SCHOOL ABSENCE AND ITS EFFECT ON SCHOOL PERFORMANCE FOR CHILDREN BORN WITH OROFACIAL CLEFTS

ABSTRACT

Background: School absence is associated with lower performance on standardised tests. Children born with orofacial clefts (OFC) are likely to have more absence than children without OFC, however school absence for children with OFC has not been quantified. We aimed to describe school absence and its relationship with school performance for children with and without OFC.

Methods: Population-based record-linked cohort study of children (402 with OFC, 1789 without OFC) enrolled in schools in Western Australia, 2008-2012. We compared median school absence rates using Wilcoxon rank tests, and investigated the impact of school absence on standardised scores from reading, numeracy and writing tests, using multivariable models fitted by generalised estimating equations.

Results: At each primary school year level, children without OFC and children with cleft lip only or cleft palate only had similar median absence rates (approximately 1 week). Children with cleft lip and palate had significantly higher absence rates in Years 4-6 (between 1-2 weeks). During secondary school, median absence rates were higher (2 weeks) for all children, but not statistically different between children with and without OFC. Higher absence was significantly associated with lower standardised reading, numeracy and writing scores. However, having a cleft of any type had little influence on the association between absence and test scores.

Conclusions: School absence affected school performance for all children. Absence did not differentially disadvantage children born with OFC suggesting current practices to identify

and support children with OFC are minimising effects of their absence on school performance.

KEY WORDS:

cleft lip, cleft palate, school performance, medical record linkage, Western Australia, school absence

Introduction

Orofacial clefts (OFCs) are among the most common congenital malformations. Children born with OFCs have difficulty feeding, and need multidisciplinary care from birth to adulthood, including surgery, speech therapy, general dentistry and orthodontics (Mossey et al., 2009). Effects on speech, hearing, and appearance can lead to chronic adverse health and developmental outcomes (Mossey et al., 2009). Population-based studies have consistently reported lower school performance for children with orofacial clefts (OFC) compared to children without OFC, especially for children born with cleft lip and palate (CL+P) or cleft palate only (CPO) (Persson et al., 2012; Wehby et al., 2014; Wehby et al., 2015).

School absence is a major influence on school results, with increasing absence associated with lower performance on standardised school tests (Daraganova, 2013; Hancock et al., 2013; Layte and McCrory, 2013). Children managing both chronic health issues and school absence face a number of challenges that may lead to adverse short and long-term consequences (Australian Research Alliance for Children and Youth (ARACY), 2015). The burden of health service use for children with OFC is considerable and may result in school absence. Children with OFC are more likely to be hospitalised and spend more time in hospital than children without OFC (Bell et al., 2016; Wehby et al., 2012). They may also be absent from school for other health care needs such as speech therapy, and dental and orthodontic care (Sell et al., 2001; Semb et al., 2005). Besides health service use, other reasons for absence may also be different between children with and without OFC, and these reasons may influence school performance. For other students, poorer academic results may affect their engagement with schooling (Hancock et al., 2013), however, the direction of the association is often difficult to ascertain.

School absence patterns and their association with school test results have not been described for children with OFC. We aimed to describe school absence patterns, and their relationship with performance in standardised school tests for a cohort of children born with cleft lip only (CLO), cleft lip and palate (CL+P) and cleft palate only (CPO) compared with children without OFC.

Methods

Study population and data sources

Our study used population-based linked data to identify live born children born in Western Australia (WA) with OFC and a random sample of children without OFC, frequency matched 4:1 on year of birth, whose records were linked to school absence data. Children born in WA with and without OFC were identified from the Midwives Notification System, a legislated surveillance system of all births in WA of >20 weeks gestation or 400g birthweight, and the WA Register of Developmental Anomalies (WARDA). The WARDA is a population based statutory notification system of congenital anomalies using active surveillance from administrative data collections (such as birth, death, and hospitalisation data) and other sources (public and private diagnostic and treatment sources), and includes diagnoses in pregnancies terminated because of fetal anomaly, stillbirths, and liveborn children up to six years of age. OFC were identified from the British Paediatric Association-ICD9 codes for CPO (74900-74909), CLO (74910-74919) and CL+P (74920-74927, 74929). We also identified the presence of additional major congenital anomalies, including chromosomal, structural or syndrome-like diagnoses (BPA-ICD9 codes 740-759). As the presence of additional major anomalies may be associated with both attendance patterns and school outcomes, we categorised children with OFC by the absence (isolated OFC) or presence of an

additional major anomaly. The comparison group included all children without OFC, with or without a congenital anomaly.

