Public Health England

Obesity and disability

Children and young people

About Public Health England

Public Health England's mission is to protect and improve the nation's health and to address inequalities through working with national and local government, the NHS, industry and the voluntary and community sector. PHE is an operationally autonomous executive agency of the Department of Health.

Public Health England
133-155 Waterloo Road
Wellington House
London SE1 8UG
Tel: 020 7654 8000
www.gov.uk/phe
Twitter: @PHE_uk
Facebook: www.facebook.com/PublicHealthEngland

Author: Mary Gatineau

Published March 2014
PHE publications gateway number: 2013436

This document is available in other formats on request. Please contact publications@phe.gov.uk

With thanks to reviewers:

Professor Julian Shield, Professor in Diabetes and Metabolic Endocrinology, University of Bristol; Practising paediatrician, Royal Hospital for Children in Bristol[a]

Professor Eric Emerson, Centre for Disability Research (CeDR), Lancaster University; Co-Director of Improving Health and Lives Learning Disabilities Observatory (IHAL)

Kate Thurland, Head of Health Intelligence, Child and Maternal Health Intelligence Network, PHE

Christine Lenehan, Director, Council for Disabled Children

Dr Monica Dent, Consultant in public health medicine, Solutions for Public Health

Alison Tedstone, Louis Levy, Mark Bush, Caroline Hancock, Louisa Ells, Harry Rutter, Di Swanston, Shireen Mathrani, PHE

[a] **Supported by an NIHR Biomedical Research Unit in Nutrition award to University Hospitals Bristol NHS Foundation Trust. His advice is independent opinion from the National Institute for Health Research Biomedical Research Centre and Unit Funding Scheme.**

Contents

Key Points

- children and young people with disabilities are more likely to be obese than children without disabilities and this risk increases with age
- due to higher rates of obesity, children and young people with disabilities are at greater risk of serious obesity-related health conditions such as diabetes, asthma, musculoskeletal problems and cardiovascular risk factors
- obesity among children and young people with disabilities may also worsen the complications that arise from the health conditions or impairment associated with their disability and increase their likelihood of developing pain, mobility limitations, fatigue and depression
- factors linking disability and obesity among children and young people include diet, physical activity, parental attitudes and behaviour, access to recreational facilities, medication and genetics
- children and young people with disabilities are likely to experience health inequalities and these can be increased by obesity
- obesity-related conditions can add to the medication and equipment needs of children and young people with disabilities, with associated healthcare costs

1. Introduction

This paper examines the evidence linking disability and obesity among children and young people. It looks at a range of impairments or health conditions associated with disability and explores the main obesity-related chronic health conditions that can develop during childhood and adolescence. It also draws attention to the inequalities experienced by children and young people in relation to obesity and disability and highlights implications for policy, practice and research.

Disability prevalence

The Office for Disability Issues estimates that in 2010/11, 6% (800,000) children[b] in the UK were covered by the 2010 Equality Act (which superseded the Disability Discrimination Act) due to their disability.[c,1,2] Other UK surveys and data sources have produced estimates ranging from 4.5% to 16%.[3]

Obesity prevalence

Data from the 2012/13 National Child Measurement Programme (NCMP) [d] in England show that 18.9% of children in Year 6 (aged 10–11) and 9.3% of children in Reception (aged 4–5) were obese. Prevalence of obesity among children in Reception seems to be remaining stable and is starting to show possible decreases, particularly among boys between 2006/07 and 2012/13. Prevalence of obesity has been increasing year-on-year among boys and girls in Year 6 up to 2011/12. The 2012/13 data for the first time suggest a possible halt to this trend of increasing obesity prevalence among children in this age group. According to the Health Survey for England (HSE) [e] 2012, obesity prevalence among 11–15 year olds is 18.7%.[4]

---

[b] **Defined as dependent children aged under 16 or unmarried 16 to 19-year-olds in full time non-advanced education.**

[c] **People are defined as disabled under the Equality Act 2010 if they have a physical or mental impairment that has a 'substantial' and 'long term' negative effect on their ability to do normal daily activities.**

