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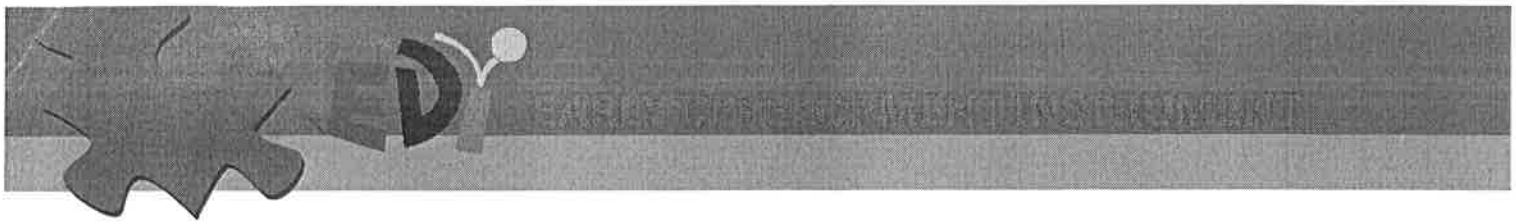

Results of the East Lothian, Scotland 2016 implementation of the Early Development Instrument

Technical Report

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September 2, 2016

Offord Centre for Child Studies

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Introduction

There is a well-established understanding in the literature that capabilities in early childhood are strongly predictive of later academic achievement (Guhn et. al., 2016; Davies, Janus, Duku, & Gaskin, 2016). Correspondingly, school readiness holds important implications for long term social, behavioural, health, and economic outcomes (Romano, Babchishin, Pagani & Kohen, 2010). Population level data provide important insights into the strengths and vulnerabilities of children locally and nationally. It is with this information that policy and programming may be tailored to support the needs of identified communities at a time when children face the significant transition to school.

The following report provides analyses for the second implementation of the Early Development Instrument (EDI) in Scotland. The EDI-Scotland was established in response to the need for a Scottish measure that could discern how well communities were preparing their children for school. It also serves as a measure that produces readily accessible and interpretable results for planning and evaluation by health, educational, and social work agencies.

The instrument was adapted from the Early Development Instrument (EDI), developed in Canada by Drs. Magdalena Janus and Dan Offord at the Offord Centre for Child Studies (OCCS) at McMaster University. The EDI is a teacher completed measure of children's developmental health at school entry. The EDI has been extensively validated both in Canada and internationally as a child development assessment tool (Janus & Reid-Westoby, 2016). Adaptation followed a pilot study of the EDI carried out in East Lothian, Scotland in March 2011 with 14 Primary 1 teachers that assessed 154 children. The first implementation took place in January 2012 with a sample of 1090 children, evaluated by 68 teachers in East Lothian. Analyses of implementation data indicated that the EDI had adequate psychometric properties for use across Scotland.

Description of dataset

Between January and March of 2016, EDI data were collected for 1259 children in Primary 1 and Primary 1/2, with ages within the range of the Canadian sample acquired for development of the EDI. In total, 116 children were excluded from the analysis on the basis of meeting one or more of the three exclusion criteria: (a) a special needs designation (112), (b) missing data on two or more EDI domains (7), (c) not in class for more than one month (10). Note that frequencies do not add up to 116, as some children met multiple exclusion criteria (see Tables 1-3).

Table 1. Identified special needs

Identified additional support needs (SN)

		Frequency	Percent
Valid	Yes	105	8.3
	No	1147	91.1

	Don't know	1	.1
	Total	1253	99.5
Missing	System	6	.5
Total		1259	100.0

Table 2. Valid EDI or not

Valid EDI or not (Valid)

		Frequency	Percent
Valid	Not valid (more than 1 scale missing)	7	.6
	Valid (1 or no scale missing)	1252	99.4
	Total	1259	100.0

Table 3. Student status in the classroom

Student status (Status)

		Frequency	Percent
Valid	In class more than 1 month	1249	99.2
	In class less than 1 month	5	.4
	Other	1	.1
	Total	1255	99.7
Missing	System	4	.3
Total		1259	100.0

Description of valid data

The final set of data utilized for the analyses comprised 1143 children. Females accounted for 50.6% (N=578) of the sample, and males 49.4% (N=565) (see Table 4). The mean age at EDI completion was 5.56 years. On average, children were absent 6.32 days (see Table 5).

Table 4. Gender of child

Child sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	578	50.6	50.6	50.6
	Male	565	49.4	49.4	100.0
	Total	1143	100.0	100.0	

Table 5. Descriptive statistics for child age at EDI completion and days absent from class

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
About how many regular sessions has this child been absent since the beginning of the school year?	1143	0	82	6.32	7.83
Age at EDI completion	1143	4.87	6.76	5.56	.31

Children were also classified into postcode quintiles based on rankings of postcodes from the Scottish Index of Multiple Deprivation (SIMD). The SIMD combines data from seven distinct domains that are considered to be important contributors to deprivation levels. These include income, employment, crime, education, health, housing, and access. Small areas known as datazones are ranked from most deprived (ranked 1) to least deprived (ranked 5). It should be noted that the aforementioned ranking method was employed for the 2009 SIMD that accompanied the 2012 East Lothian EDI implementation. Since the release of that technical report, an updated version of the SIMD was released (December 2012). Analyses

in the current report have been conducted using both SIMD rankings. Also of note is the addition of new postal codes in East Lothian not previously included in the 2009 or 2012 SIMD ranking. Postal codes of children living outside of East Lothian were also included during data collection, but have been excluded from the analyses of mean scores and percent vulnerable by postcode quintile.

In 2016, 44.9% of children were from postcodes ranked as 2 and 3, while 51.2% were from postcodes ranked as 4 and 5. Children from postcodes ranked as 1 accounted for 3.8% (N=44) of the valid sample, and therefore results from the analyses of this group should be interpreted with caution. Use of the 2012 SIMD quintiles demonstrates similar percentages with 37.7% of the sample being from postcode ranks 2 and 3, 54.7% from ranks 4 and 5, and 4.9% from rank 1 (see Table 6).

Table 6. Frequencies by 2009 and 2012 SIMD quintiles

		2009		2012	
		Frequency	Percent	Frequency	Percent
Valid	1	44	3.8	56	4.9
	2	192	16.8	201	17.6
	3	307	26.9	230	20.1
	4	419	36.7	471	41.2
	5	150	13.1	154	13.5
	Total	1112	97.3	1112	97.3
Missing	System	31	2.7	31	2.7
Total		1143	100.0	1143	100.0

In 2012 and 2016, the 10th percentile cut-offs were calculated for the Scottish Phase II dataset. Children who scored at or below the 10th percentile in each of the five EDI domains were classified as vulnerable. Overall vulnerability on the EDI is defined as being vulnerable on at least one or more EDI domains. The 10th percentile cut-offs for the 2012 and 2016 Scottish datasets, as well as the Canadian Normative dataset are included. EDI domain mean scores and vulnerability rates for the 2016 dataset using the cut-offs established in 2012 are also included (see Tables 7, 8, and 9).

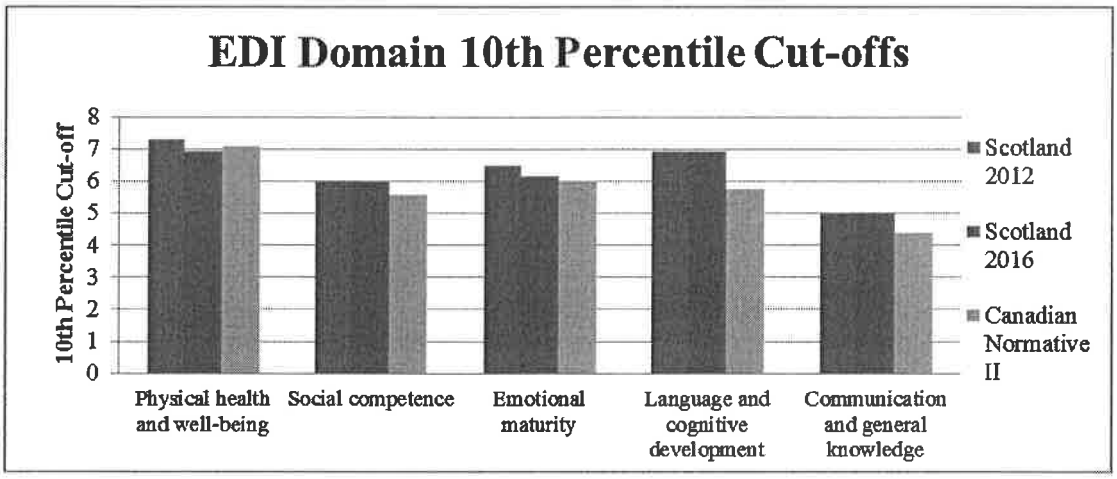
Table 7. Descriptive statistics of the EDI domains for Scotland 2016

		Physical Health and Well-being	Social Competence	Emotional Maturity	Language and Cognitive Development	Communication and General Knowledge
N	Valid	1142	1143	1128	1142	1142
	Missing	1	0	15	1	1
Mean		**8.85**	**8.41**	**8.12**	**8.89**	**8.26**
Median		9.23	9.04	8.45	9.62	9.38
Std. Deviation		1.35	1.68	1.46	1.55	2.22
Minimum		1.67	1.54	1.33	1.15	0.00
Maximum		10.00	10.00	10.00	10.00	10.00
Percentiles	**10**	**6.92**	**5.96**	**6.15**	**6.92**	**5.00**

Table 8. EDI Domain 10th percentile cut-offs

Dataset	Physical Health and Well-being	Social Competence	Emotional Maturity	Language and Cognitive Development	Communication and General Knowledge
Scotland 2012	7.31	5.96	6.50	6.92	5.00
Scotland 2016	6.92	5.96	6.15	6.92	5.00
Canadian Normative II	**7.08**	**5.58**	**6.00**	**5.77**	**4.38**

Figure 1. EDI 10th percentile cut-offs for each EDI domain by implementation.



