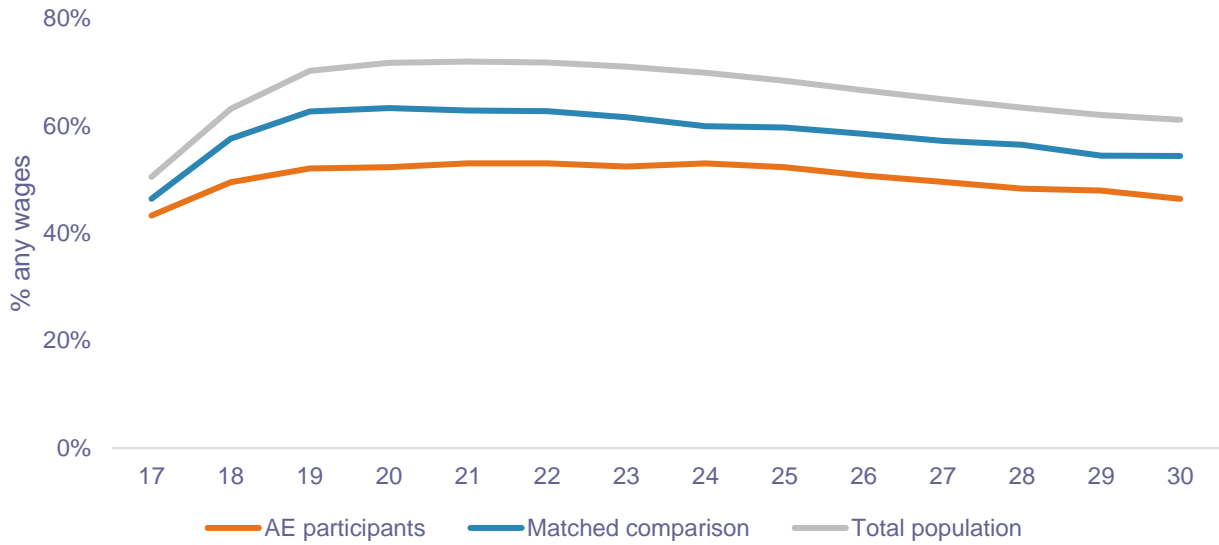


Figure 9: Comparison of benefit earners, by age

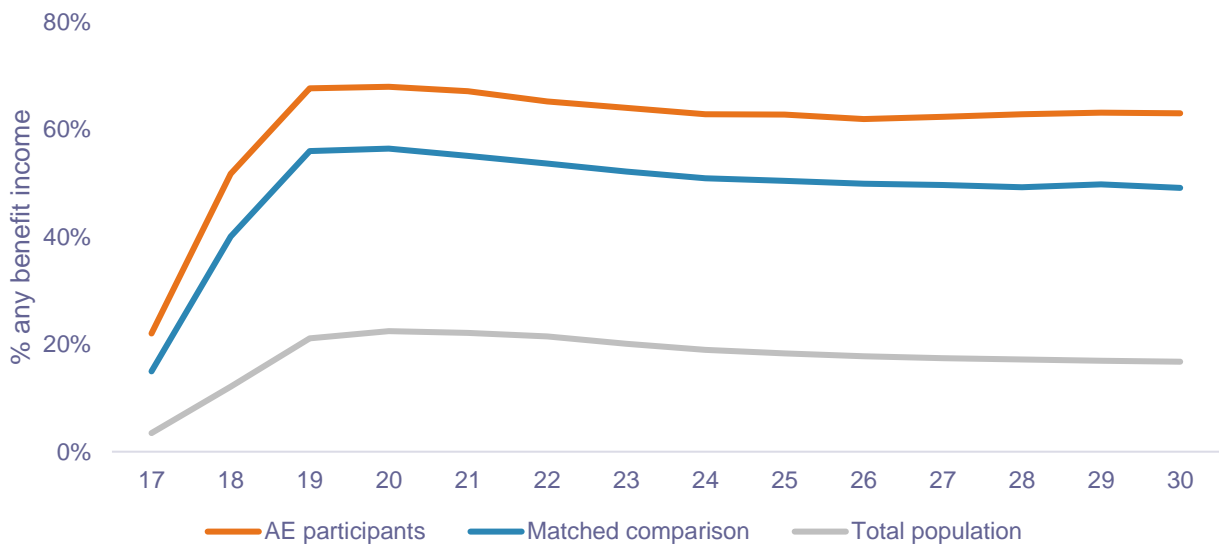
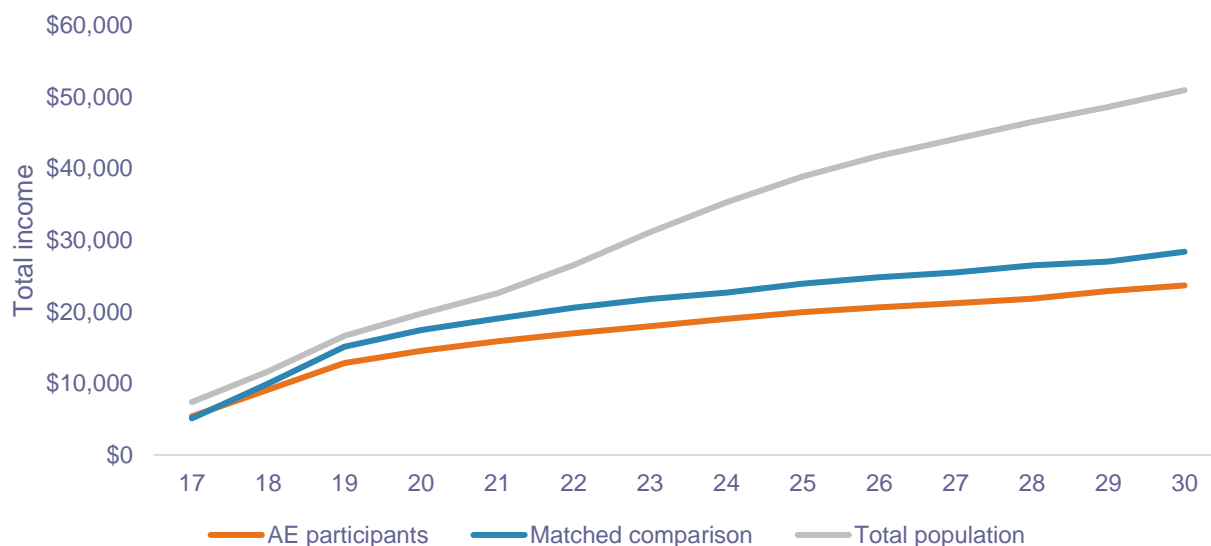


Figure 10 summarises the total amount of income reported to IR (through any source, including benefits, wages and salaries, or self-employment) for each group. Income accelerates for all three groups over age 17 to 19, but then flattens for both the AE participants and matched comparison group, while average incomes for the total population continues to rise until age 30. This is likely due to the far larger receipt of benefits shown in Figure 9.

Figure 10: Comparison of total income, by age



Crime

Figure 11-Figure 13 summarise the future patterns of three indicators relating to crime and the criminal justice system. They all show the same broad patterns. AE participants are more likely to be serving custodial sentences, be proceeded against by police for an offence, or be a reported victim of crime, than the matched comparison group, who are in turn more likely to experience these events than the rest of the population. For example, in the year they turned 26, AE participants were:

- 1.8 times more likely to be serving a custodial sentence compared to the matched comparison group, and 12.9 times more likely than the total population (13.6 percent for AE participants, compared to 7.4 percent for the matched comparison group, and 1.0 percent for the total population).
- 1.4 times more likely to come to the attention of the police for any offence compared to the matched comparison group, and 6.8 times more likely than the total population (26.1 percent for AE participants, compared to 18.1 percent for the matched comparison group, and 3.8 percent for the general population).
- 1.2 times more likely to report being a victim of crime to police compared to the matched comparison group, and 2.6 times more likely than the general population (9.9 percent for AE participants, compared to 8.1 percent for the matched comparison group, and 3.8 percent for the general population).

Figure 11: Comparison of custodial sentences, by age

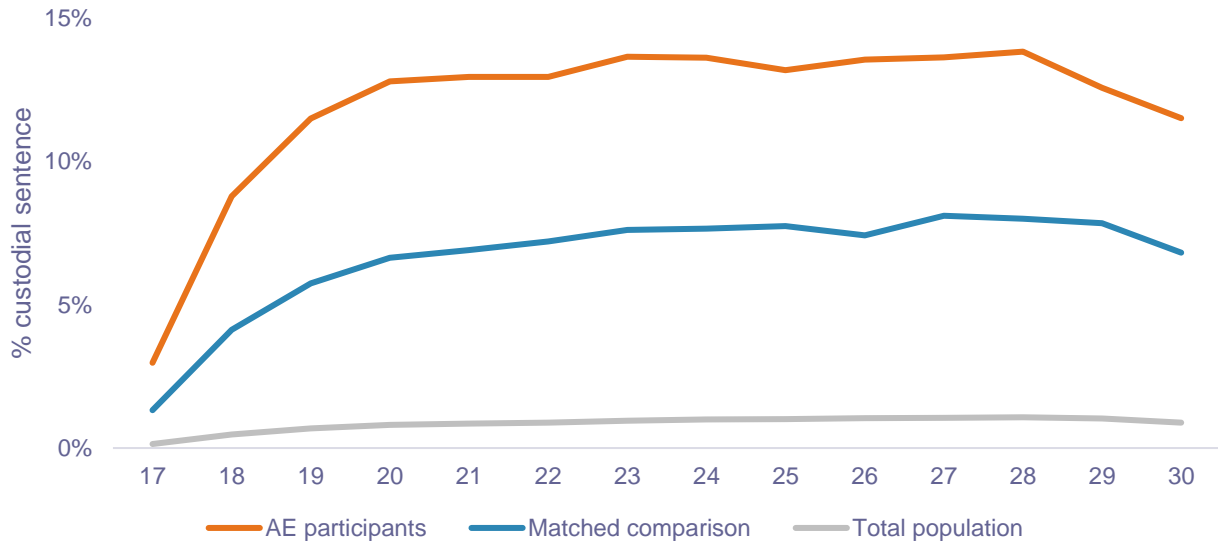


Figure 12: Comparison of police proceedings for a criminal offence, by age

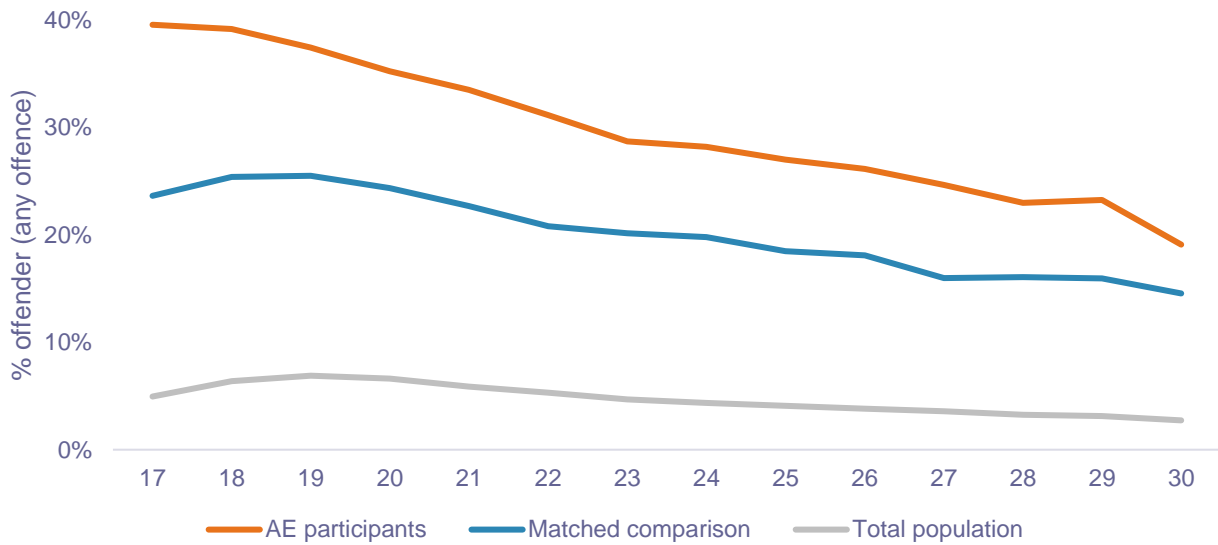
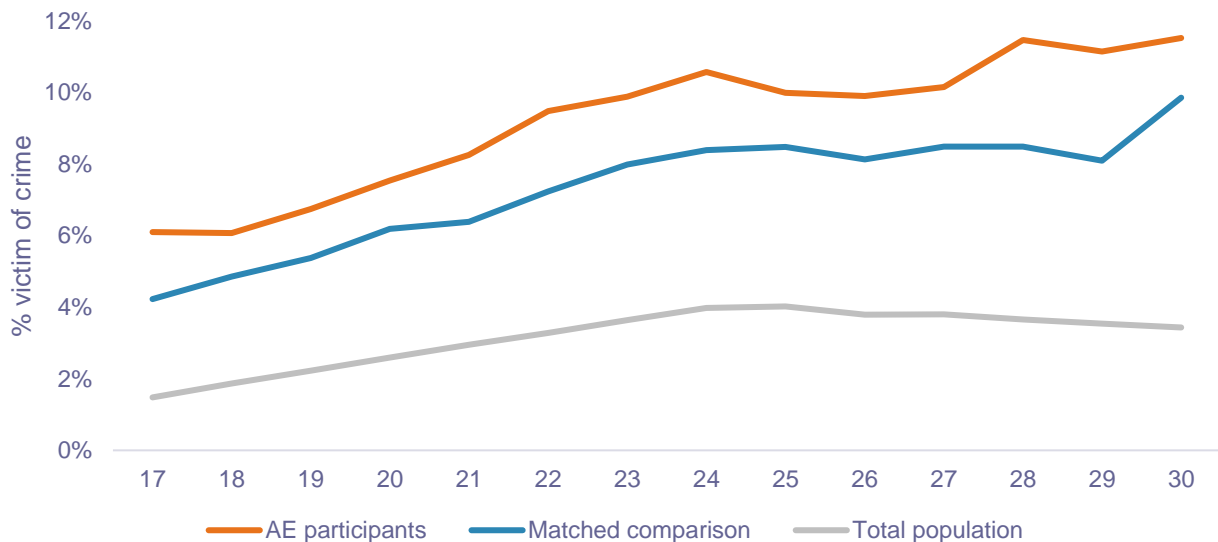