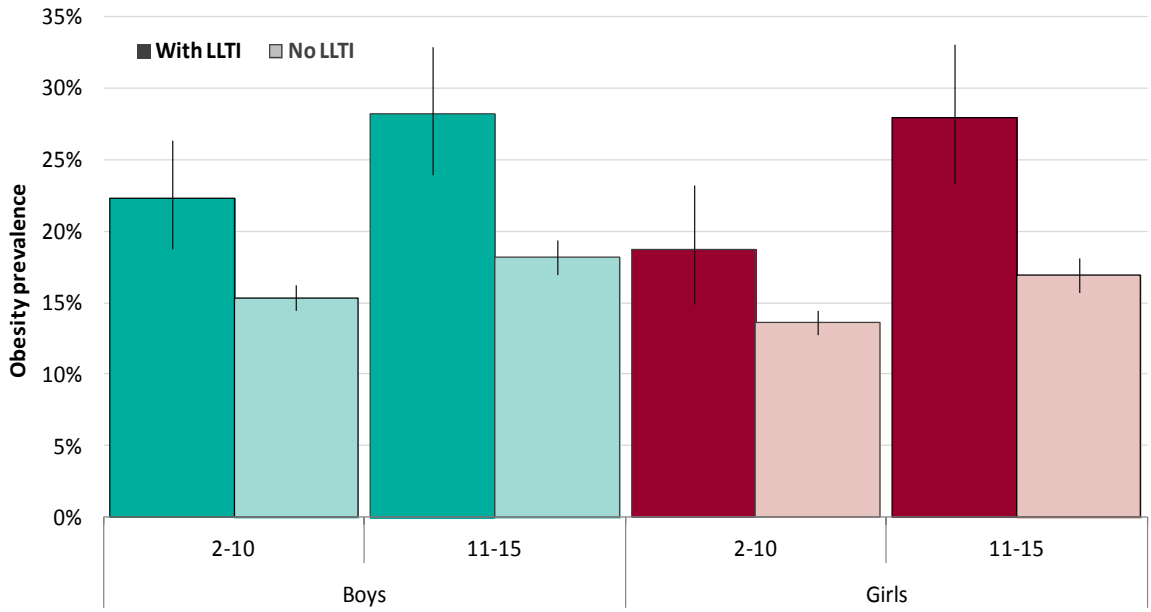
[d] **See appendix for more detailed explanation of the NCMP.**

[e] **See appendix for more detailed explanation of the HSE.**

Disability and obesity prevalence

Analysis of combined data from the HSE 2006–2010 shows that boys and girls aged 2–15 with a limiting long-term illness (LLTI)[f] are significantly more likely to be obese than those without a LLTI and this difference increases with age (see Figure 1). Children with a LLTI are approximately 35% more likely to be obese than children without a LLTI.

Figure 1: Prevalence of obesity among children (aged 2–15) with and without a limiting long-term illness or disability (LLTI) by age and sex



Source: Health Survey for England. Combined data from 2006–2010[g] Data table available in appendix

These figures are similar to those from the Centers for Disease Control and Prevention (CDC) in the US showing that obesity rates among children with disabilities are 38% higher than rates for children without disabilities.[5]

Analysis of longitudinal data from the UK Millennium Cohort Study (MCS)[h] by the Centre for Disability Research shows that children with a limiting long-term illness

---

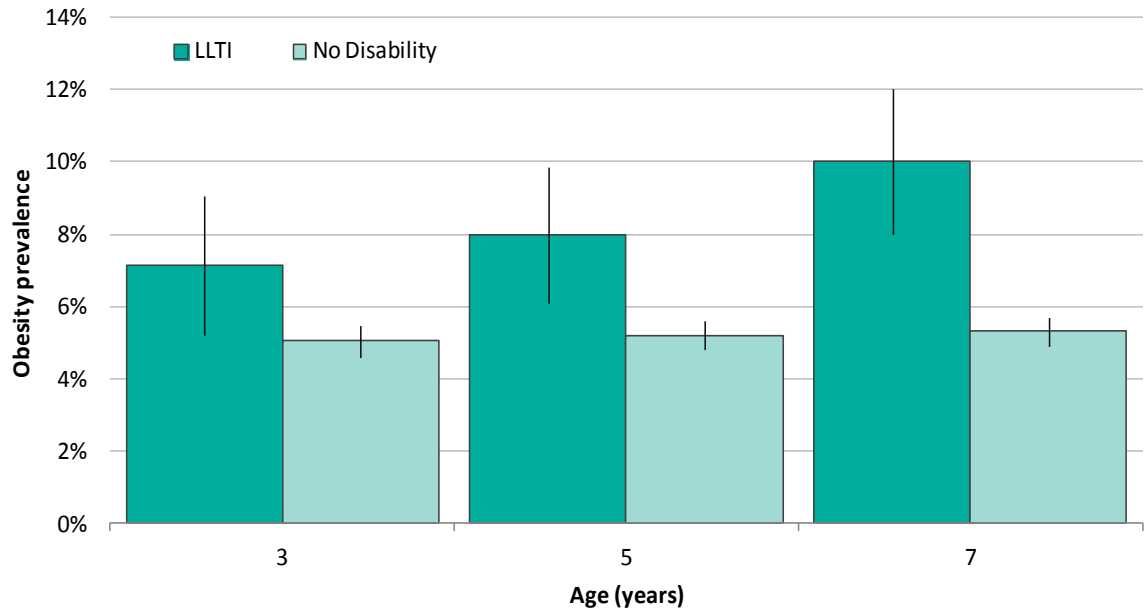
[f] **Refers to following questions: Do you have any long-standing illness, disability or infirmity? By long-standing I mean anything that has troubled you over a period of time, or that is likely to affect you over a period of time? (Yes /No) Does this illness or disability/do any of these illnesses or disabilities limit your activities in any way? (Yes/No).**
It is recognised that the definition of LLTI does not establish the extent of the limitation experienced by the child,[3] however it is currently the best indicator for disability available.