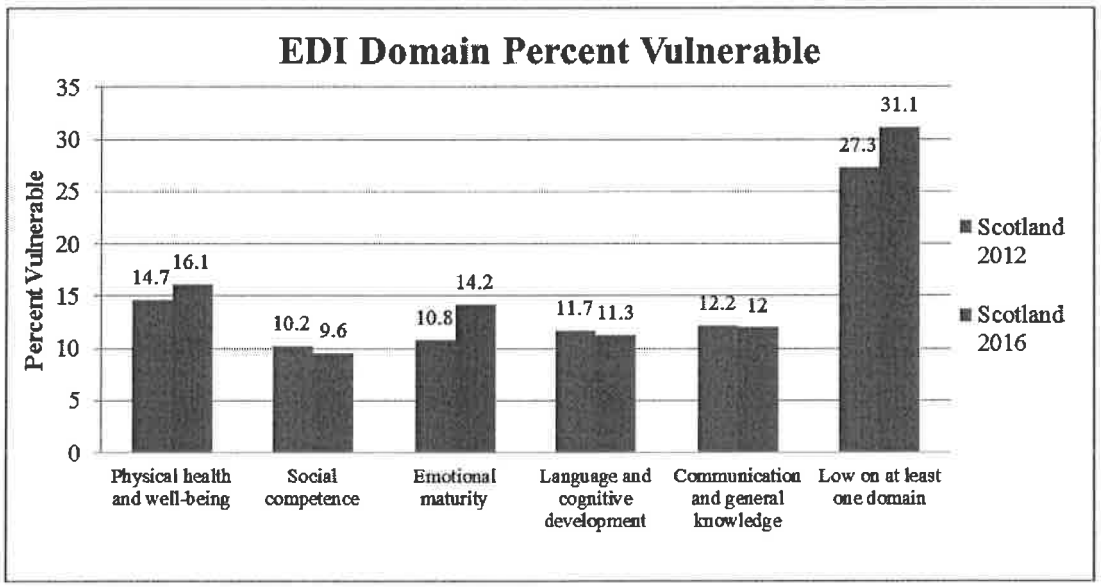
In 2016, the 10th percentile cut-offs remained the same as those established in 2012 for the Social Competence, Language and Cognitive Development, and Communication Skills and General Knowledge domains. However, the cut-offs were lower in 2016 compared to 2012 for the Physical Health and Well-being and Emotional Maturity domains. Relative to the cut-offs used for the Canadian normative II sample, both implementations in East Lothian had higher 10th percentile cut-offs for all domains except Physical Health and Well-being in 2016 (Figure 1).

Table 9. EDI domain vulnerability rates (using 2012 10th percentile cut-offs)

Domain	Percent Vulnerable (2012)	Percent Vulnerable (2016)
Physical Health and Well-being	14.7	16.1
Social Competence	10.2	9.6
Emotional Maturity	10.8	14.2
Language and Cognitive Development	11.7	11.3
Communication and General Knowledge	12.2	12.0
Overall vulnerability	27.3	31.1

The vulnerability rates indicate that greater percentages of children were vulnerable in Physical Health and Well-being, Emotional Maturity, and overall vulnerability in 2016 compared to 2012. However, a slightly smaller percentage was vulnerable in 2016 for the Social Competence, Language and Cognitive Development, and Communication Skills and General Knowledge domains (Figure 2). It is worth noting that these changes are very similar to trends over time in other countries: both in Canada and Australia there has been an increase in vulnerabilities in physical, social, and emotional areas of development, and decrease in the cognitive and communication areas.

Figure 2. EDI domain vulnerability rates by implementation year.



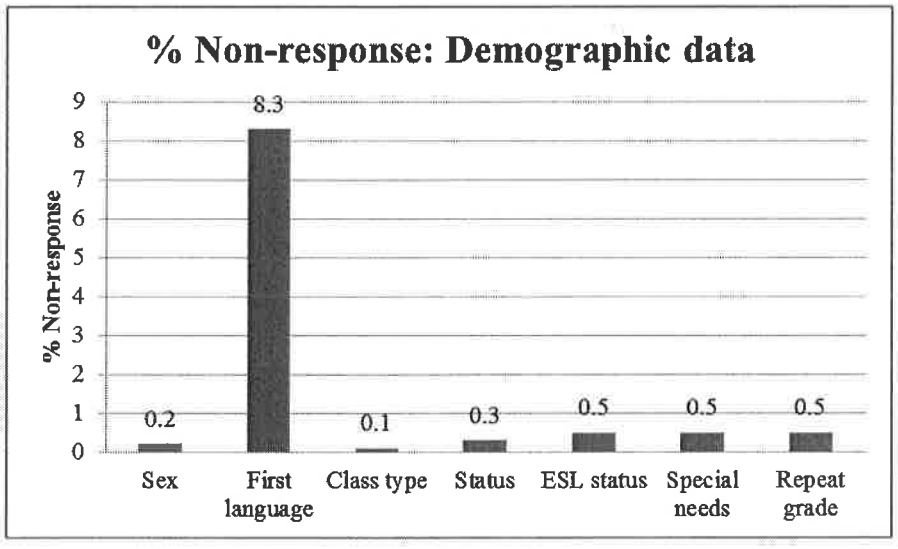
Non-response

Non-responses are items with an indication of "don't know" or are left blank. They are considered to be missing data. High percentages of missing data must be interpreted with caution as these responses reduce the reliability of the item. The demographic questions on the EDI are important for providing context in the interpretation of differences observed in EDI domain scores between groups of children. Items that appear to be systematically missing may lead to bias in the results observed, particularly if students with these non-response types differ in some way with respect to the EDI scores of other child and family characteristics. The frequencies of missing data are examined here by item and domain. Appendix II shows detailed missing data rates for items based on "don't know" and "blank" responses.

a) Demographic items

Figure 3 shows the missing data rates for selected demographic items on the EDI. Missing rates are highest for child's first language.

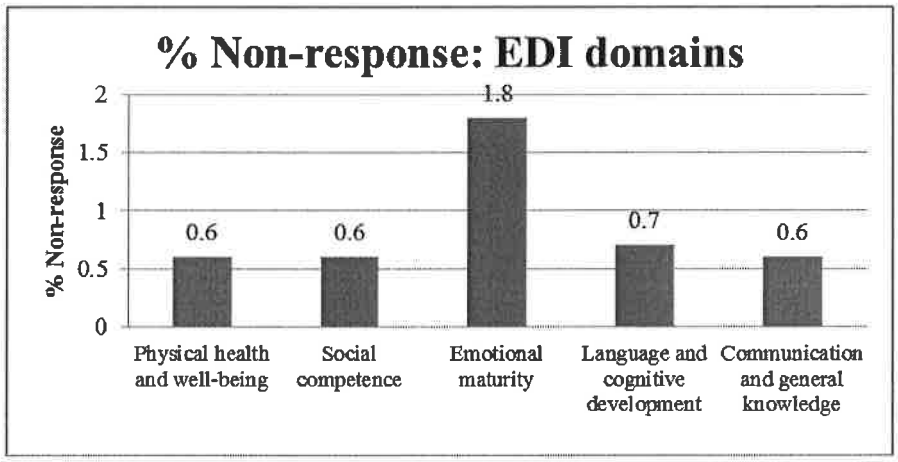
Figure 3. Percent non-response for EDI demographic data



b) EDI domains

Figure 4 shows missing data rates for the five EDI domains. The Emotional Maturity domain has the highest rate of missing data, followed by the Language and Cognitive Development domain.

Figure 4. Percent non-response for EDI domains



c) Individual items within EDI domains

The items with the highest percentage of non-responses were in the Emotional Maturity Domain. These items had total non-response rates between 5 and 10% - Qc30: *if there is a quarrel or dispute will try to stop it* (6.1%), Qc34: *invites bystanders to join in a game* (9.2%), and Qc35: *helps other children who are feeling sick* (6.8%), all of which belong to the subdomain of Prosocial Behaviour. See appendix II for a full list of percent non-response by item.

Internal consistencies of EDI domains

To ensure sound psychometric properties for the 2016 implementation of the EDI in Scotland, the internal consistency for each domain of the EDI was examined. All five domains demonstrate good internal consistency (0.77 or higher) (see Table 10). However, four items from two domains had low item-total correlations. For the Physical Health and Well-being domain, two items (*QA6 -independent in washroom* and *QC58-sucks thumb*) had item-total correlations less than 0.089. Two items in the Emotional Maturity domain (*QC36 – upset when left* and *QC57- is shy*) had item-total correlations of less than 0.131. Detailed tables of item-total correlations for each of the domains can be found in Appendix I. Exploration of the items with low item-total correlations demonstrated that items were endorsed as "yes" by teachers for most children in the sample with regards to QA6. For items QC36, QC57, and QC58, "never/not true" were endorsed for most children.