School absence data for all children enrolled in government schools in all, or any part of the period 2008-2012 were obtained from the WA Education Department. The number of half-days absent and the total number of half-days each student was available to attend (related to the time a student was enrolled) were recorded for each child in Semester 1 in each calendar year. The WA Department of Education also provided school test results from the Australia-wide National Assessment Program – Literacy and Numeracy (NAPLAN) from 2008-2011. NAPLAN is conducted annually, examining children's performance in numeracy, reading, writing, and spelling and grammar and punctuation in school year levels 3, 5, 7 and 9. In Australia, the school year approximates the calendar year; these tests are administered in May, two-thirds through the first semester.

Children with an intellectual disability were identified from two sources (linkage to the idEA database and NAPLAN records), and excluded. The idEA database is a population-based register of people with intellectual disability with ascertainment from multiple sources including the Disability Services Commission, the Department of Education and health providers (Leonard et al., 2004). Intellectual disability is defined as full IQ <70, or evidence of developmental delay at <18 years of age and accepted that the delay was present during childhood (Leonard et al., 2004). NAPLAN records classified children as exempt from a test if they were identified with a significant and complex disability (Australian Curriculum Assessment and Reporting Authority, 2008).

Study outcomes and covariates

We defined absence rate as the number of half-days absent expressed as a percentage of the number of half-days a child was enrolled. As there are approximately 100 full days of school each semester, a 1% absence rate was equivalent to approximately 1 day of absence per semester. Likewise, an absence rate of 5% translated to 5 days or one week of absence (Hancock et al., 2013). We described absence for school years 1 to 10, the years of compulsory school education (Hancock et al., 2013). During the study period, school years 1-7 comprised primary school and years 8-10 occurred in secondary school. As the Department of Education does not provide absence data for Semester 2 we used absence rates from Semester 1 for all analyses. Any records at the same year level in consecutive years were excluded as absence may have been a reason for repeating the year level.

Records for children with absence data were linked to their NAPLAN reading, numeracy and writing test scores. These assessments are curriculum based and benchmarked to a national minimum standard at each school grade level. These scaled scores (from 0 to 1000, for each test at each year level), allow monitoring of school achievement for each student over time. For example, a score of 700 in reading has the same meaning in 2010 as in 2008 (Australian Curriculum Assessment and Reporting Authority, 2008). We converted the scaled scores for each test at each year level to standardised scores (with mean = 0, standard deviation = 1). As the writing test changed from a narrative to a persuasive text task in 2011, we have included writing results from 2008-2010, but reading and numeracy results cover 2008-2011.

The Midwives Notification System provided covariate information on sex, singleton or multiple birth, birthweight ($<2500\text{g}$ vs $\geq 2500\text{g}$), gestational age (preterm <37 weeks vs term ≥ 37 weeks), family order (oldest child or not), and Indigenous status. Parental residence at birth was categorised as metropolitan, rural or remote using the Accessibility/Remoteness

Index of Australia (Australian Population and Migration Research Centre, 2012). As a measure of socioeconomic level for each child, we classified scores from the Index of Education and Occupation into quintiles, based on parental residence at the time of the child's birth. This Index scores and ranks neighbourhoods on their educational and occupational structure using information collected by the Australian Bureau of Statistics at each five-yearly Census (Australian Bureau of Statistics, 2008). School test data provided information on language background (English or other language spoken at home) and school location (remote/very remote, regional or metropolitan). We categorised each child's age as being in the oldest, middle, or youngest third of their year cohort, at the first test result.

Statistical analyses

We used Chi-square tests to compare characteristics between children with and without OFC, and between children with different types of OFC (CLO, CL+P, CPO). We rounded absence rates to the nearest whole number and calculated median, 25th and 75th percentiles for each school year level and compared the distribution of these rates between children with and without OFC at each school year level using Wilcoxon rank sum tests.