[g] **Children are defined as obese where their BMI is ≥95th centile of the British 1990 growth reference (UK90).**

[h] **See appendix for more detailed explanation of the MCS.**

or disability (LLTI) are significantly more likely to be obese than those without a disability at age 5 and age 7. These data also demonstrate that obesity prevalence in children with a LLTI increases with age, a trend which is also observed in the general population.

Figure 2: Obesity prevalence among children at ages 3, 5 and 7 in the UK with a limiting long-term illness or disability (LLTI) compared to those with no disability



Source: Millennium Cohort Study. Data provided by Eric Emerson, Centre for Disability Research, Lancaster University[i]

[i] **The MCS uses International Obesity Taskforce (IOTF) thresholds for BMI. These typically provide lower obesity prevalence figures than the UK90 thresholds used in the HSE.**

2. Disability-related obesity

A small number of studies have investigated the link between disabilities and obesity in children and young people. The areas of disability covered include cognitive/mental impairments such as learning difficulties, autism and developmental delay (including disabilities associated with genetic syndromes such as Prader-Willi syndrome and Down's syndrome); physical disabilities (including spina bifida) and audiovisual impairments.[6] The evidence suggests that children and young people with disabilities have an increased risk of being overweight and obese compared to those without disabilities.[j] However research is scarce,[2] many studies do not provide comparison groups and most are conducted outside the UK.

For children and young people with disabilities, being overweight or obese can also increase the risk of developing secondary conditions such as mobility limitations, fatigue, pain, pressure sores, depression, and social isolation.[7] This may limit their independence, add to existing medical and equipment needs and increase the need for rehabilitation and healthcare resources.[8]

Table 2 provides a summary of available evidence on the link between disabling conditions and overweight and obesity among children and young people.

Table 2: Disabling conditions linked to overweight and obesity in children and young people

	Disabling condition
Cognitive / mental impairments / syndromes	**Learning disabilities** A recent literature review found that overweight and obesity represent a significant secondary health problem among children and young people with learning disabilities and that obesity rates increase with age.[9] Analysis of data from the UK Millennium Cohort Study found that by three years of age, children with developmental delay were significantly more likely to be obese than those without developmental delay. The risk of obesity increased between three and five years of age.[10] A

[j] **Underweight can also be a problem for some children with disabilities, but this is beyond the scope of this report.[6]**

	survey of school children (aged up to 19) in Northern Ireland found that significantly higher numbers of pupils with intellectual disabilities were overweight or obese compared to those without intellectual disabilities (33% compared to 24%).[11] Analysis of the Longitudinal Study of Australian Children found significantly higher rates of obesity among six to seven year old children with intellectual disabilities, compared to those without intellectual disabilities (8.2% vs 4.6% in boys and 9.0% vs 6.2% in girls). Differences in obesity rates increased as children became older. Boys and families with lower socioeconomic status were more at risk.[12] In the US, analysis of the National Health and Nutrition Examination Survey (NHANES) 1992–2002 dataset showed that the prevalence of overweight was significantly higher in children and young people aged 6 to 17 with a learning disability compared to those without a learning disability (21.9% compared to 15.7%). The risk was more pronounced in girls.[13] Research by the National Center for the Dissemination of Disability Research (NCDDR) in the US found that young people aged 12 to 18 with autism had a higher risk of being overweight (42.5% compared to 28.8%) or obese (24.6% compared to 13%) than those without disabilities.[14] **Prader Willi syndrome** Prader Willi syndrome (PWS) is a complex genetic disorder that is associated with learning disabilities and typically causes a chronic feeling of hunger that can lead to excessive eating. It can lead to severe obesity in adolescence and adulthood if eating is not kept under control.[15] No studies were found that provided obesity prevalence data among children with PWS, possibly because the disorder itself is characterised by obesity. **Down's syndrome** Down's syndrome is a genetic condition that typically causes some level of learning disability and a characteristic range of physical features. A longitudinal study in Belgium found that compared to the general Dutch population, healthy children with Down's