Table10. Internal consistencies of EDI domains

Domain	Number of items	Cronbach's α
Physical Health and Well-being	13	0.777
Social Competence	26	0.946
Emotional Maturity	30	0.917
Language and Cognitive Development	26	0.903
Communication and General Knowledge	8	0.922

EDI domain scores and vulnerability rates by gender, age, and postcode quintiles

As is the case with most other countries, domain mean scores are higher for females compared to males across all domains, with effect sizes ranging from small (0.22) to moderate (0.51) (see Table 11). Correspondingly, girls are less likely to be vulnerable compared to boys (see Table 12).

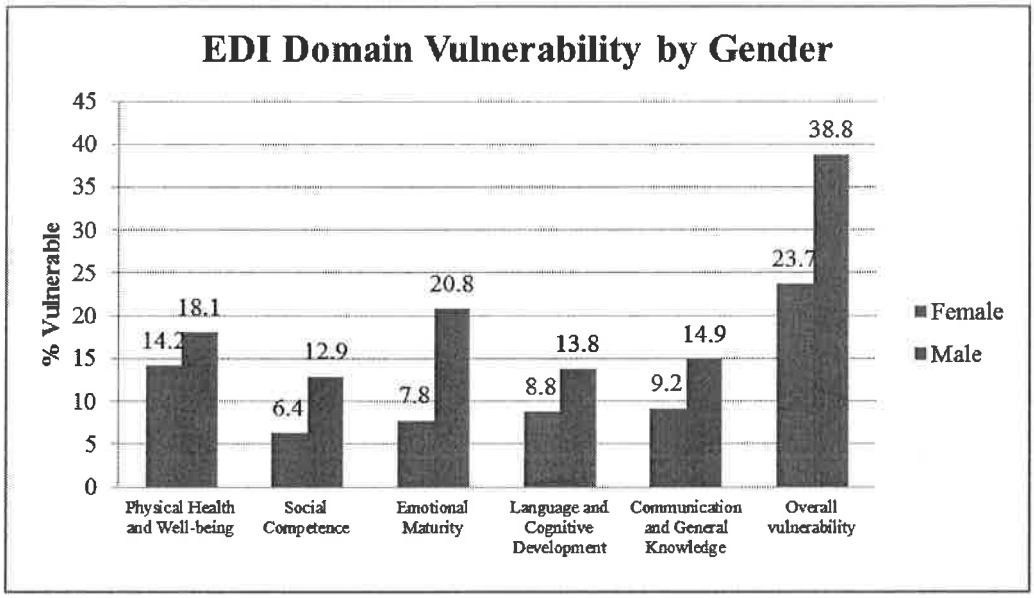
Table11. Descriptive statistics for EDI domains by gender of child

	Female			Male			Effect Size
	N	Mean	S.D	N	Mean	S.D	
Physical Health and Well-being	577	9.01	1.27	565	8.68	1.42	0.26
Social Competence	578	8.68	1.48	565	8.14	1.82	0.36
Emotional Maturity	575	8.44	1.26	553	7.80	1.57	0.51
Language and Cognitive Development	577	9.05	1.39	565	8.74	1.67	0.22
Communication and General Knowledge	578	8.56	2.06	564	7.95	2.34	0.30

Table12. Percent vulnerable by gender

	Female		Male	
	N	%	N	%
Physical Health and Well-being	82	14.2	102	18.1
Social Competence	37	6.4	73	12.9
Emotional Maturity	45	7.8	115	20.8
Language and Cognitive Development	51	8.8	78	13.8
Communication and General Knowledge	53	9.2	84	14.9
Overall vulnerability	137	23.7	219	38.8

Figure 5. EDI domain vulnerability by gender



Similarly, older children had higher mean scores on all domains compared to younger children. (see Table 13). Effect sizes for this group were small to moderate (0.18-0.40). Correspondingly, younger children are more likely to be vulnerable on all domains compared to older children (see Table 14).

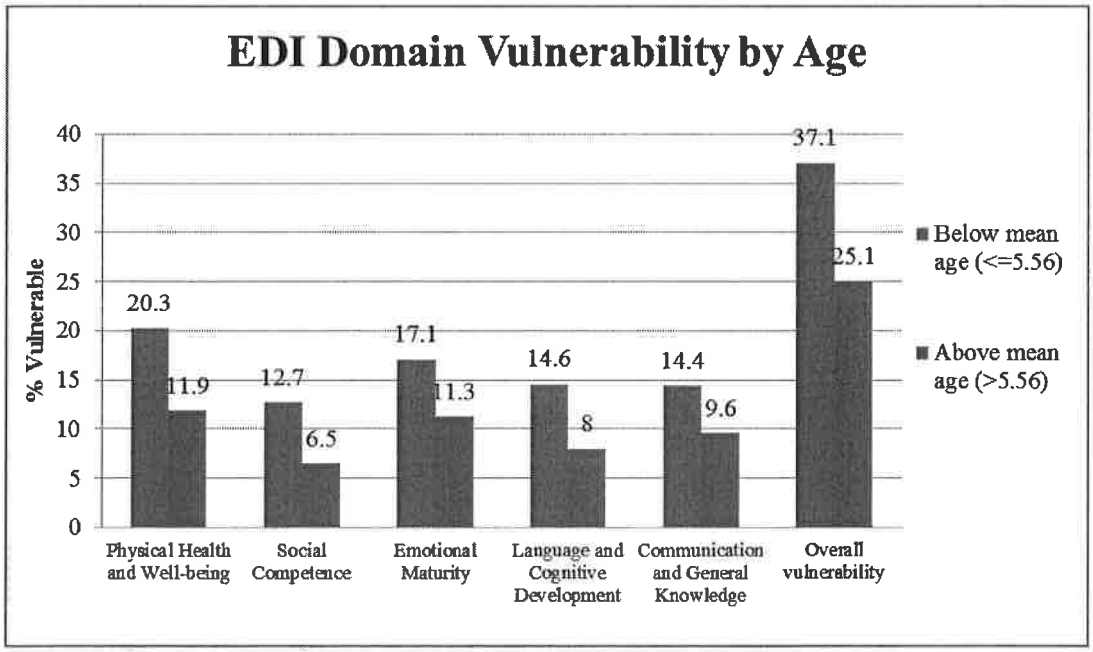
Table13. Descriptive statistics for EDI domains by age of child

	Below mean age (<=5.56)			Above mean age (>5.56)			Effect Size
	N	Mean	S.D	N	Mean	S.D	
Physical Health and Well-being	577	8.66	1.47	565	9.04	1.19	0.32
Social Competence	577	8.19	1.79	566	8.64	1.53	0.29
Emotional Maturity	568	7.92	1.55	560	8.33	1.33	0.31
Language and Cognitive Development	576	8.64	1.73	566	9.15	1.29	0.40
Communication and General Knowledge	577	8.07	2.30	565	8.45	2.13	0.18

Table14. Percent vulnerable by age

	Below mean age (<=5.56)		Above mean age (>5.56)	
	N	%	N	%
Physical Health and Well-being	117	20.3	67	11.9
Social Competence	73	12.7	37	6.5
Emotional Maturity	97	17.1	63	11.3
Language and Cognitive Development	84	14.6	45	8.0
Communication and General Knowledge	83	14.4	54	9.6
Overall vulnerability	214	37.1	142	25.1

Figure 6. EDI domain vulnerability by age



In general, EDI domain mean scores were higher with increased postcode ranking for both the 2009 and 2012 SIMD ranking systems. The differences between the middle quintiles in some domains were very small, thus resulting in slight deviation in the gradient (see Tables 15 and 17). Correspondingly, children from higher postcode ranks were a smaller percentage of those that were

vulnerable across all EDI domains (see Tables 16 and 18). The results observed are similar to those of other international implementations that employed similar SES measures.

