Development of a UK Children’s Environment and Health Strategy

Regional Priority Goal IV: Chemical, Physical and Biological Hazards

Report prepared by the Health Protection Agency for the Interdepartmental Steering Group (ISG) on Environment and Health

Professor Gary Coleman, Head of Chemical Hazards and Poisons Division and Children's Environment and Health Action Plan (CEHAP) Project Lead, Health Protection Agency

Raquel Duarte-Davidson, CEHAP Project Manager, Health Protection Agency

Authors: Capleton AC, O’Connell S, Wyke SM and Duarte-Davidson R, Health Protection Agency

Please direct queries concerning this report to: cehape@hpa.org.uk.
ACKNOWLEDGEMENTS

This document has been put together by the Health Protection Agency and was commissioned by the Department of Health and the Interdepartmental Steering Group (ISG) on Environment and Health. Initial work was undertaken by the Institute of Environment and Health and their contribution is gratefully acknowledged. We are also grateful to the comments provided by Richard Amlot, Jane Bradley, John Cooper, Robin Fielder, Martyn Green, Roy Hamlet, Jill Meara, Alistair McKinlay, Jon Miles, Colin Muirhead, Gordon Nichols, Jane Simmonds and Phil Tattersall, HPA.

This is an HPA document and, as such, does not necessarily represent the views of the Department of Health or the individual Departments, Agencies or Devolved Administrations that comprise the ISG.
EXECUTIVE SUMMARY

Regional Priority Goal 4

We commit ourselves to reducing the risk of disease and disability arising from exposure to hazardous chemicals (such as heavy metals), physical agents (e.g. excessive noise) and biological agents and to hazardous working environments during pregnancy, childhood and adolescence.

We will aim to reduce the proportion of children with birth defects, mental retardation and developmental disorders, and to decrease the incidence of melanoma and non-melanoma skin cancer in later life and other childhood cancers by:

(a) passing and enforcing legislation and regulations and implementing national and international conventions and programmes to:

i. reduce exposure of children and pregnant women to hazardous chemical, physical and biological agents to levels that do not produce harmful effects on children’s health;

ii. protect children from exposure to harmful noise (such as aircraft noise) at home and at school;

iii. ensure appropriate information on and/or testing for effects on the health of developing organisms of chemicals, products and technologies before their marketing and release into the environment;

iv. ensure the safe collection, storage, transportation, recovery, disposal and destruction of non-hazardous and hazardous waste, with particular attention to toxic waste;

v. monitor in a harmonized way the exposure of children, as well as men and women of reproductive age, to hazardous chemical, physical and biological agents;


(b) implementing policies to raise awareness and endeavour to ensure reduction of exposure to UV radiation, particularly in children and adolescents;

(c) promoting programmes, including those for the adequate dissemination of information to the public, that will prevent and minimize the consequences of natural disasters and major industrial and nuclear accidents such as Chernobyl and that take into consideration the needs of children and people of reproductive age.

We commit ourselves to advocating the elimination of the worst forms of child labour by applying International Labour Organization (ILO) Convention 182.

WHO, 2004a

A review has been undertaken to assess the current status relating to chemical, physical and biological hazards that affect children in the UK; consideration has been given as to whether the areas highlighted in the Children’s Environment and Health Action Plan for Europe’s (CEHAPE) Regional Priority Goal IV (RPG IV; see box above) have been
addressed and, where relevant, gaps and areas for further improvement have been highlighted. This paper considers chemical hazards, ionising and non-ionising radiation, noise, biological hazards, occupational exposure and emergency preparedness and has highlighted the following:

- Within the UK there is robust legislation and a wide range of initiatives to protect the public from environmental and occupational exposure to chemicals, biological hazards (particularly food safety and hygiene) and ionising (e.g. radon) and non-ionising radiation (e.g. ultraviolet; UV, radiofrequency fields from mobile phones and electric and magnetic fields). Noise regulations are also comprehensive and provide powers to local authorities to deal with and investigate complaints of excessive noise. There is also comprehensive legislation for controlling risks to health and safety from hazardous exposures in and from the workplace; legislation is also in place to ensure adequate preparations are made for unforeseen incidents.

- Work needs to be done to identify ways of reducing the number of child deaths and hospital admissions from accidental poisonings.

- There is still much to learn in general about children’s actual exposure to chemicals and chemical mixtures in the UK and the variables that influence their exposure as well as the health impacts that such exposures may have. There is also a need for a better understanding about where children are exposed (e.g. in the home, school, outdoor environment).

- Householders in radon affected areas should be encouraged to participate in radon testing and to reduce levels in houses which are above the Action Level. All schools in radon affected areas should be tested for radon and, if above the Action Level, measures should be taken to reduce the exposure of pupils and staff.

- Exposure to radon below the current Action Level of 200 Bq m$^3$ may still pose health risks. Reviewing the Action Levels should be considered to protect children from the health risks of radon. A panel of experts is due to report on radon issues to the Health Protection Agency (HPA) later this year; this report will be reviewed by the HPA and consulted widely.

- With respect to ultraviolet radiation, sun protection knowledge and behaviour in children and young adults needs to be improved. Better co-ordination and evaluation of campaigns across the UK is an area of concern and should be addressed.

- Consideration should be given to means of controlling or preventing the use of sunbeds and tanning parlours by children and young people.

- Further research is needed to improve understanding of extremely low frequency electric and magnetic fields (ELF EMF) and radiofrequency exposures of children, young people, pregnant women, foetuses and their effect on health.

- Studies have shown that children and young people are affected by noise and are annoyed by noise and that their education suffers as a result of noise. Noise maps (which are currently being produced for major roads, railways and cities) could be used to identify schools likely to be affected by noise and to design and implement appropriate noise intervention programmes. There appears to be a gap in the
Executive Summary

Research in terms of examining the health effects of noise, other than hearing loss and should consider the psychological effects of noise exposure on children.

- With respect to biological hazards, there should be a continued emphasis on teaching food hygiene to children at school in order to establish good hygiene habits at an early age. Continuing surveillance of food-borne diseases is an important way to identify the current burden of disease associated with biological hazards and to evaluate the effectiveness of any initiatives aimed at reducing this.

- Further consideration of children and young persons should be given in preparations for emergency situations and children should be included in emergency preparedness exercises more regularly.
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acknowledgements</strong></td>
<td>ii</td>
</tr>
<tr>
<td>1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Background</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Structure and content of this report</td>
<td>2</td>
</tr>
<tr>
<td>2 Chemical hazards</td>
<td>3</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>3</td>
</tr>
<tr>
<td>2.2 Legislation</td>
<td>3</td>
</tr>
<tr>
<td>2.2.1 International conventions and protocols</td>
<td>3</td>
</tr>
<tr>
<td>2.2.2 Pre-market testing of chemical products</td>
<td>5</td>
</tr>
<tr>
<td>2.2.3 Chemical control in products</td>
<td>6</td>
</tr>
<tr>
<td>2.2.4 Chemical control in buildings</td>
<td>8</td>
</tr>
<tr>
<td>2.2.5 Chemical contaminants in food</td>
<td>9</td>
</tr>
<tr>
<td>2.2.6 Chemicals in the environment</td>
<td>9</td>
</tr>
<tr>
<td>2.2.7 Chemicals from occupational environments</td>
<td>10</td>
</tr>
<tr>
<td>2.2.8 Local authorities</td>
<td>11</td>
</tr>
<tr>
<td>2.3 Current status</td>
<td>12</td>
</tr>
<tr>
<td>2.3.1 Exposure to chemical contaminants</td>
<td>12</td>
</tr>
<tr>
<td>2.3.2 Health impacts of hazardous chemicals</td>
<td>16</td>
</tr>
<tr>
<td>2.4 Current and planned initiatives</td>
<td>21</td>
</tr>
<tr>
<td>2.4.1 National initiatives</td>
<td>21</td>
</tr>
<tr>
<td>2.4.2 On-going Research</td>
<td>22</td>
</tr>
<tr>
<td>2.5 Gaps and areas for concern</td>
<td>23</td>
</tr>
<tr>
<td>3 Ionising radiation</td>
<td>25</td>
</tr>
<tr>
<td>3.1 Introduction</td>
<td>25</td>
</tr>
<tr>
<td>3.2 Legislation and standards</td>
<td>25</td>
</tr>
<tr>
<td>3.3 Current status</td>
<td>27</td>
</tr>
<tr>
<td>3.3.1 Radon Monitoring and remediation</td>
<td>27</td>
</tr>
<tr>
<td>3.3.2 Exposure</td>
<td>30</td>
</tr>
<tr>
<td>3.3.3 Health effects</td>
<td>32</td>
</tr>
<tr>
<td>3.4 Current and planned initiatives</td>
<td>33</td>
</tr>
<tr>
<td>3.4.1 Environmental radiation</td>
<td>33</td>
</tr>
<tr>
<td>3.4.2 Radon</td>
<td>34</td>
</tr>
<tr>
<td>3.4.3 Health effects</td>
<td>35</td>
</tr>
<tr>
<td>3.5 Gaps and areas for concern</td>
<td>36</td>
</tr>
<tr>
<td>3.5.1 Health effects</td>
<td>36</td>
</tr>
<tr>
<td>3.5.2 Man-made environmental radiation</td>
<td>36</td>
</tr>
<tr>
<td>3.5.3 Radon</td>
<td>36</td>
</tr>
<tr>
<td>4 Non-ionising radiation</td>
<td>38</td>
</tr>
<tr>
<td>4.1 Introduction</td>
<td>38</td>
</tr>
<tr>
<td>4.2 Epidemiology of skin cancer in the UK</td>
<td>39</td>
</tr>
<tr>
<td>4.3 Legislation</td>
<td>40</td>
</tr>
<tr>
<td>4.3.1 Ultraviolet radiation</td>
<td>40</td>
</tr>
<tr>
<td>4.3.2 Electromagnetic fields</td>
<td>40</td>
</tr>
<tr>
<td>4.3.3 Mobile phones and base stations</td>
<td>41</td>
</tr>
<tr>
<td>4.4 Current status</td>
<td>41</td>
</tr>
<tr>
<td>4.4.1 Ultraviolet radiation</td>
<td>41</td>
</tr>
<tr>
<td>4.4.2 Power frequency and electromagnetic fields</td>
<td>43</td>
</tr>
</tbody>
</table>
8.3.2 NHS Emergency Planning Guidance 77
8.3.3 UK Resilience 78
8.3.4 UK Health Departments 78
8.3.5 Health Protection Agency 79
8.3.6 The Emergency Planning Society 79
8.3.7 The Emergency Planning College 79
8.3.8 The Radioactive Incident Monitoring Network 79
8.3.9 Sampling After a Chemical Incident 80
8.3.10 Flooding and Weather Related Incidents 80

8.4 Current Initiatives 80
8.4.1 Emergency Planning Exercises 80
8.4.2 The Scientific and Technical Advice Cell 82

8.5 Gaps and areas for concern 83

References 84

APPENDIX A 91

APPENDIX B 95
BOXXES, FIGURES AND TABLES

Boxes

Box 2.1 Controlling lead to protect children’s health 8
Box 2.2 Getting local – Local authority involvement in controlling chemical hazards 12
Box 2.3 Taking action – acting on the results of food surveys to protect children’s health 15
Box 2.4 The National Poisons Information Service 17
Box 3.1 Reducing radon in the north and the south – examples of local radon programmes 29
Box 4.1 Protecting children for the sun – local initiatives 47
Box 5.1 Noisy Times 59
Box 6.1 Getting the message across – teaching children and young people about food hygiene 66
Box 7.1 Communicating risks – Health and Safety Executive leaflets concerning pregnancy in the workplace 73
Box 8.1 Levels of incident for which the National Health Service is required to develop plans 78
Box 8.2 Emergo-Application Course 79
Box 8.3 Exercise Young Neptune – managing children in major incidents 82