	syndrome were more often overweight (25.5% vs 13.3% in boys, and 32.0% vs 14.9% in girls) or obese (4.2% vs 1.8%, and 5.1% vs 2.2%, respectively).[16] In the US, research by the NCDDR found that young people aged 12 to 18 with Down's syndrome had greater risk of being overweight (55% compared to 28.8%) or obese (31.2% compared to 13%) than those without disabilities.[14]
Physical disabilities	**Physical activity limitations** Analysis of the NHANES 1992–2002 dataset in the US found that children aged 6 to 17 with physical activity limitations (health problems that limit their ability to walk, play or run), were significantly more likely to be overweight than those without physical activity limitations (29.7% versus 15.7%).[13] **Spina bifida** Spina bifida is a condition affecting the spine and spinal cord which can lead to physical complications including leg weakness and paralysis as well as orthopaedic abnormalities. Children with spina bifida, especially those who also have hydrocephalus,[k] are at high risk of obesity.[17] In the US, research by the National Center for the Dissemination of Disability Research (NCDDR) found that young people aged 12 to 18 with spina bifida were more likely to be overweight (64.5% compared to 28.8%) or obese (18.6% compared to 13.0%) than those without disabilities.[14]
Audiovisual impairments	In the US, analysis of data from the National Survey of Children's Health (NSCH) showed that 18.4% of children aged 10 to 17 with a hearing or visual impairment were obese compared to 12.2% of children without a chronic condition.[18]

[k] **Hydrocephalus is a medical condition in which there is an abnormal accumulation of cerebrospinal fluid (CSF) in the cavities of the brain.**

3. Why are children with disabilities at greater risk of obesity?

The risk of obesity among children and young people with disabilities may be related to personal factors such as genetic or metabolic complications, diet, levels of physical activity or use of medications with a side-effect of weight gain. Environmental factors such as inaccessible neighbourhoods and lack of access to recreational facilities and programs may also play an important role in this relationship.[19] A few small school-based studies have found evidence of less healthy nutrition and physical activity behaviours in children with disabilities compared to their non-disabled peers.[11,20] However research in this area is limited and causal links remain undetermined [9] – it may for example, be a function of the food and activity opportunities made available to these children.

It has been suggested that unusual dietary patterns and fewer opportunities to engage in physical activity may be linked to higher prevalence of obesity in children with developmental disorders.[18] Some conditions, such as Prader Willi syndrome may give children a predisposition to overeat.[6] Children with autism may be averse to certain textures, flavours or colours, leading them to eat a very limited range of foods.[17] Lack of social participation can also trigger feelings of isolation and result in a risk of overeating in children with disabilities.[6]

A recent systematic review concluded that non-participation in physical activity by children with disabilities is complex and multifactorial. Barriers identified by children, parents and organisation staff included lack of physical and social skills, the child's preferences, fear and lack of knowledge about exercise, parental behaviour, negative societal attitudes to disability, inadequate facilities, lack of transport, lack of programmes, lack of staff capacity and cost.[21] Secondary conditions associated with the primary impairment (eg joint and muscle pain relating to cerebral palsy and spina bifida) can also adversely impact the young person’s ability to participate in more vigorous physical activity.[19]

The energy and effort required to manage childhood disabilities means that children and their parents and carers may have to overcome significant barriers and complications in order to maintain a healthy lifestyle.[18] Results from a recent systematic review suggest that parents’ socioeconomic status, weight status, levels of activity and perception and attitude towards their disabled children’s weight and physical activity levels may all play a part.[22]

4. Childhood obesity-related health conditions

Whether or not children and young people have disabilities, those who are obese are at a greater risk for developing chronic health conditions compared to their healthy weight counterparts.[23] This can mean that young people with disabilities face extral health challenges in addition to those associated with the health conditions or impairments primarily associated with their disability. Childhood obesity has been linked to hypertension, dyslipidaemia, type 2 diabetes, fatty liver disease, sleep apnoea, asthma and psychosocial disorders.[24,25,26] Hospital admission rates for obesity and related conditions among children and young people in England have increased more than four-fold over the past decade. Some of this increase may be due to better data capture such as coding improvements in recent years. The most common reasons for admission for obesity as a co-morbidity included asthma and sleep apnoea.[27] For further information about child health and obesity see the PHE Obesity website – www.noo.org.uk.

