

## **Children and Mobile Phones**

This article is separated into 4 sections, each of which can be individually downloaded. It is a 'work in progress' incorporating new information whenever time permits.

### **Section 1**

#### **Use of mobile phones by young people**

1. Use of mobile phones by young people; the psychology of phone use; which children have phones? How are phones used? Child safety; the phones; SARs (Specific Absorption Rate); the link between phones and masts; summary; campaigning organisations
2. Official advice across the world; the United Kingdom; America; Australia; Austria; Belarus; Belgium; Canada; European Environment Agency (EEA); Finland; France; Germany; Israel; Italy; Norway and Denmark; Russia; Thailand
3. The research; summary; addiction; behaviour; brain effects; brain tumours; acoustic neuromas; parotid (salivary) gland tumours; headaches and migraines; learning, memory and behaviour changes; eye damage; hospital visiting; mental health problems; mouth cancer; DNA, cellular and organ damage; reproductive effects (testicular cancer, damaged sperm, reduced fertility); risk perception; sleep; official comments on the implications of the health research; the difficulties with the research
4. References – 110 references

## Introduction

Foetal life and childhood are the periods most vulnerable to the harmful effects of exposure to environmental insults. This is because, during these periods, there is rapid cell division, organs are being formed, and growth is rapid. Thus, disruption of these processes may result in life-long abnormalities. Of particular concern are exposures that alter cognitive function and behaviour, but exposures that alter growth, development, and reproductive and immune system function and that may increase risk of development of diseases like cancer later in life are also especially important. Exposure to environmental chemicals as well as infectious agents occurs via air, food, water, and absorption through the skin. Therefore, the environment in which foetal and childhood development occurs is very important (Leith Sly & Carpenter [2012](#)).

Youngsters probably use their mobile phones for longer than adults (except in some work-related instances). They often use text messaging as the major part of their phone use. Whilst this reduces microwave exposure to the head dramatically, text messaging is not without its own problems, see below. One of the less serious results, however debilitating, of text messaging is that it could lead to repetitive strain injury.

In Summer and Autumn 2001, surveys were carried out by the Pupil Researcher Initiative of 1000 young people and how they use their phones.

Despite how long ago that survey was done, 87% of young people under 15 had their own mobile phones and 70% had owned them for at least a year. 96% of these young mobile phone users use text messaging. A concerning 10% used their phones for more than 45 minutes per day, probably paid for by their parents, as they are not old enough to sign their own contract. A pay-as-you-go tariff will satisfy parental safety concerns and is more likely to keep calls short. 70% carried them in their pockets and 29% carried them in their bags, exposing their bodies to high levels of radiation. 11% of the young people completing the questionnaire believed that they were affected by the phone radiation. The responses did not mention concentration and memory effects, so we believe these problems were under-reported. **70% said they would not change the use of their phone based on Government or scientific advice.** It seems that if we want youngsters to change their phone use habits, it has to be done through legislation.

Professor Olle Johansson of the Department of Neuroscience at the Karolinska Institute in Sweden, said in September 2001 "*...Already in 1996, I started to warn in public of the effects on microwave irradiation on children through their use of mobile telephones. The debate has also very much focussed on the responsibility regarding ads and products directly aimed for children, and here in Sweden great alarm has been raised around the propositions to even develop and sell cellphones for the ages up to 5 years.*"

Following the recommendations in the Stewart report in May 2000, the Department of Health was asked to distribute mobile phone safety leaflets to every home, recommending that under 16s should not use mobiles at all, and giving guidelines for minimising exposure if they had to. Before distribution, the leaflet was toned down, as a result of pressure from the Department of Trade and Industry (DTI), so that it restricted itself to saying how mobiles should be used, that calls should be kept short and that the phone should be used for essential purposes only. It stated "*young people should make their own informed choices about the use of mobile phones.*"

The leaflet was *not* distributed to every home, but was only available in libraries and shops selling mobile phones as long as the purchaser knew what to ask for. The Health Secretary wrote to the chief executives of mobile phone retailers reminding them to give the Government's precautionary guidelines to customers buying handsets. However, in November 2001, a survey carried out by the Sunday Times revealed that only three out of 15 shops visited in London

offered a leaflet when asked for advice on buying a phone for an eight-year-old. The Department of Health leaflet was re-issued with no real changes in 2005. It still advises that children and young people under 16 only use a mobile phone in an emergency or for *really* important purposes.