Table 15. Descriptive statistics for EDI domains by 2009 SIMD postcode quintiles

2009 SIMD Postcode Quintiles		Physical Health and Well-being	Social Competence	Emotional Maturity	Language and Cognitive Development	Communication and General Knowledge
1	N	44	44	44	44	44
	Mean	8.07	7.51	7.33	7.75	7.22
	Std. Deviation	1.60	2.00	1.70	2.04	2.62
2	N	192	192	189	192	191
	Mean	8.66	8.15	7.95	8.87	8.10
	Std. Deviation	1.50	1.74	1.58	1.44	2.32
3	N	307	307	301	306	307
	Mean	8.81	8.36	8.19	8.85	8.19
	Std. Deviation	1.33	1.78	1.42	1.69	2.30
4	N	418	419	418	419	419
	Mean	8.90	8.51	8.18	8.89	8.35
	Std. Deviation	1.34	1.57	1.42	1.52	2.18
5	N	150	150	145	150	150
	Mean	9.27	8.83	8.33	9.31	8.72
	Std. Deviation	0.98	1.34	1.27	1.11	1.73

Table16. Percent vulnerable by 2009 SIMD postcode quintile

	1 (lowest)		2		3		4		5 (highest)	
EDI Domain	N	%	N	%	N	%	N	%	N	%
Physical Health and Well-being	14	31.8	40	20.8	53	17.3	64	15.3	9	6.0
Social Competence	11	25.0	26	13.5	34	11.1	29	6.9	6	4.0
Emotional Maturity	14	31.8	30	15.9	39	13.0	55	13.2	15	10.3
Language and Cognitive Development	12	27.3	23	12.0	36	11.8	47	11.2	10	6.7
Communication and General Knowledge	11	25.0	28	14.7	43	14.0	44	10.5	8	5.3
Overall vulnerability	26	59.1	74	38.5	94	30.6	123	29.4	30	20.0

Figure 7. EDI domain vulnerability by 2009 SIMD postcode quintile

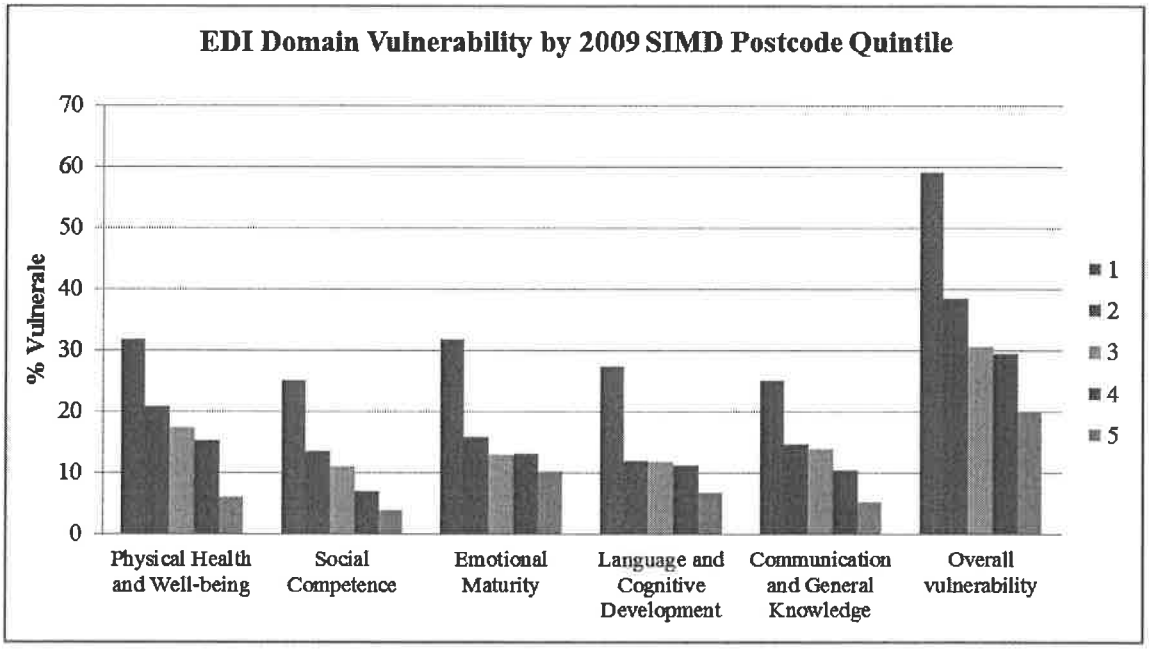


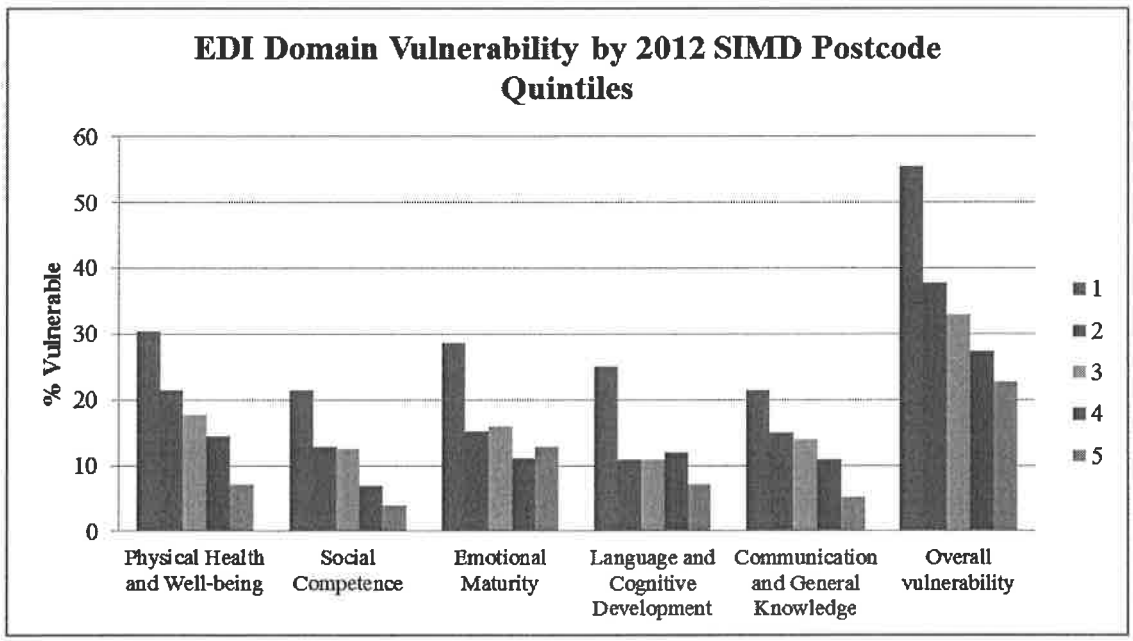
Table 17. Descriptive statistics for EDI domains by 2012 SIMD postcode quintiles

2012 SIMD Postcode Quintiles		Physical Health and Well-being	Social Competence	Emotional Maturity	Language and Cognitive Development	Communication and General Knowledge
1	N	56	56	56	56	56
	Mean	8.16	7.69	7.47	7.96	7.42
	Std. Deviation	1.51	1.94	1.64	1.97	2.55
2	N	201	201	197	201	200
	Mean	8.66	8.20	7.98	8.89	8.11
	Std. Deviation	1.50	1.74	1.56	1.43	2.32
3	N	230	230	225	230	230
	Mean	8.74	8.24	8.06	8.85	8.13
	Std. Deviation	1.38	1.82	1.47	1.69	2.36
4	N	470	471	470	470	471
	Mean	8.94	8.55	8.27	8.89	8.36
	Std. Deviation	1.31	1.56	1.38	1.51	2.17
5	N	154	154	149	154	154
	Mean	9.24	8.80	8.21	9.24	8.69
	Std. Deviation	1.01	1.39	1.36	1.31	1.73

Table18. Percent vulnerable by 2012 SIMD postcode quintile

	1 (lowest)		2		3		4		5 (highest)	
EDI Domain	N	%	N	%	N	%	N	%	N	%
Physical Health and Well-being	17	30.4	43	21.4	41	17.8	68	14.5	11	7.1
Social Competence	12	21.4	26	12.9	29	12.6	33	7.0	6	3.9
Emotional Maturity	16	28.6	30	15.2	36	16.0	52	11.1	19	12.8
Language and Cognitive Development	14	25.0	22	10.9	25	10.9	56	11.9	11	7.1
Communication and General Knowledge	12	21.4	30	15.0	32	13.9	52	11.0	8	5.2
Overall vulnerability	31	55.4	76	37.8	76	33.0	129	27.4	35	22.7

Figure 8. EDI domain vulnerability by 2012 SIMD postcode quintile



Change in EDI scores between 2012 and 2016

Between 2012 and 2016, some changes were observed in the demographic characteristics of the samples. In 2012, 3.6% of the sample were identified as having a special needs designation (N=42). This percentage more than doubled in 2016 with 8.3% of the sample being identified (N=105). In 2012, 96% (N=1133) of the sample had participated in school for more than one month, and in 2016 this amounted to 99.2% (N=1249). Moreover, the distribution of males and females in 2012 was 51.8% and 48.1% respectively. In 2016, 49.4% of the sample was male, and 50.6% of the sample was female. On average, children in the 2012 sample were slightly younger (mean age=5.51 years) compared to children in the 2016 sample (mean age=5.56 years). In 2012, on average children missed fewer days of school (5.21 days) compared to children in 2016 (6.32 days).

Between 2012 and 2016 EDI there was a decrease in all domain mean scores, with the largest difference in score being 0.64 points for the Language and Cognitive Development domain (see Figure 9). Based on the 2012 10th percentile cut-offs, there was an increase in the percentage of children that were vulnerable from 2012 to 2016 for the Physical Health and Well-being, Emotional Maturity, and overall vulnerability. On the other hand, there were decreases in percentages vulnerable for Social Competence, Language and Cognitive Development, and Communication and General Knowledge during this period (see Figure 10). The observed changes correspond to changes in reported special concerns. Between 2012 and 2016, the percentage of children that were identified as having a problem that might affect their learning remained at 9.3%. However, there was an in increase in the proportion of those identified as having an emotional problem between 2012 and 2016 from 14.42% to 20.75%. This increase may explain the increase in vulnerability rate for the Emotional Maturity domain. The percentage of students that attended an early learning program prior to school entry remained high at 98.6% and 99.1% respectively for 2012 and 2016. Other contextual factors should be examined, if available, to explore the possible factors associated with the changes.

