

Prevalence of additional disabilities with deafness: A review of the literature

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Executive Summary

With the advances in hearing screening methods, it is expected previous estimates of the prevalence of additional disabilities with hearing loss may no longer be accurate.

A thorough search of the published literature was conducted using a number of electronic databases. The search strategy clearly defined the search terms and parameters for accepting papers for review. The literature search identified 51 relevant papers, of which 39 papers were excluded from review as the data was not specific to the aims of this report. One abstract was excluded as at the time of the review the full paper had not been published in the journal. Altogether 12 papers were included in the review.

The findings from the current review are:

- The prevalence of additional disabilities in children with hearing loss identified three areas of published research:
 - Visual impairment: range of prevalence= 4-57%
 - Neurodevelopmental disorder: range of prevalence= 2-14%
 - Speech Language Disorder: range of prevalence= 61-88%
- The prevalence of deafness in children with other disabilities identified three areas of published research:
 - Autistic Spectrum Disorder (ASD): range of prevalence= 2-4.2%
 - Cerebral Palsy: range of prevalence= 2-13%
 - Pervasive Developmental Disorder (PDD): prevalence= 2%
- The literature search has highlighted the overall evidence of research on the prevalence of additional disabilities in children with deafness, and the prevalence of deafness in children with disabilities, is very low.
- More research is required in this area. A follow up study similar to the one conducted by Fortnum and Davis (1997) is much needed.

Introduction

The seminal work of Fortnum and Davis (1997) identified the prevalence rates of permanent childhood hearing impairment for children in the Trent region. The study identified 38.7% of the children were found to have another clinical or developmental problem and half of these children had at least two additional problems. Since then there have been major developments in the technology used to assess deafness, with objective measures in place allowing for hearing testing from birth. In England, the newborn hearing screening program (NHSP; www.hearing-screening.nhs.uk) offers 99.9% of babies born a hearing screening test within the first few weeks of birth. To date over 5 million children have undergone hearing screening in England. The high specificity and sensitivity rates of the objective measures employed for screening have resulted in children being identified much earlier with permanent childhood hearing impairment.

More recently, the Consortium for Research into Deaf Education (CRIDE) published a report detailing their findings from a UK wide survey on educational staffing and service provision for deaf children in the 2010/11 financial year (BATOD, 2011). The findings from this report highlighted around 19% of deaf children in the survey have some form of additional special educational need (SEN). There is a marked difference between the results from this report and the published results of Fortnum and Davis (1997). However there are two possible explanations for this difference. The first, being the research (Fortnum and Davis, 1997) used a wide definition of additional needs including, for example, eczema, whereas the CRIDE report (2011) focused on SEN, which refers to children with learning difficulty where special educational provision needs to be made for them. The second is the CRIDE report includes mild hearing loss in their definition of deafness, whereas the research (Fortnum and Davis, 1997) excluded mild hearing losses. Prevalence of additional disabilities maybe increased in children with moderate to profound hearing losses and may have been another factor in the lower prevalence rates described in the CRIDE report.

As a result the National Deaf Children's Society (NDCS) as part of their remit to serve all deaf children requested a thorough search of the literature for any studies that may have explored the prevalence of additional disabilities with childhood deafness. The purpose of the current report was to identify literature published after 2002, to take into consideration newborn hearing screening, which has identified the prevalence of additional disabilities in children with hearing loss. Secondly, the report was to focus on identifying any published literature on the prevalence of deafness in children with other disabilities.

Aim

The aim of this report is to review the published literature relating to the prevalence of additional disabilities with deafness.

The review will consider the prevalence of additional disabilities in the deaf paediatric population as well as the prevalence of deafness in the paediatric population with other disabilities.

Methods

Search Strategy

To identify relevant literature pertaining to the prevalence of deafness with additional disabilities in children, the following electronic databases were searched:

- Medline
- Embase
- PsycINFO
- Pubmed
- Science Direct
- Scopus
- Cochrane Database of Systematic Reviews.