Figures

Figure 2.1 Mean enquiries per age group of total annual enquiries (2001–2006) as recorded by the National Poisons Information Service, United Kingdom 17
Figure 2.2 Total poisoning with fatal outcomes following accidental exposure to noxious substances in England, Wales and Scotland 18
Figure 2.3 Unintentional poisoning with fatal outcome following exposure to noxious substances amongst <1–14 year olds, England, Wales and Scotland, 2000–2005 19
Figure 2.4 Unintentional poisoning with fatal outcome following exposure to noxious substances amongst 15–19 year olds, England, Wales and Scotland, 2000–2005 19
INTRODUCTION

Figure 3.1 Radon affected areas in England, Northern Ireland and Wales 28
Figure 3.2 Average annual exposure of the UK population from ionising radiation (total dose: 2.7 milliSievert) 31
Figure 4.1 Incidence of malignant melanoma in England according to age and sex, 1994–2004 42
Figure 4.2 Incidence of malignant melanoma in 20–24 year olds in England and Scotland 43
Figure 5.1 Noise complaints received by Environmental Health Officers, 1984/5–2004/5 55
Figure 5.2 People reporting hearing noise in the United Kingdom (1999 Questionnaire) 56
Figure 5.3 Percentage of the population throughout the United Kingdom who reported being disturbed by noise 57
Figure 5.4 Daytime noise map for Birmingham City 60
Figure 6.1 Notifications of food poisoning (formally notified and otherwise ascertained) in children and young people in England and Wales, 1997–2006 63

Tables
Table 2.1 Summary results of the WWF Family Biomonitoring Study 16
Table 3.1 Summary of radon measurements in the United Kingdom (January 2007) 28
Table 4.1 Incidence of malignant melanoma (all ages) by sex, England, Northern Ireland, Scotland and Wales, 2000–2004 39
Table 3.1 Upper limits for indoor ambient noise levels and reverberation times for selected school rooms 54
Table 5.1 Agents that employers are specifically required to assess for women of child-bearing age and new or expectant mothers 71
INTRODUCTION

At the Fourth Ministerial Conference on Environment and Health in 2004, the countries in the World Health Organization (WHO) European Region, including the UK, committed themselves to building a healthy future for their children by adopting the Children's Environment and Health Action Plan for Europe (CEHAPE). This was drafted to ensure reduction and, where possible, elimination of children's exposure to environmental risk factors. Individual countries were required to develop national children's environmental and health action plans (CEHAP) the purpose of which being to identify:

- specific environmental risks to children;
- initiatives currently in place to reduce these risks; and
- gaps or areas where work may be directed to continue to reduce or eliminate such risks.

The WHO European Region has identified four Regional Priority Goals (RPGs) relevant to CEHAPE under which specific areas of risk are to be considered. The four RPGs are to: (i) ensure safe water and adequate sanitation; (ii) ensure protection from accidents, injuries, obesity and physical activity; (iii) ensure clean indoor and outdoor air quality; and (iv) aim to reduce exposure to chemical, physical and biological hazards. All of these can contribute to a wide range of health effects such as birth defects, asthma, obesity and cancer. There is a wide range of environmental hazards included in CEHAPE, and the agreed approach is that individual countries should develop plans focusing on the priorities which are most relevant to them.

1.1 Background

Chemical, physical and biological, hazards are experienced in all areas of children's lives. Children can be more susceptible to the risks posed by such hazards than adults due to a number of reasons. For example:

- children’s immunity to biological hazards may be lower than that of adults as a result of their developing immune system and lack of prior exposure to particular micro-organisms;
- there exist critical windows of vulnerability that make children especially susceptible to the effect of particular hazardous exposures (e.g. the effects of lead and mercury on the developing nervous system); and
- children’s exposure to hazards can often be very different to that of adults as a result of their physiology (e.g. children have a higher respiration rate than adults), behaviour (young children often engage in exploratory behaviour and older children spend proportionately more time outdoors than adults) and diet (the diet of children is often different to that of adults).

In the United Kingdom (UK) there is a considerable body of legislation and other mechanisms aimed at controlling such environmental hazards that have resulted in
reduced risks of health effects occurring in the general population, and in children over a number of years. For example, there have been successive changes in legislation regarding lead, reducing levels in petrol, prohibiting it being used in paint, and controlling its use in toys (amongst other control measures). This has resulted in substantial declines in blood lead levels in children, from median values of 23 µg/dl in the 1960’s to 1–3 µg/dl in the 1990s and, as a result, has reduced the risk of the neurodevelopmental effects occurring in children.

1.2 Structure and content of this report

This is one of a series of four papers addressing the individual RPGs. This paper addresses Regional Priority Goal IV: chemical, physical and biological hazards. It presents a comprehensive review of the current situation in the UK. The paper also summarises key legislation in place to support measures aimed at reducing risk and protecting the public (including children) and identifies a number of national, regional and local initiatives which support the achievement of this goal. In so far as data are available, the paper highlights the current situation relating to children and attempts to identify areas where levels of risk are not sufficiently known or addressed. Areas of concern and gaps in knowledge or activity are identified and recommendations on how these gaps may be filled are provided.

This report assesses the current status relating to chemical hazards, ionising and non-ionising radiation, noise and biological hazards. Occupational exposures and emergency preparedness are also considered. Appendix A summarises UK initiatives that address the specific goals of CEHAPE.

Unless specified information presented in this report is applicable to the whole of the UK and, where relevant, issues specific to Devolved Administrations or to local and regional areas, are also highlighted. Legislation references throughout the document may be predominantly sourced from English and Welsh law; however it should be noted that equivalent separate legislation and policy documentation may exist in Devolved Administrations when referring to particular areas.

Whilst every effort has been made to ensure this document is comprehensive, it should be recognised that there are many other activities undertaken throughout the UK at a local, regional and national level as well as internationally (at WHO Europe Member State level), all of which also contribute to meeting the commitments of CEHAPE. Further information on relevant on-going activities and new CEHAPE initiatives aimed at fulfilling the UK’s commitments to CEHAPE will be placed on the HPA’s web page in due course.
2 CHEMICAL HAZARDS

2.1 Introduction

Children are exposed to a variety of potentially hazardous chemicals and man made fibres (e.g. asbestos) in the air they breathe, food and water they consume, in their homes, school, work and play areas. Some of these are naturally occurring, but others are the result of human activities. Harmful exposures to chemicals should always be minimised and prevented wherever possible to ensure that chemical exposures do not have serious effects on children’s health.

Children’s exposure begins at conception; chemicals within the mother’s body may cross the placenta and may affect the growing embryo during critical developmental periods. Pregnant women and young children come into contact with chemicals used indoors (such as cleaning products, paints, cosmetics and other related household consumer products). Infants may be more susceptible to the toxic effects of chemicals due, for example, to the immaturity of enzymes and detoxification pathways involved in the metabolism and elimination of chemicals.

Other factors which effect children’s exposure to chemicals include: children have a higher respiration rate and eat and drink more in proportion to their body weight compared to adults. Children spend extended periods of time outdoors, playing on the ground and floor where chemicals, pesticides and heavy metals are also likely to be present. Young children’s exploratory behaviour leads them to frequently place their hands or other objects in their mouths, making ingestion of and exposure to chemicals more likely. Children are also less aware of the risks around them and are therefore less likely to avoid harmful exposures.

2.2 Legislation

There is a considerable body of legislation and international commitments aimed at protecting human (including child) health from risks posed by chemical exposure in the UK. It is beyond the scope of this document to describe all these in detail. Instead, the following section aims to give a brief overview of the main areas and to highlight legislation aimed specifically at protecting the health of children.

2.2.1 International conventions and protocols

There are a number of international conventions and protocols aimed at protecting human health (including children) from the adverse effects of hazardous chemicals at an international level. The principal protocols and convention under which the UK has commitments are summarised below.

The Rotterdam Convention on the Prior Informed Consent for certain hazardous chemicals and pesticides in international trade is an international agreement to promote shared responsibility and cooperative efforts in the international trade of certain

1 The Rotterdam Convention, available [Feb 2007] at: http://www.pic.int/
hazardous chemicals to protect human health and the environment. The Convention covers 39 chemicals (including asbestos, 1,1,1-trichloro-2-bis-(4-chlorophenyl)ethane (DDT), dieldrin, lindane, mercury compounds, polybrominated biphenyls, polychlorinated biphenyls (PCBs) and some lead compounds), and creates legally binding obligations regarding the Prior Informed Consent procedure. The Convention was ratified in the UK in 2004 and is operated by HSE.

The Stockholm Convention on Persistent Organic Pollutants came into force in 2004 and was ratified by the UK in 2005, and is an international treaty designed to protect human health and the environment from persistent organic pollutants (POPs). Persistent organic pollutants are a group of chemicals that are toxic, persist in the environment, bioaccumulate in adipose tissue, biomagnify throughout the food chain and have the potential to be transported long distances and be deposited far from their initial place of release (e.g. in the Arctic). There are 12 POPs listed in the Convention and these fall into three broad categories:

- pesticides (aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), and DDT);
- PCBs; and
- unintentionally produced combustion by-products (dioxins, furans, HCB and PCBs).

In the UK (and in the EU), measures banning the use of the pesticides covered by the Stockholm Convention are in place and there has been a significant decline in the reported levels of these compounds in the UK (to include different environmental compartments such as soil, water and human tissues). To fulfil the Stockholm Convention commitments, the UK has submitted a draft National Implementation Plan, setting out the steps taken to manage POPs. The plan incorporates the UK Dioxins Action Plan, summarises the current situation regarding POPs in the UK and sets out a number of activities to be taken forward, particularly concerning diffuse sources of POPs.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal is an international agreement which aims to address issues associated with threats to human health and the environment from the movement and management of hazardous wastes. The Basel Convention uses a Prior Informed Consent procedure to control transboundary movements of waste i.e. hazardous waste cannot be shipped from one country to another without the consent of those countries directly affected, including countries of transit. The UK ratified the Convention in 1994.

2 Council Directive 79/117/EEC prohibits the use and retail sale of plant protection products which could have adverse health effects in humans or are harmful to the environment. In 2004 this Directive was amended under Regulation EC 850/2004 which also prohibited the production, use, import and export of these pesticides.
Intergovernmental Forum on Chemical Safety (IFCS)\(^1\) provides an open international forum for discussing issues of common interest and new and emerging issues in the management of chemicals. The Intergovernmental Forum on Chemical Safety has a multi-faceted role as a flexible, open and transparent brainstorming and bridge-building forum for Governments, intergovernmental organisations and non-governmental organisations including the private sector and has facilitated consensus building on issues and actions addressing the sound management of chemicals. The Forum promotes chemical safety as the prevention of associated adverse effects, both short- and long-term, to humans and the environment from the production, storage, transportation, use and disposal of chemicals. The Forum also contributes to the implementation of the Strategic Approach to International Chemicals Management and the work of other chemical related organisations, and, at its last meeting in Budapest in 2006, issued a statement on the chemical safety of toys.

### 2.2.2 Pre-market testing of chemical products

In December 2006 new European regulations (Regulation (EC) No 1907/2006) were published concerning the Registration, Evaluation and Authorisation of Chemicals (REACH) aimed at ensuring a high level of protection of human health and the environment from chemicals. The regulation replaces 40 existing legislative instruments\(^2\) and puts these into a single coherent system focussing on high production volume substances that are of greatest public health concern. A principal objective of REACH is to identify those substances of high concern which need to be authorised. Registration will initially (first 2 years) concentrate on those chemicals produced in the highest amounts (>1000 tonnes per annum (pa)) together with those produced in smaller amounts (but above 1 tonne pa), but already recognised to be of high concern. Substances of high concern are considered to be carcinogens, mutagens, or those toxic to the reproductive system; substances that are persistent, bioaccumulative and toxic; substances that are very persistent, and very bioaccumulative; and substances which cause serious and irreversible effects to humans or the environment. Eventually all 30,000 or so chemicals produced in quantities greater than one tonne pa will need to be registered. This process will be phased in over 11 years.