Figure 9. Change in EDI domain mean scores between 2012 and 2016

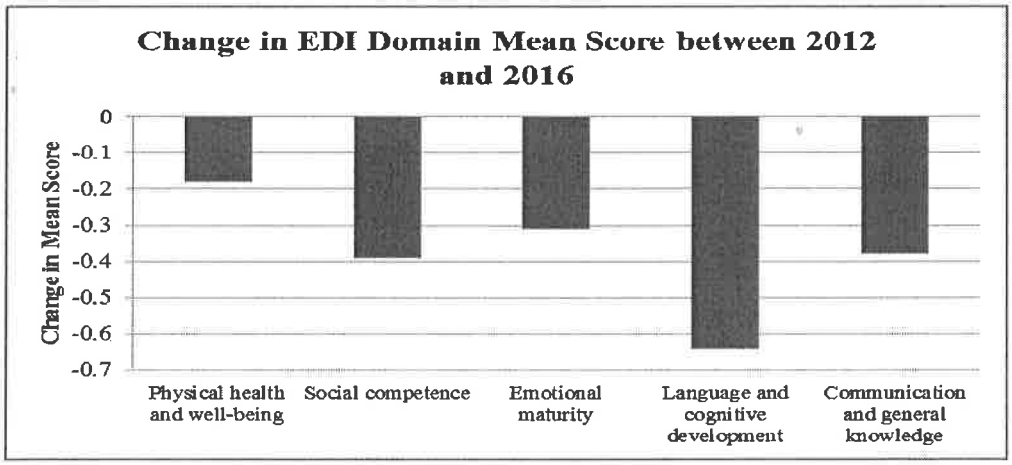


Figure 10. Change in percent vulnerable between 2012 and 2016

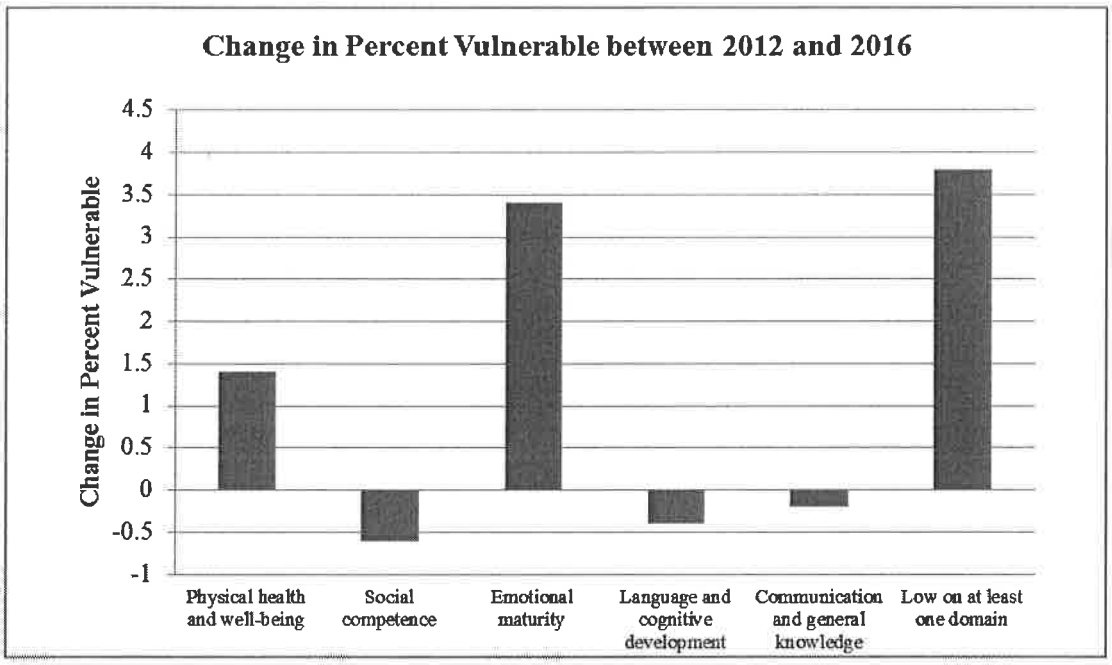


Figure 11 shows the change in domain mean scores between 2012 and 2016 using the 2009 SIMD quintiles. The greatest decrease in EDI domain mean scores between 2012 and 2016 was observed for postcode quintile rank 1. Conversely, there were increases in mean scores for Physical Health and Well-being, and smaller decreases for all other domains between 2012 and 2016 for postcode quintile rank 5. Figure 12 shows the change in percent vulnerable by 2009 SIMD quintiles between 2012 and 2016. In general, there were increases in the vulnerability rates for most domains in each postcode quintile. The greatest increase in vulnerability rates for all domains between 2012 and 2016 was observed for postcode quintile rank 1. The greatest increase was observed in overall vulnerability (20.6 % higher in 2016 than 2012) for postcode quintile rank 1. However, for postcode quintile rank 2 there was an increase in the mean scores in language and cognitive domains, and a decrease in vulnerability rates in language and cognitive and communication domains was observed for postcode quintiles ranked 2 and 3. These changes warrant further investigation.

Figure 11. Change in EDI domain mean scores between 2012 and 2016 by 2009 SIMD postcode quintiles.

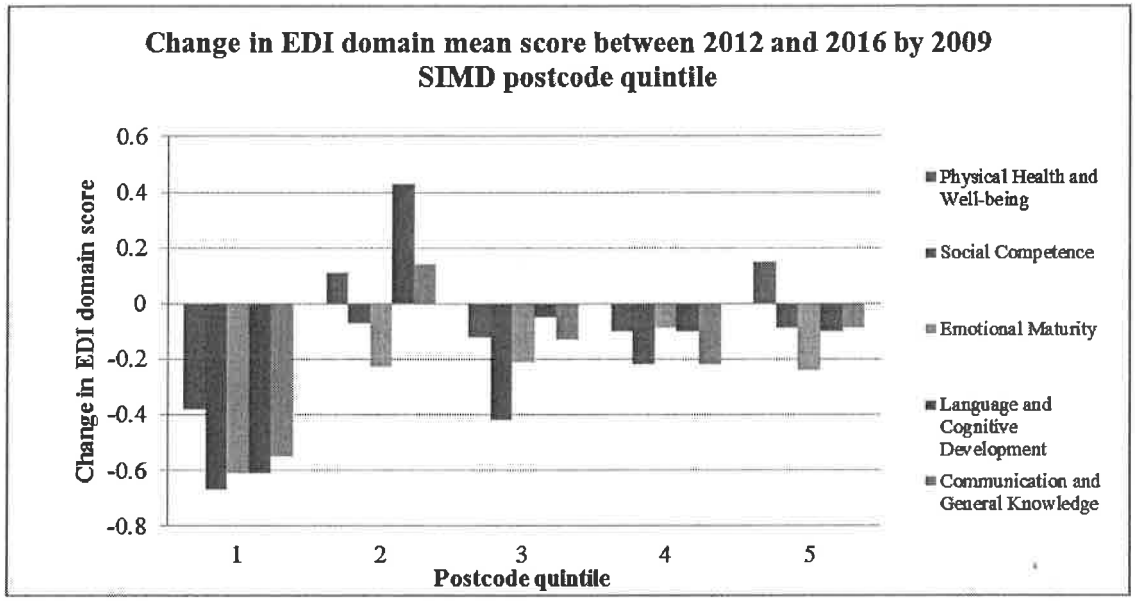
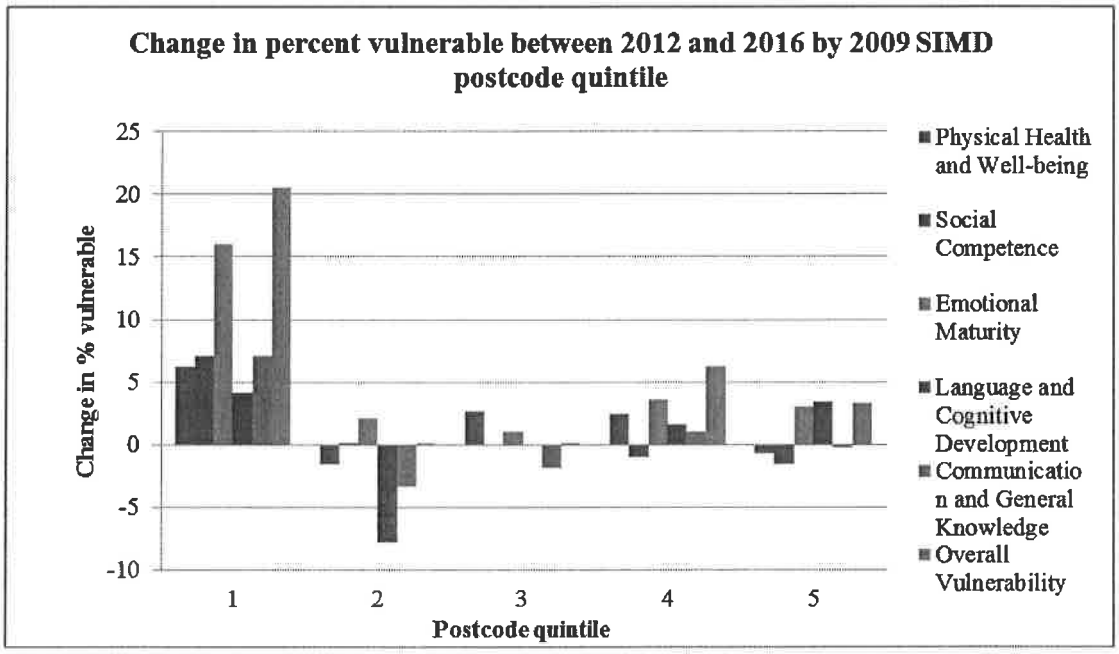


Figure 12. Change in percent vulnerable by postcode quintile between 2012 and 2016



Paired Samples Analysis

In addition to exploring change over time for East Lothian as a whole, analysis of change between 2012 and 2016 was carried out by matching schools that participated in data collections at both times. For this purpose, data from the two implementations were matched by school, and paired samples t-tests were performed to establish whether there were significant changes in domain scores and vulnerability rates. Out of 35 schools for which data were collected in 2012, 34 were matched. Table 19 shows the descriptive statistics (mean, N, standard deviation,), for each of the thirteen variables compared (age, number of days absent, domain scores for five domains, percent vulnerable for five domains, and vulnerable overall) for all schools. Table 20 shows the results of the statistical comparisons and effect sizes of the differences for the matched schools.

some schools ?