We investigated the impact of school absence and being born with OFC on standardised scores for each test over all school year levels using models fitted by generalised estimating equations with a normal distribution and robust standard errors, and accounting for within-person correlation. To account for the non-linear association between absence and achievement, (Hancock et al., 2013) absence rates were categorised into three groups based on their distribution to enable adequate cell sizes. These groups were 0-<5% (equivalent to absence of up to 1 week per semester), 5-<10% (1 week up to 2 weeks absence), and $\geq 10\%$ (absent for 2 weeks or more). After initial analyses, we examined the effects of other

covariates; using an *a priori* base model including school year level, child's sex and Indigenous status, and quintile of parental socioeconomic level at the child's birth. To obtain the final model we added additional covariates individually to the base model using forwards selection. Significance was based on Type III likelihood ratio P-values ($p < 0.05$) to test the overall effect of the variable. We presented variable estimates with 95% confidence intervals. All data were analysed using SAS release 9.4.

Members of CleftPALS WA, the support group for families with members affected by OFC, provided advice for this study. The study protocol was approved by the WA Department of Health Human Research Ethics Committee and the WA Aboriginal Health Ethics Committee. These approvals were recognised by the University of Sydney's Human Research Ethics Committee.

Results

Most (96.2%) of the 2191 children with school absence records were born 1993-2005; the remainder in 1992 and 2006. Children with OFC were more likely to be male; other birth characteristics were similar to children without OFC (Table 1). Among children with OFC, 112 were born with CLO, 109 with CL+P and 181 with CPO. Children with CLO or CL+P were more likely to be male (68.8% and 63.3%, respectively), and children with CPO were more likely to be female (53.3%). The proportion of Indigenous (Australian Aboriginal or Torres Strait Islander) children was higher among children with CLO and CL+P (15.2% and 12.8%, respectively) than in children with CPO (6.6%) ($p = 0.05$), and a higher proportion of children with CPO (73.6%) lived in metropolitan areas at birth compared to those with CLO or CL+P (61.9% and 59.6%, respectively) ($p = 0.04$). Other birth characteristics were evenly distributed among children with the different types of cleft. Additional major anomalies were

more frequent among children with CPO than children with CLO or CL+P (Table 2). Only 3.8% of children without OFC were born with a congenital anomaly. Of the children with CPO and an additional major anomaly, most (n=49, 77.8%) were diagnosed with a syndrome, while nearly all children without OFC diagnosed with an anomaly had neither a chromosomal anomaly nor syndromic diagnosis (n=64, 95.5%). As few children born with CLO (n=16) or CL+P (n=13) had additional major anomalies, we restricted further analyses for children with these cleft types to those with isolated CLO or CL+P.

Median absence rates across all school year levels 1-10 for children with each cleft type are presented in Figure 1 and Table 3. For children without OFC, the median absence rate was around 5% (approximately 1 week) in Semester 1 until year 7. In secondary school, their school absence increased, with median absence rates of around 8% and 11%, respectively in Years 8 and 10. Compared to children without OFC, children with isolated CLO or CPO had similar absence rates, but children with isolated CL+P had higher median rates of absence in school years 4 to 6. At each year level, absence rates were not significantly different between children with isolated CPO and children with CPO and additional anomalies. During secondary school median absence rates for children with OFC were not statistically significantly different from children without OFC. At almost every year level, at least 25% of students had absence rates of two weeks or more.

Of children with attendance data during school years 3 to 9 during the testing period (2008-11), 98.6% also had school test results. Summary results for reading, numeracy and writing over all school year levels (Table 4) revealed that compared with children without OFC, children born with isolated CLO or CL+P had similar mean scores, but children born with CPO (isolated or occurring with an additional anomaly) mostly had significantly lower

scores. Increasing levels of absence were associated with lower scores in all tests, and after adjusting for cleft type, the effect of absence on test scores did not change (Table 4).

The effects of absence and cleft type on standardised scores were slightly attenuated when adjusted for important covariates (Table 5). However, the overall effect remained similar: higher levels of absence were associated with lower scores, and some children born with CPO had significantly lower standardised scores in all three subjects compared to children without OFC. Compared to children without OFC, children with CPO and an additional anomaly had similar results to children with isolated CPO.