The regulation, which came into force in the UK on 1 June 2007, will place additional responsibility on industry relating to gathering data and carrying out risk assessments. Though not child specific, risk assessments will take into account vulnerable groups which includes children. The Regulations are overseen at a European level by the European Chemicals Agency; within the UK Defra has overall responsibility for the regulations and the HSE, and its counterpart in Northern Ireland, are nominated as the UK Competent Authority.

Chemicals that have an intended biological activity (e.g. medicines, pesticides, etc) also need to be tested prior to these being placed on the market to ensure their safety and

---

\(^1\) The Intergovernmental Forum on Chemical Safety (IFCS) available [Feb 2007] at: http://www.who.int/ifcs/en/

\(^2\) Including the ‘new’ (Directive 92/32/EEC) and existing (EEC Regulation No 793/93) substances regulations
efficacy. Whilst not specifically aimed at children, toxicological tests required to comply with relevant regulations normally include reproductive and developmental toxicity testing of the active substance, and the risks to children may be considered specifically where data indicates that children may be a susceptible group within the general population.

2.2.3 Chemical control in products

A number of regulations are in place to control chemicals in consumer products, largely implementing EU legislation. These aim to ensure that products placed on the market are safe and that appropriate information is provided for consumers to assess the risks associated with a product. Authorities also have the power to issue a ‘withdrawal and/or recall notice’ requiring manufacturers to withdraw a product from the market if it presents a serious health risk and to organise for its recall from consumers where necessary.

A number of chemicals in consumer products and child products have been restricted or banned under the Dangerous Substances and Preparations (Safety) Regulations 2006 (SI 2006, No. 2916). In particular, the regulations prohibit, place limits or strictly restrict the use/sale of substances that are classified as Category 1 or 2 carcinogens, mutagens or developmental or reproductive toxicants under Schedule 2 of the Chemical (Hazard Information and Packaging for Supply) Regulations 2002 (SI 2002, No. 1689). The regulations also specify a number of other requirements, including prohibiting the use of:

- benzene in toys;
- tris (2,3-dibromopropyl) phosphate, tri(aziridin-1-yl) phosphine oxide and polybrominated biphenyls in children’s textile articles;
- chlorinated solvents in consumer products;
- ornamental objects, tricks, jokes or games which contain liquid substances or preparations ‘dangerous for supply’;
- toluene, adhesives or spray paints containing toluene; and
- six phthalates in toys and childcare articles due to concerns regarding their absorption and long-term impact on children’s health (which implements Directive 2005/84/EC).

The Toy Safety Regulations 1995 specifically regulate the safety of toy products and is primarily aimed at protecting the health of children (SI 1995, No. 204). The Regulations require that toys do not contain dangerous substances or preparations in amounts that

---


3 The main provisions of the regulations come into force on 4 December 2006, with those concerning Schedule 2 substances, phthalates and toluene coming into force at various dates until 24 August 2007

4 Di-iso nonyl phthalate, di (2-ethylhexyl) phthalate, dibutyl phthalate, di-iso-decyl phthalate, di-n-octyl phthalate and butylbenzyl phthalate
may harm the health of children using them, and prescribe bioavailability limits for eight heavy metals in toys, including arsenic, cadmium, lead and mercury.

Other legislation relevant to children are summarised below:

- Levels of N-nitrosamines and N-nitrostable substances in elastomer or rubber teats and dummies are restricted (SI 1995, No. 1012)
- Appropriate labelling of all chemical products and preparations according to their physiochemical properties (i.e. explosive, oxidising and flammability) and health effects (toxic, corrosive, irritant, harmful, dangerous for environment). Substances or preparations considered dangerous for supply must carry a warning of danger and must be suitably packaged. For certain chemicals or preparations supplied to the public, the packaging must be fitted with a child resistant closure to prevent young children swallowing the contents (SI 2002, No. 1689).
- Pharmaceutical preparations containing aspirin, paracetamol (and elemental iron at concentrations greater than 24 mg), need to be packaged in child resistant packs and solid dose preparations exclusively for administration to children have to be coloured white (SI 2003, No. 2317).
- Restrictions are in place on the marketing, supply and use of leaded paint for the restoration or maintenance of historic buildings, scheduled monuments or works or art only (SI 2006, No. 3311). The regulations also restrict the use of a wide range of other chemicals in a variety of different areas, aimed at protecting human health and the environment, including arsenic, cadmium, mercury, polyaromatic hydrocarbons, organostannic compounds, pentachlorphenol, nonylphenol and nonylphenol ethoxylate.
- Restrictions are in place on the import, supply and use of all forms of asbestos, including upholding the ban introduced for blue and brown asbestos in 1985 and for white asbestos in 1999 (SI 2006, No. 2739).
Box 2.1 Controlling lead to protect children’s health

Lead has been recognised as a hazard to the neurodevelopment of children for many years and, as a result, legislation and initiatives have been implemented to control lead in the environment and protect children’s health. The principal initiatives and legislation are highlighted below:

**Banning lead in petrol** - *The Motor Fuels (Composition and Content) Regulations 1999* – this brought in a ban on the use of lead as an additive in petrol.

**Controlling lead in paint** – restrictions on the use of lead in paint have been in place in the UK since 1927 when the UK Lead Paint Regulations were introduced, although leaded paint was used in dwellings until the 1960s. The Environment Protection (Controls on Injurious Substances) Regulations 1992 banned the use of lead in paint in UK. This has since been superseded by the Controls on Dangerous Substances and Preparation Regulations 2006.

Paint containing lead still remains in some properties today. The Department for Environment, Food and Rural Affairs have published advice and a leaflet on their website providing guidance to householders on what to do if they may have lead paint in their homes. Additionally, the Housing Health and Safety Rating System highlights lead as a potential hazard in dwellings and gives local authorities powers to require owners of the property to remediate lead hazards (principally lead in paint or lead water pipes) which would present a hazard to children under 3 years of age.

**Lead in toys** – *The Toy Safety Regulations 1995* restrict the use of lead in toys.

**Lead in food** is controlled through the *Contaminants in Food Regulations 2007*.

**Other sources of lead** include lead in water pipes and contaminated land. Regulations are in place to reduce the health risks from lead exposure from contaminated land; when undertaking site specific risk assessments in contaminated sites, children (aged 6) are considered to be the most vulnerable group.

2.2.4 Chemical control in buildings

Legislation aimed to protect human health from chemical hazards in and around buildings includes taking reasonable precautions to avoid danger caused by contaminants on or in the ground and any land associated with the buildings (ODPM, 2004). The Building Regulations apply to all ‘building work’ in England and Wales and require that, where necessary, a risk assessment should be carried out to ensure the safe development of the land (ODPM, 2004). Whilst children are not mentioned specifically, the risk to children from contaminants would be assessed where appropriate. Similarly, the Scottish Building Regulations require that harmful and dangerous substances are made safe such that they will not be a threat to the health of people in or around the building. Similar provisions also apply in the Northern Ireland Building Regulations.

The Housing Health and Safety Rating System (England) Regulations 2005 (SI. 2005, No. 3208) provides a risk assessment tool to assess the health and safety of occupants in residential dwellings. The regulations include that the risk from asbestos (and man-made mineral fibres), biocides and lead are assessed and that specific consideration is given to the most vulnerable age group. In particular, for lead, children under 3 years of age are considered to be the most vulnerable group, and, hence, risk assessments are aimed at protecting children specifically (DCLG, 2006).

The Control of Asbestos Regulations 2006 (SI 2006, No. 2739) applies to asbestos in non-domestic premises (including schools) and place a duty on those responsible for the maintenance and/or repair of the premises to identify whether the premises contain asbestos, to assess its condition and to prepare a written plan to manage it properly so
to protect the health and safety of employees. In particular, the HSE has issued specific guidance to schools in England and Wales highlighting the key issues that schools should be aware of concerning asbestos.\(^1\) The Department for Education and Skills has routinely required condition surveys to be conducted of school premises as part of their Asset Management Planning guidance and that the findings of the condition assessment are recorded in the schools Asset Management Plan, with the need for any further testing and remedial work being linked to the school’s maintenance programme (DfEE, 2000). As part of the condition assessment, priorities are allocated according to the seriousness of the condition revealed and the urgency associated with any breaches of legislation. The presence of friable asbestos would be considered urgent work.

### 2.2.5 Chemical contaminants in food

Chemical contaminants in food are controlled largely through implementing EU Directives and Regulations. In the UK a large body of legislation exists controlling chemical contaminants in food, a summary of this is provided in Appendix 1; where there is legislation that is specific to England, analogous legislation also applies to each of the Devolved Administrations, although there may be regional differences.

A number of pieces of legislation concerning chemical contaminants in food consider children specifically, these are highlighted below:

- The Contaminants in Food Regulations 2007 sets maximum levels for a range of contaminants in foodstuffs, including specifically for infant formula and other infant foodstuffs. Some standards are also set on the basis that infants or young children are the most vulnerable group;
- The Infant Formula and Follow-on Formula Regulations 1995 (as amended) set maximum residue limits for pesticides in infant formula and follow-on formula; and
- The Processed Cereal-Based Foods and Baby Foods for Infants and Young Children Regulations 2003 prohibit the sale of such foods if the foods contain pesticide residues above certain specified levels.

### 2.2.6 Chemicals in the environment

Emissions from industrial installations are controlled by the Integrated Pollution Prevention and Control (IPPC) system, which aims to ensure a high level of protection for the environment as a whole (which includes health) in an integrated manner.\(^2\) As such, emissions to air, water, land and other environmental effects are considered together. As part of the process of determining an application for a permit, the Regulator must consult with a number of Statutory Consultees, including those with responsibility for public health, and must consider their views before issuing a permit. In formulating a public health opinion, consideration may be given to sensitive members of the

---


population or key receptors, which may include children or schools likely to be affected by the installation.\textsuperscript{1} Further information on IPPC is presented in O’Connell et al. (2007).

The contaminated land regime (Part IIA of the Environmental Protection Act 1990) provides a risk based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment. Children are given consideration within the regime in that in assessing the risks from contaminants, the potential exposure to children (aged 6) living and playing and consuming locally grown vegetables on such sites are assessed. Similar legislation will be introduced in Northern Ireland.

The Hazardous Waste (England and Wales) Regulations 2005 and the List of Waste (England) Regulations 2005 control and track the movement of hazardous waste within England and Wales (similar legislation applies in Northern Ireland and Scotland). Hazardous waste is defined on the basis of the properties of the waste and whether it is harmful to human health and covers a wide range of chemicals or chemical residues. Premises producing hazardous waste are notified to the relevant environment agency\textsuperscript{2} annually and inspected at appropriate intervals to ensure that hazardous waste is handled properly. The Environmental Protection (Duty of Care) Regulations 1991 place a duty on those producing hazardous waste to ensure it is produced and handled safely. Additionally, waste must be transferred to a registered carrier or licensed waste manager.

Polychlorinated biphenyls were employed in a wide range of applications (such in electric transformers and capacitors, as additives in paint, and in sealants). Some PCBs can exhibit similar biological activity to dioxins, and are known as dioxin-like PCBs. The sale of PCBs for use in ‘open applications’ was prohibited in the UK in 1972 and subsequent manufacture and use in new plant equipment was prohibited from 1986 (SI 1986, No. 902). However, a reservoir of PCBs still remain in use or may have been disposed of (historically) into landfills. Measures have been taken to minimise the impact of these compounds and PCBs must now be adequately disposed of and phased out no later than 2010 (SI 2000, No. 1043). The environment agencies hold registers of all remaining PCB holdings in the UK.