Table 19. Descriptive Statistics for Schools in 2012 (Time 1) and 2016 (Time 2)

Variables		Mean	N	Std. Deviation
Pair 1	Age Time 1	5.53	34	0.13
	Age Time 2	5.58	34	0.12
Pair 2	Days Absent Time 1	5.02	34	2.29
	Days Absent Time 2	6.84	34	3.08
Pair 3	PHWB Time 1	8.80	34	0.64
	PHWB Time 2	8.93	34	0.51
Pair 4	SC Time 1	8.53	34	0.75
	SC Time 2	8.52	34	0.74
Pair 5	EM Time 1	8.20	34	0.49
	EM Time 2	8.12	34	0.59
Pair 6	LCD Time 1	8.94	34	0.49
	LCD Time 2	9.04	34	0.55
Pair 7	CGK Time 1	8.28	34	1.05
	CGK Time 2	8.41	34	0.83
Pair 8	Vulnerable PHWB Time 1	0.17	34	0.15

	Vulnerable PHWB Time 2	0.15	34	0.13
Pair 9	Vulnerable SC Time 1	0.12	34	0.13
	Vulnerable SC Time 2	0.08	34	0.12
Pair 10	Vulnerable EM Time 1	0.13	34	0.09
	Vulnerable EM Time 1	0.14	34	0.12
Pair 11	Vulnerable LCD Time 1	0.11	34	0.08
	Vulnerable LCD Time 2	0.08	34	0.08
Pair 12	Vulnerable CGK Time 1	0.13	34	0.13
	Vulnerable CGK Time 2	0.11	34	0.12
Pair 13	Vulnerable Overall Time 1	0.29	34	0.15
	Vulnerable Overall Time 2	0.30	34	0.16

Table 20 shows the means and standard deviations of the differences between 2012 and 2016 for East Lothian for matched schools. Children were older at the time of data collection in 2016 compared to 2012. They also missed more days of school in 2016 than 2012. Although change in mean scores and vulnerability rates were observed, these changes were not statistically meaningful (see Table 20).

Table 20. Results of paired samples t-tests and effect sizes of differences for the matched schools between 2012 and 2016

Variables	Mean difference	Std. Deviation of differences	t-statistic	degrees of freedom	p-value (2-tailed)	Effect Size
Age	-0.06	0.14	-2.44	33	0.02	-0.43
Days Absent	-1.82	3.28	-3.23	33	0.00	-0.55
PHWB	-0.13	0.66	-1.20	33	0.24	-0.20
SC	0.00	0.81	0.02	33	0.98	0.00
EM	0.07	0.64	0.66	33	0.52	0.11
LCD	-0.10	0.59	-0.97	33	0.34	-0.17
CGK	-0.13	1.12	-0.69	33	0.50	-0.12
Vulnerable PHWB	0.03	0.14	1.05	33	0.30	0.21
Vulnerable SC	0.03	0.15	1.29	33	0.21	0.20
Vulnerable EM	0.00	0.15	-0.16	33	0.88	0.00
Vulnerable LCD	0.02	0.10	1.39	33	0.18	0.20
Vulnerable CGK	0.02	0.17	0.77	33	0.45	0.18
Vulnerable Overall	-0.01	0.18	-0.42	33	0.68	-0.06

Discussion

The results of the 2016 EDI implementation in East Lothian, Scotland, show similar developmental patterns as those observed and reported in the 2012 data collection (Wolfson et al., 2013): as expected, girls had higher EDI domain scores than boys across all domains of the EDI, as did older children compared to younger children. These results also allow evaluation of population-level changes over the course of four years. Using the 10th percentile cut-offs established in the 2012 implementation

indicates that in the 2016 implementation there were more children who were vulnerable in the Physical Health and Well-being, Emotional Maturity domains, and vulnerable overall, and fewer children vulnerable in the Social Competence, Language and Cognitive Development, and Communication Skills and General Knowledge domains (see Table 11). Further, analysis by 2009 SIMD quintiles show that the largest decrease in EDI domain mean scores, and correspondingly the largest increase in vulnerability rates across all domains between 2012 and 2016 was observed in quintile rank 1 (most deprived).

While every effort was made to reduce sources of error, some limitations of the data must be noted. The percent of the sample in postcodes of rank 1 was very small, and thus interpretation of results in this group should be considered with caution. Further, since the revision of the SIMD in 2012, new postcodes were established in East Lothian. Postcode quintile rankings were absent for some datazones (N=31), and were therefore excluded, limiting the opportunity to understand these new areas. In addition, children that attended a school within the East Lothian were included in the analysis, although they may have resided outside of the district (N=6). Therefore, it is possible that children residing outside of East Lothian may have been subject to differing contextual factors specific to place of residence that were unaccounted for in the analyses of outcomes. However, they constituted a very small proportion of the overall sample.

In conclusion, the change over time trends in children's vulnerabilities in East Lothian reflect those observed in other countries. The availability of socioeconomic data in both 2012 and 2016 contributes an important perspective to the understanding of those changes, as well as opportunities for further exploration: vulnerability rates for children in the most deprived areas increased the most, but the largest change in vulnerability happened in the areas with postcodes in rank 2 and 3. More contextual data should be sought to further understand the context and potential reasons for the largest changes, decreases in vulnerability – such as in the language and cognitive area – and increases, as well as in providing indicators for action to address the changes.

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Appendix I: Item-total correlations

Physical Health and Well-being

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
QA2 over or underdressed for school-related activities	106.10	268.504	.316	.770
QA3 too tired/ sick to do school work	106.33	264.308	.291	.773
QA4 late	107.44	247.828	.267	.789
QA5 hungry	105.97	276.237	.254	.775
QA6 is independent in toilet habits most of the time	105.87	287.989	.088	.784
QA7 shows an established hand preference (right vs. left or vice versa)	105.90	278.468	.255	.774
QA8 is well coordinated (i.e. moves without running into or tripping over things)	106.57	246.137	.441	.759
QA9 proficiency at holding a pen, crayons or a brush	107.91	227.671	.603	.739
QA10 ability to manipulate objects	107.40	232.657	.662	.734
QA11 ability to climb stairs	107.11	240.212	.655	.738
QA12 levels of energy throughout the school day	107.58	234.937	.609	.740
QA13 overall physical development	107.27	234.982	.672	.735
QC58 sucks a thumb/finger	106.08	288.568	.059	.787

Social Competence

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
QC1 overall social/emotional development	211.68	1702.625	.669	.944
QC2 ability to get along with peers	211.43	1705.292	.686	.944
QC3 plays and works cooperatively with other children at the level appropriate for his/her age	210.70	1716.945	.722	.943
QC4 is able to play with various children	211.03	1716.748	.662	.944
QC5 follows rules and instructions	210.46	1721.293	.744	.943
QC6 respects the property of others	209.97	1746.946	.672	.944
QC7 demonstrates self-control	210.59	1721.667	.678	.944
QC8 shows self-confidence	211.62	1761.237	.459	.946
QC9 demonstrates respect for adults	209.73	1777.938	.611	.945
QC10 demonstrates respect for other children	210.25	1748.720	.646	.944
QC11 accepts responsibility for actions	210.78	1714.985	.671	.944
QC12 listens attentively	211.18	1709.038	.698	.943
QC13 follows directions	210.61	1714.644	.744	.943
QC14 completes work on time	211.11	1718.480	.631	.944

QC15 works independently	210.94	1719.621	.650	.944
QC16 takes care of school materials	209.95	1750.329	.649	.944
QC17 works neatly and carefully	211.18	1720.675	.607	.945
QC18 is curious about the world	210.09	1773.134	.513	.946
QC19 is eager to play with a new toy	209.60	1823.603	.340	.947
QC20 is eager to play a new game	209.62	1819.634	.359	.947
QC21 is eager to play with/read a new book	210.05	1772.873	.487	.946
QC22 is able to solve day-to-day problems by him/herself	211.37	1706.183	.644	.944
QC23 is able to follow one-step instructions	209.89	1765.033	.641	.944
QC24 is able to follow class routines without reminders	210.57	1715.510	.716	.943
QC25 is able to adjust to changes in routines	210.17	1757.161	.597	.945
QC27 shows tolerance to someone who made a mistake (e.g. when a child gives a wrong answer to a question posed by the teacher)	210.07	1764.664	.592	.945