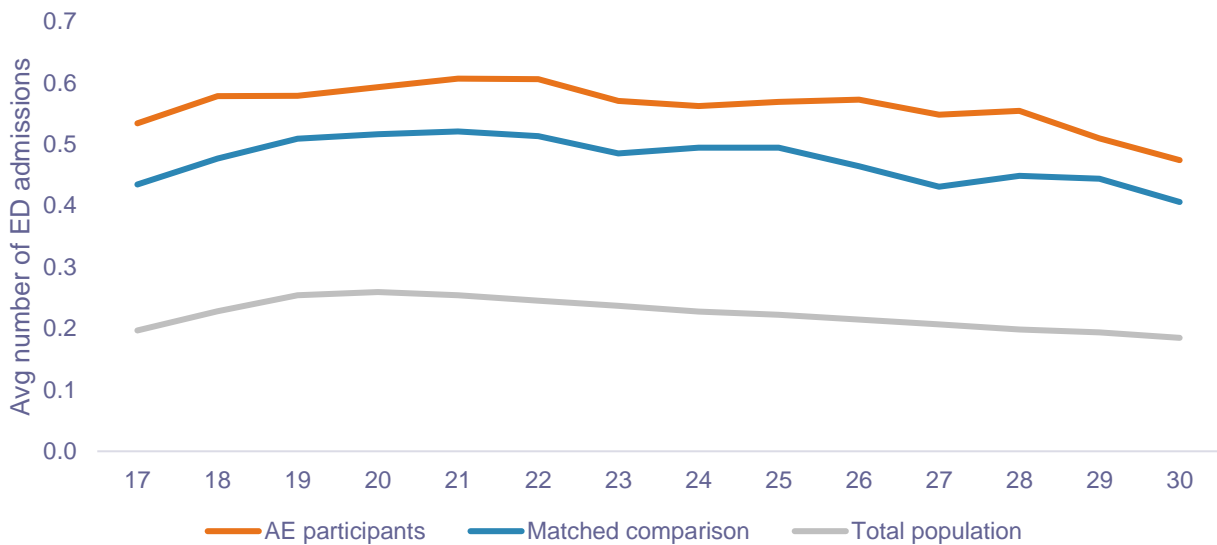
Figure 13: Comparison of reported victimisation to police, by age



Health

In general, there were relatively few substantial differences between the AE participants and the matched comparison group in the health indicators we looked at. However, one exception is the number of emergency department admissions, which could be considered a measure of increased barriers to primary health care, and/or increased risk of serious injury (Figure 14). AE participants had consistently more admissions to emergency departments (broadly between 0.5 and 0.6 admissions per year from age 17 to age 30, with an average of 0.56 per year) than either the matched comparison group (an average of 0.47 admissions per year) or the total population (an average of 0.22 per year).

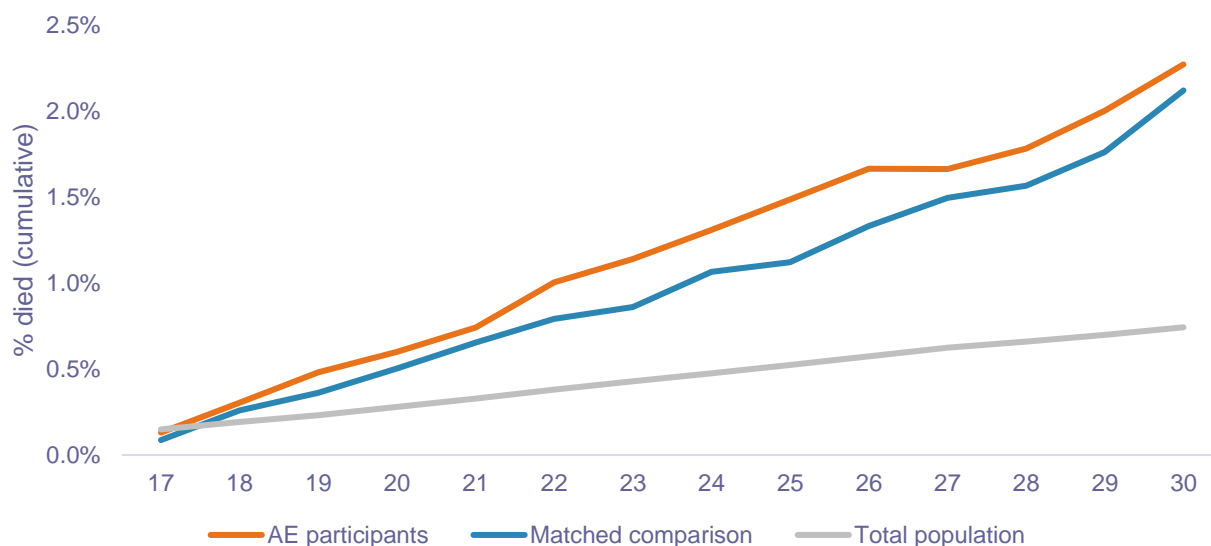
Figure 14: Comparison of emergency department admissions, by age



We also tracked mortality through death records (Figure 15). There was a small difference between AE participants and the matched comparison group, though these differences were generally not statistically significant.²⁴ Mortality for both AE participants and the matched comparison group appeared higher than for the general population, although numbers are small and we did not test the statistical significance of this difference.

²⁴ Mortality was significantly higher in the AE participants than the matched comparison group in three out of the 14 ages we examined.

Figure 15: Comparison of mortality, by age



Summarised differences in outcomes between AE and matched comparison groups

We computed statistical estimates of the differences between outcomes of AE participants and outcomes of matched comparison groups. These allowed us to see which differences in outcomes between the groups were statistically significant.²⁵ The full results are shown in Tables A3-5 in the appendix. Table 5 summarises this information, by indicating for each age and outcome combination, whether outcomes for the AE participants were significantly better than the matched comparison group, significantly worse than the matched comparison group, or not significantly different.²⁶

This table indicates AE participants have consistently and significantly worse outcomes across the indicators we examined, up to age 30. The two exceptions are tertiary enrolment and income at age 17 only (where AE participants show higher rates than the matched comparison group) and most health outcomes (where at most ages there is no significant difference between the groups).

²⁵ These estimates were taken from regression models that included all matching variables as covariates, to account for the effects of any remaining imbalance between the AE participant and matched comparison groups.

²⁶ We consider the following outcomes to be 'better' if they are higher in the AE group: % at school; % NCEA 1+; % NCEA 2+; % NCEA 3+; % UE; % tertiary enrolment; qual level attained; total income; wage income; % wages; N GP contacts; % PHO enrolment. We consider the following outcomes to be 'worse' if they are higher in the AE group: % any benefit; % custodial sentence; % community sentence; % offender – any; % offender – violent; % victim – any; % victim – violent; N ASH; N ED admissions; % died.

Table 5: Summary of differences between AE and comparison groups, by age

Outcome		17	18	19	20	21	22	23	24	25	26	27	28	29	30
Education	% at school	-													
	% NCEA 1+	-	-												
	% NCEA 2+	-	-												
	% NCEA 3+	-	-												
	% UE	-	-												
	% tertiary enrolment	+		-	-	-	-	-	-	-	-	-	-	-	-
Qual level attained		+	-	-	-	-	-	-	-	-	-	-	-	-	-
Income	Total income	+	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wage income	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% any wages	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% any benefit	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crime	% custodial sentence	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% community sentence	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% offender - any offence	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% offender - violent	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% victim - any offence	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% victim - violent offence	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Health	N ASH					-					-	-	-		
	N ED admissions	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	N GP contacts		-			-	-	-		-					
	% PHO enrolment		-	-	-	-		-							
	% died						-	-		-					

Key: + Significantly **better** outcomes for AE participants - Significantly **worse** outcomes for AE participants
 No significant difference.

Note: Significance shown at the 5% level. See Table A1 in the appendix for definitions of outcomes.

The detailed results (reported in Tables A3-5) indicate often substantial differences in later life outcomes. One way to interpret these differences is the potential benefit that could result if the needs of AE participants were able to be more adequately supported. There are approximately 1,600 learners first enrolling in AE each year. The results indicate that more effective support for these learners could lead to:

- 454 more learners attaining a qualification at school
- 361 more learners attaining at least NCEA Level 2
- 81 more learners per year in tertiary education at age 19
- A \$6,450 per person (about 40 percent) increase in annual wage income at age 30
- 237 fewer people per year on benefit at age 30
- 86 fewer people serving custodial sentences at age 26
- 154 fewer people serving community sentences at age 26
- 384 fewer reported victims of crime over age 20-30
- 1,539 fewer emergency department admissions over age 20-30.

Are there differences for different learners?

Key takeaways

- We looked at whether the results were different when focusing on subsets of learners relating to gender, ethnicity, region, age of first AE enrolment, and a proxy of disengagement.
- We found evidence that AE has different effects in some outcomes for male learners, Māori learners, and those first enrolling in AE at later ages.
- However, we could not find any evidence that any subgroup of AE participants had better outcomes than their counterparts in the matched comparison group.

All previous estimates are the result of averaging differences between all AE participants and the matched comparison group. However, it is possible that these averages hide differences in effectiveness for some types of learners or providers. To investigate this, we ran modifications of our models that aimed to detect statistically significant differences for different types of learners. We examined differences by gender, ethnicity, region of provider (when the learner was 15), age of learner when they first enrolled in AE, and the model's predicted probability that they would enrol in AE.²⁷

Table A6 of the appendix reports aggregated results from this analysis, counting two types of differences²⁸:

1. The first three columns indicate whether there are significant differences in the implied effect of AE for different types of learners (for example, whether the difference between the AE and comparison groups is larger for males than it is for females).
2. The last three columns indicate whether the implied AE effect is significantly different from zero for the group of interest (for example, whether male AE participants have significantly different outcomes than males in the matched comparison group).

The first of these sets of estimates indicate that there are differences in the implied effect of AE depending on the type of learner. In particular:

- AE effects on education outcomes tend to be higher for male learners than female learners. However, effects of income are mixed (some higher for males, other higher for females). AE effects of crime outcomes tend to be higher for female learners than male learners.

²⁷ Because AE is targeted towards learners who are disengaged from education, the model's predicted probability of enrolling in AE can be conceived as a 'disengagement/alienation index', where learners with higher predicted probabilities having more complex needs and/or more extensive histories of educational disengagement and alienation.

²⁸ Numbers in the table are the proportion of estimates that are not significant, significantly better or significantly worse, across all outcomes and ages within the broad outcome type. This analysis produced 16,646 separate estimates, which are not feasible to individually report. Note also that with this many statistical tests being conducted, there are likely to be some results that appear statistically significant but are not meaningful. Across 16,000 statistical tests with a significance level of 5 percent, we would expect 800 results to be significant simply due to chance.

- AE effects on education and income outcomes tend to be higher for Māori than non-Māori learners.
- AE effects on some education and income outcomes are higher in some areas (Tai Tokerau, Waikato, Hawke’s Bay-Tairāwhiti, Wellington, and Canterbury-Chatham Islands) than in Auckland. However, most effects did not significantly differ by region.
- AE effects on income and crime outcomes tend to be higher for learners who first enrol in AE at age 15 or 16, compared to learners first enrolling at age 13.
- AE effects on education and income tend to be higher for learners who the model estimates moderate probabilities (0.3 to 0.5), compared to learners with low estimated probabilities of enrolling in AE.

However, the second set of estimates in Table A6 indicate that any differences between types of learners are not enough to mean any subset of AE learners has better outcomes than their counterparts in the matched comparison group. While many of these estimates in the last three columns are not significant, this is likely a function of the smaller groups we are examining, leading to wider confidence intervals. There is no subgroup of AE learners for whom there is consistent evidence of better outcomes than in the matched comparison group.

These patterns can be illustrated through some example graphs of some outcomes (differences between AE participants and matched controls), split by gender, ethnicity, and region (Figure 16- Figure 18). While the difference in these outcomes for females, Māori learners, and learners in Wellington is better than those for males, European learners, and learners in Auckland, in every case all subgroups of AE learners have noticeably worse outcomes than their counterparts in the matched comparison group. (That is, the implied effect of AE on income is not positive for females, but it is *less negative* than it is for males.)

Figure 16: Differences in income between AE and comparison group, by gender

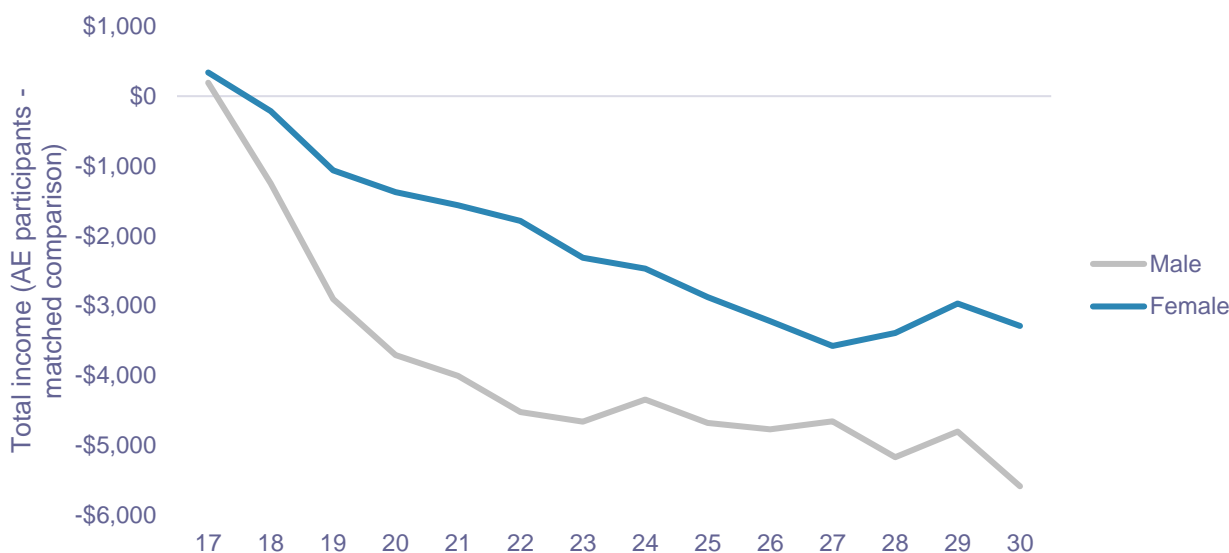


Figure 17: Differences in tertiary enrolment between AE and comparison group, by ethnicity