2.2.7 Chemicals from occupational environments
All employers have duties under the Health and Safety at Work Act to assess the risks to employees, self-employed people and the public from hazards in the workplace and this includes chemical hazards arising from work.\textsuperscript{3}

\textsuperscript{2} The Environment Agency in England and Wales, the Scottish Environment Protection Agency in Scotland, and the Environment and Heritage Service in Northern Ireland
\textsuperscript{3} e.g. The Control of Substances Hazardous to Health (COSHH) Regulations 2002 (SI 2002, No. 2677), as amended, specifically requires that the risk to people’s health from hazardous chemicals is assessed and that appropriate action is taken to prevent or adequately control exposure.
The Department for Children, Families and Schools (DCFS)\(^1\) has published specific guidance concerning asbestos in schools.\(^2\) Whilst much of it deals with asbestos in buildings (see above) the guidance incorporates advice given by the Health and Safety Commission’s Working Group on Action to Control Chemicals (WATCH) at their February 2006 meeting concerning the practice in schools of pinning, stapling and tacking display materials to boards that might contain asbestos.\(^3\) The guidance advises that the practice might result in a small but significant amount of asbestos fibres being released, resulting in low levels of exposure to teachers (and pupils), and recommends that such activities should cease as they are avoidable. Whilst primarily concerned with the health of teachers, WATCH did give consideration to the exposures of children, noting that they are likely to be lower than that of teachers.\(^4\) The guidance from DCFS also deals with accidental exposure to asbestos (e.g. as a result of building work) and the need to be open and inform parents about the level of risk posed should accidental exposure occur.

2.2.8 Local authorities
Local authorities have a varied and important role in controlling chemical hazards at a local level. Box 2.2 outlines some of the principle ways local authorities have responsibility for the control of chemical hazards.

\(^1\) Formerly the Department for Education and Skills
Box 2.2 Getting local – Local authority involvement in controlling chemical hazards
Local authorities have a central role in controlling chemical hazards, particularly in the community. Their responsibilities range from enforcing health and safety standards in dwellings to dealing with contaminated land within their region. Many of these issues are not children specific, but can be of relevance to children, particularly in environments such as schools and the home. Below are examples of areas where local authorities have responsibility for relating to chemicals.

Trading standards – Local Authority and District Council (in NI) trading standards are responsible for enforcing laws relating to the safety of goods. Trading standards officers respond to complaints by the public and carry out routine surveys to ensure product safety. Examples of ensuring chemical safety include enforcing the law on toxic metals, such as lead, in toys.

Food law enforcement falls within the responsibility of local Environmental Health Officers. This includes chemical safety and, as necessary, local authorities will carry out surveys of food products to ensure that they comply with national legislation.

Housing health and safety rating system covers a number of chemical hazards in domestic premises including lead in paint, volatile organic compounds in air and the use of biocides in the home. Enforcement of the regulations is undertaken by local authority Environmental Health Officers who have powers to investigate any property that comes to their attention.

Contaminated land – Local councils are responsible for implementing the contaminated land regime in their areas.

Integrated Pollution Prevention Control – Local authorities have responsibility for the authorisation of smaller installations’ emissions to air, water and land (category A2 installations) and smaller installations of limited polluting potential (category B installations), which are regulated under local authority IPPC and local authority Pollution Prevention and Control regimes, respectively. In Scotland, these installations are regulated by the Scottish Environment Protection Agency. In Northern Ireland there are three categories of industrial process (A, B and C). The Environment and Heritage Service regulates category A (potentially the most polluting) and B processes, and Local Authorities regulate category C processes.

2.3 Current status

2.3.1 Exposure to chemical contaminants
There appear to be limited data available regarding children’s exposure to chemicals in the UK from consumer products, the environment and in the home and although there is comprehensive legislation in place to reduce risks, potential exposure to chemicals in the environment such as lead, mercury and other heavy metals remain a concern. Indoor air quality and contaminated land are particular areas of interest.

2.3.1.1 Chemicals in consumer products and the environment
Consolidated statistics on the chemical safety of consumer products were not identified. However, surveys of consumer products and toys are routinely carried out by Trading Standards Departments of local authorities. Where these indicate a problem with the chemical safety of a product, local authorities have powers to require retailers to remove these products from sale and, if necessary, instigate a product re-call.

2.3.1.2 Chemical contaminants in breast milk and food
There have been several studies looking at contaminants in breast milk. The most recent of these took place in 2001, the SUREmilk study, carried out by the University of Leeds and funded by Defra, DH, the FSA and HSE. The study’s primary aim was to look at whether a national breast milk archive could be established and to verify the suitability of breast milk samples for analysis, the researchers analysed breast milk for various environmental pollutants, including dioxins and dioxin-like PCBs, organochlorine...
pesticides, phthalates and heavy metals (aluminium, antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, tin and zinc; Woolridge et al., 2004).

The results of the study were reviewed by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT). The Committee noted that the results could not be assumed to be representative of the UK population, but that some conclusions could be drawn from the data. In particular, the Committee noted that the data seemed to indicate that intakes of dioxins and dioxin-like compounds had decreased by over 50% since a previous study in 1993/94, although levels still exceed the Tolerable Daily Intake (TDI). The decline in dioxins and dioxin-like compounds in breast milk is expected to continue to fall, although the FSA are unable to predict when body burdens in women will fall to a level at which the exposure of breast-fed babies is below the TDI. The Committee also concluded that the estimated intakes of metals and other elements in the breast milk samples did not raise toxicological concerns and that, although intakes of HCB by some breast-fed babies may be higher than desirable, the short period over which the TDI is likely to be exceeded would be unlikely to result in adverse effects. Overall, the COT concluded that the new data did not suggest any reason to alter Government advice that breast-feeding should continue to be encouraged and recommended that monitoring of contaminants in breast milk should continue, particularly for HCB, dioxins, PCBs and brominated flame retardants.

A further study of polybrominated diphenyl ethers (PBDEs) and chlorinated paraffins in breast milk was undertaken between late 2001 and early 2003 (Kalantzi et al., 2004). The survey looked at breast milk samples from 54 women from southeast (London) and northwest (Lancaster) England and analysed the samples for 15 PBDE congeners, 15 PCBs and other selected chlorinated compounds. The study found levels of contaminants that were a similar order of magnitude to those found in the SUREmilk study. Comparison of levels with previous studies showed that levels of total PCBs, \( p,p' \)-DDE, HCB and \( \beta \)-HCB have been falling in breast milk for sometime, although breast milk samples from London tended to exhibit higher geometric mean levels for all contaminants analysed compared with Lancaster samples.

The COT have also considered the issue of phytoestrogens in food and health and specifically considered the impact on the health of infants fed soy based infant formulae (COT, 2003). The Committee concluded that the available studies did not provide definitive evidence that phytoestrogens can adversely affect the health of infants. However, the Committee also expressed concern about the use of soy-based infant formulae and recommended that the DH review its advice on the use such formulae.

Pesticide residues are monitored in a wide range of foods under an on-going surveillance programme coordinated by the Pesticide Residues Committee (PRC). Between 2000 and 2006 the surveillance programme included 979 samples of infant

---

and baby foods and infant formula. Of these only 9 samples (0.1%) exceeded 0.01 mg/kg (the Maximum Residue Level (MRL) in force from July 2002), though 8 of these exceedances occurred before the regulatory limit came into force. In all cases, the exceedances were reviewed by the PRC and no concerns for infant health were identified. Additionally, pesticide residues are monitored every school term in fruit used for the School Fruit and Vegetable Scheme (Wyke et al., 2007). Between summer 2001 and 2006, 924 pieces of fruit were sampled of which 10 (1.1%) contained pesticide residues above the MRL. The Pesticide Residues Committee reviewed the results and found that none of the residues would give cause for concern for children’s health.

Veterinary medicine residues are also routinely monitored in produce from animals intended for human consumption in the UK, in accordance with Council Directive 96/23/EC. In 2001 and 2002 the non-statutory surveillance programmes included baby foods containing chicken, lamb and pork, as foods consumed by susceptible groups (VRC, 2002 & 2003). The baby foods were analysed for a range of veterinary medicines and all samples analysed contained no residues above the reporting limit.

The Food Standards Agency commission regular surveys looking at chemical contaminants in food and chemical contaminants from food contact materials and articles. In assessing the risks from contaminants in food, children and young people are given specific consideration in that exposures are routinely calculated for these age groups based on age-specific consumption data. Examples of recent surveys that have specifically focused on children include surveys of metals in weaning foods and formulae for infants, polycyclic aromatic hydrocarbons in baby foods and infant formulae, dioxin and dioxin-like PCBs in baby food and a survey of baby foods for mycotoxins. Of these surveys, none found levels of contaminants that would be of concern to the health of babies or infants. Examples of surveys that have resulted in direct action are given in Box 2.3.

Box 2.3  Taking action – acting on the results of food surveys to protect children’s health

Both the Food Standards Agency (FSA) and local authorities conduct surveys of chemical contaminants in foods to ensure their safety. Whilst the FSA surveys are for information gathering purposes and monitoring, the FSA liaises with enforcement authorities, and vice versa. If a food safety problem is identified and survey results are made available prior to publication to ensure that follow-up action can be taken where appropriate. Below are examples of action taken to protect child health as a result of recent food surveys.

Lead in Calabash Chalk

In 2002, local authorities in the London Borough of Greenwich identified that a morning sickness treatment, known as Calabash chalk, contained high levels of lead that posed a risk to the neurodevelopment of the foetus. As a result of the survey, the FSA issued advice to pregnant and breastfeeding women not to eat the product. A Food Hazard Warning was also issued to all local authorities in England, Scotland and Wales requesting them to visit premises where the product was likely to be sold and to seek that the retailer surrender the product to them for further analysis. Where samples exceeded 1 mg/kg of lead, local authorities were advised to consider the product unfit for human consumption and seize it under the Food Safety Act 1990. Additionally, advice was provided to all Directors of Public Health and Medical Directors of NHS Trusts for forwarding to all General Practitioners, Directors of Nursing, Maternity Units and Heads of Midwifery highlighting the problem and advising them to advise patients not to use the product.

Mercury in fish and shellfish

The FSA commissioned a survey of mercury in fish and shellfish (between September 1999 and February 2002).¹ The results of the survey were reviewed by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment, who noted that consumption of one portion per week of marlin, shark or swordfish would result in a dietary methylmercury exposure close to or above the Permissible Tolerable Weekly Intake and that this could be harmful to the foetus, women who are pregnant, and women who are likely to become pregnant in a year.² The Committee also considered that pregnant women should limit their intake of tuna. As a result, the FSA issued advice that pregnant women and those under 16 avoid consumption of marlin, shark or swordfish and that pregnant women limit their consumption of tuna to protect against potential neurodevelopmental effects in the foetus and infant.

2.3.1.3  Chemical contamination in the indoor environment

The majority of non-occupational exposure to dioxins and PCBs is considered to occur through the diet (Duarte-Davidson & Jones, 1994, Harrad et al., 2003), though dietary intakes have fallen in recent years (FSA, 2000). There are increasing indications that indoor air remains contaminated where PCBs are still used in household applications (e.g. elastic sealants or acoustic ceiling tiles) and therefore inhalation of indoor air constitutes an important exposure pathway, a fact compounded by the downward trend in dietary intake of these compounds (Harrad et al., 2006).

2.3.1.4  Biomonitoring

Only a few UK studies on biomonitoring studies have included children. There have been a number of blood lead surveys in the UK. The most recent large surveys took place in the mid-1990s, one of which was a component of the Health Survey for England in 1995 and the other which was part of the Avon Longitudinal Study of Parents and Children (ALSPAC) Study. The Health Survey for England looked at blood lead in nearly 7000 people of whom 320 were aged 11–15 years of age. The mean blood lead level in these children was 2.2 µg/dl and none of the children had blood lead levels above 10 µg/dl (the level above which blood lead is considered to be abnormal; Primatesta et

The ALSPAC study looked at 584 children aged 2½ years in 1995 and found that the mean blood lead was 4.2 µg/dl (median: 3.3 µg/dl) and that 11% of children had blood lead levels greater than 10 µg/dl (Golding et al., 1998). The study found that whilst the blood lead levels were lower than in previous studies, some high levels were identified. Overall, these blood lead levels represented a decline in blood lead over the 20 years previous to the studies (Delves, 1998).