Discussion

This is the first study to describe school absence and its association with school performance for a population-based cohort of children born with OFC. School absence was significantly higher for children with CL+P in the primary school years, but not for children born with CLO or CPO compared to children without OFC. Higher levels of absence were significantly associated with lower standardised reading, numeracy and writing scores. However, having a cleft of any type had little influence on the association between absence and test scores. Even though we were able to account for school absence, children with CPO were still more likely to have poorer results in standardised school tests, as found in other studies (Persson et al., 2012; Wehby et al., 2014; Wehby et al., 2015) and this was similar for children with isolated CPO and children with CPO and additional anomalies. The reasons for poorer school performance for children with CPO are unclear, but may be related to higher prevalence of learning difficulties (such as attention deficit hyperactivity disorder, autism, or dyslexia) in these children (Feragen et al., 2009).

That absence from school was negatively associated with test results is consistent with previous reports and studies (Daraganova, 2013; Hancock et al., 2013; Morrissey et al., 2014). Adjustment for key covariates made most difference to estimates for children with CL+P, although their standardised scores were not significantly different to those for children without OFC.

The greater absence for children with CL+P especially in the primary school years may be related directly to their burden of health care use. Almost 90% of children with CL+P are admitted to hospital during the primary school years, compared to around 72% of children with CPO, 62% of children with CLO and 33% of children without OFC (Bell et al., 2016). During this period, the median cumulative length of hospital stay for children with CL+P was nearly one week, compared to 2.5 days for children with CLO and CPO, and 1 day for children without OFC (Bell et al., 2016). There is limited population-based information on the burden of ambulatory care for children with CLO or CPO. However for children with CL+P, clinical audits conducted in the United Kingdom in the 1990s and in northern Europe in the early 2000s showed that the burden imposed by speech therapy and orthodontic care was considerable (Sell et al., 2001; Semb et al., 2005). Despite their greater burden of health care, there was no difference in school performance between children with CL+P and those without OFC.

Cumulative absence is also related to future achievement in these tests (Hancock et al., 2013). While absence at each year level was lower for children with OFC, although not significantly, it is possible that cumulative absence for children with OFC may be an important factor in test results. We were unable to assess this in our study as the period covering absence and

school test data was too short for meaningful analysis. However, this should be examined in future studies.

Reasons for absence, are also important. Absence can be considered legitimate or otherwise, with both types contributing to poorer school test results (Hancock et al., 2013). In primary school, illness and family events (legitimate absences) are the most common reasons for absence (Daraganova, 2013). In secondary school, in addition to absence for legitimate causes, absence for unexplained or unacceptable reasons, or for truancy, is more likely to occur; these unauthorized absences are more strongly associated with achievement than legitimate absences (Hancock et al., 2013). Moreover, for some secondary students, particularly those who struggle academically, the work demands may affect their engagement with schooling (Hancock et al., 2013). Unfortunately we were unable to determine specific reasons for absence from our data, and cannot address possible underlying differences in reasons for absence.

Absence data were only available for Semester 1 and may not reflect absence in Semester 2. Semester 2 in WA coincides with late winter and spring, and members of CleftPALS WA (the support group for families with a family member affected by a cleft) report that absence for children with OFC in Semester 2 may be relatively higher due to a heavier burden of respiratory illness and sinus conditions. Thus absence in Semester 1 may underestimate school absence for these children. Members of CleftPALS WA also highlighted they make a concerted effort to ensure their children are not disadvantaged by school absence related to OFC care but we could not account for the effects of home support external to school. Absence data was also only available for children enrolled in government schools, who comprise two-thirds of the total school enrolment, (WA Department of Education, 2012) and

absence patterns may differ between children enrolled in government and non-government schools.

Absence was an important factor affecting school performance for all children. Absence did not differentially disadvantage children born with OFC suggesting that current practices used by schools and families to identify and support children with OFC are minimising the effects of their absence on school performance. However, after accounting for school absence, children with CPO were still more likely to have poorer results in standardised school tests. Given their higher burden of health issues and ongoing care, we suggest all children with OFC, especially children with CPO, be monitored, so that intervention can be initiated, if necessary, to maximise their school performance.