The search terms used for deafness were deaf, deafness, hearing, hearing impairment, hearing loss and hard of hearing. A joint meeting and further correspondence with NDCS and specialist professionals working with deaf children helped finalise the search terms. The search terms of additional disabilities included were:

- Autistic spectrum disorder, autism
- Blind, visual impairment
- Cerebral Palsy
- Cytomegalovirus, CMV
- Complex needs
- Cystic Fibrosis
- Intellectual Disability
- Mental Retardation, mental
- Neurodevelopmental Disorder
- Pervasive Developmental Disorder
- Physical Disabilities
- Profound and multiple learning disabilities, PMLD
- Severe learning disabilities, severe learning difficulties, SLD
- Speech Language Disorder
- Special Educational Needs, SEN

The reference lists of included studies e.g. review papers, were used to identify other appropriate published papers.

Selection Criteria

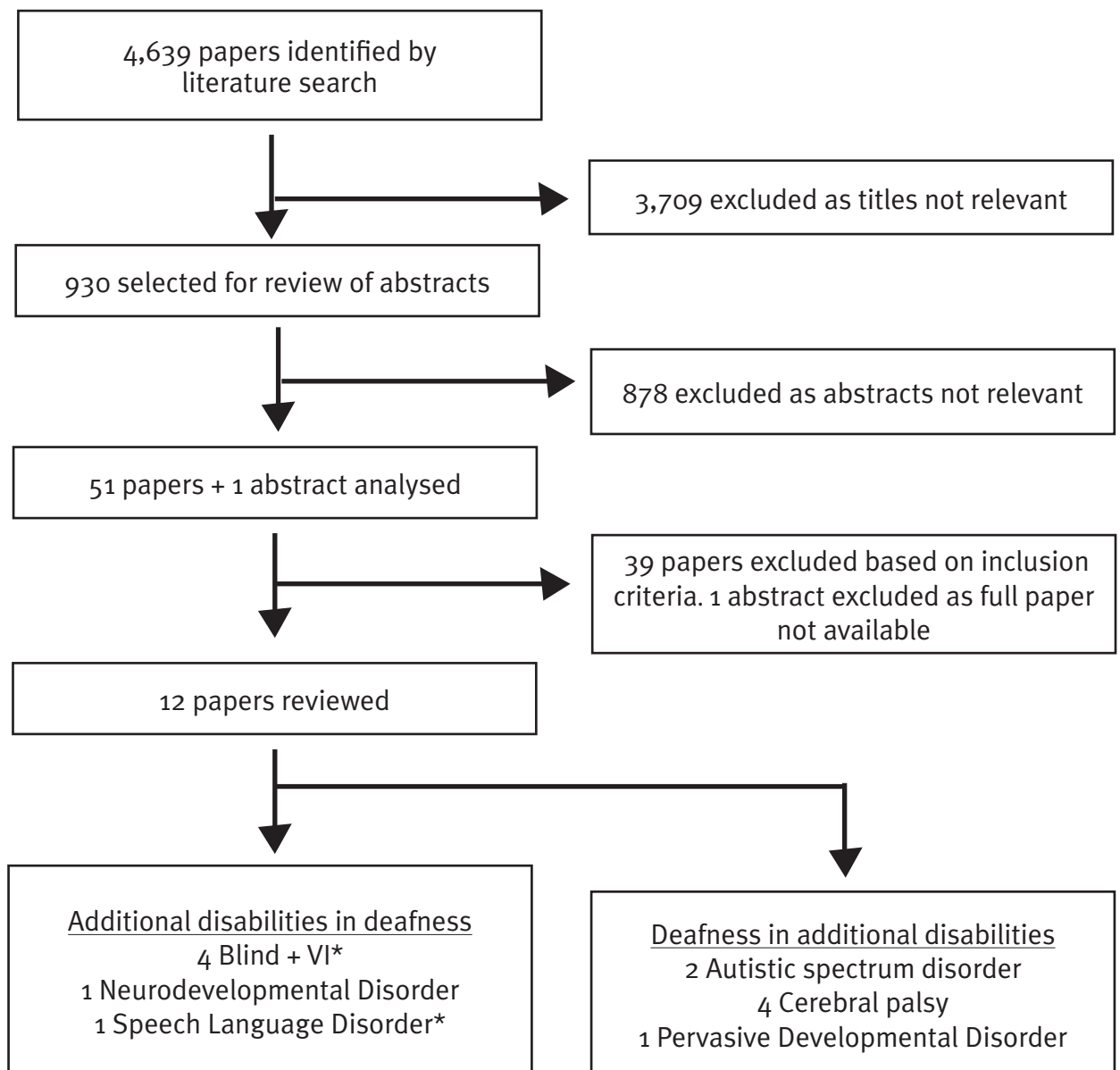
Papers were included if they met the following criteria:

- Published after 2002: papers published prior to 2002 were excluded.
- Reported in the English language: translation facilities were not available.
- Data related to countries in North America, Western Europe, Australia and New Zealand as the prevalence data in these countries would be relevant to the UK.
- Data was related to the paediatric population: papers reporting prevalence of deafness with additional disabilities in adult populations were excluded.
- Data was reported with sufficient definition and precision to allow extraction and contribution to this review: papers not including data specific to the prevalence of deafness with additional disabilities, or where deafness data was merged with another disability when reporting prevalence, were excluded.

The search yielded 4,639 papers. All titles were reviewed and 3,709 references were excluded as not relevant to the research. The abstracts of the remaining 930 references were reviewed and a further 878 were excluded as the abstracts were not relevant. Of the remaining 52 references, full papers were sought but one could not be retrieved. This abstract was excluded as at the time of the review the full paper had yet not been published. After assessment of the 51 full papers, 39 full papers were excluded as they did not meet the inclusion criteria (Figure 1).

Figure 1: Literature review

* 1 study included data for more than one disability.



Results

Data on the prevalence of additional disabilities in the paediatric deaf population are presented in Table 1. Data on the prevalence of deafness in paediatric populations of other disabilities are presented in Table 2.

Table 1: Prevalence of additional disabilities in paediatric deaf population

Reference	Type of paper (Review/ Study)	Location	Hearing loss	Disability description	Age range in years (mean; standard deviation)	Number	Prevalence (%)
Blind and VI							
Falzon et al., 2009	Study	Dublin, Ireland	Severe- Profound	Ocular abnormalities	1.4-16 (m:2.4)	141	59 (41.8)
Guy et al., 2003	Study	Derbyshire, UK	Moderate- Profound	Ophthalmic abnormalities	0.8-16.8	110	48 (43.6)
Nikolopoulos et al., 2006	Review	International studies		Ophthalmic disorders		54-960	12%-57%
				Refractive errors			27-57%
				Muscle coordination			3-20%
				Retinal abnormality			4-26%
Wiley et al., 2011	Study	Canada & USA		Eye exam	0.1-19.7 (5.9)	198	
			Bilateral Mod- Prof and unilateral or mild	Need for corrective lenses		105	60 (57)
				Significant eye problems			13(12)

Neurodevelopmental Disorder

Chilosi et al., 2010	Study	Italy	Sev-Prof	0.8-16 (5.7)	100	
				Cognitive		14 (14)
				Motor		14 (14)
				Behaviour-emotional		13 (13)
				Pervasive DD		5 (5)
				Epilepsy		2 (2)

Speech Language Disorder

Wiley et al., 2011	Study	Canada & USA	0.1-19.7 (5.9)	198		
				118	Speech evaluation	91 (77)
				69	Speech delay	61 (88)
		Bi Mod-Prof				
		Uni or Mild		49		30 (61)
					Aural rehabilitation assessment	
					Therapy required	
		Bi Mod-Prof		80		48 (60)
		Uni or Mild		24		4 (17)

Table 2: Prevalence of deafness in paediatric population with additional disabilities

Reference	Type of paper (Review/ Study)	Location	Hearing loss	Disability description	Age range in years (mean)	Number	Prevalence (%)
Autistic spectrum disorder							
Close et al., 2012	Study	National Survey of Children's Health, USA	Moderate/ Severe	Current ASD:	3-5 (4.14)	154	3 (2.0)
					6-11 (8.38)	373	10 (2.7)
					12-17 (14.41)	386	16 (4.2)
Schendel et al., 2009	Study	Atlanta, GA, USA	NR	Current ASD	3-5 (4.13)	53	1 (2.0)
				Past but not current (PBNC) ASD:	6-11 (8.63)	189	4 (2.1)
					12-17 (14.75)	211	12 (5.7)
					3-10	617	9 (1.5)
Cerebral Palsy							
Andersen et al., 2008	Study	Norway	Severe	Cerebral Palsy	1.9-10.2 (6.9)	268	12 (4)
				Unilateral		90	2 (2)
				Bilateral		128	7 (5)
				Dyskinetic		17	1 (6)
				Ataxi		14	1 (7)
				Not classified		19	1 (5)
Himmelman et al., 2012	Study	Europe	Severe	Dyskinetic CP	NR. CP confirmed by age 5 for all children	578	28 (6)