In January 2002, Sir William Stewart repeated his assertion that "*I am not prepared to let my grandchildren use mobile phones*". In March 2002, the then World Health Organisation (WHO) Director-General and former Norwegian Prime Minister and medical doctor, Gro Harlem Brundtland, who suffers from Electrical Hypersensitivity, regrets that she gave her grandchild a mobile phone as a gift. She said "*The younger you are, the more reason to take this (precautionary approach) seriously. One should in any case be careful with their use. But children are extra vulnerable.*"

The use of mobile phones by ever younger children is increasing despite international recommendations that children should use mobile phone technology with caution, if at all, because the risk of severe adverse health effects cannot be ruled out. Mobile phone related companies, often in collaboration with the entertainment industry, seem to be specifically targeting the child market. Phones do not make children safer, possibly even the opposite, as the phones cannot pinpoint lost or 'disappeared' children with accuracy; more crime is associated with mobile phones; and, in the mistaken belief that the phone gives a child protection, parents may relax their safety good practice.

The reality of the risks seems to be growing as the studies show an increased possibility of developing health problems, even life-threatening illnesses, with even short exposure to mobile phone radiation.

## **The psychology of phone use**

In June 2008, the BBC reported that 2 Spanish children aged 12 and 13, had been admitted to a mental health institution as a result of addiction to their mobile phones. They were doing badly at school, displayed disturbed behaviour and were lying to their relatives in order to get money to spend on their phones. Dr José Martínez-Raga, an expert in addictions, said that such children often became irritable, withdrawn and antisocial and their school performance deteriorated. He warned that these cases could be "*the tip of the iceberg*" and that mobile phone addiction "*could definitely be a danger in the future*". The two children in question had had their phones for 18 months and it is believed that it may take a year to wean them off the 'drug'.

This follows 2 cases of phone addiction reported in Britain by the Telegraph in the same month. The young people were obsessed with their phones and became depressed when the number of incoming calls or messages dropped.

A report in the Daily Express in March 2009, based on research by youngpoll.com, stated that millions of youngsters were spending up to six hours a day on their phone. 81% of children in the UK now say their phone is their most important possession - with one in three saying they would feel alone without it. Nearly half of youngsters (6 - 17-year olds) slept with their mobile at the bedside, and three quarters said they checked it for missed calls or texts as soon as they woke in the morning.

A Korean study (Lee [2007](#)) reported that school students who were impulsive, anxious and prone to stress were more likely to be heavy users of mobile phones than students without these characteristics. The study population was chosen according to the amount of phone use, and it would be interesting to know whether these characteristics predated the phone use, or were a result of using the phones extensively.

The prevalence of problematic users among British adolescent students was 10%, and the typical problematic user tended to be an adolescent between 11 and 14 years old, studying in a public school, who considered themselves to be an expert user of this technology, who made extensive use of his/her mobile phone, and who attributed the same problem of use among their peers (Lopez-Fernandez [2014](#)). In a study of Iranian students, about 19% of our participants had tried to decrease use of mobile phone but were unsuccessful (Baghianimoghadam [2013](#)).

A study in 2013 separated Japanese students into 3 categories of mobile phone use; normal users, excessive users and dependent users. Dependent users were characterised by excessive use and personality immaturity. The characteristics of excessive and dependent users included a young age at initial mobile phone use, more frequent use of text messaging and higher novelty-seeking. Dependent users also had higher anxiety and depression, whereas excessive users had high reward dependence and co-operativeness (Lu [2014](#)).

Smartphone addiction is an increasing problem along with internet addiction. Kim ([2014](#)) developed a Smartphone Addiction Proneness Scale (SAPA) based on the existing internet and cellular phone addiction scales.

Pedersen ([2004](#)) found that among 13-18 year-olds who did not use mobile phones, less than 10% reported having had sexual intercourse while two out of three of the most active users reported intercourse.

Professor Michael Abramson, from Monash University in Melbourne says constant texting makes children more impulsive and less likely to think things through (Express December 2009). He asked a selection of children aged 11-14 to do a series of computer tests. *"The kids who used their phones a lot were faster on some of the tests but less accurate. We suspect using phones a lot, particularly tools like predictive texts for SMS, is training them to be fast but inaccurate"* he says.