Emotional Maturity

Item-Total Statistics

PRO SOCIAL

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
QC28 will try to help someone who has been hurt	235.90	1856.341	.594	.913
QC29 volunteers to help clear up a mess someone else has made	237.00	1812.633	.615	.912
QC30 if there is a quarrel or dispute will try to stop it	238.43	1818.645	.591	.913
QC31 offers to help other children who have difficulty with a task	237.93	1799.946	.628	.912
QC32 comforts a child who is crying or upset	236.58	1834.918	.602	.913
QC33 spontaneously helps to pick up objects which another child has dropped (e.g. pencils, books)	237.67	1796.206	.649	.912
QC34 will invite bystanders to join in a game	238.47	1827.484	.581	.913
QC35 helps other children who are feeling sick	236.93	1831.995	.589	.913
QC36 is upset when left by parent/guardian	235.24	1969.324	.130	.920
QC37 gets into physical fights	234.72	1897.845	.543	.914
QC38 bullies or is mean to others	234.65	1916.503	.475	.915
QC39 kicks, bites, hits other children or adults	234.53	1904.713	.555	.914
QC40 takes things that do not belong to him/her	234.45	1924.772	.459	.915

QC41 laughs at other children's discomfort	234.45	1930.794	.449	.915
QC42 can't sit still, is restless	235.63	1831.255	.631	.912
QC43 is distractible, has trouble sticking to any activity	235.80	1822.843	.661	.912
QC44 fidgets	235.97	1831.936	.610	.913
QC45 is disobedient	234.60	1890.756	.624	.913
QC46 has temper tantrums	234.26	1945.204	.405	.916
QC47 is impulsive, acts without thinking	235.33	1850.901	.604	.913
QC48 has difficulty awaiting turn in games or groups	235.32	1854.855	.599	.913
QC49 cannot settle to anything for more than a few moments	234.74	1874.149	.627	.913
QC50 is inattentive	235.30	1852.995	.636	.912
QC51 seems to be unhappy, sad or depressed	234.69	1928.371	.391	.916
QC52 appears fearful or anxious	234.81	1952.797	.251	.918
QC53 appears worried	235.44	1946.006	.243	.918
QC54 cries a lot	234.74	1933.079	.329	.917
QC55 is nervous, high-strung, or tense	234.72	1937.015	.342	.916
QC56 is incapable of making decisions	235.03	1918.193	.420	.916
QC57 is shy	236.03	1977.311	.087	.921

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
QB8 knows how to handle a book (e.g. turn a page)	221.67	1584.771	.273	.903
QB9 is generally interested in books (pictures and print)	222.00	1528.125	.463	.900
QB10 is interested in reading (inquisitive, curious about the meaning of printed material)	222.36	1477.207	.585	.898
QB11 is able to identify a least 10 letters of the alphabet	222.11	1495.987	.599	.898
QB12 is able to attach sounds to letters	221.97	1525.156	.507	.900
QB13 is showing awareness of rhyming words	222.77	1433.425	.655	.896
QB14 is able to participate in group reading activities	221.97	1531.200	.465	.901
QB15 is able to read simple words	222.60	1443.792	.661	.896
QB16 is able to read complex words	227.86	1438.636	.387	.906
QB17 is able to read simple sentences	223.74	1390.106	.643	.896
QB18 is experimenting with writing tools	222.03	1538.911	.379	.902
QB19 is aware of writing directions in English (left to right, top to bottom)	222.19	1497.137	.553	.899

QB20 is interested in writing voluntarily (and not only under the teacher's direction)	224.25	1423.354	.484	.901
QB21 is able to write his/her own name in English	222.06	1520.758	.479	.900
QB22 is able to write simple words	222.94	1420.946	.666	.895
QB23 is able to write simple sentences	224.55	1393.316	.557	.899
QB24 is able to remember things easily	223.53	1417.187	.575	.898
QB25 is interested in mathematics	222.31	1493.031	.525	.899
QB26 is interested in games involving numbers	222.15	1519.824	.441	.901
QB27 is able to sort and classify objects by a common characteristic (e.g. shape, colour, size)	221.67	1581.535	.302	.903
QB28 is able to use one-to-one correspondence	222.00	1524.095	.490	.900
QB29 is able to count to 20	222.67	1452.930	.598	.897
QB30 is able to recognise numbers 1 - 10	222.20	1495.357	.559	.899
QB31 is able say which number is bigger of the two	222.43	1477.405	.557	.898
QB32 is able to recognise geometric shapes (e.g. triangle, circle, square)	221.79	1564.364	.339	.902
QB33 understands simple time concepts (e.g. today, summer, bedtime)	221.99	1539.919	.395	.901

Communication and General Knowledge

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
QB1 ability to use language effectively in English	57.88	232.580	.864	.901
QB2 ability to listen in English	57.78	246.651	.726	.913
QB3 ability to tell a story	58.31	229.133	.829	.904
QB4 ability to take part in imaginative play	58.04	256.930	.615	.921
QB5 ability to communicate own needs in a way understandable to adults and peers	57.74	239.518	.827	.905
QB6 ability to understand on first try what is being said to him/her	57.90	240.161	.790	.907
QB7 ability to articulate clearly, without sound substitutions	57.88	241.714	.728	.913
QC26 answers questions showing knowledge about the world (e.g. leaves fall in autumn, apple is a fruit, dogs bark)	57.18	271.871	.515	.927

Appendix II: Missing data

a) Demographics

i. Gender

		Frequency	Percent
Valid	Female	616	48.9
	Male	641	50.9
	Total	1257	99.8
Missing	System	2	.2
Total		1259	100.0

ii. Child's first language

		Frequency	Percent
Valid	English	1155	91.7
Missing	System	104	8.3
Total		1259	100.0

iii. Class type

		Frequency	Percent
Valid	P1	1077	85.5
	P1/2	181	14.4
	Total	1258	99.9
Missing	System	1	.1
Total		1259	100.0

iv. Status

		Frequency	Percent
Valid	in class more than 1 month	1249	99.2
	in class less than 1 month	5	.4
	other	1	.1
	Total	1255	99.7
Missing	System	4	.3
Total		1259	100.0

v. ESL status

		Frequency	Percent
Valid	yes	47	3.7
	no	1204	95.6
	don't know	2	.2
	Total	1253	99.5
Missing	System	6	.5
Total		1259	100.0

vi. Special Needs

		Frequency	Percent
Valid	yes	105	8.3
	no	1147	91.1
	don't know	1	.1
	Total	1253	99.5
Missing	System	6	.5

Total	1259	100.0

vii. Repeat Grade

		Frequency	Percent
Valid	yes	2	.2
	no	1251	99.4
	Total	1253	99.5
Missing	System	6	.5
Total		1259	100.0

b) EDI Domains

i. Physical Health and Well-being

		Frequency	Percent
Valid	Not missing	1251	99.4
	Yes missing	8	.6
	Total	1259	100.0

ii. Social Competence

		Frequency	Percent
Valid	Not missing	1252	99.4
	Yes missing	7	.6
	Total	1259	100.0

iii. Emotional Maturity

		Frequency	Percent
Valid	Not missing	1236	98.2
	Yes missing	23	1.8
	Total	1259	100.0

iv. Language and Cognitive Development

		Frequency	Percent
Valid	Not missing	1236	98.2
	Yes missing	23	1.8
	Total	1259	100.0

v. Communication and General Knowledge

		Frequency	Percent
Valid	Not missing	1251	99.4
	Yes missing	8	.6
	Total	1259	100.0

c) Individual items by domain

Physical Health and Well-being				
EDI items	Label	% Don't Know	% Blank	% Total non-response
Qa2	Over- or under-dressed for school related activities	0.0	0.6	0.6
Qa3	Too tired/ sick to do school work	0.2	0.6	0.8
Qa4	Late	0.0	0.6	0.6

Qa5	Hungry	0.4	0.6	1.0
Qa6	Independent in washroom habits most of time	0.0	0.6	0.6
Qa7	Established hand preference	0.0	0.6	0.6
Qa8	Well-coordinated	0.1	0.6	0.7
Qa9	Proficiency at holding a pencil, crayons, or brush	0.0	0.6	0.6
Qa10	Ability to manipulate objects	0.0	0.6	0.6
Qa11	Ability to climb stairs	0.5	0.6	1.0
Qa12	Level of energy throughout the school day	0.0	0.6	0.6
Qa13	Overall physical development	0.0	0.6	0.6
Qc58	Sucks his/her thumb/finger	2.7	0.6	3.3
Social Competence				
EDI items	Label	% Don't Know	% Blank	% Total non-response
Qc1	Overall social/ emotional development	0.1	0.6	0.6
Qc2	Gets along with peers	0.0	0.6	0.6
Qc3	Plays of works cooperatively with other children at level appropriate for his/ her age	0.0	0.6	0.6
Qc4	Plays with various children	0.0	0.6	0.6
Qc5	Follows rules and instructions	0.0	0.6	0.6
Qc6	Respects the property of others	0.0	0.6	0.6
Qc7	Demonstrate self-control ability	0.0	0.6	0.6
Qc8	Shows self-confidence	0.0	0.6	0.6
Qc9	Demonstrates respect for adults	0.0	0.6	0.6
Qc10	Demonstrates respect for children	0.2	0.6	0.7
Qc11	Accepts responsibility for actions	0.3	0.6	0.9