In 2004, the campaign group WWF undertook a biomonitoring study of seven families, including 14 children, from across the UK. The study looked at 104 pollutants: 12 organochlorine pesticides, 44 PCBs, 33 brominated flame retardants, 8 phthalates, and 7 perfluorinated chemicals. The results are summarised below (Table 2.1).

<table>
<thead>
<tr>
<th>Chemical group</th>
<th>Number of children in which chemical were detected (n=14)</th>
<th>Total concentration range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phthalates</td>
<td>11</td>
<td>0–1171 ng/g whole blood</td>
</tr>
<tr>
<td>Organochlorine pesticides</td>
<td>14</td>
<td>14.9–342.5 ng/g lipid</td>
</tr>
<tr>
<td>Polychlorinated biphenyls</td>
<td>14</td>
<td>17.7–776.1 ng/g lipid</td>
</tr>
<tr>
<td>Polybrominated diphenyl ethers</td>
<td>14</td>
<td>5.6–63.8 ng/g lipid</td>
</tr>
<tr>
<td>Perfluorinated chemicals</td>
<td>9</td>
<td>0–150 ng/g whole blood</td>
</tr>
</tbody>
</table>


Whilst some children had measurable levels of some of these chemicals in their blood, the levels detected were low. The small sample size means that it is difficult to know whether the results are representative of all children in the UK. There was also only limited information on the children’s exposures to specific chemicals.

### 2.3.2 Health impacts of hazardous chemicals

#### 2.3.2.1 Unintentional poisonings

Widespread introduction of Child Resistant Containers (CRCs), increased use of blister packaging and introduction of new packaging materials are factors which may have contributed to the reduction in mortality and morbidity from poisoning by pharmaceutical and household products in the <5 age group. Wiseman et al. (1987) reported medications involved in suspected poisoning were most frequently packed in containers without CRCs (63%) or involved transparent blister packs (23%) as both had high Accident Association Indexes (AAI). However, CRCs, strips, sachets and opaque blister packs had low AAIs.

Flanagan et al. (2005) analysed death certificates due to poisoning in England and Wales from 1968–2000 in children aged <10. Overall the number of deaths fell from 169 (20.6 per million children) in 1968 to 30 (4.6 per million children) in 2000, a decline of 82%. Specifically, the <5 years old age group experienced the biggest decline in death rates. Flanagan et al. (2005) concluded that the marked decrease in fatal poisoning in children in England and Wales since 1968–2000 together with the decrease in poisoning-related hospital admissions confirms the overall success of initiatives aimed at improving safety in the home.

The pattern of accidental poisoning in children is largely determined by medication availability, but is also influenced by current prescribing patterns, as well as the
regulatory context that determines packaging (especially the use of CRCs) and storage of potentially toxic substances. For example, there was a 90% overall decline in salicylate (aspirin) deaths from 1964–1974 as paracetamol increased in popularity and was prescribed as an alternative to salicylate analgesics (Fraser, 1987).

Young children (aged 5 years or below) consistently account for the second highest proportion of all enquiries to the National Poisons Information Service (NPIS; Box 2.4). Figure 2.1 shows that children under 5 accounted for a mean average of 26% of all enquiries from 2001–2005/06 throughout the UK.

Box 2.4 The National Poisons Information Service

The National Poisons Information Service is a clinical toxicology service for health care professionals working in the National Health Service, and is commissioned by the Health Protection Agency. The Service consists of a network of units across the UK, providing information and advice on the diagnosis, treatment and management of patients who may have been accidentally or deliberately poisoned.

National Poisons Information Service units also provide information to government agencies such as the Medicines and Healthcare products Regulatory Agency, Department for Environment Food and Rural Affairs, Pesticides Safety Directorate; contribute to undergraduate and postgraduate teaching; provide training courses for nurses, doctors, NHS Direct/NHS 24 staff and other medical professionals and carry out research in the field of clinical toxicology and poisons information.

Figure 2.1 Mean enquiries per age group of total annual enquiries (2001–2006) as recorded by the National Poisons Information Service, United Kingdom

Call enquiries regarding children aged <5 are as a result of unintentional poisoning. Average admissions for children aged 0–14 years due to poisoning by drugs and medicaments and biological substances from 2003–2005 was 8.5% of all hospital episodes (2003/04–2004/05).\(^1\)\(^2\) Average admissions in children aged 0–14 years due to


toxic effects of substances chiefly non-medicinal as to source accounted for 26% of hospital episodes.

Regarding accidental poisoning or exposure to noxious substances (which includes pharmaceutical preparations and narcotics) from 2000–2005, 15–19 year-olds consistently account for higher proportions of deaths.

**Figure 2.2** Total poisoning with fatal outcomes following accidental exposure to noxious substances in England, Wales and Scotland

![Figure 2.2: Total poisoning with fatal outcomes following accidental exposure to noxious substances in England, Wales and Scotland](image)

Pharmaceutical preparations and narcotics are chiefly responsible for fatal unintentional poisoning in England, Scotland and Wales (Figure 2.3 and 2.4).

Deaths following unintentional poisoning and exposure to opiates and narcotics were responsible for the highest proportion of unintentional deaths in the <1–14 year-old age group, accounting for 27% of 105 deaths from 2000–2005 in this group (Figure 2.3). Other unspecified pharmaceutical preparations were responsible for 23% of deaths, and antidepressants accounted for 17% of deaths following unintentional poisoning or exposure to noxious substances from 2000–2005. It is likely that the deaths resulting from exposure to these agents could be a result of improper storage in and around the home.
Unintentional poisoning and exposure to opiates and narcotics were again responsible for the highest proportion of deaths in the 15–19 year-old age group, accounting for 46% of 337 deaths from unintentional poisoning or exposure to noxious substances from 2000–2005. Other unspecified pharmaceutical preparations were responsible for 27% of deaths, and antidepressants accounted for 14% of deaths (Figure 2.4).
There are significant variations between hospital admission rates for unintentional poisoning and deprivation. Amongst 0–4 year old children hospital admission rates for medicinal poisoning (particularly psychotropic medicines) have been found to be 2–3 times higher for children living in the most deprived areas compared with the least deprived; for non-medicinal poisonings admission rates are about twice as high (Groom et al., 2006).

2.3.2.2 Chronic health effects

Limited information is currently available concerning the health impacts that long-term, low-level exposures to chemicals on the foetus, infants, children and young adults may have in the UK population. A number of recent studies are summarised below.

Several studies have considered the health risk of living near landfill sites. For example, one study examined the risk of living near the Nant-y-Gwyddon landfill site in Wales (Fielder et al., 2000). The study looked at a number of measures of reproductive health and identified an increased risk of congenital malformations, which predated the opening of the landfill site, and a cluster of gastroschisis that post-dated the opening of the site. A national study of the risk of adverse birth outcomes has also been undertaken (Elliot et al., 2001). The study looked at the risk of adverse birth outcomes in populations living within 2 km of 9565 landfill sites operational between 1982 and 1997. The study found a small excess risk of congenital anomalies and low and very low birth weight in populations living near landfill sites. The risks did not differ systematically between hazardous and non-hazardous waste sites. The authors concluded that no causal mechanisms were available to explain the findings. A similar study was conducted in Scotland and found no increased risk of congenital abnormalities or low birth weight in populations living near landfill sites. The risks did not differ systematically between hazardous and non-hazardous waste sites. The authors cautioned that causal inferences were difficult because of possible study bias.

The issue of the health outcomes of populations living around landfill sites was considered by the COT.¹ The Committee commented on a number of difficulties in interpreting the data and drawing firm conclusions from this study about the possible health effects of landfill sites. Nevertheless, they felt that the finding of a risk ratio of 1.07 for congenital abnormalities overall for populations living around hazardous waste sites, whether or not it is related to the presence of the landfill sites, merited further investigation. A Government funded research programme to further investigate this issue was initiated and is currently on-going.²

The Committee on Carcinogenicity (COC) have recently reviewed childhood cancer incidence in the UK and whether there is any evidence of a possible chemical aetiology

---

(Committees on Toxicity, Mutagenicity and Carcinogenicity of Chemicals in Food, Consumer Products and the Environment, 2006). Four childhood cancers were identified as being relevant for further consideration (central nervous system tumours, acute lymphocytic leukaemia (ALL); germ cell tumours and neuroblastomas). All four types of tumour showed an upward trend in incidence, although only for ALL was there considered to be to some extent a true increase in incidence. Overall, the COC considered that the evidence for a chemical aetiology for these tumours was weak.

2.4 Current and planned initiatives

2.4.1 National initiatives

The United Kingdom Chemicals Strategy (DETR, 1999b) aims to:

- phase out chemicals posing an unacceptable risk to human health or the environment as soon as possible, and
- reduce as far as possible the risks posed by chemicals that are essential to our everyday lives.

Key elements of the strategy include a precautionary approach, voluntary agreements with industry and establishing the UK Chemical Stakeholders Forum (UKCSF), which was set up in 2000, and is supported by the Advisory Committee on Hazardous Substances. Since being established the UKCSF has sought to advise Government on how industry should voluntarily reduce the risks from hazardous chemicals to the environment and to human health through the environment. So far the Forum has issued statements on only a few chemicals, 1 proposing actions that industry should take to reduce the risks from the chemicals concerned. In 2004, the work of the UKCSF was reviewed and an approach of looking at groups of chemicals implemented to speed up the review process. Work in progress includes a number of chemical groups of specific interest with regards to children, including brominated flame retardants and some phthalates.

The Home Information Pack Regulations 2006 (SI 2006, No. 1503) – these come into force on 01 August 2007 and require homeowners in England and Wales to produce a Home Information Pack before putting up their home for sale (initially this will apply only to owners of properties with four or more bedrooms). Of the mandatory searches required, the pack must specify whether records indicate that the property (or land adjacent to it) is subject of a contaminated land notice, included in a register made under section 78R of the Environmental Protection Act 1990, or is subject of a consultation (under section 78(3) of the Environmental Protection Act 1990) regarding serving of a remediation notice.

National curriculum – Non-statutory guidance for the Personal, Social and Health Education (PSHE) element of the National Curriculum suggests that at Key Stage 1 (5–7 year olds) children are taught that all household products, including medicines, can be

1 These are hexabromocyclododecane; nonylphenols, octylphenols and their ethoxylates; and medium chain chlorinated paraffins
harmful if not used properly. The curricula in other parts of the UK also include safety as a topic.

Single Integrated National Control Plan – Under EC Regulation 882/2004 each Member State is required to prepare a three to five year national control plan describing the national food and feed, and animal health and welfare control arrangements and setting out objectives and priorities (see Section 5.2.1.5 for more details). The plan for the UK was published in 2006 and includes limiting and monitoring the risks to consumers from chemical and radiological contamination. Whilst not specifically aimed at children the plan is likely to be of benefit to children as part of the general population.

Voluntary actions

There are a number of voluntary initiatives on-going in the UK aimed at reducing emissions of chemicals, improving safety and at protecting human health and the environment. Whilst not primarily aimed at children, they may nonetheless be of benefit to children and contribute to the CEHAPE commitments. Examples of such actions include schemes such as Responsible Care©, operated by the Chemical Industry Association, which encourages member companies to exceed their legal obligations and participate in voluntary and Government initiatives; and the Voluntary Emissions Control Action Programme, which aims to reduce emissions of deca-BDE in the textile and plastics industry.