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References

- Australian Bureau of Statistics. 2008. An Introduction to Socio-Economic Indexes for Areas (SEIFA) 2006. ABS Catalogue No. 2039.0. Canberra: Australian Bureau of Statistics.
- Australian Curriculum Assessment and Reporting Authority. 2008. NAPLAN Achievement in Reading, Writing, Language Conventions and Numeracy: National Report for 2008. Sydney: ACARA.
- Australian Population and Migration Research Centre. 2012. ARIA and accessibility. University of Adelaide.
- Australian Research Alliance for Children and Youth (ARACY). 2015. Missing School–Part 1: School connection for seriously sick kids: who are they? . Canberra, ACT. .
- Bell J, Nassar N, Turner R et al. 2016. Hospitalisations up to adulthood for children born with orofacial clefts. *Journal of Paediatrics and Child Health* 52:441-448.
- Daraganova G. 2013. The Longitudinal Study of Australian Children Annual Statistical Report 2012. Chp 5. Is it OK to be away? School attendance in the primary school years.
- Feragen KB, Borge AIH, Rumsey N. 2009. Social experience in 10-year-old children born with a cleft: Exploring psychosocial resilience. *Cleft Palate Craniofac J* 46(1):65-74.
- Hancock KJ, Shepherd CCJ, Lawrence D, Zubrick SR. 2013. Student attendance and educational outcomes: Every day counts. Report for the Department of Education, Employment and Workplace Relations, Canberra. Perth: Telethon Institute for Child Health Research at the University of Western Australia.
- Layte R, McCrory C. 2013. Paediatric chronic illness and educational failure: the role of emotional and behavioural problems. *Soc Psychiatry Psychiatr Epidemiol* 48(8):1307-1316.
- Leonard H, Petterson B, Bourke J, Glasson E, Morgan V, Bower C. 2004. Inaugural Report of the idEA Database – Intellectual disability in Western Australia. Perth WA: Telethon Institute for Child Health Research.
- Morrissey TW, Hutchison L, Winsler A. 2014. Family income, school attendance, and academic achievement in elementary school. *Dev Psychol* 50(3):741-753.
- Mossey PA, Little J, Munger RG, Dixon MJ, Shaw WC. 2009. Cleft lip and palate. *Lancet* 374(9703):1773-1785.
- Persson M, Becker M, Svensson H. 2012. Academic achievement in individuals with cleft: a population-based register study. *Cleft Palate Craniofac J* 49(2):153-159.
- SAS Institute Inc. . Cary, NC 27513-2414, USA.
- Sell D, Grunwell P, Mildinhal S et al. 2001. Cleft lip and palate care in the United Kingdom- the Clinical Standards Advisory Group (CSAG) Study. Part 3: Speech outcomes. *Cleft Palate Craniofac J* 38(1):30-37.
- Semb G, Brattstrom V, Molsted K, Prah-Andersen B, Shaw WC. 2005. The Eurocleft study: intercenter study of treatment outcome in patients with complete cleft lip and palate. Part 1: Introduction and treatment experience. *Cleft Palate Craniofac J* 42(1):64-68.
- WA Department of Education. 2012. Department of Education Statistical Reports. WA Department of Education.
- Wehby GL, Collet B, Barron S, Romitti PA, Ansley TN, Speltz M. 2014. Academic achievement of children and adolescents with oral clefts. *Pediatrics* 133(5):785-792.
- Wehby GL, Collett BR, Barron S, Romitti P, Ansley T. 2015. Children with oral clefts are at greater risk for persistent low achievement in school than classmates. *Archives of Disease in Childhood* 100(12):1148-1154.
- Wehby GL, Pedersen DA, Murray JC, Christensen K. 2012. The effects of oral clefts on hospital use throughout the lifespan. *BMC Health Serv Res* 12:58.