Qc12	Listens attentively	0.1	0.6	0.6
Qc13	Follows directions	0.0	0.6	0.6
Qc14	Completes work in time	0.0	0.6	0.6
Qc15	Works independently	0.0	0.6	0.6
Qc16	Takes care of school materials	0.0	0.6	0.6
Qc17	Works neatly and carefully	0.0	0.6	0.6
Qc18	Curious about the world	0.4	0.6	1.0
Qc19	Eager to play with a new toy	0.2	0.6	0.7
Qc20	Eager to play with a new game	0.2	0.6	0.7
Qc21	Eager to play with/ read a new book	0.2	0.6	0.7
Qc22	Solves day-to-day problems by himself/ herself	0.0	0.6	0.6
Qc23	Follows one-step instructions	0.0	0.6	0.6
Qc24	Follows class routines without reminders	0.0	0.6	0.6
Qc25	Adjusts to changes in routine	0.0	0.6	0.6
Qc27	Tolerance to someone who made a mistake	0.6	0.6	1.1
Emotional Maturity				
EDI items	Label	% Don't Know	% Blank	% Total non-response
Qc28	Tries to help someone who has been hurt	2.8	0.6	3.3
Qc29	Volunteers to help clear up a mess made by someone else	1.7	0.6	2.3
Qc30	If there is a quarrel or dispute will try to stop it	5.6	0.6	6.1
Qc31	Offers his/ her help to others who have difficulty with a task	2.9	0.6	3.4
Qc32	Comforts a child who is crying or angry	3.2	0.6	3.8
Qc33	Spontaneously helps pick up objects which another	2.6	0.6	3.2

	child has dropped			
Qc34	Invites bystanders to join in a game	8.7	0.6	9.2
Qc35	Helps other children who are feeling sick	6.3	0.6	6.8
Qc36	Is upset when left by parents/ guardians	0.1	0.6	0.6
Qc37	Gets into physical fights	0.0	0.6	0.6
Qc38	Bullies or is mean to others	0.2	0.6	0.7
Qc39	Kicks, bites, hits other children or adults	0.0	0.6	0.6
Qc40	Takes things that do not belong to him/her	0.7	0.6	1.3
Qc41	Laughs at other children's discomfort	0.3	0.6	0.9
Qc42	Cannot sit still/is restless	0.0	0.6	0.6
Qc43	Distractible, has trouble sticking to any activity	0.0	0.6	0.6
Qc44	Fidgets	0.0	0.6	0.6
Qc45	Disobedient	0.0	0.6	0.6
Qc46	Has temper tantrums	0.1	0.6	0.6
Qc47	Impulsive/ acts without thinking	0.1	0.6	0.6
Qc48	Has difficulty waiting for turn in games or groups	0.2	0.6	0.7
Qc49	Cannot settle on anything for more than a few moments	0.0	0.6	0.6
Qc50	Inattentive	0.0	0.6	0.6
Qc51	Seems to be unhappy, sad, or depressed	0.1	0.6	0.6
Qc52	Appears fearful or anxious	0.0	0.6	0.6
Qc53	Appears worried	0.2	0.6	0.7
Qc54	Cries a lot	0.0	0.6	0.6
Qc55	Nervous, high strung, and tense	0.0	0.6	0.6
Qc56	Is incapable of making decisions	0.2	0.6	0.7
Qc57	Shy	0.0	0.6	0.6

Language and Cognitive Development				
EDI items	Label	% Don't Know	% Blank	% Total non-response
Qb8	Knows how to handle a book	0.0	0.6	0.6
Qb9	Generally interested in books	0.1	0.6	0.6
Qb10	Interested in reading	0.5	0.6	1.0
Qb11	Identifies letters	0.0	0.6	0.6
Qb12	Sounds to letters	0.0	0.6	0.6
Qb13	Rhyming awareness	0.8	0.6	1.4
Qb14	Group reading	0.0	0.6	0.6
Qb15	Reads simple words	0.1	0.6	0.6
Qb16	Reads complex words	0.1	0.6	0.6
Qb17	Reads simple sentences	0.1	0.6	0.6
Qb18	Experiments with writing tools	0.0	0.6	0.6
Qb19	Aware of writing directions	0.1	0.6	0.6
Qb20	Interested in writing voluntarily	0.3	0.6	0.9
Qb21	Writes his/her own name in English language	0.0	0.6	0.6
Qb22	Writes simple words	0.0	0.6	0.6
Qb23	Writes simple sentences	0.0	0.6	0.6
Qb24	Remembers things easily	1.0	0.6	1.7
Qb25	Interested in mathematics	0.4	0.6	1.0
Qb26	Interested in games involving numbers	0.2	0.6	0.9
Qb27	Sorts and classifies objects by a common characteristic	0.5	0.6	1.1
Qb28	Makes one-to-one correspondence	0.1	0.6	0.7
Qb29	Counts to 20	0.2	0.6	0.8

Qb30	Recognizes numbers from 1-10	0.0	0.6	0.6
Qb31	Says which number is bigger of the two	0.3	0.6	1.0
Qb32	Recognizes geometrical shapes	2.8	0.6	3.4
Qb33	Understands simple time concepts	0.6	0.6	1.2
Communication and General Knowledge				
EDI items	Label	% Don't Know	% Blank	% Total non-response
Qb1	Effective use of English Language	0.2	0.6	0.7
Qb2	Listens in English Language	0.0	0.6	0.6
Qb3	Tells a story	0.2	0.6	0.8
Qb4	Takes part in an imaginative play	0.2	0.6	0.8
Qb5	Communicates own needs	0.0	0.6	0.6
Qb6	Understands on first try what is being said to him/ her	0.0	0.6	0.6
Qb7	Articulates clearly without sound substitutions	0.2	0.6	0.7
Qc26	Answers questions showing knowledge about the world	0.3	0.6	0.9

Appendix III: Effect Sizes

i. Effect Sizes for EDI domain mean scores by 2009 SIMD postcode quintiles

	Postcode quintiles 5 and 1	Postcode quintiles 5 and 2	Postcode quintiles 5 and 3	Postcode quintiles 5 and 4
Physical Health and Well-being	1.22	0.62	0.47	0.38
Social Competence	0.99	0.51	0.35	0.24
Emotional Maturity	0.79	0.30	0.11	0.12
Language and Cognitive Development	1.41	0.39	0.41	0.38
Communication and General Knowledge	0.87	0.36	0.31	0.21

ii. Effect Sizes for EDI domain mean scores by 2012 SIMD postcode quintiles

	Postcode quintiles 5 and 1	Postcode quintiles 5 and 2	Postcode quintiles 5 and 3	Postcode quintiles 5 and 4
Physical Health and Well-being	1.16	0.67	0.50	0.30
Social Competence	0.80	0.43	0.40	0.18
Emotional Maturity	0.54	0.17	0.11	-0.04
Language and Cognitive Development	0.98	0.27	0.30	0.27
Communication and General Knowledge	0.73	0.34	0.32	0.19

Appendix IV: Change between 2012 and 2016

Change in domain mean scores and vulnerabilities between 2012 and 2016

	Change in EDI Domain Mean Score between 2012 and 2016	Change in EDI Domain Percent Vulnerable between 2012 and 2016
Physical Health and Well-being	-0.18	1.4
Social Competence	-0.39	-0.6
Emotional Maturity	-0.31	3.4
Language and Cognitive Development	-0.64	-0.4
Communication and General Knowledge	-0.38	-0.2
Overall vulnerability		3.8

Change in domain mean scores by 2009 SIMD postcode quintile between 2012 and 2016

	Change in EDI Domain Mean Score				
	Postcode Quintile 1	Postcode Quintile 2	Postcode Quintile 3	Postcode Quintile 4	Postcode Quintile 5
Physical Health and Well-being	-0.38	0.11	-0.12	-0.10	0.15
Social Competence	-0.67	-0.07	-0.42	-0.22	-0.09
Emotional Maturity	-0.61	-0.23	-0.21	-0.09	-0.24
Language and Cognitive Development	-0.61	0.43	-0.05	-0.10	-0.10
Communication and General Knowledge	-0.55	0.14	-0.13	-0.22	-0.09

Change in domain vulnerabilities by 2009 SIMD postcode quintile between 2012 and 2016

	Change in EDI Domain Percent Vulnerable				
	Postcode Quintile 1	Postcode Quintile 2	Postcode Quintile 3	Postcode Quintile 4	Postcode Quintile 5
Physical Health and Well-being	6.2	-1.6	2.7	2.5	-0.7
Social Competence	7.1	0.1	0	-1.0	-1.6
Emotional Maturity	16	2.1	1.1	3.6	3.0
Language and Cognitive Development	4.2	-7.8	-0.1	1.6	3.4
Communication and General Knowledge	7.1	-3.4	-1.9	1.1	-0.3
Overall vulnerability	20.6	0.1	0.1	6.2	3.3