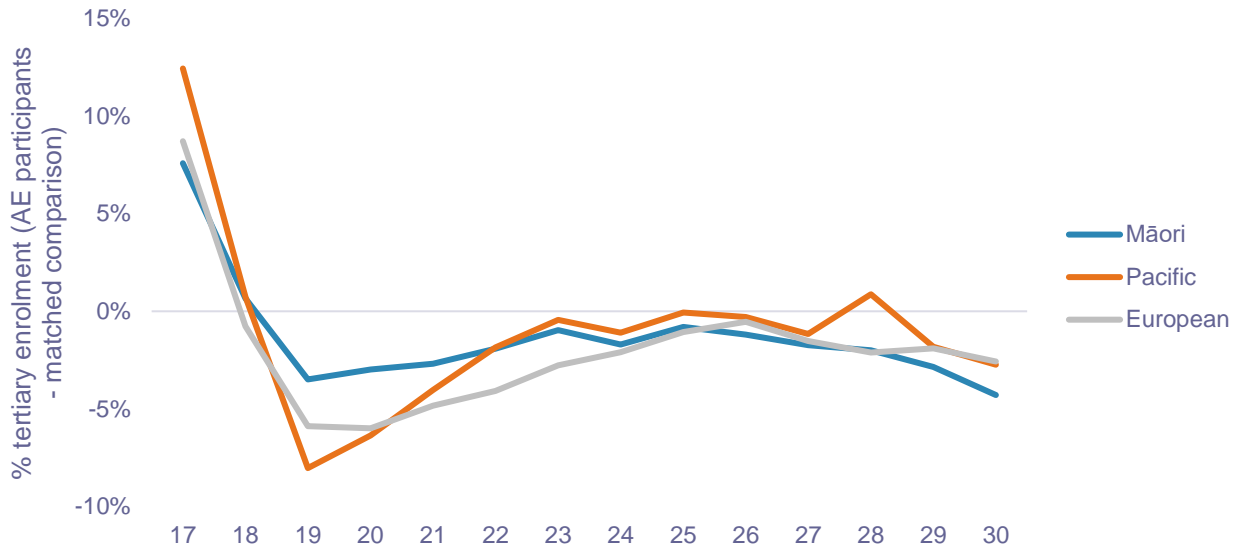
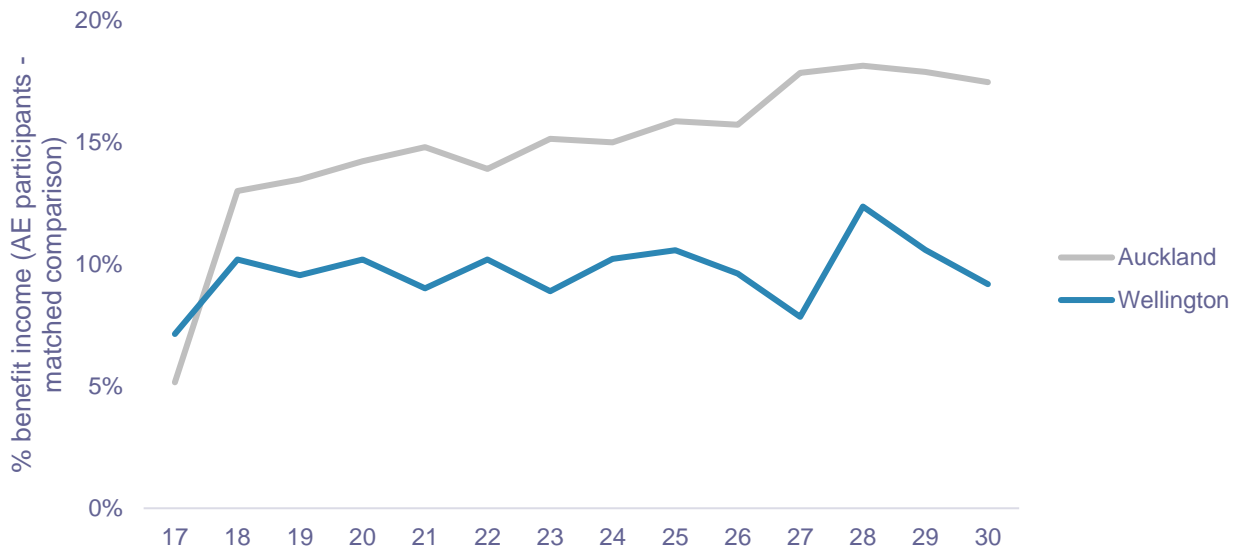


Figure 18: Differences in receiving benefit between AE and comparison group, by region



Sensitivity analysis

Key takeaways

- We investigated how results would change if we constructed the matched comparison group in different ways.
- Our results are robust to the precise decisions we made: there is no alternative model that did not result in AE participants having worse outcomes than the matched comparison group.
- The evidence for potential bias in our results is greater for income and crime outcomes than it is for education and health outcomes.

When performing the matching to produce the results in the previous section, we made design decisions that could have impacted on the results. We tested how our results changed if we made different design decisions, to inform how robust our results are. This section summarises the results of this sensitivity analysis (the full details are reported in the Appendix).

The differences in results as of age 20 between the different statistical models are summarised in Table 6. There are two key features of these results. Firstly, the results from each model are qualitatively similar (showing meaningfully worse outcomes for AE participants compared to the matched comparison group, in all domains other than health). These results mean that our main results are robust to the modelling decisions we were able to examine here.

The second feature is that the difference between magnitude of effects between models might also give clues as to how robust these results could be to other sources of bias that we were not able to directly test here. For example, one could conceptualise the difference in results between the standard 1999+ model and the attendance Q1 model as explaining the combined effects of eliminating two sources of potential bias: including attendance data and shortening the delay in matching from up to a year to up to three months. Eliminating this bias reduced the estimated difference in NCEA 1+ achievement rates between AE participants and matched comparisons from -32 percent to -29 percent.

Another way of viewing this is that, for the true effect of AE to be zero or positive, our analysis would need to be missing sources of bias that are at least nine times greater than the effect of leaving out prior attendance or having a delay of up to a year between matching and AE enrolment. In outcomes like income and criminal justice system involvement, there is more evidence of sensitivity to sources of bias: we would need to be missing sources of bias that are only 2-4 times greater than those we tested here to turn the negative result into a positive one.²⁹

²⁹ For some outcomes, the results for the conceptually 'less biased' model are **more** negative than in the standard model. These outcomes are enrolment in tertiary education, maximum qualification attained, and victimisation outcomes.

Table 6: Summary of outcomes at age 20 by model

Outcome		Standard	Standard Q1 only	Exact	Exact Q1 only	Standard 1999+	Standard 1999+ Q1	Attendance 1999+	Attendance 1999+ Q1
Education	% at school (@ age 17)	-13%	-11%	-13%	-10%	-13%	-10%	-12%	-8%
	% NCEA 1+	-28%	-23%	-28%	-23%	-32%	-29%	-30%	-29%
	% NCEA 2+	-23%	-18%	-22%	-19%	-29%	-25%	-26%	-24%
	% NCEA 3+	-9%	-7%	-9%	-7%	-13%	-11%	-10%	-10%
	% UE	-5%	-3%	-4%	-3%	-4%	-4%	-4%	-4%
	% tertiary enrolment	-5%	-4%	-5%	-5%	-5%	-6%	-5%	-5%
	Qual attainment	-0.22	-0.21	-0.23	-0.21	-0.21	-0.21	-0.20	-0.21
Income	Total income	-\$283	-\$259	-\$291	-\$269	-\$347	-\$343	-\$298	-\$224
	Wage income	-\$397	-\$338	-\$415	-\$369	-\$497	-\$449	-\$429	-\$356
	% any wages	-11%	-9%	-11%	-10%	-11%	-8%	-9%	-8%
	% any benefit	+12%	+10%	+12%	+10%	+14%	+11%	+12%	+11%
Crime	% custodial sentence	+6%	+4%	+6%	+4%	+5%	+4%	+5%	+3%
	% community sentence	+10%	+6%	+10%	+7%	+10%	+5%	+9%	+5%
	% offender - any	+10%	+9%	+10%	+7%	+11%	+9%	+11%	+8%
	% offender - violent	+5%	+3%	+4%	+3%	+5%	+4%	+5%	+4%
	% victim - any	+1%	-	+1%	-	+3%	+4%	+3%	+5%
	% victim - violent	+1%	-	+1%	+1%	+3%	-	+3%	+4%
Health	N ASH	-	+0.01	-	-	-	-	-	-
	N ED admissions	+0.08	+0.06	+0.09	+0.08	+0.06	-	+0.11	-
	N GP contacts	-	-	-0.04	-	-0.15	-	-0.14	-
	% PHO enrolment	-1%	-	-1%	-	-3%	-3%	-2%	-
	% died	-	-	-	-	-	-	-	-

Key: + Significantly **better** outcomes for AE participants - Significantly **worse** outcomes for AE participants
□ No significant difference.

Note: All outcomes are as of age 20, with the exception of 'at school', which as of age 17. Significance shown at the 5 percent level. Results that are not significant are not reported.

Limitations of this analysis

Key takeaways

- This report is not intended to be comprehensive of all aspects that are relevant to evaluating the role and effectiveness of AE, and this analysis should be read in conjunction with the work done by the Education Review Office.
- The method we have used is a less reliable measure of impact than a randomised controlled trial, because it is possible that there are differences between AE participants and our matched comparison group that aren't captured in our data.
- The most relevant differences we are not able to measure are unmet or unidentified need, educational progress in primary school, personal traits, the influences of peers, whānau or mentors, and school practices relating to inclusion and engagement.

While we have taken all care to provide the best possible description of the characteristics and experiences of learners prior to arriving to AE, and the outcomes they experience in their future lives, our analysis is subject to several important limitations.

The first limitation is that this analysis is not (and is not intended to be) a comprehensive assessment of all the factors relevant to the evaluation of AE (and its role in the education system). This analysis includes only a description of characteristics and prior experiences of AE participants, their later life outcomes, and how these outcomes compare to a group of other learners with similar prior experiences. We have no ability to investigate important aspects in AE such as the adequacy of resourcing, effectiveness of teaching instruction and pastoral care at providers, views of AE by the staff of providers or schools, or how learners themselves (or their whānau) would describe their AE experiences. These aspects have been covered in the broader evaluation activity undertaken by the Education Review Office (2023). The findings from those activities broadly align with the findings of this analysis.

The second limitation of this analysis is an inherent limitation of the method we have used to construct the matched comparison group when examining outcomes: propensity score matching. One way of assessing the reliability of impact evaluation methods is the Maryland Scientific Methods Scale (What Works Centre for Local Economic Growth, 2015). This is a five-point rating scale that ranges from level 1 (simple before-and-after comparisons of outcomes, without a separate comparison group) to level 5 (randomised controlled trials). On this scale, our method fits under level 3. The scale notes that this method provides evidence that the two groups are similar, 'but there are likely to be important unobserved differences remaining' (What Works Centre for Local Economic Growth, 2015). The most reliable way to address these limitations is to subject AE to a randomised controlled trial.³⁰

³⁰ Randomised controlled trials in the social sector are sometimes perceived to be unethical, on the basis that a treatment presumed to be beneficial is withheld from some people (Mezey et al., 2015). We note that the results of this analysis might provide evidence against this presumption with respect to AE.

There are conceptual reasons for and against the idea that we might be able to identify a relevant comparison group, and that our comparison of outcomes is truly 'like-for-like'. On one hand, AE is intended for learners who are the most disengaged from and alienated by the schooling system, which would argue against the existence of a comparable group who does not participate in AE. On the other hand, there is evidence (see Education Review Office, 2023) that there are substantial capacity constraints with AE, meaning many learners who schools perceive are eligible or appropriate for AE do not receive it. The number of AE places are set within a relatively small geographic area. This means depending on the region in which they live, learners with the same characteristics may either be participating or not participating in AE.

There are characteristics or experiences, in particular, that we do not observe in our data, for which it is possible that AE participants meaningfully differ from our constructed matched comparison group. The aspects we are most concerned about not adequately capturing are:

- The learner's prior educational achievement (before age 12).
- The learner's personality and other traits, including aspirations.
- Unmet or unidentified need, particularly with respect to mental health, learning support need, and neurodiversity.
- Peer influences (whether positive or negative).
- Practices of schools previously attended, particularly with respect to inclusion and engagement.
- Whānau attitudes and resources, particularly with respect to educational expectations and aspirations.
- The presence or absence of mentors for the learner, whether in the home, the school, or in the broader community.

Since AE is targeted at learners who are at risk of disengaging from the education system, if there are any differences in the above factors between our groups, our matched comparison group are likely exposed to more desirable conditions than the AE participants. This means that the resulting differences in later life outcomes between the groups are at risk of being biased against the AE group (that is, the differences we report are too negative). Based on how the results changed when we added attendance data into our models, we think that the risk of this bias is highest for the outcomes relating to income and criminal justice involvement.

Implications of this work

Key takeaways

- These results are consistent with other evidence about AE, and similar to results from evaluations of programmes supporting similar groups of young people.
- We view our results as (not fully conclusive) indications that with respect to provision of AE, an opportunity to better support the lives of young people is being missed.
- Improving support available in AE, reviewing the conditions for inclusive schooling before learners arrive at AE, and the sustainability of support offered after AE, will benefit learners over their lives, and will support a more equitable, inclusive and productive society.

Our analysis found AE participants are highly atypical compared to the overall school student population, particularly with respect to events reflective of educational discipline or disengagement (such as standdowns, suspensions, exclusions, truancy, and referral to the Attendance Service) and involvement in the youth justice and care and protection systems. However, we were able to find a group of students who looked almost identical to AE participants on these factors, and our statistical model appeared to capture the most important factors that predict enrolment in AE. We tracked AE participants up until age 30. We found they have initially positive participation in tertiary education, but then experience substantially worse later life outcomes (across education, income and employment, crime and health) than the matched comparison group and the total population. While the results were robust to making different modelling decisions or incorporating different data, there remain inherent limitations to the method we used.

This analysis extends upon and is consistent with an earlier evaluation focused on AE by the Education Review Office (2011). While that previous evaluation was not able to describe the past experiences and future outcomes of AE participants in as much detail as the IDI affords, it reported key findings more than a decade ago that we find evidence for still being true in 2023. In particular, it found fewer than half of AE learners immediately transitioned back to schooling, or to further education, training or work. Unfortunately, the results of our analysis not only support this finding, but also indicate that the statistics with respect to participation in education, employment or training several years later are even more grim.