In Hungary, youngsters who were more likely to use mobile phones regularly were ~ girls; children with no siblings; children who were members of a sports club and children who played computer games daily (Mezei [2007](#)).

Sansone & Sansone ([2013](#)) discuss the psychosocial risks of mobile phone use. They list under this heading 1) user stress, which appeared to be related to feeling compelled to promptly respond to mobile phone contacts in order to maintain spontaneity and access with others 2) disruptions to sleep 3) the user's risk of exposure to cyberbullying, particularly the unwanted exposure of photographs and/or videos of the victim 4) overuse, particularly among adolescents. The boundaries between overuse, misuse, dependency and addiction are not scientifically clear, commented the authors.

A study of twins by Miller ([2012](#)) found inherited tendencies for how often teenagers make voice calls; and for how often they send text messages. There were negative tendencies between talking/texting frequency and intelligence and positive correlations between talking/texting frequency and extraversion. Shared family environment, including neighbourhood, social class, parental education and parental income had much weaker effects.

## Which children have phones?

Different surveys give different figures, and break them down by different ages, so comparisons of usage increase are not straightforward. It is clear that mobile phone use by young children is increasing. In 2004, in a cross section of 10-year-old children 34.7% owned and used a mobile (Böhler & Schüz [2004](#)). Now 13% of 3 year olds have used a mobile phone, rising to 23% of 3-6 year-olds, 50% of 5-9 year-olds, and by secondary school 97% of children have their own mobile

phone. In August 2013, the Mail Online reported that one in ten 5-year-olds (about a million children) have a handset, parents often use them to keep children entertained. However, Swedish research has suggested that heavy mobile phone use over decades increases brain tumour risk by 2.5 times in adults and up to five times in children. Infertility has been linked to boys and men who carry phones in their trouser pockets (and presumably those who use phones on their laps). Ernest Doku of uSwitch.com, a price comparison website, says *"If you do give in to your kids' requests, asking networks to place caps on their mobile bills is a very sensible precaution."*

Owning a mobile phone is associated with being older, having no siblings, spending more time watching TV and playing computer games, being picked up by parents from school by car (instead of walking or cycling) and going to bed late (Böhler & Schüz [2004](#)). In a survey of 15-19 year-olds by Soderqvist ([2008](#)), most participants reported access to a mobile phone (99.6%) and use increased with age; 55.6% of the 15-year-olds and 82.2% of the 19-year-olds were regular users. Girls generally reported more frequent use than boys. Use of wired hands-free equipment 'anytime' was reported by 17.4%. Cordless phones were used by 81.9%, and 67.3% were regular users. Watching TV increased the likelihood of use of wireless phones. Some of the most frequently reported health complaints were tiredness, stress, headache, anxiety, concentration difficulties and sleep disturbances. A large number of adolescents sleep for 7-8 hours instead of 9-10 hours per night, which can lead to a cumulative sleep debt with fatigue, behavioural problems and poor academic achievement (Touitou [2013](#)).

In a study of Korean children and adolescents, the ownership rate and the amount of mobile phone use were higher in females than males and in higher school grades than lower grades. The average age of first mobile phone ownership was 8.4 years in elementary school students. More than 90% of children in the 5th grade owned a mobile phone. More children owned a mobile phone in lower socioeconomic communities than in higher ones. Children with parents educated less than those with parents educated more were more likely to own and use mobile phone (Byun [2013](#)).

In the area of Spain near Barcelona, 90% of teenagers owned a mobile phone and nearly half owned one before the age of 12. Girls used it for social relationships and boys for playing. 98% also had a computer at home, and 45% used it for 2 or more hours a day; 99% could access the Internet and 47% without parental control. At home 68% played videogames and 36% for 3 or more hours a week; 67% without parental control (Muñoz-Miralles [2014](#)).