5. Childhood disability, obesity and inequalities

In the UK, children with disabilities are more likely to live with low income, deprivation, debt and poor housing than their non-disabled counterparts. Disabled children from black and minority ethnic groups, mixed parentage groups and lone-parent households are most at risk of socioeconomic deprivation.[1] Childhood disability is also associated with parental disability.[28] Many parents of disabled children may be unable to work because of care responsibilities, the cost of childcare or the lack of appropriate childcare provision.[29] Poorer health outcomes are also experienced by family carers of children with disabilities.[30] Compared to families without disabled children with disability, families supporting a disabled child are more likely to be poor, more likely to become poor and less likely to escape from being poor.[31]

Data from the National Child Measurement Programme (NCMP) show that in England, obesity prevalence among children in both Reception and Year 6 increases with socioeconomic deprivation. Obesity prevalence of the most deprived 10% of the child population is approximately twice that of the least deprived 10% and there is evidence that socioeconomic inequalities are widening.[32]

Children and young people with disabilities in the UK are likely to experience health inequalities which may leave them at risk of health conditions and serious ill health as they grow older.[33] Obesity can worsen the complications that arise from the disability itself and further restrict social participation and quality of life.[6] Poor health in childhood is also likely to increase the risk of poor educational attainment and further social exclusion.[34] The stigma associated with disability can be compounded by obesity[2,17] and young people with disabilities have been found to experience significantly more bullying than their non-disabled peers.[35]

6. Discussion

Children and young people with disabilities are more likely to be obese than children without disabilities.[6] This puts them at higher risk of serious obesity-related health conditions such as diabetes, asthma, musculoskeletal problems and cardiovascular risk factors. As such, childhood obesity may represent a particular threat to the long-term health of many children and young people with disabilities.[2]

Obesity among children and young people with disabilities may also worsen the complications that arise from the health conditions or impairment associated with their disability and increase their likelihood of developing pain, mobility limitations, fatigue and depression.[6,7] Obesity-related conditions can add to existing medication and equipment needs of young people with disabilities, undermine their independence and limit opportunities for social interaction, leisure and physical activities.[8,23,36] Being obese also provides an added stigma for children and young people who may already be stigmatised because of their disability.[17]

The association between disability and obesity in children has been linked to a range of factors including diet, physical activity, parents and carers attitudes and behaviour, lack of access to recreational facilities and genetics. In addition, both disability and obesity are strongly related to deprivation. In the UK, children with disabilities experience higher levels of poverty and personal and social disadvantage than other children.[28] With socioeconomic inequalities in child obesity in England widening,[32] children with disabilities may be at increasing risk of health inequalities.

There are limited data on the combination of childhood disability and obesity in England. The Health Survey for England and the Millennium Cohort Study provide indicators for limiting long-term illness, however they only relate to private households and are likely to marginally underestimate disability prevalence.[28] The Family Resources Survey and the Life Opportunities Survey are key sources of information on child disability in the UK, but they do not include height and weight data. Other studies of obesity among children and young people with disabilities are often conducted outside the UK, are based on non-representative samples or are limited to children with specific disabilities.[2] It may also be difficult to accurately measure weight and height of children who are wheelchair users, who have developmental or behavioural problems, or conditions such as cerebral palsy or spina bifida.[37,38]

Once established, obesity is extremely difficult to reverse, so prevention and early intervention are very important. Obese children and young people with chronic conditions and disabilities may be at risk of under-management of obesity because of increased attention to their existing illnesses.[18] Understanding the personal and environmental factors associated with obesity in children and young people with disabilities is key to being able to design future interventions.[19] Children with disabilities represent a diverse population with a wide range of complex health needs and efforts to promote healthy weight and prevent obesity in this group should be tailored accordingly.[2]

7. Implications for policy, practice and research

Key issues for policy, practice and research highlighted in the literature include:

- it is important that health care providers and policy makers are made aware of the threat that overweight and obesity pose to children with disabilities, so that they can work with families and communities to help reduce the risks these children face[2]

- there is a need for interventions in the early years of life to prevent the emergence of obesity among children with disabilities and associated obesity related conditions. Interventions should be sensitive to the particular needs of families, carers and organisations supporting this high-risk group of children[10]

- those responsible for planning lifestyle weight management services for children and young people should:

    - consider how best to provide services for overweight or obese children and young people with special needs or disabilities. For example, these could be through specific programmes or by making reasonable adaptations to existing programmes (including training staff). All programmes should be evaluated
    - ensure there is an appropriate interface with specialist obesity services to help those with more complex needs manage their weight[39]

- weight control and chronic disease prevention should be core components of health education and transition planning for young people with disabilities[23]

- health services and support networks for children with disabilities can help combat obesity by providing routine weight monitoring and counselling for parents and carers about healthy eating and regular physical activity[2]

- it is important that health promotion strategies encompass a multi-professional, multi-agency approach with the family and child at the centre[11]

- local authorities can help to achieve better health outcomes for children and young people with disabilities by bringing together local services to help improve access to health services, leisure and play facilities and opportunities[40]

- an understanding of the barriers and motivating factors for physical activity is essential for designing effective interventions to promote participation among children with a disability[21]