2.4.2 On-going Research

There are a number of on-going research projects looking at the effects of chemical exposure on children in the UK, or which have a UK component. Though not necessarily comprehensive, the principal projects identified are highlighted below.

Assessment of caffeine consumption, altered caffeine metabolism and pregnancy outcome – this study aimed to explore the links between caffeine intakes and increased risk of spontaneous miscarriage and low birth weight. The study aimed to link accurate estimates of caffeine intake, inter-individual variations in caffeine metabolism and pregnancy outcome and, in doing so, help reduce uncertainties in the current risk assessment and provide a robust basis for advice to pregnant women on caffeine consumption. This study was carried out in Leeds and Leicester and was completed in mid-2006. Caffeine consumption during pregnancy was determined by measuring caffeine and its metabolites in urine and saliva, in conjunction with information from a specially designed caffeine assessment questionnaire and diet recalls.

**NewGeneris Project**\(^1\) – is an EU Framework 6 funded project aimed at investigating the effect of pre-natal and early life exposure to genotoxic chemicals in the development of childhood cancer and immune disorders. The study cohort will be derived from five existing Biobanks, mainly consisting of mother-child pair, across the EU and three new Biobanks, one of which will be from the UK (the UK Women’s cohort and the Bradford Multiethnic Longitudinal Birth Cohort, respectively). The study will use a combination of biomarkers, questionnaire data and health data to elucidate the potential effects of the exposures of interest.

**The Avon Longitudinal Study of Parents and Children**\(^2\) – aims “…to understand the ways in which the physical and social environment interact, over time, with the genetic inheritance to affect the child’s health, behaviour and development”. The study includes 14,000 children born in 1991 and 1992 for which a broad range of data have been collected through questionnaires, physical assessments, biological samples and environmental measurements. A number of sub-studies have focussed on issues concerning chemicals, including looking at antimony exposure and Sudden Infant Death Syndrome, pesticides and use of household chemical products. The study is on-going and provides a resource for other studies.

**Investigation of gastrointestinal effects of organophosphate/carbamate pesticide residues in young children** – this project aims to establish background levels of organophosphate and carbamate biomarkers in urine and faecal samples from approximately 100 children in the Sheffield area and determine whether there are links with gastrointestinal effects and the influence of diet on exposure. The project is funded by Defra and undertaken by the Health and Safety Laboratory and is due to be completed in 2007.

**Placental uptake and transfer of environmental chemicals relating to allergy in childhood years**\(^3\) – this EU funded project aims to determine whether there is a link between exposure of the foetus to environmental pollutants and the development of allergies in early childhood. The project is being undertaken by a number of EU partners, and is being coordinated by Bristol University in the UK, and will involve the analysis of placental tissue to determine maternal exposure to selected environmental pollutants. It is not clear whether any of the study participants will be from the UK.

### 2.5 Gaps and areas for concern

Good legislation and a wide range of initiatives are in place in the UK to protect the public (including children) from environmental exposure to chemicals. As a consequence of this, there have been measurable decreases in exposure to chemical contaminants, such as a decline in blood lead levels in children and of other contaminants in breast milk. Additionally, children are now often specifically considered

---


\(^3\) University of Bristol (200x) *Placental uptake and transfer of environmental chemicals relating to allergy in childhood years*, available [May 2007] at: [http://www.bris.ac.uk/](http://www.bris.ac.uk/)
when undertaking risk assessments to estimate chemical exposures from a variety of sources (e.g. contaminated land, food). However, there may be scope for accounting further for the increased susceptibility (and sometimes exposure) experienced by children, taking into consideration work undertaken in the US and elsewhere on children in chemical risk assessment.

There is still much to learn regarding children’s actual exposure to chemicals in the UK and the variables that influence their exposure as well as the health impacts that such exposures may have. The main difficulty is that the effects of environmental pollution on children’s health are difficult to quantify as these often relate to chronic exposures to multiple chemicals which may have an effect on health later on in life.

There are a number of chemicals for which the health effects in children (and the rest of the population) remain poorly understood. These include endocrine disruptors, low-level exposures to pharmaceuticals, and new emerging chemicals that are persistent and bioaccumulative (e.g. brominated flame retardants). In particular, the safety of nanotechnology has not yet been well researched and, as such, the potential health impacts are not well understood. A few laboratory studies have demonstrated effects on cells extracted from the brains of mice (e.g. Long et al., in press), however, it is not yet known whether any similar effects would be expected to occur in humans, nor whether children (or other groups of the population) are especially vulnerable to any health affects associated with such technology. Research in such areas should be encouraged.

Though currently there is no national biomonitoring network in place in the UK for establishing baseline values of children’s exposure to chemicals, a number of projects are underway that will provide additional data regarding children’s exposures. For example, a proposal is being submitted to the EC to get funding to set a Europe wide biomonitoring pilot study. The UK is actively contributing to this activity and if successful, will provide an opportunity to develop a UK wide biomonitoring network.
3 IONISING RADIATION

3.1 Introduction

There are a number of sources of ionising radiation exposure in the UK, these include natural radiation (e.g. cosmic radiation, radon), medical uses of radiation, occupational exposures, consumer products, radioactive fallout and the disposals of radioactive wastes (Watson et al., 2005). Natural sources make up 84% of the average annual exposure. There are limited direct data on the health risks from exposure to low doses of ionising radiation, although studies of prenatal diagnostic x-rays (not used routinely now) suggest that even quite low doses (around 10–20 milliSieverts(mSv)) can increase the risk of childhood cancer. Estimates of cancer risks from low radiation doses are generally based on extrapolations from studies of populations with higher radiation exposures. These studies indicate that for various types of cancer, the risks from ionising radiation are generally higher for exposure in childhood than for exposure later in life (HPA, 2005). Calculations based on these risk estimates suggest that exposure to natural radiation \textit{in utero} and in childhood might account for approximately 30% of leukaemias in young people in the UK (Darby, 1991 and Simmonds et al., 1995 cited in HPA, 2005). However, this has not been demonstrated epidemiologically. With specific regard to radon, a collaborative analysis of data from 13 European studies has recently been conducted concerning radon in homes and the risk of lung cancer (Darby et al., 2005). The study found that the risk of lung cancer increased by 8.4% (95% confidence interval: 3.0–15.8%) per 100 Bq/m$^3$ increase in measured radon. The dose-response relation seemed to be linear with no threshold and remained significant in analysis limited to individuals from homes with measured radon less than the current Action Level of 200 Bq/m$^3$ (Darby et al., 2005). However, it was not possible to quantify the extent to which exposures in childhood may have affected the risk of lung cancer, as compared with exposures in adult life.

3.2 Legislation and standards

There is a considerable body of legislation in the UK concerning the safe storage, use and disposal of radioactive material. In particular, the Radioactive Substances Act, 1993 regulates the disposal of radioactive waste and is enforced by the Environment Agency in England and Wales, by the Environment and Heritage Service in Northern Ireland, and by the Scottish Environment Protection Agency (SEPA) in Scotland. In discharging their functions under the Act, the agencies are required to ensure that all exposures to ionising radiation of any member of the public arising from practices (i.e. human activities that increase radiation exposure, excluding natural and medical exposures to radiation) are kept as low as reasonably practicable and that the sum of the doses resulting from the exposure of any member of the public does not exceed 1 mSv per year for whole-body (effective dose), 50 mSv per year for skin exposure and 15 mSv per year for the lens of the eye (DETR, 2000; Scottish Executive, 2000; SR 2003, No. 208). This is in accordance with Council Directive 96/29/EURATOM regarding basic safety standards for the protection of workers and the general public against risks from ionizing radiation (CEU, 1996). The exposure limits apply to all ages (Environment Agency et al., 2006).
A number of other pieces of legislation are also relevant to radiation exposure of the general public, including children and the foetus. Some of these are highlighted below. Where Great Britain regulations are referred to, equivalent legislation is also in place in Northern Ireland.

• Regulations are in place to protect individuals against the risks of ionising radiation in relation to medical exposures. These require that diagnostic reference levels are established and used locally to minimise ionising radiation exposure. The regulations give specific consideration to pregnant women, women who are breastfeeding and children requiring operators to pay special attention to their exposures and the exposures of the foetus or breastfed child. For nuclear medicine, the urgency of the exposure must also be justified in cases where pregnancy cannot be excluded, or where the patient is breastfeeding.

• Employers must take all necessary steps to restrict exposure of, employees and non-employees to ionising radiation, as far as is practicable. When notified that an employee is pregnant, they are required to ensure that the exposure of the foetus is unlikely to exceed 1 mSv during the remainder of the pregnancy and, where an employee is breastfeeding, exposure is restricted to prevent significant bodily contamination.

• The Housing Health and Safety Rating System (England) Regulations 2005 (SI. 2005, No. 3208) provides a risk assessment tool to assess the health and safety of occupants in residential dwellings, including risk from sources of radiation which principally applies to radon in Radon Affected Areas. Although lung cancer is most likely to occur in older people, radon exposures throughout life are thought to be significant antecedents, therefore protecting homes will decrease risks in all potential occupants of a dwelling (including children).

• The Building Regulations 2000 (as amended) require that, in order to ensure the health and safety of people in and around buildings, all 'building work' in England and Wales must comply with specific requirements (ODPM, 2005). Similar legislation applies in Scotland and Northern Ireland. The regulations require that reasonable precautions should be taken to avoid risks to health and safety caused by contaminants on or in the ground associated with the building. All new buildings, extensions and conversions may need to incorporate precautions against radon if they are in a Radon Affected Area (ODPM, 2004).

• In England and Wales radon protection is required in buildings in areas where 3% of homes are expected to exceed the Action Level. In Northern Ireland and Scotland,

---

2 The Ionising Radiations Regulations 1999 (SI 1999, No. 3232)
3 The regulations also specify specific dose limits for the abdomen of women of reproductive capacity, trainees under 18 years of age and other persons including those under 16 years of age
4 A Radon Affected Area is a part of the country where radon concentrations in more than 1% of existing dwellings are expected to exceed the Action Level.
5 The Action Level is the level at which action is advised to reduce long-term radon concentrations in dwellings. Currently, this is 200 Bq m⁻³.
protection is required in areas where more than 1% of homes are expected to exceed the Action Level (Kendall et al., 2005).

- The addition of radioactive substances to toys is prohibited,\(^1\) and further regulations\(^2\) stipulate that toys must not contain radioactive elements in forms or proportions likely to be of detriment to a child’s health.

- In order to comply with the Management of Health and Safety at Work Regulations 1999 in assessing health and safety risks in the workplace (including schools), employers must include radon in the assessment in Radon Affected Areas. The Ionising Radiations Regulations 1999 come into effect where radon levels in the workplace are above 400 Bq/m\(^3\) and, in such circumstances, employers are required to take action to restrict the resulting exposures.

Furthermore, the Health Protection Agency has a statutory responsibility to provide information and advice in relation to the protection of the community (or any part of the community) from radiation risks.

### 3.3 Current status

#### 3.3.1 Radon Monitoring and remediation

There have been programmes of radon monitoring in homes in the UK for a number of years. An initial, representative, survey was conducted in the 1980s, looking at 2100 homes. The survey found that the arithmetic mean radon exposure in UK homes was approximately 20 Bq/m\(^3\) and that the distribution of radon measurements in UK homes followed an approximately log-normal distribution (Kendall et al., 2005). From this survey it was estimated that there would be in excess of 100,000 homes above the Action Level of 200 Bq/m\(^3\), of which over 90% would be in England.

This initial survey has been followed by a number of monitoring campaigns, aimed at mapping Radon Affected Areas, identifying homes with high levels of radon and encouraging householders to remediate homes above the action level. Radon levels in any particular building may be very different in neighbouring buildings, therefore testing of individual buildings is the only way to reliably determine radon levels. The monitoring campaigns have led to the publication of radon atlases, based on 5 km grid squares, for England and Wales (Green et al., 2002) and Northern Ireland (Green et al., 1999; Figure 3.1) and the publication of a radon survey of Scotland (Green et al., 1996). Mapping in the southwest of England has been carried out in finer detail of 1 km grid squares and it is expected that other areas with high measurement densities will be mapped in similar detail (Green et al., 2002).