Table 1. Characteristics of children with school absence data^a, with and without orofacial clefts

Characteristic	OFC N=402		No OFC N=1789		P-value
	n	(%)	n	(%)	
Male	230	(57.2)	900	(50.3)	0.01
Singleton	384	(95.5)	1739	(97.2)	0.08
Preterm birth	34	(8.5)	121	(6.8)	0.23
Birthweight < 2500g	35	(8.7)	123	(6.9)	0.20
Oldest in family ^b	139	(34.6)	701	(39.2)	0.09
Indigenous	43	(10.7)	168	(9.4)	0.42
Socioeconomic quintile ^{c,d}					0.24
1 low	88	(22.1)	473	(26.5)	0.60
2	117	(29.4)	455	(25.5)	
3	77	(19.4)	328	(18.4)	
4	77	(19.4)	324	(18.2)	
5 high	39	(9.8)	203	(11.4)	
Residence ^{c,d}					
major city	255	(66.6)	1146	(66.7)	0.60
regional area	91	(23.8)	381	(22.2)	
remote area	37	(9.7)	192	(11.2)	
Cleft type					
CLO	112	(27.9)			
CL+P	109	(27.1)			
CPO	181	(45.0)			

^a School years 1-10, children with intellectual disability excluded

^b At birth, oldest child alive

OFC

^c At birth

^d Missing data: socioeconomic quintile at birth n=10, residence at birth n=89

OFC, orofacial cleft

Table 2. Proportion of children^a with additional major anomalies by cleft type

	CLO N=112		CL+P N=109		CPO N=181		No OFC N=1789	
	n	(%)	n	(%)	n	(%)	n	(%)
Isolated	96	(85.7)	96	(88.1)	118	(65.2)	1722	(96.3)
Additional anomaly ^b	16	(14.3)	13	(11.9)	63	(34.8)	67	(3.8)

^a Children with intellectual disability excluded

^b For children with no OFC, presence of a major anomaly

CLO, cleft lip only, CL+P, cleft lip and palate; CPO, cleft palate only; OFC orofacial cleft

Table 3. Median school absence rates (IQR) by school year level and cleft type, WA Semester 1, 2008-2012

School Level	Age	CLO ¹			CL+P ¹			CPO ¹			CPO ²			No OFC ³		
		N	Median	(IQR)	N	Median	(IQR)	N	Median	(IQR)	N	Median	(IQR)	N	Median	(IQR)
1	6.4	36	6	(3, 9)	39	7	(4, 15)	45	5	(3, 11)	21	7	(3, 10)	712	5	(3, 11)
2	7.4	37	4	(2, 11)	41	6	(3, 11)	55	6	(2, 13)	20	6	(2.5, 13)	725	5	(2, 10)
3	8.4	33	5	(4, 9)	37	6	(3, 12)	52	4	(2.5, 7)	24	5	(2.5, 9)	700	5	(2, 10)
4	9.4	26	7*	(4, 14)	37	9**	(4, 16)	47	6	(3, 9)	25	8	(3, 10)	662	4	(2, 9)
5	10.4	34	6	(3, 13)	39	8*	(5, 11)	46	4	(2, 8)	20	5.5	(3, 9)	644	5	(2, 9)
6	11.4	30	5	(2, 11)	30	9.5*	(3, 16)	41	4	(2, 10)	21	4	(2, 7)	568	5	(2, 10)
7	12.3	27	9	(3, 12)	30	7	(4, 19)	37	6	(3, 8)	23	7	(2, 9)	519	5	(2, 12)
8	13.2	23	8	(4, 15)	27	8	(4, 20)	23	14	(6, 16)	22	8.5	(3, 12)	448	8	(3, 14)
9	14.1	24	12.5	(6, 21.5)	22	13	(6, 21)	25	15*	(9, 22)	18	11.5	(5, 17)	433	9	(5, 17)
10	15.0	22	13	(7, 28)	21	13	(5, 26)	27	8	(6, 16)	17	11	(6, 16)	420	11	(5.5, 19.5)

¹ isolated cleft, ² cleft with additional major anomaly, ³ children without OFC ± congenital anomaly

Age=mean age (years). Absence rates (%) rounded to whole numbers. Absence rates approximate the number of days absent in a semester (as approx. 100 days each semester). IQR=interquartile range.