Reid et al., 2011	Study and Review	Study: Victoria, Australia	Mod-Prof	Cerebral Palsy	5.1-10.11 (8.1)	685	88 (13)
			Sev-Prof				48 (7)
		Review:				14 data sets: 75-6216	4-13%
		Data from countries in search strategy	Any hearing loss				
			Severe				2-12%
Surman et al., 2009	Study	5 CP registers in the UK	Sev-Prof	All	NR	4566	356 (8)
				MIG1		3176	205 (7)
				MIG2		473	39 (8)
				MIG3		917	112 (12)
<hr/>							
Pervasive Developmental Disorder							
Sturm et al., 2004	Study	Sweden	Severe	Pervasive DD	5-12 (9.8)	101	2 (2)

Discussion

The prevalence of additional disabilities in children with deafness and the prevalence of deafness in children with additional disabilities, in the published studies reviewed, vary considerably depending on the disability and the specific definitions used by the researchers. The findings for additional disabilities in children with deafness highlighted three areas where published papers were present: visual impairment, neurodevelopmental disorders and speech and language disorders. The prevalence of visual impairment with deafness in children varied from 4-59%. This marked variance was highly dependent on the visual difficulties being reported. Previously, the Fortnum and Davis (1997) study reported 9.5% of deaf children were also reported to have visual problems. The findings from Wiley et al. (2011) were much closer to this reported figure at 12%. However this was specific to “significant eye problems”. Once the need for corrective lenses was taken into consideration the figure rose to 57%. The other reported studies also identified quite high prevalence of visual deficits in children with deafness. Future research would benefit from establishing if this high prevalence is disproportionately higher in deaf children compared to normal hearing children.

The prevalence of neurodevelopmental disorders ranged between 2-14% depending on the type of neurodevelopmental disorder. Fortnum and Davis (1997) found 7.7% of deaf children were reported to have neuro-motor problems. Chilosi et al. (2010) found approximately double the figures, with 14% of children reported to have neurodevelopmental motor disorders. The findings from Chilosi et al. (2011) also identified 14% of children had cognitive neuro developmental problems and this finding was similar to the 13.9% reported by Fortnum and Davis (1997). The findings from Wiley et al. (2011) reported a very high prevalence of speech delays in children with bilateral moderate to profound hearing losses at 88%. A marked prevalence for speech delays in children with unilateral and mild hearing loss was also identified at 61%. These results highlight two important factors, the first being despite the advances in newborn hearing screening and early intervention a large group of children were still being identified with speech delays. Secondly, more attention needs to be given to the population of children with mild and unilateral hearing losses, as they are generally overlooked when it comes to intervention, yet a large percentage are still affected by speech delays.

The findings for the prevalence of deafness in children with additional disabilities identified three areas of research: ASD, cerebral palsy and PDD. The prevalence of deafness in children with ASD increased with age as identified by Close et al. (2012). The older age group (12-17 years) were found to have close to twice the prevalence of deafness (4.2%) compared to the younger groups of 3-5 years and 6-11 years who both had a 2% and 2.7% prevalence of deafness respectively. Interestingly, higher levels of prevalence were reported for the older group of children (12-17 years) identified as having past but not current ASD at 5.7%. Schendel et al. (2009) grouped all 3-10 year olds together and reported a similarly low prevalence of deafness in 1.5% of children with current ASD. The findings relating to the older children are interesting and should be explored further in future research. The studies exploring the prevalence of deafness in children with cerebral palsy consistently identified a prevalence rate of 2-13%. These findings are much higher than those reported by Fortnum and Davis (1997) when identifying aetiology of hearing loss, where the aetiology of hearing loss in 2 out of 653 children was attributed to cerebral palsy. Sturm et al. (2004) reported quite low prevalence of hearing loss in children with PDD at 2%. In comparison, Chilosi et al. (2010) reported slightly higher prevalence rates of PDD in children with deafness at 5%.