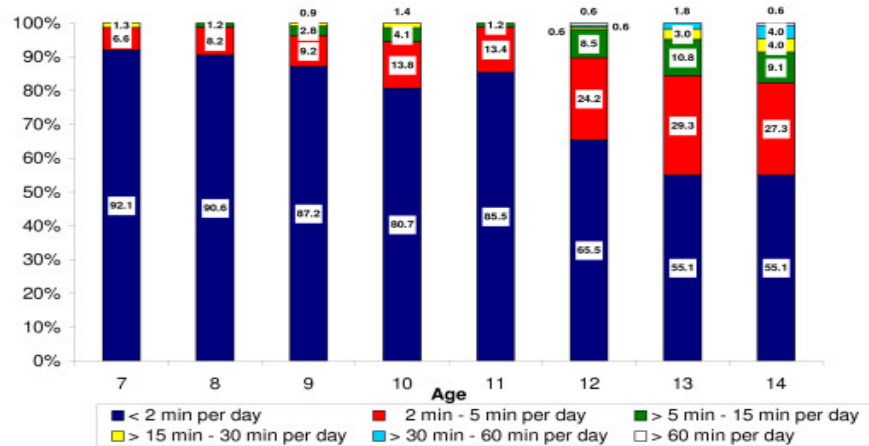
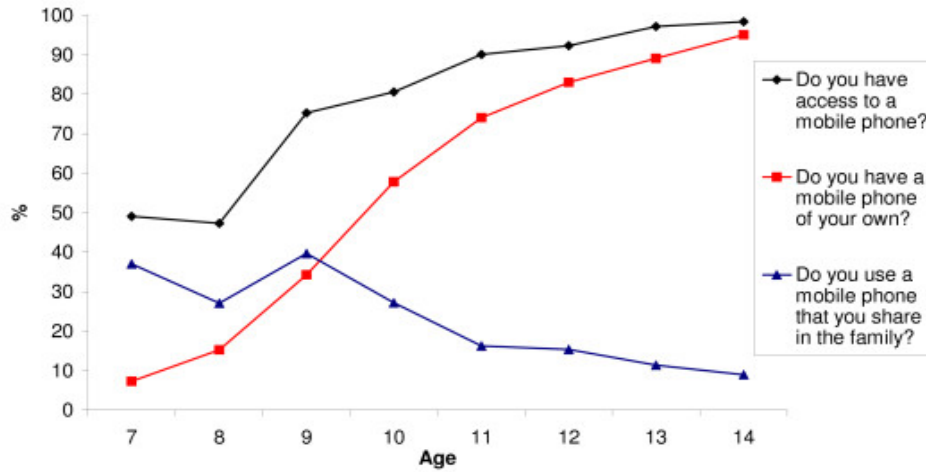
Regular users of wireless phones had health symptoms more often and reported poorer perceived health than less frequent users.

Interestingly, children of lower socioeconomic status are more than twice as likely to own a mobile phone and to use it more; this increases to more than 3 times in adolescence (Thomas [2010](#)), though the reason for this is unclear.

Mezei ([2007](#)) reported that in 3 Hungarian cities, 76% of students owned a mobile phone, 24% used them daily and 33% more used them at least several times a week. 5% sent daily text messages, and 24% more sent texts at least several times a week.

Although the majority of adults are phone *owners*, and many will use them extensively, the much younger age groups are, apparently, catching up quickly. In many cases they are heavy users, probably only second to 18-25s and some business users. The exact statistics as regards child users will always be relatively hard to establish, as, in many cases, adults will be registered as the phone owner due to contracts needing to be agreed by over-18s, no matter who uses the phone concerned.

The graphs below are taken from a [2007](#) study by Söderqvist showing ownership and usage of mobile phones by children aged 7-14 years in Sweden, and the time the phone was used.



The guidelines laid down by the Department of Health in 2005, confirmed in 2009 as still current, have now become fairly meaningless "... if parents want to avoid their children being subject to any possible risk that might be identified in the future, the way to do so is to exercise their choice not to let their children use mobile phones." The preceding sentence conveys a clear intention of covering the Department's collective backs in case a problem with phone use is found in the future, and they might be held accountable for advice given.