P-value * <0.05, ** <0.01, Wilcoxon Rank test, compared to individuals without OFC

Table 4. Effect of cleft type and absence on standardised scores

	Reading		Numeracy		Writing	
N children (<i>N records</i>)	1387	(2029)	1379	(2007)	1179	(1518)
<i>Unadjusted</i>	estimate	(95% CI)	estimate	(95% CI)	estimate	(95% CI)
Cleft type						
No cleft	Reference		Reference		Reference	
CLO, isol	-0.174	(-0.395, 0.047)	-0.057	(-0.297, 0.182)	-0.268	(-0.557, 0.021)
CL+P, isol	-0.022	(-0.297, 0.253)	-0.104	(-0.372, 0.164)	-0.129	(-0.381, 0.124)
CPO, isol	-0.239	(-0.463, -0.015)	-0.296	(-0.538, -0.055)	-0.104	(-0.328, 0.121)
CPO + anomaly	-0.498	(-0.756, -0.239)	-0.342	(-0.666, -0.018)	-0.330	(-0.636, -0.024)
Absence rate						
0-<5%	Reference		Reference		Reference	
5-<10%	-0.105	(-0.208, -0.002)	-0.219	(-0.326, -0.112)	-0.173	(-0.289, -0.057)
10%+	-0.448	(-0.567, -0.329)	-0.532	(-0.645, -0.420)	-0.514	(-0.651, -0.377)
<i>Adjusted for cleft type</i>						
Absence rate						
0-<5%	Reference		Reference		Reference	
5-<10%	-0.097	(-0.200, 0.007)	-0.215	(-0.322, -0.109)	-0.168	(-0.284, -0.052)
10%+	-0.447	(-0.565, -0.329)	-0.532	(-0.644, -0.420)	-0.509	(-0.646, -0.372)

CI, confidence interval; CLO, cleft lip only; CL+P, cleft lip and palate; CPO, cleft palate only; isol, isolated cleft; anomaly, additional major anomaly;

Reference, reference group (all children without OFC ± congenital anomaly);

Scores from reading and numeracy tests 2008-2011, writing 2008-2010, standardised to mean 0, sd 1

Table 5. Effect of cleft type and absence on standardised scores, adjusted for other covariates

	Reading		Numeracy		Writing	
<i>N children (N records)</i>	1377	(2018)	1369	(1996)	1170	(1508)
	Adjusted estimate	(95% CI)	Adjusted estimate	(95% CI)	Adjusted estimate	(95% CI)
Cleft type						
No cleft	Reference		Reference		Reference	
CLO isol	-0.122	(-0.326, 0.082)	-0.021	(-0.242, 0.199)	-0.240	(-0.501, 0.020)
CL+P isol	0.135	(-0.109, 0.378)	0.017	(-0.232, 0.265)	0.021	(-0.215, 0.256)
CPO isol	-0.263	(-0.474, -0.052)	-0.316	(-0.544, -0.088)	-0.125	(-0.327, 0.077)
CPO + anomaly	-0.419	(-0.690, -0.147)	-0.245	(-0.567, 0.077)	-0.247	(-0.516, 0.021)
Absence rate						
0-<5%	Reference		Reference		Reference	
5-<10%	-0.055	(-0.153, 0.044)	-0.204	(-0.306, -0.101)	-0.120	(-0.228, -0.012)
10%+	-0.264	(-0.378, -0.149)	-0.373	(-0.482, -0.263)	-0.283	(-0.402, -0.163)

CI, confidence interval; CLO, cleft lip only; CL+P, cleft lip and palate; CPO, cleft palate only; isol, isolated cleft; anomaly, major anomaly; Reference, reference group (all children without OFC ± congenital anomaly).

Scores from reading and numeracy tests 2008-2011, writing 2008-2010, standardised to mean 0, sd 1

All models for each domain adjusted for cleft type, absence rate, socioeconomic quintile at birth, Indigenous background yes/no, school year level, and sex. Reading also adjusted for family order (oldest or younger child in family). Numeracy also adjusted for child's age relative to class (oldest, middle or youngest third) and language background (English/not English). Writing also adjusted for family order, child's age relative to class and birthweight (<2500g/2500+g).

Figure 1. Median absence rates (%) at each school year level by cleft type (isolated CLO, isolated CL+P, all CPO) 2008-2012