---

\(^1\) The Justification of Practices Involving Ionising Radiation Regulations 2004 (SI 2004, No. 1796)

\(^2\) Toy (Safety) Regulations 1995 (SI 1995, No. 204)
Overall, approximately 496,000 radon measurements have been made in UK homes, from which 50,600 homes above the action level have been identified (Table 3.1).

**Table 3.1 Summary of radon measurements in the United Kingdom (January 2007)**

<table>
<thead>
<tr>
<th></th>
<th>Dwellings (millions)</th>
<th>Number of results</th>
<th>Mean (Bq/m³)</th>
<th>Above action level</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>22.1</td>
<td>439,000</td>
<td>21</td>
<td>47,400</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>0.7</td>
<td>22,800</td>
<td>19</td>
<td>1140</td>
</tr>
<tr>
<td>Scotland</td>
<td>2.4</td>
<td>18,200</td>
<td>16</td>
<td>360</td>
</tr>
<tr>
<td>Wales</td>
<td>1.3</td>
<td>16,400</td>
<td>20</td>
<td>1740</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>26.5</strong></td>
<td><strong>496,000</strong></td>
<td><strong>20</strong></td>
<td><strong>50,600</strong></td>
</tr>
</tbody>
</table>

Source: HPA Centre for Radiation, Chemical and Environmental Hazards, Radiation Protection Division

If, as estimated, there are approximately 100,000 homes in the UK above the Action Level, there remain about 50,000 that have not yet been identified.

The most recently completed monitoring campaign ran from 2000 until the March 2005. This was carried out in partnership with local authorities (supported centrally by the National Radiological Protection Board and Buildings Research Establishment) to encourage remediation. As found in previous campaigns, this campaign was successful in terms of the number of measurements undertaken but only 10–20% of householders carried out remedial action (Kendall *et al.*, 2005). The pilot campaigns were successful, both in increasing interest in radon and in leading to at least a doubling of levels of remediation in each of the pilot study areas (Insite Research and Consultancy, 2001
cited in Kendal et al., 2005). Examples of how local authorities have implemented the programme are provided in Box 3.1. Similar campaigns have been carried out in Northern Ireland and Wales.

**Box 3.1 Reducing radon in the north and the south – examples of local radon programmes**

A number of radon programmes have been implemented by local authorities under the radon programme for England. Examples in the north and south-west of England are given below:

**The North Northumberland Radon Partnership**

The North Northumberland Radon Partnership was set up in 2004 and is a collaboration of seven local organisations and General Practitioners (GPs) established to highlight issues associated with radon in and around Wooler, Northumberland, and to encourage radon testing and remediation (McGivern, 2006). The emphasis of the partnership is that radon is a local problem being addressed locally. The programme has included half-day training sessions for council staff, building professionals, builders and community workers, and a seminar for GPs. Free radon tests were offered to residents using letters from the Health Protection Agency, the partnership and GPs, emphasising the health implications and encouraging uptake of testing. This was accompanied by media statements, posters and advertorials. As a result, 39% of households took up offers of radon tests, of which 16% exceeded the Action Level and a further 21% were between 100 and 200 Bq/m³. Householders with results above 100 Bq/m³ were invited to road shows to discuss their results and possible remediation measures. Attendance at the road shows was 44% of households who exceed the Action Level and 35% of those with levels between 100 and 200 Bq/m³. As a result of this, and previous campaigns, about 60% of all residential property in the Affected Area have been tested. The partnership is currently looking at using local initiatives to encourage remediation in properties with high radon levels (McGivern, 2006).

**Kerrier District Council, South Hams District Council and the Unitary Authority of Torbay Council**

Kerrier District Council, South Hams District Council and the Unitary Authority of Torbay Council contain 40% of the homes in Cornwall and Devon known to have high radon levels. The radon programme in these areas involved seminars for local council staff, housing professionals, local builders and DIY store staff and road shows and/or exhibitions for householders. Occupants of untested dwellings were offered free radon tests and free retests to confirm the effectiveness of remedial measures. Throughout the programme, the local councils were the public face of the campaign and were supported by the Department for Environment, Food and Rural Affairs, the Health Protection Agency and the Building Research Establishment. In Kerrier District, two road shows attracted 150–200 people each day and householders in areas that had greater than 5% probability of being above the Action Level (25,000 householders) were offered free radon tests (Davey, 2004). Response rates were 36–37% and 48% of properties tested were found to be at or above the Action Level (Wagland, 2005). Eight properties with exceptionally high radon levels (above 9000 Bq/m³) were identified and were offered specific advice and assistance in remediation (Wagland, 2006).

In support of these programmes a number of free leaflets were published by Defra to explain the risks associated with radon and how to reduce radon in homes. These include:

- *Radon – you can test for it!* (Defra, 2004c);
- *Radon: a householder’s guide* (Defra, 2004b); and
- *Radon: a guide to reducing levels in your home* (Defra, 2004a)

Similar leaflets have also been published by the Welsh Assembly Government and the Environment and Heritage Service in Wales and Northern Ireland.

Surveys have been carried out in a number of schools in Affected Areas. For example, the HSE (Northern Ireland) required risk assessments and radon measurements to be undertaken in schools in Northern Ireland where the probability of exceeding the Action Level for radon is >1%. Initial results of the survey found that between 3–8% of schools
need of further action (Jones, 2002). Cornwall County Council has also tested its stock of over 800 buildings, including schools (Gregory, 1995).

The cost-effectiveness of radon remediation has been assessed in schools in Northamptonshire (Denman & Phillips, 1998). All Northamptonshire County Council schools were surveyed (not including grant maintained schools) and 2.8% were found to be over 400 Bq/m³. The remediation programme in schools was found to be the most cost-effective of all programmes to reduce radon in an Affected Area (cf. domestic and workplace programmes), particularly as the analysis noted that it is impossible to persuade all householders in an Affected Area to take remedial action. The analysis assumed similar sensitivity between adults and children to the induction of lung cancer; if, however, children were more susceptible, the cost-effectiveness of the remediation programme would be improved (Denman & Phillips, 1998). A similar cost-effectiveness analysis confirmed these results, but noted that although school interventions compare favourably with other radon interventions, they compare less favourably with other lung cancer prevention programmes such as smoking prevention campaigns (Kennedy & Gray, 2000).

Some radon monitoring has been carried out in new buildings to assess the effectiveness of radon preventive measures in Radon Affected Areas.¹ The monitoring has identified that some homes built with preventive measures exceed the Action Level (one study in Northamptonshire identified 16% of new homes exceed the Action Level, although other monitoring data suggest that it may be lower in other parts of the country). The authors have recommended that mandatory testing be introduced for all new houses in Radon Affected Areas and that further research be conducted regarding radon mitigation and its efficacy (Groves-Kirkby et al., 2006).

3.3.2 Exposure

The exposure of the UK general population to ionising radiation from both natural and artificial sources is reviewed periodically by the HPA Radiation Protection Division (formerly the National Radiological Protection Board). The most recent review was conducted in 2005 (mainly based on data collected for 2001 to 2003), which estimated that the overall average annual dose was 2.7 mSv (Watson et al., 2005). The principal sources of exposure were natural radiation (radon, gamma, cosmic and internal) and medical radiation of which radon accounted for approximately 50% of the average annual ionising radiation dose (Figure 3.2). The average levels of natural radiation showed little variation with time (Watson et al., 2005). However, there are likely to be significant differences in doses between individuals and from one geographical area to another (Kendall et al., 2006). Children’s exposure was assessed separately with regard to internal exposures (i.e. consumption of foods containing traces of natural radionuclides). Children (1 and 10 year olds) were estimated to have an annual average internal dose of 0.32 mSv compared with that of adults of 0.25 mSv (Watson et al. 2005).

Several recent publications have given specific consideration to radiation exposures of children in the UK. Annual doses are estimated to be similar for adults and children from cosmic radiation and from inhalation of radon and its decay products (Kendall & Smith, 2005; Kendall et al., 2006). For medical exposures, annual average doses for the 0–15 year age group are estimated to be lower than that of adults by a factor of about four (although doses in the first year of life would be higher than the rest of the 0–15 year age group; Kendall et al., 2006). Doses from gamma radiation are calculated to result in effective doses of about 30% and 15% higher, for infants and children respectively, than those of adults (Kendall et al., 2006), and doses to a 1 year old from ingestion of radon and its decay products in drinking water are calculated to be higher than that of adults by a factor of about three (Kendall & Smith, 2005). However, exposure to high levels of radon in drinking water supplies (i.e. above the proposed EU limit of 1000 Bq/l) in the UK is likely to be a rare phenomenon, confined to private water supplies in Radon Affected Areas (Capleton & Duarte-Davidson, 2007). Annualised radiation doses to the foetus from radon and its decay products (both via inhalation and ingestion) are estimated to be low (0.17 mSv; Kendall & Smith, 2002).

The exposure of populations living near nuclear sites in the UK has also been assessed. The Environment Agency, SEPA and the FSA carry out monitoring of radioactivity around nuclear sites in Great Britain; the Environment and Heritage Service have an environmental monitoring programme to assess the impact of radioactive discharges on the Northern Ireland coastline. The monitoring is used as a check on the monitoring programmes undertaken by site operators as part of their authorisations, to demonstrate that any radioactivity in food does not compromise food safety and to check that public
radiation exposure is within national and international limits (Environment Agency et al., 2006). Because children and/or the foetus may receive higher doses than adults, doses are assessed for adults, children (10 year olds), infants (1 year old) and foetuses to determine which is the critical group.1

In 2005, estimated radiation doses to people living around nuclear sites were all below national and European limits. The highest dose was assessed to be 0.46 mSv received by adult high-rate consumers of fish and shellfish in Cumbria and would be in addition to the average annual UK dose of approximately 2.2 mSv from natural radiation (Environment Agency et al., 2006). Children, infants and the foetus were assessed to be the critical group for a number of other sites and exposure pathways (mainly terrestrial food or fish and shellfish consumption); estimated doses ranged from <0.005 to 0.11 mSv (Environment Agency et al., 2006).

The FSA continues to carry out radioactivity monitoring of sheep in areas of the UK affected by an accident at the Chernobyl nuclear power plant in the former Union of Soviet Socialist Republics.2 The aim of the monitoring programme is to ensure food safety and hence protect public (including children’s) health. Under powers provided in the Food and Environment Protection Act 1985, Emergency Orders imposed restrictions on sheep entering the food chain from a number of farms in upland areas in the UK. Initially, in 1986, restrictions were placed on over 8900 farms, but following a continuous programme of assessing the need for restrictions over 95% of these restrictions have now been lifted.

Dose coefficients for the foetus and neonate arising from intakes of radionuclides by the mother from occupational sources have also been published (Phipps et al., 2001). A number of theoretical scenarios were identified where the dose received by the foetus or offspring could potentially be greater than the dose received by the worker due to preferential uptake by the placenta or foetus. The report concluded that its findings reinforced guidance provided in the Health and Safety Commission’s Approved Code of Practice and Guidance on the Ionising Radiations Regulations 1999 regarding assessing the risks for female employees where a woman is likely to receive significant intakes of radionuclides. Guidance on the application of dose coefficients for the embryo and foetus has been provided by the National Radiological Protection Board (which is now part of the HPA; Cooper et al., 2005).