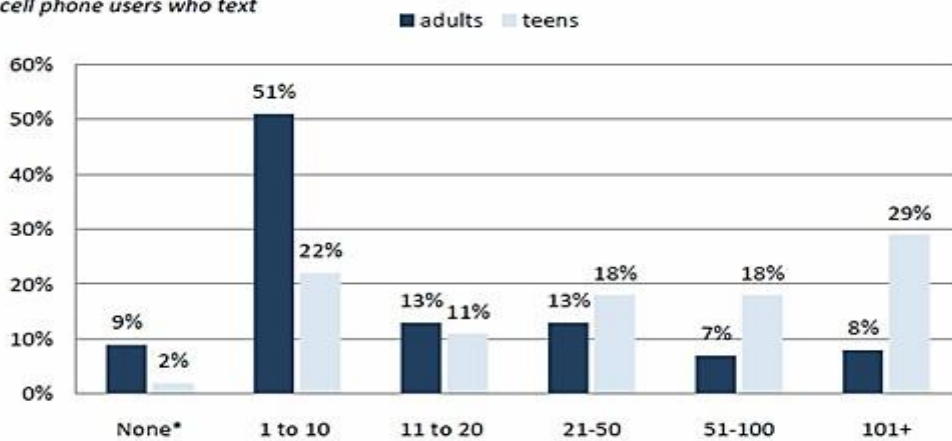
Meanwhile, many children's television programmes have presenters that encourage their child viewers to text them their feedback. This seems a very irresponsible stance by the programme producers.

## How are phones used?

Teenage children use texting more than adults as we can see from the following graph from the USA published in 2010.

### Adults vs. Teens: Number of texts on a typical day

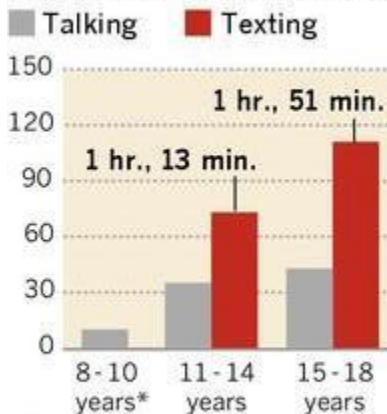
Based on cell phone users who text



Source: Pew Research Center's Internet & American Life Project, April 29 - May 30, 2010 Tracking Survey. N=2,252 adults 18 and older; n=1,917 based on cell phone users. The teen results are based on data from June 26 - September 24, 2009 telephone survey, including cell phones, with n=800 teens ages 12-17 and a parent or guardian; n=625 for teen cell phone users.

### Time spent on a cellphone

(Daily average minutes, by age group)



\*Texting n/a for age group

Source: Kaiser Family Foundation

Los Angeles Times

The hours spent on a mobile phone either using an ordinary voice call or texting would put most youngsters in the category of *heavy users* as described in all the research papers. It doesn't just end there, though.

According to the survey by Pew in April 2010, the typical American teenager sends and receives 50 or more text messages per day, or 1,500 per month. In addition to this, 83% use their phones to take pictures; 60% play music on their phones; 46% play games on their phones; 32% exchange videos on their phones; 27% go online for general purposes on their phones and 23% access social networking sites on their phones.

These may well be an overestimate, if self-reported, leading to a reality that an increased risk is there for a lower usage of a phone, but maybe for a subset of the population. In a study by Aydin (2011) looking at adolescents with and without brain tumours, the cases overestimated their number of calls by 9% on average and controls by 34%. Cases also overestimated the duration of calls by 52% on average and controls by 163%. Either that, or there was a problem with the questions asked, which elicited exaggerations.

## Child Safety

The safety of children is of paramount importance to all of us, but without any real evidence that having a phone will help, marketing a phone for this reason is extremely misleading and may put your child at greater risk.

There is no evidence that mobile communication makes children any safer. If someone kidnaps a child, the first thing to go would be the mobile phone, so even if the child had managed to get out an SOS signal, there is no way that anyone could get to the location of the phone before the kidnappers are long gone. Phones which use an automatically generated map of the phone's location are usually too imprecise to identify the exact position of the child, though this is improving with some phones having built-in GPS.

In January 2006, the Sunday Times reported a rise of about 12 percent in muggings. Police blame the increase mainly on "teen-on-teen" crimes in which children attack each other for desirable items such as mobile phones. In April 2007, the police said that more than 50% of street theft in the last year involved a mobile phone. In February 2010 the BBC said that 228 mobile phones are reported stolen in the UK every hour. The Metropolitan Police say as many as 10,000 mobile phones are stolen every month. Two thirds of the victims are aged between 13 and 16. The research shows that children under 15 are the most common targets with up to half a million young people aged between 11 and 15 falling victim to phone theft.