Some of the results shown in this report are also similar to the results of an impact evaluation of Youth Service NEET, an employment programme for young people aged 16-18 who are considered to be at risk of poor outcomes.³¹ This programme was evaluated by the Treasury (Crichton & Dixon, 2017) also using IDI data, and an almost identical method to our AE analysis. That evaluation found that Youth Service NEET resulted in short term increases (up to one year after beginning the programme) in tertiary participation, but that this had minimal impact on qualification attainment,

³¹ Conceptually the target audience for Youth Service NEET has strong overlap with AE, though neither our study nor the Treasury evaluation measured the exact overlap.

and subsequently negative impacts on employment and benefit receipt. While that evaluation followed Youth Service NEET participants only for two years after first enrolment in the programme (compared to several decades in our case), the similarity of initially positive educational participation followed by meaningfully negative employment outcomes is striking. Potentially, this speaks to the difficulty in both programmes of either supporting learners to select an educational pathway that will support sustainable employment aspirations in the longer term, or in continuing to support their needs while in education in a way that leads to completion and attainment.

The description of the past experience of AE participants' lives in this report also resonates with other work done by the Social Wellbeing Agency (2022) on other cohorts of children and young people with very high needs. The analysis focused on AE, in conjunction with this other work, provide evidence that referral to AE in adolescence is a manifestation of traumatic and disruptive experiences throughout these learners' lives. These learners are in regular contact with various parts of government from an early age. There is therefore an opportunity for the education system to better partner with other parts of the social sector to more effectively wrap around support earlier to enable a quality and inclusive education.

All research is subject to limitations, and assessing the implications of the research, therefore, involves a subjective judgment that takes into account the results and the limitations. Our approach has been to present our method, results, and outcomes of our analysis in as much detail as is practicable, to allow readers to exercise their own judgment about what these results might imply. To acknowledge the limitations of the method we have used, we have avoided explicitly labelling our results as causal effects.

However, there are things that are clear, regardless of any limitation of the matching method. AE participants have high and complex needs at the point they enrol in AE, and a large fraction of AE participants do not go on to have positive pathways. The stated purpose of AE is to 'support [learners] to transition back to school, further education, training, or employment' (Ministry of Education, 2023). This does not appear to be consistently achieved. Four in ten previous participants in AE come to the attention of police for offending behaviour when they are 17. Seven in ten are receiving benefit income by age 19. By age 24, at least one in ten are victims of crime. Less than one in five attain any qualification, in school or in a tertiary provider. This indicates substantial opportunity to better support these young people in their education before and during their enrolment in AE.

The opportunity to better support these learners also enables the education system to better support an equitable and productive society. Learners enrolling in AE are highly socio-economically disadvantaged and two-thirds are Māori. Improvement on the outcomes we examined would benefit not only the learners but also other parts of society, including iwi, victims of crime, employers, and taxpayers. Given we found strong evidence for intergenerational impacts of educational disengagement (about one-third of AE participants have parents with no qualifications, and one-fifth also have siblings in AE), more effective support is likely to lead to enduring benefits. This report described the experience of more than 23,000 learners in need over the past several decades, for whom there was a lost opportunity for more effective support. Improvements in support, both before and during AE, would enable the next 23,000 learners to better achieve their aspirations, and promote a more effective and equitable system.

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Appendix: Supporting tables and figures

Table A1: Description of all variables

Variable	Definition	Time dimension	Source
Context and prior experiences			
Male	Learner's recorded sex is male.	Time invariant	Stats NZ
Ethnicity	Learner is the specified ethnicity (total response; learners can be multiple ethnicities).	Time invariant	Stats NZ
Born overseas	Learner has no birth record in NZ.	Time invariant	DIA
Ever received ESOL	Learner has a record of receiving learning support related to English for Speakers of Other Languages.	Cumulative: Up to match year	MoE
Education region (of first school)	The MoE region associated with the first recorded school enrolment for the learner.	Cumulative: Up to match year	MoE
Disability (WGSS)	The learner reported having at least one common activity (on the Washington Group Short-Set) that they could only do with a lot of difficulty, or could not do at all.	In either Census 2013 or Census 2018	Stats NZ
ADHD	Learner has a diagnosis of Attention Deficit Hyperactivity Disorder captured through: NASC assessments, hospitalisations, mental health specialists, OT gateway assessments, pharmaceutical data; and/or the learner has ever had a prescription for drugs associated with management of ADHD.	Cumulative: Up to age 16	MoH/OT
ASD	Learner has a diagnosis of Autism Spectrum Disorder captured through a variety of sources (see above).	Cumulative: Up to age 16	MoH/OT
Intellectual disability	Learner has a diagnosis of intellectual disability captured through a variety of sources (see above).	Cumulative: Up to age 16	MoH/OT
Ever received ORS	Learner has a record of receiving learning support related to the Ongoing Resourcing Scheme.	Cumulative: Up to match year	MoE
Mental health need	Learner has had: any referral to a specialist mental health service; diagnoses relating to mental health/addiction; GP medical certificates referring to mental health needs; as well as pharmaceutical data that is consistent with mental health/AOD need.	Cumulative: Up to age 16	MoH
Evidence of traumatic brain injury	Learner has a diagnosis captured through a variety of sources (see above, plus ACC) that is consistent with traumatic brain injury (for example, concussion with loss of consciousness). Only diagnoses that are associated with heightened incidence of intellectual disability were included.	Cumulative: Up to match year	MoH/ACC

Variable	Definition	Time dimension	Source
Birth year	Learner's year of birth.	Time invariant	Stats NZ
Age first enrolled in AE	The learner's age at the end of the year in which they first enrol in AE.	Time invariant	MoE
Māori medium schooling (ever)	Learner has had a school roll return record of having more than 50% learning content delivered in te reo Māori.	Cumulative: Up to match year	MoE
Sibling in AE	The learner's 'sibling' has a record of enrolling in AE at some point. Siblings are defined as children who share at least one parent with a learner in our sample.	Time invariant	MoE
Non-structural school moves	Count of school moves the learner has made, which are non-structural (eg not between primary/intermediate/secondary school).	Cumulative: Up to match year	MoE
% attendance rate	Proportion of time in Term 2 that the learner was recorded as attending school.	In match year	MoE
% justified absence rate	Proportion of time in Term 2 that the learner was recorded as being absent from school for justified reasons.	In match year	MoE
% unjustified absence rate	Proportion of time in Term 2 that the learner was recorded as being absent from school for unjustified reasons.	In match year	MoE
Attendance Service referral	Count of referrals to the Attendance Service, either for non-enrolment or for chronic absence.	Cumulative: Up to match year	MoE
Standdowns	Count of standdowns recorded for the learner.	Cumulative: Up to match year	MoE
Suspensions/exclusions	Count of suspensions or exclusions recorded for the learner.	Cumulative: Up to match year	MoE
Youth justice FGC	Learner has participated in a Youth Justice Family Group Conference.	Cumulative: Up to match year	OT
Ever had report of concern	Learner was the subject of a report of concern to Oranga Tamariki.	Cumulative: Up to match year	OT
Ever had OT investigation	Learner was the subject of an investigation by Oranga Tamariki.	Cumulative: Up to match year	OT
Ever placed in care	Learner has had a placement into care.	Cumulative: Up to match year	OT
Deprivation index (NZDep)	The NZDep decile associated with the first recorded address of the learner.	Time invariant	Stats NZ
School decile (of first school)	The school decile associated with the first recorded school enrolment for the learner.	Time invariant	MoE
Number of addresses lived at	Count of the number of distinct addresses associated with the learner.	Cumulative: Up to match year	Stats NZ
Mother* sole parent at birth	The learner's birth certificate does not record a second parent.	Time invariant	DIA

Variable	Definition	Time dimension	Source
Mother* was teen parent	The learner's mother was younger than 20 when giving birth to the learner.	Time invariant	Stats NZ
Missing father* (in all data)	There is no record of the learner being associated with a second parent across multiple datasets.	Time invariant	Stats NZ/ DIA/Census/ Customs/ Immigration/ MSD/OT
Receive benefit income	The learner's mother*/father* recorded some benefit income.	In match year	IR
Average income	The total recorded real income of the learner's mother*/father*. Denominated in 2017 dollars using the CPI as an inflator.	In match year	IR
Police proceeding – any offence	The learner's mother*/father* has been proceeded against by police.	Cumulative: From learner's birth up to match year	Police
Police proceeding – violent offence	The learner's mother*/father* has been proceeded against by police for a violent offence.	Cumulative: From learner's birth up to match year	Police
Served community sentence	The learner's mother*/father* has a record of serving a community sentence.	Cumulative: From learner's birth up to match year	Corrections
Served custodial sentence	The learner's mother*/father* has a record of serving a custodial sentence.	Cumulative: From learner's birth up to match year	Corrections
Highest qualification	The highest qualification recorded by the learner's mother*/father* across many data sources.	Cumulative: Up to age 16	Census/ MSD/MoE
Future outcomes			
At school	The final school enrolment record ends on or after the relevant year.	Cumulative: Up to relevant year	MoE
NCEA 1+	The school leaver entry records a highest attained qualification as NCEA Level 1 (or equivalent) or higher.	Time invariant	MoE
NCEA 2+	The school leaver entry records a highest attained qualification as NCEA Level 2 (or equivalent) or higher.	Time invariant	MoE
NCEA 3+	The school leaver entry records a highest attained qualification as NCEA Level 3 (or equivalent) or higher.	Time invariant	MoE
UE	The school leaver entry records that the person achieved the University Entrance award.	Time invariant	MoE

Variable	Definition	Time dimension	Source
Tertiary enrolment	The person had any record of an enrolment in a tertiary provider (including industry training).	In relevant year	MoE
Total income	Total recorded real income from any source (including self-employment). Denominated in 2017 dollars using the CPI as an inflator.	In relevant year	IR
Wage income	Total recorded real income from wages/salaries. Denominated in 2017 dollars using the CPI as an inflator.	In relevant year	IR
Receive any wages	Person had any recorded income from wages/salaries.	In relevant year	IR
Receive any benefit	Person had any recorded income from benefits.	In relevant year	IR
Custodial sentence	Person had any record of serving a custodial sentence.	In relevant year	Corrections
Community sentence	Person had any record of serving a community sentence.	In relevant year	Corrections
Offender – any offence	Person was proceeded against by police.	In relevant year	Police
Offender – violent offence	Person was proceeded against by police for a violent offence.	In relevant year	Police
Victim – any offence	Person was recorded by police as a victim of crime.	In relevant year	Police
Victim – violent offence	Person was recorded by police as a victim of a violent crime	In relevant year	Police
N ASH	Count of the person’s recorded Ambulatory Sensitive Hospitalisations. This refers to where someone is hospitalised for a condition that could have been prevented with primary health care.	In relevant year	MoH
N ED admissions	Count of the number of times the person presented to hospital emergency departments.	In relevant year	MoH
N GP contacts	Count of the number of contacts the person had with their GP.	In relevant year	MoH
PHO enrolment	Person was enrolled in a Primary Health Organisation.	In relevant year	MoH
Died	The person has a death record in the relevant year or before.	Cumulative: In or before relevant year	Stats NZ

Note: * We mainly identified the parents of learners in our sample through the parents listed on the birth certificate of the learner (using alternative sources only where the learner did not have a New Zealand birth record). These fields are ‘parent 1’ and ‘parent 2’, and allow for the possibility that both listed parents are of the same gender. However, in our sample, almost all (very close to 100% of) people identified as ‘parent 1’ were female and almost all people identified as ‘parent 2’ were male. To acknowledge the strong gender differences in many of the aspects we are measuring (such as income and criminal justice experience), we report parent 1 as the mother and parent 2 as the father.

For more information about how these indicators have been constructed, see the underlying code published on the SWA Github page: <https://github.com/nz-social-wellbeing-agency>.

Table A2 – Results of predictive models

Variable	Age 12		Age 13		Age 14		Age 15	
	Standard	Attendance	Standard	Attendance	Standard	Attendance	Standard	Attendance
Demographics								
Male	1.20 ***	1.11	1.17 ***	1.11 **	1.10 ***	1.20 ***	1.12 ***	1.20 ***
Born in NZ	1.31 *	1.61 *	1.47 ***	1.79 ***	1.25 ***	1.25 **	1.52 ***	1.22
Ethnicity (vs European)								
Māori	2.01 ***	1.48 ***	1.73 ***	1.54 ***	1.50 ***	1.35 ***	1.43 ***	1.32 ***
Māori (only)	1.62 ***	1.43 ***	1.48 ***	1.29 ***	1.30 ***	1.17 ***	1.24 ***	1.08
Pacific	1.38 ***	1.28 **	1.30 ***	1.11 *	1.22 ***	1.00	1.29 ***	1.01
Asian	0.70 **	0.69	0.57 ***	0.58 ***	0.54 ***	0.48 ***	0.79 **	0.69 *
MELAA	0.78	0.40	1.21 *	0.85	0.87	0.68	0.99	0.88
Other ethnicity	0.94	1.20	1.02	1.07	0.88	1.16	1.15	1.46
Region (of first school, vs Auckland)								
Tai Tokerau	1.25 **	1.24	0.96	0.98	0.82 ***	0.89	0.73 ***	0.66 ***
Waikato	1.17 *	0.98	1.17 ***	1.18 **	1.06	1.02	0.84 **	0.92
Bay of Plenty	1.14	1.18	1.26 ***	1.15 *	1.07	1.10	0.72 ***	0.79 *
Hawke's Bay	0.89	0.83	0.91	0.98	0.98	1.10	0.85 **	0.97
Taranaki	1.10	0.93	1.11 *	1.10	1.08	1.18 **	1.01	1.00
Wellington	1.19 *	1.21	1.03	1.08	0.92 **	0.99	0.82 ***	0.91
Nelson	1.17	0.74	1.53 ***	1.25 *	1.41 ***	1.38 ***	1.04	1.34
Canterbury	0.69 ***	0.72 **	1.18 ***	1.18 **	1.41 ***	1.48 ***	1.16 **	1.21
Otago	0.43 ***	0.39 ***	0.72 ***	0.79 **	1.71 ***	1.72 ***	2.75 ***	3.36 ***
Disability/neurodiversity/mental health								
ADHD	0.97	0.95	1.23 ***	1.17 **	1.09 *	1.10	1.04	1.27 **
ASD	0.52 ***	0.41 **	0.46 ***	0.49 ***	0.55 ***	0.59 ***	0.95	0.82
Intellectual disability	0.80	1.03	0.72 ***	0.84	0.70 ***	0.83	1.05	1.21
Ever received ORS	0.16 **	0.14 ***	0.13 ***	0.12 ***	0.14 ***	0.08 ***	0.09 ***	0.04 ***
Mental health need	1.47 ***	1.59 ***	1.75 ***	1.84 ***	1.76 ***	1.74 ***	1.88 ***	1.93 ***
Birth year (vs 1990)								
1991	7.32 ***		1.73 ***		1.04		0.76 *	
1992	9.77 ***		1.97 ***		1.44 ***		1.13	
1993	8.72 ***		1.92 ***		1.46 ***		1.23	
1994	9.63 ***		1.82 ***		1.13		1.20	
1995	13.92 ***		1.56 ***		1.24 ***		1.31 *	