- weight management strategies for children and young people with disabilities should accommodate the diverse needs of children with disabilities and be culturally and functionally relevant to them[19]

Research

- researchers and policy makers should include children with disabilities in their studies, plans and policies to combat childhood obesity[17]

- there is a need for more research on child obesity and disability to improve understanding of this complex relationship and document health inequalities[41]

- there is a need for high quality population level data on child obesity and disability prevalence in England

- more data is needed on effective lifestyle weight management programmes for children and young people with disabilities[39]

8. Appendix

Datasets

The National Child Measurement Programme (NCMP)

The National Child Measurement Programme (NCMP) is an important element of the Government's work programme on childhood obesity, and is operated by the Department of Health (DH). The NCMP was established in 2006. Every year, as part of the NCMP, children in Reception (aged 4–5 years) and Year 6 (aged 10–11 years) have their height and weight measured during the school year to inform local planning and delivery of services for children; and gather population-level surveillance data to allow analysis of trends in growth patterns and obesity. Data collection in special schools for children with special educational needs is encouraged but not mandated. NCMP national reporting does not include data from special schools because the low participation rates mean that the data are unlikely to be representative.

The NCMP also helps to increase public and professional understanding of weight issues in children and is a useful vehicle for engaging with children and families about healthy lifestyles and weight issues.

Health Survey for England (HSE)

The Health Survey for England is an annual survey designed to measure health and health related behaviours in adults and children living in private households in England. It has been undertaken since 1991. Since 1995 the survey has also included children aged 2–15 years, and since 2002 infants under two have been included.

Measured height and weight data are recorded as part of a core data set (which also includes general health, smoking, drinking, blood pressure measurements) and topic specific health indicators. Includes a health measure for limiting long-term illness or disability (LLTI). Data on fruit and vegetable intake are collected every two years. Child weight status is classified using the "population monitoring" thresholds of the 85th and 95th percentiles of the British 1990 growth reference population (UK90) to classify children as overweight or obese. In clinical settings the 91st and 98th percentiles tend to be used.

Millennium Cohort Study

The Millennium Cohort Study (MCS) is a multi-disciplinary research project following the lives of around 19,000 children born in the UK in 2000–01. It is a national longitudinal birth cohort study that has been tracking the Millennium children through their early childhood years and plans to follow them into adulthood. It collects information on the children's siblings and parents. MCS's field of enquiry covers topics including parenting; childcare; school choice; child behaviour and cognitive development; child and parental health; parents' employment and education; income and poverty; housing, neighbourhood and residential mobility; and social capital and ethnicity. It also includes measured height and weight. The study is core funded by the Economic and Social Research Council (ESRC) and a consortium of Government departments.

Data table for figure 2

Prevalence of obesity among children (aged 2–15) with and without a limiting long-term illness or disability (LLTI) by age and sex with 95% confidence intervals

	Age group	With LLTI	LCI*	UCI§	No LLTI	LCI	UCI
Boys	2–10	22.3%	18.8%	26.4%	15.3%	14.5%	16.2%
	11–15	28.2%	24.0%	32.9%	18.2%	17.0%	19.4%
	2–15	25.0%	22.2%	28.1%	16.4%	15.7%	17.1%
Girls	2–10	18.7%	14.9%	23.2%	13.6%	12.8%	14.4%
	11–15	28.0%	23.3%	33.1%	16.9%	15.7%	18.1%
	2–15	23.2%	20.2%	26.6%	14.8%	14.1%	15.5%
TOTAL	2–10	20.8%	18.1%	23.8%	14.5%	13.9%	15.1%
	11–15	28.1%	24.9%	31.5%	17.5%	16.7%	18.4%
	2–15	24.2%	22.1%	26.5%	15.6%	15.1%	16.1%

Source: Health Survey for England. Combined data from 2006-2010[I]
* Lower confidence Interval
§ Upper confidence interval

Search strategy

A search was conducted on Medline, Embase, Cochrane, TRIP and NHS Evidence, limited to English language and 2002–2013 for children and:

Obesity and physical disability
Obesity and learning disabilities
Obesity and mental health

[I] **Children are defined as obese where their BMI is ≥95th centile of the British 1990 growth reference (UK90).**