The current review has highlighted an important gap in the current research evidence base. Another study similar to that carried out by Fortnum and Davis (1997) would benefit by identifying the prevalence of additional disabilities in children with deafness and highlight any differences since the introduction of newborn hearing screening. The newborn hearing screening program in England is one of the most comprehensive databases of its kind in the world and may provide the initial foundations for carrying out such research.

The main conclusions for this report are:

Research focussing on prevalence of additional needs in deaf children has highlighted three main areas where published research currently exists: visual impairment, neurodevelopmental disorder and speech language disorder. It is important to note the prevalence of VI with deafness was highly varied at a prevalence rate of 3-57%. If the strictest interpretation was taken then recent research suggests 12% of children have “significant eye problems”. The prevalence of neurodevelopmental disorders ranged between 2-14% depending on the type of disorder. A high prevalence (88%) of speech disorders was identified in children with bilateral moderate to profound deafness. Interestingly, a high prevalence (61%) of speech delay was also identified in children with mild and unilateral hearing losses.

The research focussing on prevalence of deafness in children with additional needs has also highlighted three main areas where published studies were present: ASD, cerebral palsy and PDD. The prevalence of deafness with ASD ranged from 2-4.2%. It was interesting to note, the older children in the research were reported to have had a higher prevalence of deafness. The prevalence of deafness with cerebral palsy ranged between 2-13%. Finally, a low prevalence of deafness was identified for children with PDD (2%).

The findings of this review highlight the paucity of published research in this area. The overall evidence of research on the prevalence of additional disabilities with deafness is very low. With the developments in newborn hearing screening it would be expected that more research on this important area would have emerged. There is a growing need for robust published studies assessing the prevalence of additional needs in children with deafness.

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- Schendel D, Autry A, Wines R and Moore C. (2009) The co-occurrence of autism and birth defects: prevalence and risk in a population-based cohort, *Developmental Medicine & Child Neurology*, 51: 779-786
- Sturm H, Fernell E and Gillberg, C (2004) Autism Spectrum disorders in children with normal intellectual levels: associated impairments and subgroups, *Developmental Medicine and Child Neurology*, 46: 444-447
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Appendix A: Excluded Papers

Table: research papers excluded from literature review

No.	Reference	Location	Disability description	Reason for exclusion
1	Schendel, D and Karapurkar Bhasin, T. (2008) Birth Weight and Gestational Age Characteristics of Children With Autism, Including a Comparison With Other Developmental Disabilities, <i>Pediatrics</i> , 121: 1155-1164	Atlanta, Georgia, USA	Low birth weight + additional disabilities	Data on prevalence of hearing loss with low birth weight presented. Did compare with autism and other disabilities but did not provide specific prevalence of hearing loss with other disabilities.
2	Boyle C, Boulet S, Schieve L, Cohen R, Blumberg S, Yeargin-Allsopp M, Visser S and Kogan M. (2011) Trends in the Prevalence of Developmental Disabilities in US children , <i>Pediatrics</i> , 127: 1034-1042	Atlanta, Georgia, USA	Prevalence of Developmental Disabilities	Prevalence of hearing loss presented. Data on prevalence of hearing loss with other disabilities not presented
3	Centre for Disease Controls and Prevention (2012) Prevalence of Autism Spectrum Disorders – Autism and Developmental Disabilities Monitoring Network, 14 Sites, United States, 2008 , <i>Morbidity and Mortality Weekly Report</i> , 61 (3): 1-19	Atlanta, Georgia, USA	ASD	Data on hearing and visual impairment were presented as a joint disability. Prevalence of hearing loss with ASD was not presented separately.
4	Kogan M, Blumberg S, Schieve L, Boyle C, Perrin J, Ghandour R, Singh G, Strickland B, Trevathan E and van Dyck P. (2009) Prevalence of Parent-Reported Diagnosis of Autism Spectrum Disorder Among Children in the US, 2007 , <i>Pediatrics</i> , 124: 1395-1403	Atlanta, Georgia, USA	ASD	This paper was included as previous papers from these authors included data on hearing loss with ASD as well. However after reading the paper no data on hearing loss was presented.
5	Szymanski C, Brice P, Lam K and Hatto S. (2012) Deaf Children with Autism Spectrum Disorders , <i>Journal of Autism and Developmental Disorders</i> , pg 1-11	Washington, DC, USA	Current ASD	Full paper not yet available. Accepted abstract presented in online journal.
6	Msall M, Avery R, Tremont M, Lima J, Rogers M and Hogan D (2009) Functional Disability and School Activity Limitations in 41 300 School-Age Children: Relationship to Medical Impairments , <i>Pediatrics</i> , 111: 548-553	Providence, Rhode Island, USA	Medical Impairments	Although hearing impairment was included in the study it was grouped with a number of other impairments and the data was presented under the broad category of neurosensory impairments. The data on hearing loss with other disabilities was not presented separately.