1996	9.51	***		1.42	***		1.01		1.35	**					
1997	8.85	***		1.45	***		1.10		1.26						
1998	7.97	***		1.42	***		1.10		1.05						
1999	8.70	***		1.35	**		0.99		0.99						
2000	9.39	***	1.06	1.25	*	0.91	0.85	*	0.86	**	0.88				
2001	8.93	***	0.97	1.19		0.87	0.91	*	0.93		0.84	*			
2002	7.75	***	0.85	1.32	**	0.98	0.91		0.94		0.75	*	0.73	***	
2003	9.03	***	1.00	1.20		0.90	0.68	***	0.70	***	0.61	***	0.59	***	
2004	6.88	***	0.79	1.07		0.79	0.57	***	0.58	***	0.39	***	0.37	***	
2005	12.58	***	1.40	0.85		0.61	0.28	***	0.27	***	0.18	***	0.17	***	
Mother's characteristics															
Sole parent at birth	1.26	***	1.19	1.12	***	1.17	**	1.19	***	1.21	***	1.09		1.18	*
Teen parent	0.89		1.00	1.01		1.23	***	1.04		1.21	***	1.14	***	1.22	**
Supported by main benefit	1.59	***	1.38	1.52	***	1.42	***	1.41	***	1.30	***	1.33	***	1.20	**
Mental health need	0.91	*	0.89	0.96		1.01		1.01		1.02		0.97		1.04	
Served community sentence	1.25	***	1.31	1.28	***	1.28	***	1.13	***	1.14	***	1.06		1.10	
Served custodial sentence	0.95		0.87	0.98		1.01		1.04		0.97		1.10		1.11	
Mother's highest qual (vs none)															
School	0.85	***	0.86	0.85	***	0.92		0.86	***	0.80	***	0.90	**	0.94	
Diploma	0.84	**	0.91	0.73	***	0.77	***	0.79	***	0.76	***	0.79	***	0.89	
Degree	0.64	***	0.55	0.61	***	0.68	***	0.51	***	0.47	***	0.61	***	0.64	***
Post-grad	0.47	***	0.34	0.39	***	0.43	***	0.43	***	0.51	***	0.43	***	0.47	***
Unknown	0.78	**	1.08	0.82	***	1.33	***	0.76	***	1.12		0.78	***	1.26	
Father's characteristics															
Supported by main benefit	1.13	*	1.24	1.20	***	1.23	***	1.12	***	1.13	***	1.12	**	1.12	
Mental health need	1.05		1.04	1.04		1.09	*	1.08	***	1.11	**	0.98		0.95	
Served community sentence	1.52	***	1.51	1.43	***	1.43	***	1.37	***	1.49	***	1.49	***	1.66	***
Served custodial sentence	1.23	***	1.25	1.17	***	1.08		1.06	*	1.04		0.94		0.89	
Father's highest qual (vs none)															
School	0.82	***	0.86	0.79	***	0.79	***	0.84	***	0.94		0.90	**	1.17	**
Diploma	0.69	***	0.64	0.71	***	0.67	***	0.73	***	0.79	***	0.72	***	0.85	
Degree	0.50	***	0.56	0.39	***	0.36	***	0.50	***	0.45	***	0.56	***	0.75	
Post-grad	0.47	**	0.51	0.41	***	0.33	***	0.43	***	0.40	***	0.42	***	0.57	
Unknown	0.95		1.33	0.82	***	1.11		0.83	***	1.27	***	0.91		1.23	
Prior school moves (vs none)															

1	1.20	**	1.11		1.28	***	1.18	***	1.18	***	1.14	***	1.18	***	1.03
2	1.37	***	1.36	***	1.34	***	1.23	***	1.21	***	1.13	**	1.26	***	1.07
3+	1.32	***	1.32	**	1.31	***	1.36	***	1.15	***	1.14	**	1.29	***	1.17 *
Prior Attend. Service referrals (vs none)															
1	2.04	***	1.87	***	1.99	***	1.62	***	2.16	***	1.85	***	1.91	***	2.17 ***
2	2.68	***	2.21	***	2.81	***	2.05	***	2.91	***	2.47	***	2.60	***	2.43 ***
3+	3.60	***	2.46	***	3.10	***	2.05	***	3.42	***	2.50	***	2.99	***	2.74 ***
Prior standdowns (vs none)															
1 prior standdown	6.23	***	5.75	***	4.45	***	3.89	***	3.56	***	3.14	***	2.71	***	2.56 ***
2 prior standdowns	10.75	***	10.63	***	6.98	***	6.08	***	5.47	***	4.40	***	3.52	***	2.69 ***
3 prior standdowns	12.80	***	13.48	***	8.98	***	7.47	***	6.10	***	5.61	***	4.20	***	3.37 ***
4 prior standdowns	13.02	***	12.23	***	9.14	***	7.39	***	6.26	***	6.54	***	4.22	***	3.47 ***
5 prior standdowns	12.57	***	13.36	***	7.84	***	5.37	***	6.16	***	5.12	***	3.67	***	2.55 ***
Prior suspensions (vs none)															
1 prior suspension	2.91	***	2.53	***	2.93	***	2.37	***	2.53	***	2.07	***	2.10	***	1.86 ***
2 prior suspensions	3.50	***	2.52	***	3.24	***	2.67	***	2.43	***	1.75	***	1.96	***	1.54 ***
3 prior suspensions	2.57	***	2.00	**	2.99	***	1.85	***	2.17	***	1.47	**	1.77	***	1.20
Attendance rates															
+1% justified absence			1.01	***			1.02	***			1.02	***			1.02 ***
+1% unjustified absence			1.02	***			1.02	***			1.02	***			1.02 ***
Youth justice/care and protection															
Ever had report of concern	2.36	***	2.46	***	2.18	***	1.83	***	1.98	***	1.98	***	2.43	***	2.18 ***
Ever had OT investigation	1.21	**	1.21		1.18	***	1.42	***	1.05		1.04		1.00		1.04
Ever had YJ family group conference	1.66	***	1.52		1.99	***	1.65	***	1.59	***	1.55	***	1.18	***	1.27 **
Ever placed in care	0.88	*	0.73	***	0.89	***	0.83	***	0.95		0.87	**	0.99		0.89
Other experiences															
Māori medium school participation	0.97		1.06		1.14	**	1.17	***	1.00		1.01		0.99		0.98
NZDep index	1.05	***	1.02		1.06	***	1.03	***	1.05	***	1.04	***	1.05	***	1.04 ***
School decile	0.97	**	0.97	*	0.96	***	0.94	***	0.95	***	0.96	***	0.97	***	0.97 **
Number of previous addresses	1.01		0.99		0.99	*	0.98	***	1.00		1.00		0.99		1.01
Area under ROC curve (AUC)	0.9546		0.9591		0.9466		0.9529		0.9372		0.9449		0.9291		0.9382

Note: This table shows results from age-specific logistic regression models predicting AE enrolment in the following year. All results reported as odds ratios (numbers above one mean the factor is associated with a greater probability of enrolling in AE; numbers below one mean the factor is associated with a lower probability of enrolling in AE). *, ** and *** denote the odds ratio is statistically significantly different from one at the 10%, 5% and 1% level of significance, respectively. Models also included a series of indicators for missing data and an intercept term, not reported here.