References

1. Office for Disability Issues. (2013) Fulfilling Potential Building a deeper understanding of disability in the UK today. London: Department of Work and Pensions.
2. Minihan PM, Fitch SN, Must A. What does the epidemic of childhood obesity mean for children with special health care needs? *J Law Med Ethics.* 2007;35(1):61–77.
3. Read J, Blackburn C, Spencer N. Disabled children in the UK: a quality assessment of quantitative data sources. *Child: Care, Health and Development* 2009;36(1):130–41.
4. National Obesity Observatory (2013) Child weight factsheet. http://www.noo.org.uk/uploads/doc/vid_17926_ChildWeightFactsheetFeb2013.pdf.
5. Disability and health: Division of Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention, 2012.
6. Reinehr T, Dobe M, Winkel K, Schaefer A, Hoffmann D. Obesity in disabled children and adolescents: an overlooked group of patients. *Deutsches Arzteblatt International* 2010;107(15):268–75.
7. Liou TH, Pi-Sunyer FX, Laferrere B. Physical disability and obesity. *Nutr Rev.* 2005;63(10):321–31.
8. Taylor ED, Theim KR, Mirch MC, Ghorbani S, Tanofsky-Kraff M, Adler-Wailes DC, et al. Orthopedic complications of overweight in children and adolescents. *Pediatrics.* 2006;117(6):2167–74.
9. Maiano C. Prevalence and risk factors of overweight and obesity among children and adolescents with intellectual disabilities. *Obesity Reviews* 2011;12(3):189–97.
10. Emerson E. Overweight and obesity in 3- and 5-year-old children with and without developmental delay. *Public Health* 2009;123(2):130–3.
11. Slevin E, Truesdale-Kennedy M, McConkey R, Livingstone B, Fleming P. Obesity and overweight in intellectual and non-intellectually disabled children. *J Intellect Disabil Res* 2012;7(10):1365–2788.
12. Emerson E, Robertson J. Obesity in young children with intellectual disabilities or borderline intellectual functioning. *International Journal of Pediatric Obesity* 2010;5(4):320–6.
13. Bandini LG, Curtin C, Hamad C, Tybor DJ, Must A. Prevalence of overweight in children with developmental disorders in the continuous national health and nutrition examination survey (NHANES) 1999–2002. *Journal of Pediatrics* 2005;146(6):738–43.
14. Rimmer J. Disparities in Obesity and Disability (Part 2): Developing Research Partnerships and Collaborations.: National Center for the Dissemination of Disability Research (NCDDR), 2010.
15. Elena G, Bruna C, Benedetta M, Stefania DC, Giuseppe C. Prader-Willi Syndrome: Clinical Aspects. *Journal of obesity* 2012;2012:13.
16. Van Gameren-Oosterom HB, Van Dommelen P, Oudesluys-Murphy AM, Buitendijk SE, Van Buuren S, Van Wouwe JP. Healthy growth in children with Down syndrome. *PLoS One.* 2012;7(2):e31079. doi: 10.1371/journal.pone.0031079. Epub 2012 Feb 17.
17. AbilityPath. Finding Balance. Obesity and Children with special needs. A Report and Guide from AbilityPath.org, 2011.

18. Chen AY, Kim SE, Houtrow AJ, Newacheck PW. Prevalence of obesity among children with chronic conditions. *Obesity (Silver Spring).* 2010;18(1):210–3. Epub 2009 Jun 11.
19. Rimmer JH, Rowland JL, Yamaki K. Obesity and Secondary Conditions in Adolescents with Disabilities: Addressing the Needs of an Underserved Population. *Journal of Adolescent Health* 2007;41(3):224–29.
20. Neter JE, Schokker DF, de Jong E, Renders CM, Seidell JC, Visscher TL. The prevalence of overweight and obesity and its determinants in children with and without disabilities. *J Pediatr.* 2011;158(5):735–9. doi: 10.1016/j.jpeds.2010.10.039. Epub 10 Dec 10.
21. Shields N, Synnot AJ, Barr M. Perceived barriers and facilitators to physical activity for children with disability: a systematic review. *Br J Sports Med.* 2012;46(14):989–97. doi: 10.1136/bjsports-2011–090236. Epub 2011 Sep 26.
22. McGillivray J, McVilly K, Skouteris H, Boganin C. Parental factors associated with obesity in children with disability: a systematic review. *Obes Rev.* 2013;14(7):541–54. doi: 10.1111/obr.12031. Epub 2013 Mar 25.
23. Yamaki K, Rimmer JH, Lowry BD, Vogel LC. Prevalence of obesity-related chronic health conditions in overweight adolescents with disabilities. *Research in Developmental Disabilities* 2011;32(1):280–8.
24. Daniels SR. Complications of obesity in children and adolescents. *Int J Obes (Lond).* 2009;33(Suppl 1):S60-5. doi: 10.1038/ijo.2009.20.
25. Lobstein T, Baur L, Uauy R, Force IIOT. Obesity in children and young people: A crisis in public health. *Obesity reviews : an official journal of the International Association for the Study of Obesity* 2004;5(Suppl 1):4–104.
26. Egan K, Ettinger A, Bracken M. Childhood body mass index and subsequent physician-diagnosed asthma: a systematic review and meta-analysis of prospective cohort studies. *BMC Pediatrics* 2013;13(1):121.
27. Jones Nielsen JD, Laverty AA, Millett C, Mainous Iii AG, Majeed A, Saxena S. Rising Obesity-Related Hospital Admissions among Children and Young People in England: National Time Trends Study. *PLoS ONE* 2013;8(6):e65764.
28. Blackburn C, Spencer N, Read J. Prevalence of childhood disability and the characteristics and circumstances of disabled children in the UK: secondary analysis of the Family Resources Survey. *BMC Pediatrics* 2010;10(1):21.
29. Pillai R, Rankin J, Stanley K, Bennett J, Hetherington D, Stone L, et al. Disability 2020: Opportunities for the full and equal citizenship of disabled people in Britain in 2020: IPPR, 2007.
30. Emerson E, Vick B, Reche B, Muñoz-Baell I, Sørensen J, Färm I. Background Paper 5. Health Inequalities and People with Disabilities in Europe “Social Exclusion, disadvantage, vulnerability and health inequalities”A task group supporting the Marmot region review of social determinants of health and the health divide in the EURO region, 2012.
31. Emerson E, Shahtahmasebi S, Lancaster G, Berridge D. Poverty transitions among families supporting a child with intellectual disability *Journal of intellectual and developmental disability* 2010;35(4):224–34.
32. Obesity knowledge and Intelligence. http://www.noo.org.uk/NCMP/National_report.
33. Allerton LA, Welch V, Emerson E. Health inequalities experienced by children and young people with intellectual disabilities: a review of literature from the United Kingdom. *J Intellect Disabil.* 2011;15(4):269–78. doi: 10.1177/1744629511430772. Epub 2011 Nov 30.