7	Rice C, Schendel D, Cuniff C and Doernberg N (2004) Public Health Monitoring of Developmental Disabilities with a Focus on the Autism Spectrum Disorders , <i>American Journal of Medical Genetics</i> , 125C: 22-27.	Atlanta, Georgia, USA	Developmental disabilities and ASD	No data specific to prevalence of hearing loss with ASD presented.
8	Vernon M and Rhodes A (2009) Deafness and Autistic Spectrum Disorders , <i>American Annals of the Deaf</i> , 154: 5-14	Jacksonville, Florida, USA	Deafness and ASD	No data specific to prevalence of hearing loss with ASD presented.
9	Hitoglou M, Ververi A, Antoniadis A and Zafeiriou D, (2010) Childhood Autism and Auditory System Abnormalities , <i>Pediatric Neurology</i> , 42: 309-314	Thessaloniki, Greece	ASD with hearing loss	No data specific to prevalence of hearing loss with ASD presented.
10	J. Bist, P. Adhikari and A. K. Sharma (2010) Ocular morbidity in hearing impaired schoolchildren , <i>Child: care, health and development</i> , 37: 394-397	Kathmandu, Nepal	Ocular morbidity with hearing loss	Research outside of countries specified in inclusion criteria.
11	Centre for Disease Controls and Prevention (2006) Prevalence of Four Developmental Disabilities Among Children Aged 8 Years- Metropolitan Atlanta Developmental Disabilities Surveillance Program, 1996 and 2000 , <i>Morbidity and Mortality Weekly Report</i> , 55 (1): 1-9	Atlanta, Georgia, USA	Mental retardation Cerebral Palsy Visual impairment Hearing loss	No data specific to prevalence of hearing loss with additional disabilities presented.
12	Morales Angulo C, Azuara Blanco N, Gallo Teran J, Gonzalez Aledo A and Rama Quintela J (2006) Sensori-Neural Hearing Loss in Cerebral Palsy , <i>Acta Otorrinolaringol Esp</i> , 57: 300-302	Cantabria, Spain	Cerebral Palsy	Results presented were specific to adults. No data on children presented.
13	Johnson S, Fawke J, Hennessey E, Rowell V, Thomas S, Wolke D and Marlow N (2009) Neurodevelopmental Disability Through 11 Years of Age in Children Born Before 26 weeks of gestation , <i>Pediatrics</i> , 124: e249-e257	UCL, London, UK,	Neurodevelopmental Disabilities	No data specific to prevalence of hearing loss with additional disabilities presented.
14	Petersen M, Kube D and Palmer F (2006) High Prevalence of Developmental Disabilities in Children Admitted to a General Pediatric Inpatient Unit , <i>Journal of Developmental and Physical Disabilities</i> , 18: 307-318	Memphis, Tennessee, USA	Developmental Disabilities	No data specific to prevalence of hearing loss with additional disabilities presented.
15	Williams E, Thomas K, Sidebotham H and Emond A. (2008) Prevalence and characteristics of autistic spectrum disorders in the ALSPAC cohort , <i>Developmental Medicine</i> , 50: 672-677	Bristol, UK	ASD	No data specific to prevalence of hearing loss with additional disabilities presented.