US law enforcement agencies handled an estimated 3477 cases of youth-produced sexual images during 2008 and 2009 63% of the images were distributed by mobile phones only (sexting). 31% of these 3477 involved a minor engaged in malicious, non-consensual or abusive behaviour (Wolak 2012). The rate of youth exposure to sexting highlights a need to provide them with information about legal consequences of sexting and advice about what to do if they receive a sexting image. However, the data (Mitchell 2012) suggest that appearing in, creating, or receiving sexual images is far from being a normative behaviour for youth. Indeed sexting, rather than functioning as an alternative to 'real world' sexual risk behaviour, appears to be part of a cluster of risky sexual behaviours amongst adolescents (Rice 2012).

Sexting behaviour (both photo and text messages) was not uncommon among middle school students and co-occurred with sexual behaviour. These data suggest that phone behaviours, even flirtatious messages, may be an indicator of risk (Houck 2014).

There were 19,000 reported muggings in London alone, between April 2005 and February 2006. One teenage girl was shot in the head for her mobile. There have been incidences of gang rape, photographs of which have been taken by phone users and broadcast to absent gang members. Dr Nick Barlow, a psychologist at Leicester Royal Infirmary said that mobile phones could give parents a false sense of confidence, and reduce their child's development of independence.

Although mobile phones offer privacy to children, calls to potential boyfriends, girlfriends, drug dealers, or access to dubious internet sites may be all too possible without the adult awareness that there used to be when a household landline was used. Children need not even walk to a chemist to get photographs (of whatever scenes have been taken) developed.



In a survey reported in the Daily Express in November 2007, only 36% of parents stopped their children from accessing the internet on their mobile phone. Rod Barnes, head of mobile phones at moneysupermarket.com said *"Take heed of warnings regarding internet access and look into whether filters can be placed on your child's mobile to bar access to specific sites."* Far from a mobile offering you peace of mind about your child's safety, it may be exposing them to pornographic sites and paedophiles 'grooming' them for dubious contacts.

Researchers at Örebro University Hospital in Sweden (see section 3) have indicated that children may be five times more likely to get brain cancer if they use mobile phones.

On top of this comes concern about the long-term effects of mobile phone use on the mental health of youngsters. In June 2009 Dr Michael Carr-Gregg, a leading Australian psychologist, called parents who allow young children to use mobile phones "insane". Carr-Gregg, a University of Melbourne professor of paediatrics, is worried about the power of mobile phones to distract and overexcite.

According to a new survey conducted by Carr-Gregg, 40 per cent of children with mobile phones are sleep-deprived on school nights, as peer pressure has made it normal for children of 6 and 7 to stay up until the early hours texting friends. His evidence, revealed in a series of Australian academic seminars, suggests that millions of children are allowed mobile phones in their bedrooms, creating a generation of overtired "zombies".

## The phones

Mobile phone companies reacted furiously to the Stewart report and Sir William Stewart saying that young children should not be given phones. The companies said that it fanned public concern without presenting new research. The youth market is a highly lucrative one because teenagers are more likely to use video downloads and other services.

Mobile phones for young children is a whole new market for the companies wanting to make money as the adult market has become saturated. Karen Barratt of campaign group Mast Sanity believes *"These companies targeting children have a cleverly worked-out strategy - not only are they expanding their market now but they're securing their market for the future."*

Sometimes the phones are being offered as part of a 'family package' with cheap rates for young people's phones included.

Phones aimed at the very young have received a mixed reception over the years. Companies are there to capitalise on a potentially very lucrative new market, and to focus on parental safety concerns whilst doing so. Considering it is the Department of Health's express recommendation that children (under 16) should only use their mobile phone in an emergency, it seems surprising that these initiatives go unchallenged. They try to get round the advice by saying they are for safety reasons. Some are sold so that a child can broadcast his location to his parents when he gets lost. It is unclear why a 4 - 8 year old should be in a position where he or she is lost, but we put that question to one side. The phone is only accurate to approximately 500 metres in built up urban areas (despite the fact that there are plenty of phone masts for triangulation), which is next to useless. A 500 metre radius of accuracy gives a search area of about 785,000 square meters to search, which in a crowded city centre would be just about impossible. .