Figure A1: Distribution of propensities, age 12 model

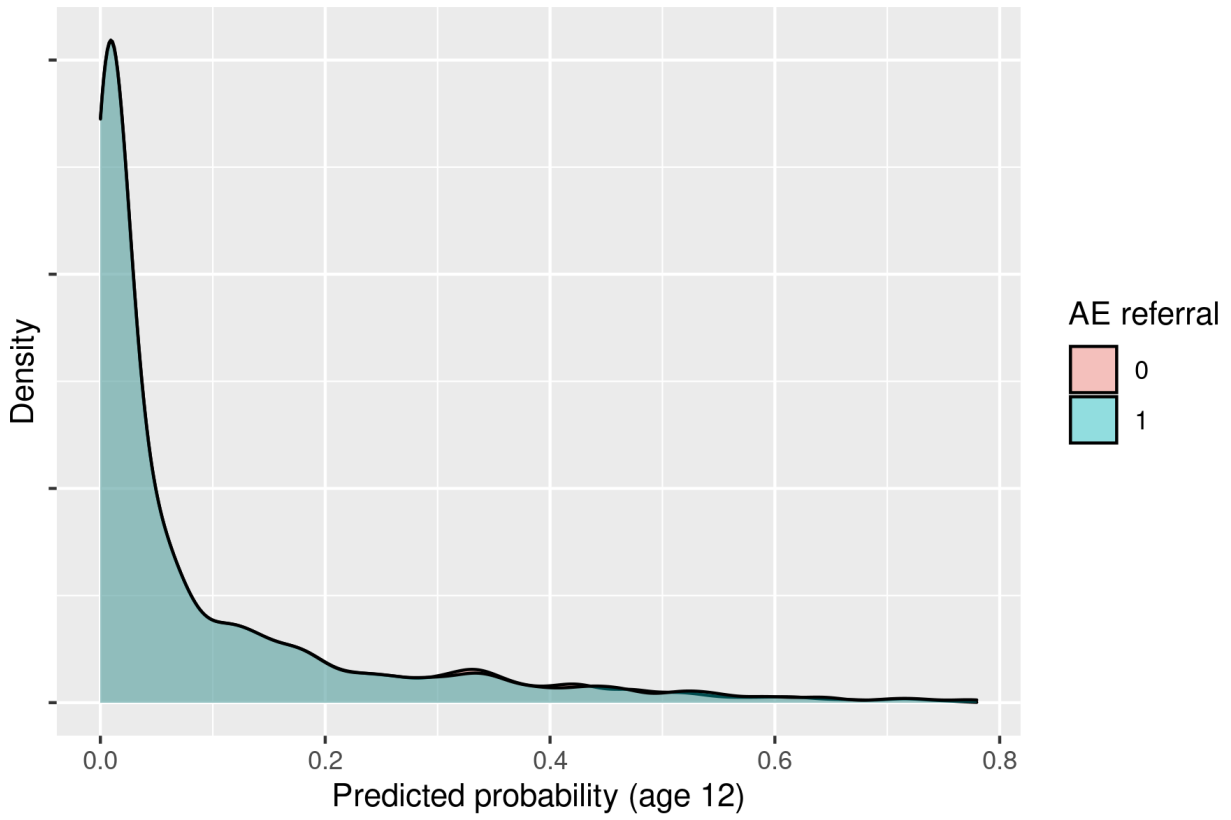


Figure A2: Distribution of propensities, age 13 model

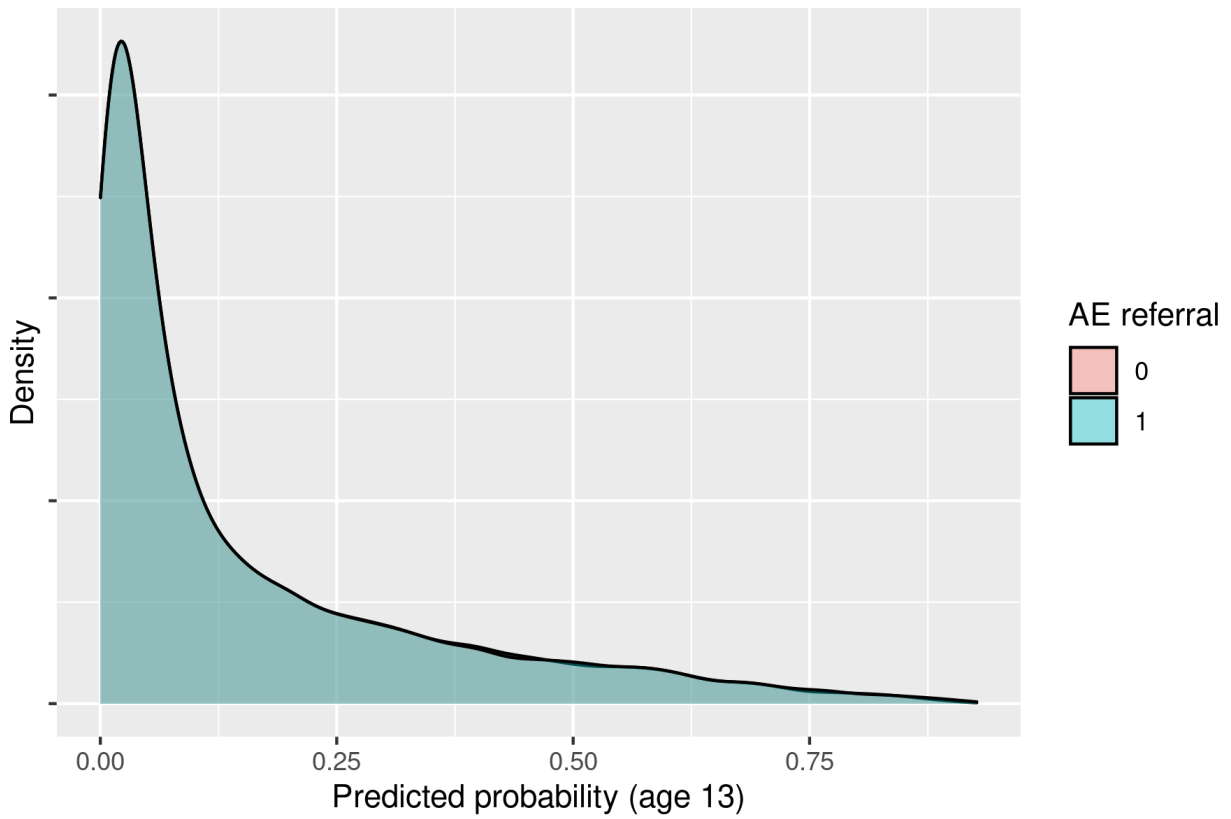


Figure A3: Distribution of propensities, age 15 model

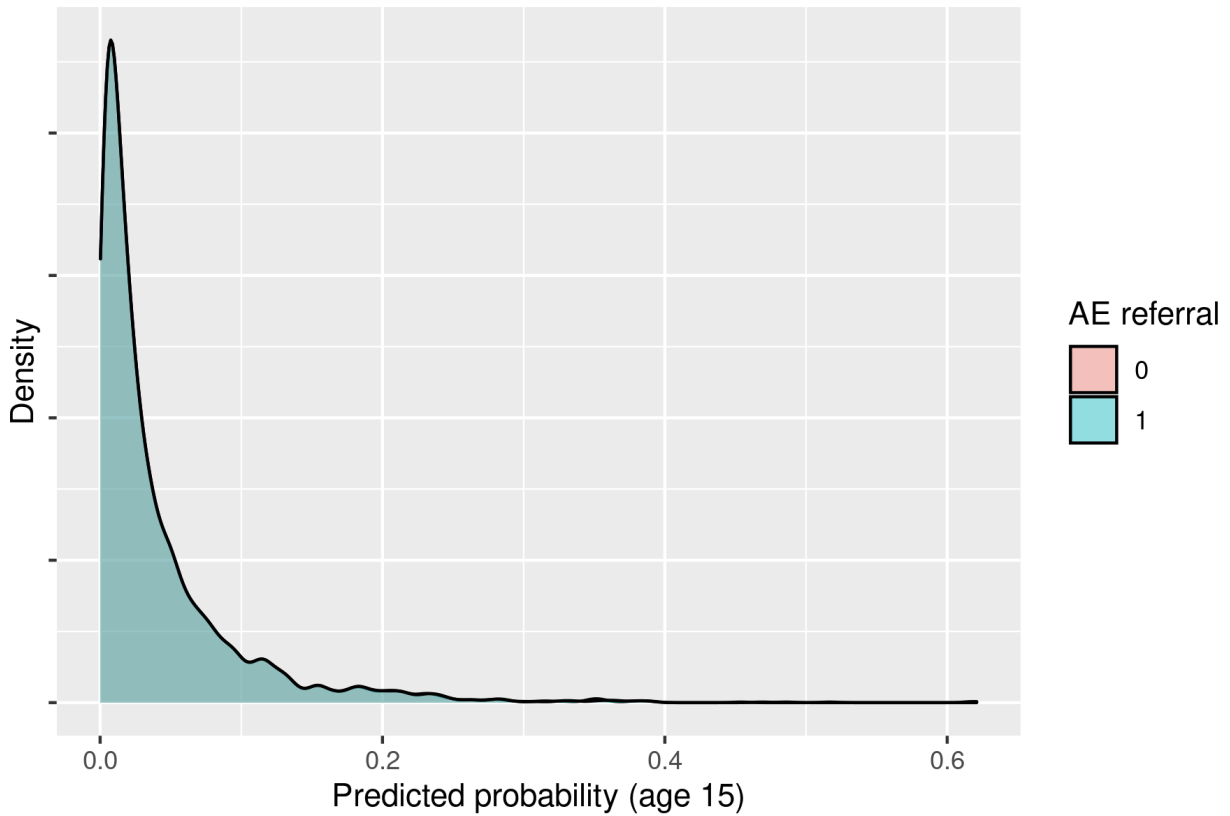


Figure A4: Receiver Operating Characteristic curve distinguishing between AE participants and the rest of the population, age 14 model

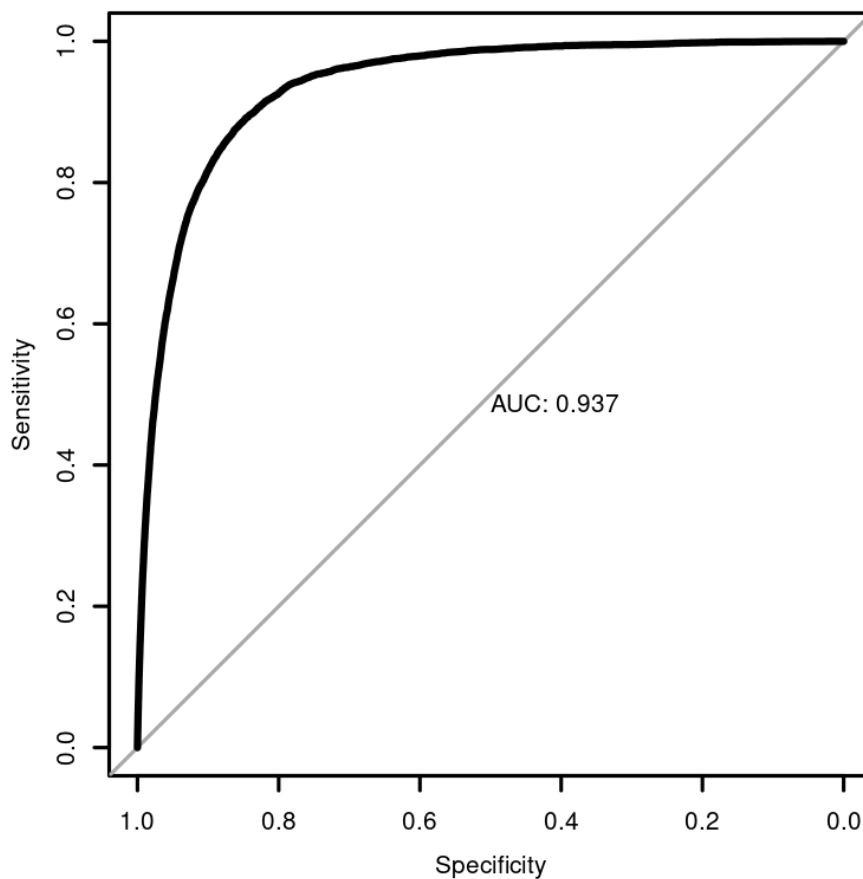


Figure A5: Receiver Operating Characteristic curve distinguishing between AE participants and the rest of the population, age 14 model

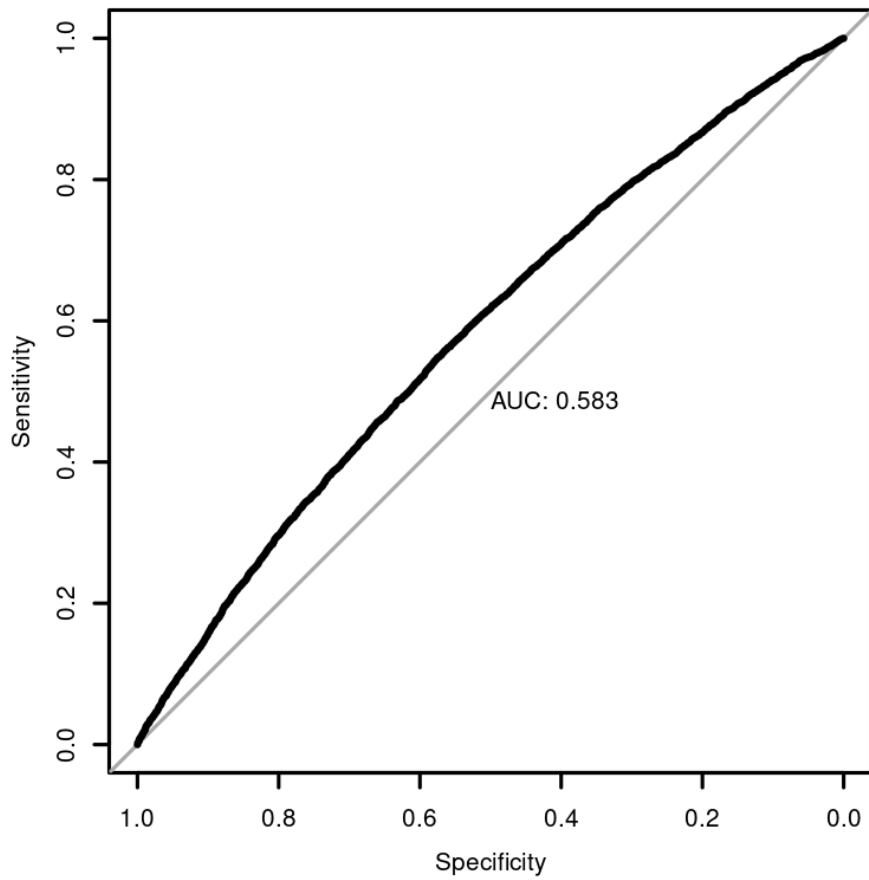


Figure A6: Distribution of mother's income at age 14, AE participants vs matched comparison group

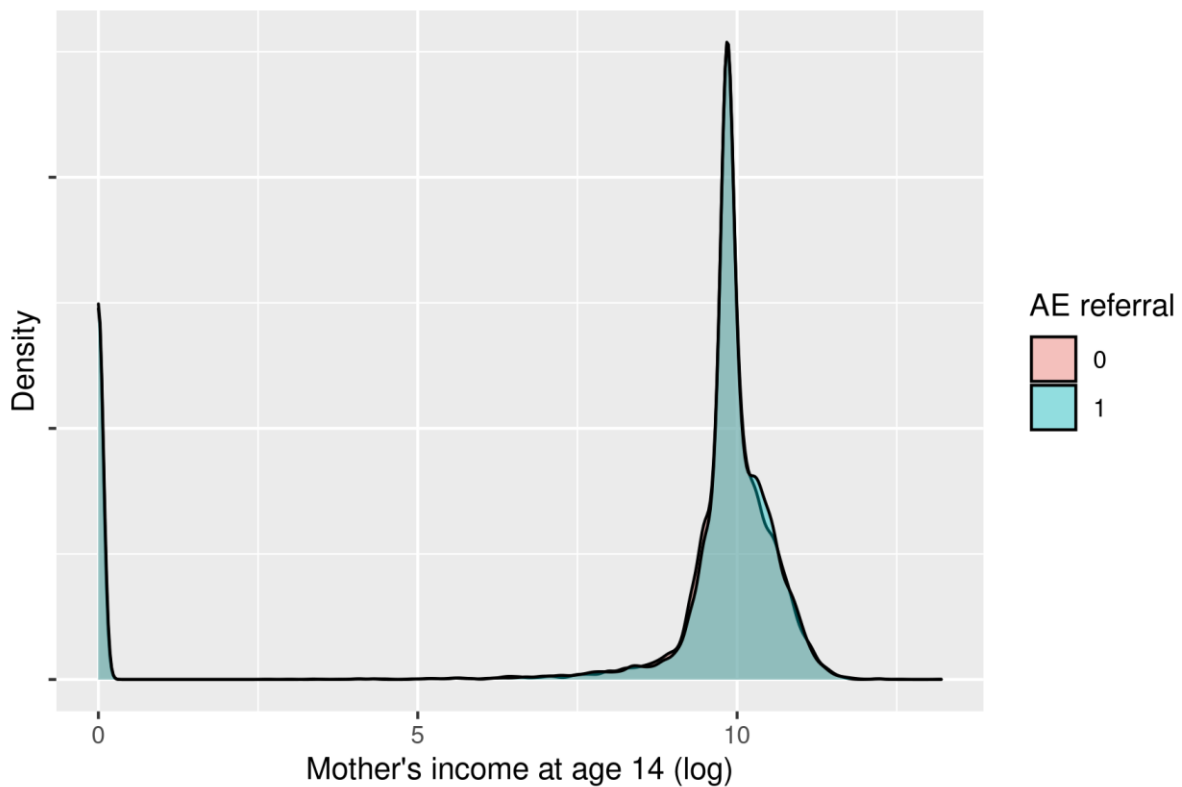


Figure A7: Distribution of mother's income at age 14, AE participants vs matched comparison group

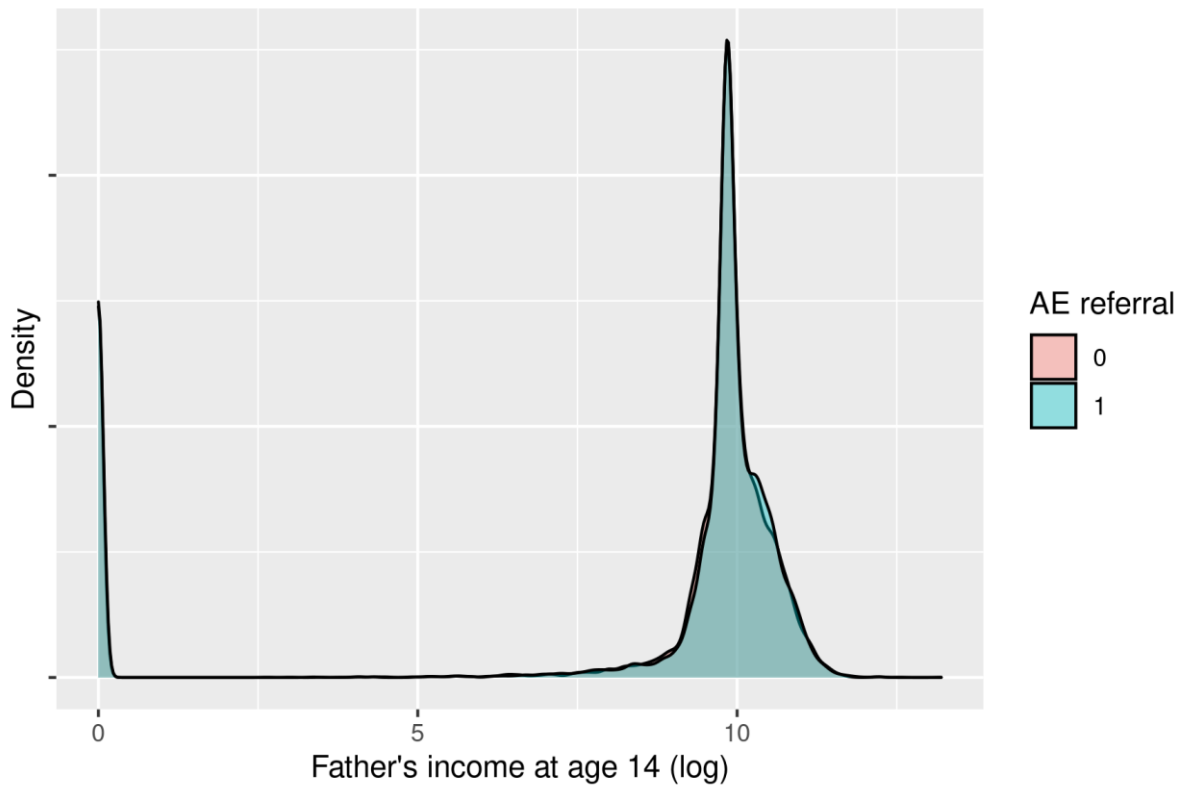


Table A3 – Differences between AE participants and matched comparison group (education and income)