16	De Vries J, Korver A, Verkerk P, Rusman L, Claas E, Loeber J Kroes A and Vossen A (2011) Congenital cytomegalovirus infection in the Netherlands: birth prevalence and risk factors , <i>Journal of Medical Virology</i> , 83: 177-1782	Leiden, Netherlands	CMV	No data specific to prevalence of hearing loss with CMV presented.
17	Grosse S, Ross D and Dollard S (2008) Congenital cytomegalovirus infection as a cause of permanent bilateral hearing loss: a quantitative assessment, <i>Journal of Clinical Virology</i> , 41: 57-62	Atlanta, Georgia, USA	CMV	Data was calculated through a prediction assessment where two sets of reviews were processed. Does not provide actual data.
18	Nance W, Lim B and Dodson M. (2006) Importance of congenital cytomegalovirus infections as a cause for pre-lingual hearing loss , <i>Journal of Clinical Virology</i> , 35: 221-225	England, UK USA data used for calculations.	CMV	Data on study design and methods for retrospective calculations not clear.
19	Misono S, Sie K, Weiss N, Huang M, Boeckh M, Norton S and Yueh B (2011) Congenital cytomegalovirus infection in pediatric hearing loss , <i>Archives of Otolaryngology- Head and Neck Surgery</i> , 137: 47-53	Washington, USA	Congenital Cytomegalovirus	Data highlighted 8.9% of hearing loss in children in Washington can be attributed to CMV infection. However, methods for retrospective calculations not clear.
20	Martins L, Camargos P, Becker H, Becker C and Guimaraes R (2010) Hearing Loss in Cystic Fibrosis, <i>International Journal of Pediatric Otorhinolaryngology</i> , 74: 469-473	Brazil	Cystic Fibrosis	Research outside of countries specified in inclusion criteria.
21	Piltcher O, Teixeira V, Oliveira M, Scattolin I and Piltcher S (2003) The prevalence of neurosensorial hearing loss among cystic fibrosis patients from Hospital de Clinicas de Porto Alegre , <i>International Journal of Pediatric Otorhinolaryngology</i> , 67: 939-941	Spain	Cystic Fibrosis	Data related to the effects of ototoxic drugs (aminoglycosides) rather than prevalence of hearing loss in cystic fibrosis population in general.
22	Cheng A, Johnston P, Luz J, Uluer A, Fligor B Licameli G, Kenna M and Jones D (2009) Sensorineural hearing loss in patients with cystic fibrosis, <i>Otolaryngology – Head and Neck Surgery</i>	Boston, MA, USA	Cystic Fibrosis	Data related to the effects of ototoxic drugs (aminoglycosides) rather than prevalence of hearing loss in cystic fibrosis population in general.

23	Charlot L, Abend S, Ravin P, Mastis K, Hunt A and Deutsch C (2011) Non-psychiatric health problems among psychiatric in-patients with intellectual disabilities , <i>Journal of Intellectual Disability Research</i> , 55: 199-209	MA, USA	Intellectual disabilities	Data was related to adults and not children. Data related to the age group cluster 16-25 was not presented separately.
24	Pinborough-Zimmerman J, Satterfield R, Miller J, Hossain S and McMahon W (2007) Communication disorders: prevalence and comorbid intellectual disability, autism and emotional/behavioural disorders , <i>American Journal of Speech-Language Pathology</i> , 16: 359-367	Utah, USA	Communication disability	Data on prevalence of hearing loss with communication disability not presented.
25	Iliadou V, Bamiou D, Kaprinis S, Kandyliis D and Kaprinis G (2009) Auditory Processing Disorders in children suspected of Learning Disabilities- A need for screening? <i>International Journal of Pediatric Otorhinolaryngology</i> , 73: 1029-1034	Thessaloniki, USA	APD Learning Disability	Data on prevalence of hearing loss with additional disabilities not presented.
26	Boulet S, Schieve L and Boyle C (2011) Birth weight and health and developmental outcomes in US children, 1997-2005 , <i>Matern Child Health J</i> , 15: 836-844	Atlanta, Georgia, USA	Developmental outcomes	Data on prevalence of hearing loss with additional disabilities not presented.
27	McLeod S and McKinnon D (2007) Prevalence of communication disorders compared with other learning needs in 14 500 primary and secondary school students , <i>International Journal of Language and Communication Disorders</i> , 42: 37-59	Sydney, Australia	Communication Disorders	Data on prevalence of hearing loss with additional disabilities not clear as additional disabilities all merged into overarching learning need.
28	Ulovec Z, Sosic Z, Skrinjaric I, Catovic A, Civijak M and Szivovicza L (2004) Prevalence and significance of minor anomalies in children with impaired development , <i>Acta Paediatr</i> , 93: 836-840	Zagreb, Croatia	Impaired Development	Data on prevalence of hearing loss with additional disabilities not presented.
29	Marchisio P, Selicorni A, Pignataro L, Milani D, Baggi E, Lambertini L, Dusi E, Villa L, Capaccio P, Cerutti M, Esposito S and Principi N (2008) Otitis media with effusion and hearing loss in children with Cornelia de Lange syndrome , <i>American Journal of Medical Genetics</i> , 146A: 426-432	Milan, Italy	OME	Data on prevalence of hearing loss with additional disabilities not clear.