34. Marmot M. Fair Society, Healthy Lives: Strategic review of health inequalities in England post 2010. London: University College London Institute of Health Equity, 2010.
35. Carter B, Spencer V. The Fear Factor: Bullying and Students with Disabilities. 2006;21(1):11–23.
36. Simeonsson RJ, McMillen JS, Huntington GS. Secondary conditions in children with disabilities: spina bifida as a case example. *Ment Retard Dev Disabil Res Rev.* 2002;8(3):198–205.
37. Daniels SR. The use of BMI in the clinical setting. *Pediatrics.* 2009;124(Suppl 1):S35–41. doi: 10.1542/peds.2008–3586F.
38. Liusuwan RA, Widman LM, Abresch RT, Styne DM, McDonald CM. Body composition and resting energy expenditure in patients aged 11 to 21 years with spinal cord dysfunction compared to controls: comparisons and relationships among the groups. *J Spinal Cord Med.* 2007;30(Suppl 1):S105–11.
39. NICE. Managing overweight and obesity among children and young people: lifestyle weight management services.Public health guidance 47, 2013.
40. National Obesity Observatory. Local Authority pages http://www.noo.org.uk/LA.
41. Rimmer JH, Wang E, Kiyoshi Y, Davis B. Focus technical brief No. 24. Documenting Disparities in Obesity and Disability: National Center for the Dissemination of Disability Research, 2010.

Reader information

Title	Obesity and disability: children and young people
Author(s)	Mary Gatineau
Reviewer(s)	Professor Julian Shield, Professor in Diabetes and Metabolic Endocrinology, University of Bristol; Practising paediatrician, Royal Hospital for Children in Bristol[m] Professor Eric Emerson, Centre for Disability Research (CeDR), Lancaster University; Co-Director of Improving Health and Lives Learning Disabilities Observatory (IHAL) Kate Thurland, Head of Health Intelligence, Child and Maternal Health Intelligence Network, PHE Christine Lenehan, Director, Council for Disabled Children Dr Monica Dent, Consultant in public health medicine, SPH Alison Tedstone, Louis Levy, Mark Bush, Caroline Hancock, Louisa Ells, Harry Rutter, Di Swanston, Shireen Mathrani,PHE
Publication date	March 2014
Target audience	Policymakers and practitioners
Description	It explores the main obesity-related chronic health conditions that can develop during childhood and adolescence and highlights implications for policy, practice and research.
How to cite	Gatineau M. Obesity and disability: children and young people. Oxford: Public Health England Obesity Knowledge and Intelligence, 2014.
Contact	PHE Obesity Knowledge and Intelligence www.noo.org.uk info@noo.org.uk @PHE_obesity
Electronic location	http://www.noo.org.uk/NOO_pub/briefing_papers
Copyright	

[m] **Supported by an NIHR Biomedical Research Unit in Nutrition award to University Hospitals Bristol NHS Foundation Trust. His advice is independent opinion from the National Institute for Health Research Biomedical Research Centre and Unit Funding Scheme.**