Age	% tertiary enrolment			Qual level attained (NZQF)			Total income			Wage income			% any wages			% any benefit		
	Diff	SE	p	Diff	SE	p	Diff	SE	p	Diff	SE	p	Diff	SE	p	Diff	SE	p
17	8.7%	0.5%	0.000	0.03	0.01	0.002	\$248	\$80	0.002	-\$230	\$75	0.002	-3.4%	0.5%	0.000	7.0%	0.4%	0.000
18	0.1%	0.4%	0.830	-0.12	0.01	0.000	-\$863	\$100	0.000	-\$1,598	\$99	0.000	-8.3%	0.5%	0.000	12.0%	0.5%	0.000
19	-5.1%	0.4%	0.000	-0.24	0.01	0.000	-\$2,214	\$113	0.000	-\$3,234	\$121	0.000	-10.6%	0.5%	0.000	12.3%	0.5%	0.000
20	-4.6%	0.4%	0.000	-0.22	0.01	0.000	-\$2,834	\$130	0.000	-\$3,972	\$140	0.000	-10.9%	0.5%	0.000	12.2%	0.5%	0.000
21	-4.1%	0.4%	0.000	-0.22	0.01	0.000	-\$3,092	\$148	0.000	-\$4,266	\$160	0.000	-9.8%	0.5%	0.000	12.8%	0.5%	0.000
22	-2.7%	0.4%	0.000	-0.18	0.01	0.000	-\$3,502	\$171	0.000	-\$4,840	\$183	0.000	-9.8%	0.5%	0.000	12.3%	0.5%	0.000
23	-1.7%	0.4%	0.000	-0.16	0.01	0.000	-\$3,789	\$197	0.000	-\$5,269	\$208	0.000	-9.3%	0.6%	0.000	12.7%	0.6%	0.000
24	-1.6%	0.4%	0.000	-0.14	0.01	0.000	-\$3,649	\$221	0.000	-\$5,186	\$236	0.000	-7.0%	0.6%	0.000	13.0%	0.6%	0.000
25	-0.9%	0.4%	0.032	-0.11	0.02	0.000	-\$4,014	\$251	0.000	-\$5,471	\$268	0.000	-7.4%	0.7%	0.000	13.4%	0.6%	0.000
26	-1.1%	0.5%	0.016	-0.10	0.02	0.000	-\$4,200	\$290	0.000	-\$5,651	\$310	0.000	-7.7%	0.7%	0.000	13.3%	0.7%	0.000
27	-1.7%	0.5%	0.000	-0.12	0.02	0.000	-\$4,256	\$331	0.000	-\$5,792	\$353	0.000	-7.6%	0.8%	0.000	13.8%	0.8%	0.000
28	-1.8%	0.6%	0.001	-0.12	0.02	0.000	-\$4,506	\$396	0.000	-\$6,102	\$420	0.000	-7.7%	0.9%	0.000	14.5%	0.9%	0.000
29	-2.3%	0.6%	0.000	-0.14	0.03	0.000	-\$4,109	\$495	0.000	-\$5,937	\$530	0.000	-6.2%	1.2%	0.000	14.6%	1.1%	0.000
30	-3.6%	0.9%	0.000	-0.16	0.04	0.000	-\$4,679	\$722	0.000	-\$6,450	\$771	0.000	-7.8%	1.6%	0.000	14.8%	1.5%	0.000

Note: Results are from a statistical model that also includes all matching variables. 'Diff', 'SE' and 'p' denote the adjusted difference between AE participants and matched comparison group, the standard error of that difference, and the p-value, respectively.

Table A4 – Differences between AE participants and matched comparison group (crime)

Age	% custodial sentence			% community sentence			% police – any offence			% police – violent			% victim – any			% victim – violent		
	Diff	SE	p	Diff	SE	p	Diff	SE	p	Diff	SE	p	Diff	SE	p	Diff	SE	p
17	1.5%	0.1%	0.000	2.7%	0.2%	0.000	15.1%	0.4%	0.000	7.4%	0.3%	0.000	1.8%	0.2%	0.000	1.8%	0.2%	0.000
18	4.2%	0.2%	0.000	8.4%	0.3%	0.000	13.1%	0.4%	0.000	6.0%	0.3%	0.000	1.1%	0.2%	0.000	1.3%	0.2%	0.000
19	5.2%	0.3%	0.000	10.2%	0.4%	0.000	11.3%	0.4%	0.000	4.4%	0.3%	0.000	1.4%	0.2%	0.000	1.7%	0.2%	0.000
20	5.5%	0.3%	0.000	10.1%	0.4%	0.000	10.5%	0.5%	0.000	4.6%	0.3%	0.000	1.3%	0.3%	0.000	1.4%	0.2%	0.000
21	5.4%	0.3%	0.000	10.1%	0.4%	0.000	10.4%	0.5%	0.000	4.4%	0.3%	0.000	1.9%	0.3%	0.000	1.9%	0.2%	0.000
22	5.2%	0.3%	0.000	10.3%	0.4%	0.000	9.9%	0.5%	0.000	4.2%	0.3%	0.000	2.3%	0.3%	0.000	2.3%	0.3%	0.000
23	5.3%	0.4%	0.000	9.6%	0.5%	0.000	8.2%	0.5%	0.000	3.8%	0.4%	0.000	2.1%	0.3%	0.000	1.9%	0.3%	0.000
24	5.2%	0.4%	0.000	9.3%	0.5%	0.000	7.8%	0.5%	0.000	3.0%	0.4%	0.000	2.3%	0.4%	0.000	2.0%	0.3%	0.000
25	4.6%	0.4%	0.000	8.8%	0.5%	0.000	8.0%	0.6%	0.000	3.0%	0.4%	0.000	1.7%	0.4%	0.000	1.6%	0.3%	0.000
26	5.4%	0.4%	0.000	9.6%	0.6%	0.000	7.6%	0.6%	0.000	3.0%	0.4%	0.000	2.0%	0.4%	0.000	1.8%	0.4%	0.000
27	4.9%	0.5%	0.000	9.2%	0.6%	0.000	8.2%	0.7%	0.000	3.2%	0.5%	0.000	1.8%	0.5%	0.000	2.0%	0.4%	0.000
28	5.2%	0.6%	0.000	8.2%	0.7%	0.000	6.6%	0.7%	0.000	2.2%	0.5%	0.000	3.0%	0.6%	0.000	2.8%	0.5%	0.000
29	4.3%	0.7%	0.000	7.3%	0.9%	0.000	7.1%	0.9%	0.000	2.6%	0.6%	0.000	3.6%	0.7%	0.000	2.9%	0.6%	0.000
30	3.9%	0.9%	0.000	6.9%	1.2%	0.000	4.1%	1.2%	0.001	1.7%	0.9%	0.044	2.0%	1.0%	0.048	1.8%	0.8%	0.029

Note: Results are from a statistical model that also includes all matching variables. ‘Diff’, ‘SE’ and ‘p’ denote the adjusted difference between AE participants and matched comparison group, the standard error of that difference, and the p-value, respectively.

Table A5 – Differences between AE participants and matched comparison group (health)

Age	N ASH			N ED admissions			N GP contacts			% PHO enrolment			% died		
	Diff	SE	p	Diff	SE	p	Diff	SE	p	Diff	SE	p	Diff	SE	p
17	0.1%	0.2%	0.501	8.9%	1.1%	0.000	-2.2%	1.9%	0.248	-0.2%	0.3%	0.401	0.1%	0.0%	0.096
18	0.1%	0.2%	0.513	9.5%	1.2%	0.000	-4.8%	1.9%	0.011	-0.6%	0.3%	0.028	0.0%	0.1%	0.631
19	0.0%	0.2%	0.958	6.8%	1.2%	0.000	-0.9%	1.9%	0.644	-1.0%	0.3%	0.001	0.1%	0.1%	0.112
20	0.2%	0.2%	0.227	7.7%	1.3%	0.000	-3.9%	2.0%	0.055	-1.1%	0.3%	0.001	0.1%	0.1%	0.319
21	0.5%	0.2%	0.010	8.6%	1.4%	0.000	-6.5%	2.1%	0.002	-1.2%	0.4%	0.001	0.1%	0.1%	0.330
22	0.2%	0.2%	0.394	9.0%	1.6%	0.000	-5.0%	2.2%	0.024	-0.6%	0.4%	0.158	0.2%	0.1%	0.033
23	0.1%	0.2%	0.669	8.5%	1.5%	0.000	-5.5%	2.4%	0.023	-0.9%	0.4%	0.050	0.3%	0.1%	0.026
24	0.1%	0.2%	0.586	7.0%	1.6%	0.000	-1.3%	2.6%	0.609	-0.4%	0.5%	0.459	0.2%	0.1%	0.099
25	0.4%	0.2%	0.071	7.7%	1.8%	0.000	-6.3%	2.9%	0.031	-0.6%	0.5%	0.280	0.4%	0.2%	0.012
26	0.5%	0.3%	0.049	11.4%	1.8%	0.000	-6.0%	3.3%	0.067	-0.2%	0.6%	0.694	0.3%	0.2%	0.062
27	0.7%	0.3%	0.010	11.6%	2.1%	0.000	-3.8%	3.8%	0.320	-0.5%	0.7%	0.472	0.1%	0.2%	0.524
28	0.9%	0.3%	0.001	10.8%	2.3%	0.000	-8.3%	4.7%	0.079	0.1%	0.7%	0.876	0.2%	0.2%	0.450
29	0.5%	0.3%	0.139	6.7%	3.1%	0.028	-5.6%	5.8%	0.338	0.6%	0.9%	0.523	0.2%	0.3%	0.562
30	0.1%	0.3%	0.829	7.2%	3.2%	0.026	-5.6%	8.1%	0.487	-1.6%	1.3%	0.218	0.0%	0.5%	0.918

Note: Results are from a statistical model that also includes all matching variables. 'Diff', 'SE' and 'p' denote the adjusted difference between AE participants and matched comparison group, the standard error of that difference, and the p-value, respectively.

Table A6 – Differences in outcomes by learner type

Group/outcome	Difference in AE effect for this group compared to non-group			AE effect for this group compared to comparison group		
	Better	No diff	Worse	Better	No diff	Worse
Male learners						
Education	64%	30%	6%	3%	52%	45%
Income	32%	41%	27%	0%	9%	91%
Crime	30%	13%	57%	0%	39%	61%
Health	1%	90%	9%	0%	100%	0%
Māori learners						
Education	48%	45%	6%	3%	58%	39%
Income	50%	50%	0%	0%	13%	88%
Crime	6%	85%	10%	0%	39%	61%
Health	1%	87%	11%	0%	100%	0%
Pacific learners						
Education	12%	67%	21%	6%	55%	39%
Income	9%	86%	5%	0%	11%	89%
Crime	2%	96%	1%	0%	44%	56%
Health	1%	94%	4%	0%	97%	3%
European learners						
Education	12%	67%	21%	6%	55%	39%
Income	9%	86%	5%	0%	11%	89%
Crime	2%	96%	1%	0%	44%	56%
Health	1%	94%	4%	0%	97%	3%
Learners in Auckland						
Education				6%	27%	67%
Income				0%	5%	95%
Crime				0%	20%	80%
Health				0%	70%	30%
Learners in Tai Tokerau						
Education	21%	79%	0%	3%	76%	21%
Income	14%	86%	0%	0%	38%	63%
Crime	0%	95%	5%	0%	61%	39%
Health	3%	96%	1%	0%	100%	0%
Learners in Waikato						
Education	24%	70%	6%	3%	70%	27%
Income	14%	82%	4%	0%	25%	75%
Crime	0%	93%	7%	0%	50%	50%
Health	3%	96%	1%	0%	100%	0%
Learners in Bay of Plenty						
Education	15%	82%	3%	3%	55%	42%
Income	14%	84%	2%	0%	29%	71%
Crime	4%	83%	13%	0%	50%	50%
Health	1%	90%	9%	0%	91%	9%

Group/outcome	Difference in AE effect for this group compared to non-group			AE effect for this group compared to comparison group		
	Better	No diff	Worse	Better	No diff	Worse
Learners in Hawke's Bay						
Education	9%	91%	0%	3%	64%	33%
Income	21%	77%	2%	0%	48%	52%
Crime	0%	86%	14%	0%	49%	51%
Health	4%	96%	0%	0%	97%	3%
Learners in Taranaki						
Education	9%	79%	12%	3%	64%	33%
Income	0%	89%	11%	0%	29%	71%
Crime	2%	85%	13%	0%	49%	51%
Health	7%	90%	3%	0%	97%	3%
Learners in Wellington						
Education	21%	70%	9%	3%	67%	30%
Income	30%	70%	0%	0%	25%	75%
Crime	2%	89%	8%	0%	50%	50%
Health	3%	96%	1%	0%	100%	0%
Learners in Nelson						
Education	9%	91%	0%	3%	67%	30%
Income	2%	98%	0%	0%	34%	66%
Crime	0%	95%	5%	0%	68%	32%
Health	7%	93%	0%	0%	100%	0%
Learners in Canterbury						
Education	15%	73%	12%	3%	48%	48%
Income	16%	82%	2%	0%	23%	77%
Crime	2%	94%	4%	0%	58%	42%
Health	4%	96%	0%	0%	100%	0%
Learners in Otago						
Education	6%	94%	0%	3%	58%	39%
Income	5%	89%	5%	0%	32%	68%
Crime	2%	90%	7%	0%	64%	36%
Health	9%	91%	0%	0%	100%	0%
Learners who first enrol in AE at age 13						
Education				3%	45%	52%
Income				0%	9%	91%
Crime				0%	23%	77%
Health				0%	81%	19%
Learners who first enrol in AE at age 14						
Education	0%	100%	0%	3%	73%	24%
Income	11%	89%	0%	0%	38%	63%
Crime	15%	85%	0%	0%	58%	42%
Health	6%	94%	0%	0%	100%	0%
Learners who first enrol in AE at age 15						
Education	6%	91%	3%	3%	73%	24%

Group/outcome	Difference in AE effect for this group compared to non-group			AE effect for this group compared to comparison group		
	Better	No diff	Worse	Better	No diff	Worse
Income	36%	63%	2%	0%	41%	59%
Crime	54%	46%	0%	0%	85%	15%
Health	1%	99%	0%	0%	100%	0%
Learners who first enrol in AE at age 16						
Education	6%	82%	12%	3%	70%	27%
Income	41%	55%	4%	0%	46%	54%
Crime	55%	45%	0%	0%	94%	6%
Health	4%	96%	0%	0%	100%	0%
Estimated probability <0.1						
Education				3%	58%	39%
Income				0%	14%	86%
Crime				0%	38%	62%
Health				1%	94%	4%
Estimated probability 0.1-0.3						
Education	6%	94%	0%	0%	94%	6%
Income	0%	98%	2%	0%	75%	25%
Crime	2%	73%	25%	0%	62%	38%
Health	14%	84%	1%	6%	93%	1%
Estimated probability 0.3-0.5						
Education	48%	52%	0%	12%	85%	3%
Income	32%	68%	0%	0%	98%	2%
Crime	11%	86%	4%	2%	87%	11%
Health	11%	89%	0%	4%	96%	0%
Estimated probability 0.5-0.7						
Education	3%	73%	24%	3%	76%	21%
Income	0%	82%	18%	0%	57%	43%
Crime	4%	80%	17%	0%	70%	30%
Health	13%	86%	1%	6%	93%	1%
Estimated probability >0.7						
Education	0%	100%	0%	3%	82%	15%
Income	2%	96%	2%	0%	66%	34%
Crime	8%	79%	13%	0%	65%	35%
Health	7%	93%	0%	0%	99%	1%

Note: The first three columns indicate whether there is evidence of the AE effect being significantly more beneficial or less beneficial for the relevant group, as opposed to everyone not in that group (eg males vs females, or Māori vs non-Māori). This was determined via the significance of an interaction term between AE participation and the group of interest. The last three columns provide an indication of whether AE participants in the group of interest have significantly better or worse outcomes than the same group in the matched comparison (eg males in AE vs males in matched comparison).