30	Morton R, Sharma V, Nicholason J, Broderick M and Poyser J (2002) Disability in children from different ethnic populations , <i>Child: Care, Health and Development</i> , 28: 87-93	Derbyshire, UK	Severe neurodisability	Data on prevalence of hearing loss with other additional disabilities not presented.
31	Hutchinson T and Gordon D (2004) Ascertaining the prevalence of childhood disability , <i>Child: Care, Health and Development</i> , 31: 99-107	Bath, UK	Childhood disability	Description of hearing loss subjective, audiometric measures to assess hearing not used.
32	Dammeyer J (2010) Psychosocial Development in a Danish Population of Children With Cochlear Implants and Deaf and Hard of Hearing Children , <i>Journal of Deaf Studies and Deaf Education</i> , 15: 50-58	Copenhagen, Denmark	Psychosocial Development	Study identified under search term “mental”. Results highlighted the findings were related to socio-emotional difficulties and not within the search term parameters.
33	Fellinger J, Holzinger D, Sattel H, Manfred L and Goldberg D (2009) Correlates of mental health disorders among children with hearing impairments , <i>Developmental Medicine and Child Neurology</i> , 51: 635–641	Linz, Austria	Mental health disorder	Study identified under search term “mental”. Results highlighted the findings were related to socio-emotional difficulties and not within the search term parameters.
34	Fellinger J, Halzinger D and Pollard R (2012) Mental health of deaf people , <i>The Lancet</i> , 379: 1037-1044	Vienna, Austria	Mental health	Study identified under search term “mental”. Results highlighted the findings were related to socio-emotional difficulties and not within the search term parameters.
35	Hintermair M. (2009) Prevalence of Socioemotional Problems in Deaf and Hard of Hearing Children in Germany , <i>American Annals of the Deaf</i> , 152: 320-330	Hiedelberg, Germany	Socioemotional Problems	Study identified under search term “mental”. Results highlighted the findings were related to socio-emotional difficulties and not within the search term parameters.
36	Stefanis N, Thewissen V, Bakoula C, Van Os J and Myin-Germeys (2006) Hearing impairment and psychosis: A replication in a cohort of young adults , <i>Schizophrenia Research</i> , 85: 266-272	Athens, Greece	Self reported psychotic like experiences	Study identified under search term “mental”. Results highlighted the findings were related to psychotic like experiences and not within the search term parameters.

37	Van Eldik T, Treffers A, Veerman J and Verhulst F (2004) Mental Health Problems of Deaf Dutch Children As Indicated by Parents' Responses to the Child Behaviour Checklist , <i>American Annals of the Deaf</i> , 148: 390-395	Netherlands	Emotional Behavioural Problems	Study identified under search term "mental". Results highlighted the findings were related to socio-emotional difficulties and not within the search term parameters.
38	Van Gent T, Goedhart A, Hindley P and Treffers P (2007) Prevalence and correlates of psychopathology in a sample of deaf adolescents , <i>Journal of Child Psychology and Psychiatry</i> , 48: 950-958	Netherlands	Emotional Behavioural Problems	Study identified under search term "mental". Results highlighted the findings were related to socio-emotional difficulties and not within the search term parameters.
39	Van Naarden Braun K, Autry A and Boyle C (2005) A population based study of the recurrence of developmental disabilities , <i>Paediatric and Perinatal Epidemiology</i> , 19: 69-79	Atlanta, Georgia, USA	Serious developmental disabilities	Data on prevalence of hearing loss with other additional disabilities not presented.
40	Boulet S, Boyle C and Schieve L. (2009) Health care and health and functional impact of developmental disabilities among US children, 1997-2005 , <i>Archives of Pediatrics and Adolescent Medicine</i> , 163: 19-26	Atlanta, Georgia, USA	Developmental Disabilities	Data on prevalence of hearing loss with other additional disabilities not presented.

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