In May 2013, the 1stFone was launched by OwnFone. The phone which is aimed at 4 to 9 year olds costs £55 and is available on a contract or pay as you go basis. Sue Palmer, author of Toxic Childhood, said marketing a phone for children so young was 'just another way of trying to make money out of children and their parents. The marketing of technology to very young children is just a hook to get them into techno-consumerism.' Siobhan Freegard, founder of the UK parenting

site Netmums.com said that no four year old needs their own phone as they should never be left alone or in a situation where they need to ring an adult.

## SARs (Specific Absorption Rate)

Using SAR values [[www.sarvalues.com/measuring-sar.html](http://www.sarvalues.com/measuring-sar.html)] as a guide as to whether a particular model of mobile phone is safer than another is very misleading. The SAR value represents the absorption of microwaves by brain tissue from the phone operating at its maximum power, whereas in reality, phones (especially in areas of good signal) rarely operate anywhere near this level, and can function at as much as 1000 times lower. It is impossible to have more than a 'snapshot' in time of SAR values, as phone models are changing so rapidly. Phones with visible external antennas seem to be better at running at lower power than those with internal antennas.

A study by Bakker (2010) found that the restriction on SAR is occasionally exceeded for children, up to 45% in small children. The authors suggest that ICNIRP levels need 'fine tuning'.

If companies maintain they have reduced the SAR of child-targeted handsets (such as the Teddyfone [[www.teddyfone.com/](http://www.teddyfone.com/)] by means of lowering the phone's output power, then a side-effect of this will be that the phone may not work in vehicles or low signal areas. For a phone sold primarily on the merit of increased safety this would be largely self-defeating.

## The link between phones and masts

The more mobile phones are used, the more base stations will need to be erected to meet the demand for call traffic, under the terms of the operators' licences.

Companies have needed to put up masts next to schools to meet the demand from pupils at break times and after school. Although some schools ban mobile phones, this can only be during school hours. Children only wait until they are away from school buildings to make calls. Most school children do not have the means to pay for the calls they make. The phones *are bought for them by adults, usually their parents.*

## Summary

The age of children using mobile phones seems to be getting younger, despite international recommendations that they should only use them with care, see section 2.

The driving force seems to be the industry seeing a potential vast under-tapped market for increasing their profits, often persuading parents and grandparents that a mobile phone keeps children safe. This is not borne out in reality and children with mobile phones are much more likely to become victims of street crime and sometimes very serious offences are committed against them.

Independent research suggests the need for precaution in the use of mobile phones, if they are to be used at all (see section 3), and serious health effects including cancer, DNA damage and early dementia may be in store for our youngsters. Meanwhile under-achieving as a result of memory and learning disturbances, together with behaviour and mood changes may blight their future.

Apparently according to the youngpoll.com research in March 2009, a quarter of children have been caught using their mobile during lessons and one in 10 has physical problems from using mobile phones with repetitive strain injury or sore thumbs being the most common complaint.

We recommend that we listen to the Department of Health advice and do not allow our children to affect their future health and potential by using a mobile phone.

## **Campaigning organisations**

Mobile Wise [www.mobilewise.org](http://www.mobilewise.org) – UK Charity, formed in 2011, which aims to increase public awareness of possible risks to children from using mobiles and the measures that can protect them.

Safe Schools Information Technology Alliance (SSITA) [www.ssita.org.uk](http://www.ssita.org.uk) – SSITA is an Alliance of Partner organisations, parents, teachers, scientists, lawyers and other experts who work together to identify the issues and concerns regarding WiFi and other wireless technologies in schools, nurseries, day care environments and colleges.

WiFi in Schools [www.wifiinschools.org.uk](http://www.wifiinschools.org.uk) – Information website set up by a small group of scientists concerned about the rapid spread of wireless technologies in schools and lack of information that schools and parents have been given about the potential risks from this technology. It aims for “Safe Technologies for Nurseries, Schools and Colleges.”

Wired Child [www.wiredchild.org](http://www.wiredchild.org) – UK charity Wired Child gives advice to reduce the risks from using mobile phones, cordless phones, WiFi and other wireless products.