Appendix: Technical details of sensitivity analysis

Exact matching process

As outlined in the section discussing the balance of the matching characteristics, there is potentially a balancing issue with four matching variables:

- Number of referrals to Attendance Service;
- Number of stand-downs;
- Number of suspensions and exclusions; and
- Whether the person had participated in a youth justice family group conference.

These variables were all highly conceptually relevant to the choice to refer a learner to AE, and they were all slightly imbalanced, so that the AE group had more of these events than the matched comparison group. To test whether this was an issue, we undertook an alternative matching process, which used exact matching on each of these characteristics, as well as birth cohort.³² This resulted in a greater degree of balance across these characteristics. However, it meant a small number (less than 5 percent) of AE participants could not be matched at all, because there were no learners in the rest of the population with exactly the same combination of characteristics.³³

Constructing the matched group in this way appeared to make very little difference to the results. Figure A8 shows the difference between the AE and matched comparison group in our standard model, and difference between the AE and matched comparison group using this exact matching process, for three key outcomes. The lines are essentially overlapping. This potentially has three implications:

1. The decision of whether to use exact or nearest neighbour matching is not material to the results;
2. The exact number of stand-downs, suspensions, and attendance service referrals may not be critical to identifying learners with a relevant amount of educational disengagement; and
3. Our results are likely not driven by outlier individuals, since these learners would have been the ones most likely to have been dropped when an exact match could not be found.

³² An AE participant born in 2000 with 3 prior stand-downs, 2 prior suspensions/exclusions, 3 prior Attendance Service referrals, and who had participated in a youth justice family group conference will only be matched to a non-AE counterpart born in the same year with exactly the same number of each of these events.

³³ Our standard model included 20,667 AE participants for whom we tracked outcomes. This 'exact' matching variant resulted in 930 of these learners not being able to be matched.

Figure A8: Comparison of selected outcomes between standard and exact matching models

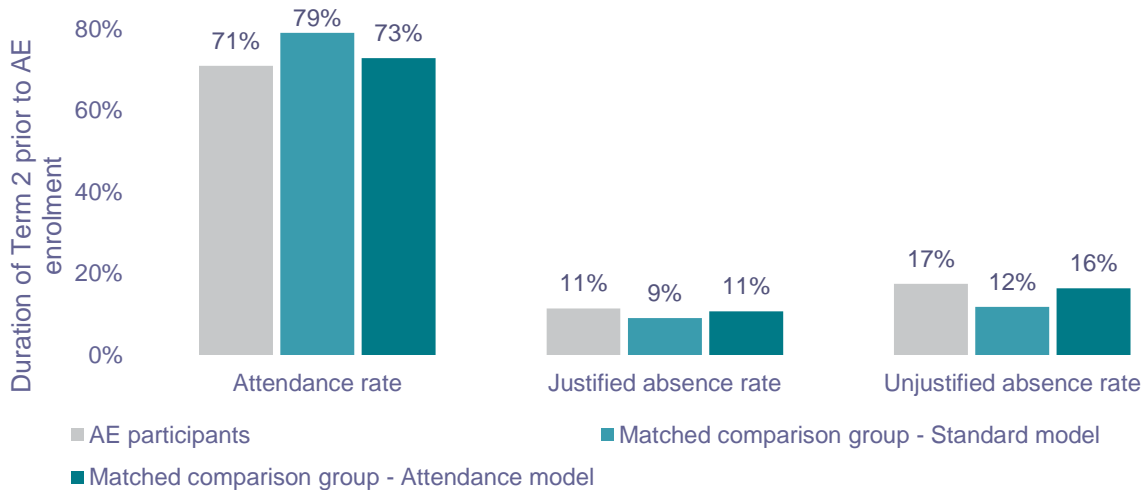


Note: All graphs show the difference in outcomes between the AE participants and the matched comparison group. The error bars indicate the 95 percent confidence intervals.

Model incorporating attendance data

We wanted to follow learners through to age 30, but for this group we were not able to incorporate data on prior school attendance rates. This data has only been available since 2011. Conceptually, prior attendance rates are a strong measure of educational disengagement, so our model’s inability to incorporate this data is potentially a large limitation. Moreover, when we compared attendance rates for AE participants and our standard matched comparison group (among the subset for whom we had data), there were substantial differences here. AE participants had meaningfully lower attendance rates, and especially high unjustified absence rates, relative to the comparison group (Figure A9).

Figure A9: Comparison of prior attendance rates between matching models



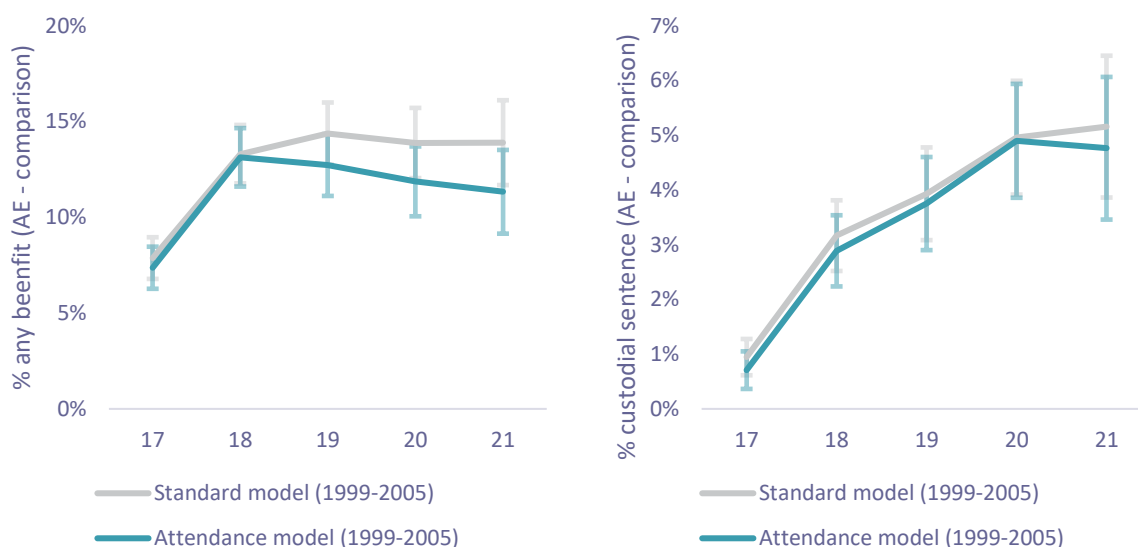
To test this, we repeated the match incorporating attendance data into the predictive model.³⁴ This model was only able to be undertaken on relatively recent birth cohorts (born 1999-2005). This meant that the standard model would differ from the attendance model in two respects: incorporating attendance data into the matching process; and the birth cohorts examined. To isolate the effect of only incorporating attendance data, we constructed a separate model: the standard matching procedure, using only the 1999-2005 birth cohorts ('standard 1999+').

The biggest differences between the two models are in the outcomes relating to income and employment, where the attendance model produces slightly less negative effects (Figure A10). For example, the attendance model produces estimates of differences in total income at age 24 that are 14 percent lower (a difference in total income between the AE and comparison groups of -\$3,469 according to the standard model, but -\$2,977 according to the attendance model). There are far fewer impacts on outcomes relating to future educational or crime outcomes.

Figure A10: Comparison of selected outcomes between standard and attendance models



³⁴ The results of this alternative predictive model are reported in Table A2 in the appendix, under the 'attendance' columns.



Note: All graphs show the difference in outcomes between the AE participants and the matched comparison group. The error bars indicate the 95% confidence intervals.

Quarter 1 enrolments

Our standard process matched all learners who first enrolled in AE at any point in a particular year, based on information as of 31 December in the previous year. This means, for example, if a learner first enrolled in AE in December in the year they turned 14, our model matches them up with a comparison student using only information up until the end of the year they turned 13 (12 months prior). For many AE learners, there might be many events rapidly occurring between when we run our predictive model and the point at which they enter AE. This could cause our results to be biased.

To investigate the effect of this, we re-ran our matching process using only the learners who first enrolled in AE in January to March each year. For these learners, our matching data could only be a maximum of three months out of date, and so our matching process is more likely to determine an appropriate comparison student to pair them with.³⁵ We repeated this 'quarter 1' variant on every other model we used (standard; exact match; attendance; standard 1999+), which means that we compared eight distinct versions of our results.

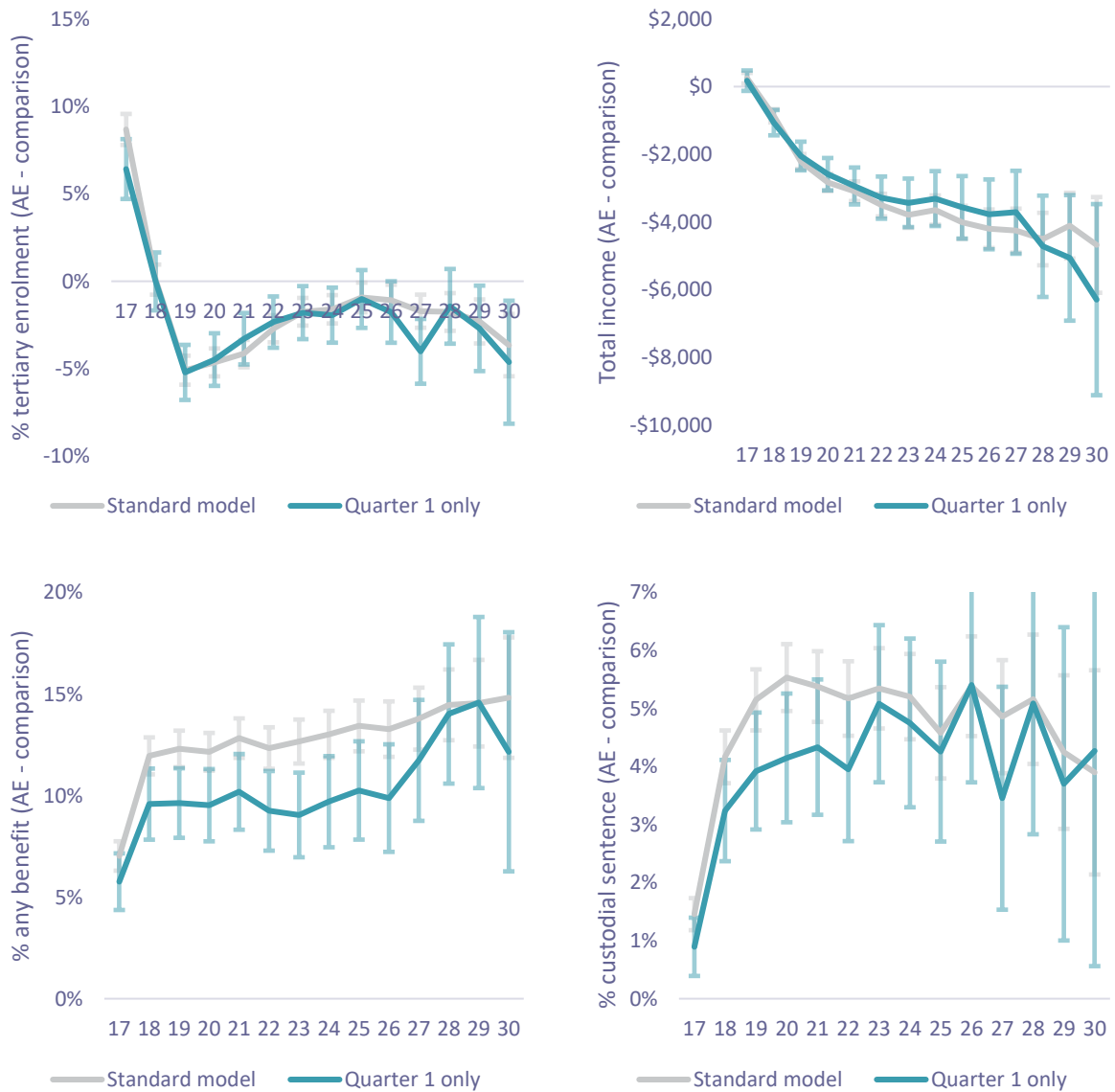
Figure A11 shows comparisons between the standard model using all learners, and the standard model using only the subset of learners enrolling in AE in the first quarter of the year (and their matched counterparts). There are relatively few differences in outcomes between these two groups, noting that the confidence intervals are much wider for the quarter 1 group.³⁶ However,

³⁵ The resulting estimates will show the combined effect of two things: 1) the impact of our model using more up to date data; and 2) the difference between learners enrolling in AE in the first three months versus those enrolling at other times. It is possible, for example, that learners enrolling in AE in February are systematically different from learners enrolling in AE in September. There is some evidence this might be the case: AE participants first enrolling in the first quarter of the year subsequently earn between 1-5 percent less than those enrolling in AE at other times of the year (this difference is not statistically significant). This might mean that the results from our quarter 1 models are slightly less able to be generalised to all AE participants.

³⁶ This is a function of there being fewer learners in the quarter 1 group. Because this group has roughly one quarter of the total sample, it means the estimates produced by this subset are inherently more uncertain.

there is some evidence of bias in the benefit and custodial sentence outcomes, where the quarter 1 group produces estimates that are slightly closer to zero than the model using the full sample.

Figure A11: Comparison of selected outcomes between standard and quarter 1 models



Note: All graphs show the difference in outcomes between the AE participants and the matched comparison group. The error bars indicate the 95 percent confidence intervals.