3.3.3 Health effects
The Committee on Medical Aspects of Radiation in the Environment (COMARE) has considered various aspects of the potential health risks of ionising radiation in the environment. In particular, the Committee has recently considered the incidence of childhood cancers around nuclear installations in Great Britain and the distribution of childhood cancers more generally (COMARE, 2005 & 2006). Whilst there are recognised excesses of childhood cancer near some nuclear sites (specifically

---
1 The Critical Group is those who receive the largest dose from artificially-produced radionuclides due to their habits, diet and/or where they spend their time
Aldermaston, Burgfield, Dounreay, Harwell and Sellafield), the committee found no evidence of excess incidence close to nuclear power stations (COMARE, 2005). As a result, COMARE concluded that there was little support for their hypothesis that there is a link between radioactive discharges and childhood cancer in Great Britain and considered that the results of their study were consistent with other hypotheses, such as an abnormal response to a common infection (COMARE, 2006). Similarly, COMARE has considered reports of a cluster of childhood cancers in North Wales and concluded that the temporal pattern of the excess was not what would have been expected if nuclear discharges were responsible.¹

The Committee on Medical Aspects of Radiation in the Environment has also reviewed pregnancy outcomes following preconception exposure to radiation, and the evidence concerning parents’ occupational exposure to radiation prior to conception and the incidence of cancer in their children (COMARE, 2002 & 2004). The Committee concluded that there was little significant evidence that parental exposure to radiation was related to adverse pregnancy outcomes or congenital abnormalities (COMARE, 2002). It also found that there was no convincing evidence to suggest that exposure to doses of ionising radiation alone at levels experienced by male nuclear industry workers results in an increased incidence of childhood cancer (COMARE, 2004).

Various studies have examined the risk of childhood cancer in relation to exposure to natural radiation, such as radon in the home. Large case-control studies, such as the UK Childhood Cancer Study, have generally not shown raised risks in relation to radon and natural radiation (UK Childhood Cancer Study Investigators, 2002a & b). This is in part likely to reflect the limited statistical power available, even in large studies, to detect what are likely to reflect the limited statistical power available, even in large studies, to detect what are likely to be relatively small increases in risk.

A recent, relatively small, case-control study looking at risk factors for osteosarcoma in young people in Cornwall identified domestic radon levels as a risk factor (Wright & Pheby, 2006). Other risk factors identified included some immunisations, difficulty coping at school, low mood and previous accidents. The authors recommended that the study should be repeated on a larger scale in order to confirm the findings.

### 3.4 Current and planned initiatives

#### 3.4.1 Environmental radiation

The UK has made a number of international and national commitments regarding radioactive discharges. In particular, the UK has ratified the Oslo and Paris (OSPAR) Convention for the Protection of the Marine Environment of the North-East Atlantic and, at the 1998 meeting of the OSPAR Commission, signed a strategy regarding radioactive substances (the Sintra Statement) committing the UK to reducing discharges, emissions and losses of radioactive substances by 2020 (Defra, 2002). The Government has published the UK strategy for radioactive discharges detailing how the UK will implement the OSPAR Strategy and specifically committed itself to a “…progressive

---

reduction of human exposure to ionising radiation arising from radioactive discharges, as a consequence of reductions in discharges, such that a representative member of a critical group of the general public will be exposed to a mean dose of no more than 0.02 mSv a year from liquid radioactive discharges to the marine environment made from 2020 onwards" (Defra, 2002). Whilst not specifically targeted at children, children are considered to be the critical group in some circumstances (Environment Agency et al., 2006). The strategy will take effect in conjunction with statutory guidance on nuclear discharges issued by Government to the Environment Agency and SEPA. The Scottish Executive have consulted on its Statutory Guidance and finalised guidance is in preparation; statutory guidance to the Environment Agency has been drafted and issued to other government departments for comment, after which it will be consulted on publicly.¹

3.4.2 Radon
A number of initiatives are currently underway in the UK addressing radon issues. These are generally focused at the general public, but also encompass children.

Radon Programme for England – A new radon programme for England was announced in March 2007, funded by the Department of Health. The initiative will be coordinated by the HPA, and offer free radon tests for householders living in selected local authorities in radon affected areas. As with the previous programme, local authorities will be the main point of contact for householders and more emphasis will be placed on effective remediation. In addition, provisions have been made to improve communication about the health risks from radon and to allow direct intervention in the handful of properties with very high radon levels. The HPA and BRE are also exploring the most effective measures to increase the rate of dose reduction and ways of providing better information about mitigation to householders and local builders. Results of the previous programme showed that many householders selected the cheapest option for remedial works, which often resulted in less effective remediation (Anon, 2005).

Radon survey of Scotland – Whilst radon measurements have been going on in Scotland for many years, there were insufficient measurements to develop a radon map of Scotland to the same level of detail as other parts of the UK. In 2004, a project was initiated by the Scottish Executive and NRPB to complete a national radon map of Scotland. Letters were sent to 30,000 householders, selected in order to complete the existing database of levels of radon in Scottish dwellings and with the aim of obtaining at least five measurements in each 5 km grid square (Green & Bradley, 2005). The map is expected to be completed shortly and will also be useful for identifying areas where there may be high radon levels in workplaces, such as schools (Hall, 2003).

Radon in Wales – A pilot programme to identify homes with high radon levels and to encourage radon remediation in homes in high risk areas of Flintshire has been completed on behalf of the Welsh Assembly Government. The results will form the basis for recommendations for future work in Wales.

Radon in Northern Ireland – The Radon in Dwellings Report, produced in 1999 by the Environment and Heritage Service includes information on radon tests carried out in Northern Ireland. To data there have been 15,700 houses tested in Northern Ireland and the average radon levels is 19 Bq/m³, similar to the rest of the UK. It is estimated that approximately 4000 homes in Northern Ireland are likely to exceed the Action level. Free radon tests are provided in certain areas likely to exceed the Action Level and a number of fact sheets and householder guides (produced by the Environment and Heritage Service) are available to assist those who may be at risk.

UK National Radon Forum¹ – this is an initiative aimed at bringing together a wide range of stakeholders who have a role to play in helping to reduce the risk from radon in the UK. The forum meets annually and is 1 of 20 fora, originally funded by the EC's European Radon Research and Industry Collaboration Concerted Action project, and is coordinated in the UK by the Building Research Establishment and HPA which provides support following the ending of EC funding. Areas considered by forum meetings include progress in radon mapping and monitoring programmes throughout the UK, increasing public awareness of radon issues, protection of new buildings and remediation measures for existing buildings.

Local Authority Housing Renewal Schemes – Under The Regulatory Reform (Housing Assistance) Order 2002 local authorities are required to produce a Housing Renewal Policy detailing the provision of assistance to householders for housing repairs and improvements. Repairs and improvements eligible for financial assistance include radon remediation. Financial assistance may be in the form of a grant, loan or equity release and is usually restricted to vulnerable households on low incomes.

The Home Information Pack Regulations 2006 (SI 2006, No. 1503) – these regulations came into force on 01 August 2007 and require homeowners of four bedroom properties or larger in England and Wales to produce a Home Information Pack before putting up their home for sale. Of the mandatory searches required by the regulations, the pack must specify whether records indicate that the property is in a Radon Affected Area as specified by the HPA.

3.4.3 Health effects

A subgroup of the HPA Independent Advisory Group on Ionising Radiation (AGIR) is currently finalising a report on health risks of radon including a formal health economics analysis of testing and remediation. The HPA has a statutory duty to advise on protection against radiation risks, which it does through publications and responding to requests for advice from Government Departments and others. The AGIR report will guide future HPA advice on radon protection.

The Committee on Medical Aspects of Radiation in the Environment’s remit is to “assess and advise Government and the Devolved Administrations on the health effects of natural and man-made radiation in the environment and to assess the adequacy of the

available data and the need for further research’ (COMARE, 2006). The Committee has a standing commitment to advise on authorised discharges of radioactive materials and when new or revised authorisations are produced, and is regularly kept aware of and reviews radiation related matters (this includes radon, electromagnetic fields, and medical procedures). On-going work is focused on several areas, but includes a further analysis of cases of leukaemia and non-Hodgkin lymphoma in children living within 25 km of Rosyth and consideration of radiation doses arising from new medical procedures (COMARE, 2006).1

3.5 Gaps and areas for concern

3.5.1 Health effects
Currently, the weight of evidence suggests that there are no specific concerns for the health of children and young people in relation to ionising radiation exposures in the UK. However, it is important to consider children and young people in taking forward research into radiation mechanisms and health impacts to further understand low dose effects and strengthen radiological protection.

3.5.2 Man-made environmental radiation
There is currently in place a comprehensive system for monitoring of environmental radiation, particularly that associated with nuclear installations, which gives specific consideration to children, where appropriate. The Government has also made specific commitments to reduce exposure to radiation from such sources under its OSPAR commitments. As a result, this area appears to be adequately addressed.

3.5.3 Radon
Whilst children are not necessarily more vulnerable than adults to the effects of radon, they nevertheless form part of the general population. Various radon programmes carried out over the years have successfully measured radon in homes. However, there appears to be limited published data available on the success of such programmes in stimulating households to undertake remedial work and the long-term effectiveness of this in reducing exposures. Indeed, available evidence seems to suggest that a substantial proportion of properties in Radon Affected Areas remain untested and that, amongst those properties tested, remediation is not always undertaken. Furthermore, there appears to be a lack of data on the longevity of remedial measures and whether periodic monitoring is necessary to ensure their continued efficacy. This is of concern. Means of encouraging householders to undertake testing and remedial work, where necessary, should continue to be explored further. The HPA is currently evaluating the remediation rate in homes that have had radon tests above the Action Level and looking at what characteristics of the test programmes influence remediation rates.

Building Regulation guidance for Scotland and Northern Ireland differs from that for England and Wales in terms of the Affected Areas in which radon protection is required.

---

for new buildings. Consideration should be given to reviewing and harmonising the requirements across the UK to offer uniform standards of health protection.

Comprehensive radon surveys of schools in Affected Areas have been carried out by several local authorities. However, it would be beneficial to do this in all Affected Areas and take appropriate remedial action to ensure pupils are adequately protected. This is particularly important given the cost-effectiveness of such interventions.

Increasingly, epidemiological evidence indicates that there may be risks to health at exposures below the 200 Bq/m$^3$ Action Level. Considering this Action Level was set some 15 years ago, a review of the Action Level might be timely. Any such review should give specific consideration as to whether the Action Level provides sufficient protection to children from the risks of lung cancer in later life. Consideration should also be given to whether the 400 Bq/m$^3$ limit for occupational environments is sufficiently protective for children in the school environment. The AGIR radon report will be reviewed by HPA, which will consult widely before preparing revised advice to Government.
4 NON-IONISING RADIATION

4.1 Introduction

Non ionising radiation includes ultraviolet radiation (UVR), visible radiation (light, including lasers), infrared radiation (radiated heat), radiofrequency radiation (including broadcast transmissions and mobile phone signals) and electric and magnetic fields (including electric power generation and supply).

The sun is the main source of UVR exposure for most people. Due to the limited penetration of UVR into body tissues, its effects are mainly confined to the skin and eyes. Excessive sun exposure increases the exposure to UVR consequently increases the risk of both non-melanoma and melanoma skin cancers.

Skin cancer is one of the commonest forms of cancer in the UK. Studies indicate that the risk of skin cancer may be related to having a fair complexion (light skin, red or blonde hair and blue eyes) and having many large and irregular moles. There is also evidence that short, intense exposures are important in the causation of melanomas, but that cumulative exposure may also be relevant (NRPB, 2002). Age at exposure is also an important risk factor for UVR induced skin cancer as episodes of sunburn and intermittent exposure to UVR, especially in childhood and adolescence, have been associated with raised risks of developing melanoma.¹

The widespread and increasing use of sunbeds for cosmetic tanning purposes, particularly in young people, is a potential health concern. Although it has not been established directly whether sunbeds cause skin cancer, in part because of difficulties in distinguishing risks due to sunbeds from risks to sun exposure, sunbeds are an appreciable source of intense intermittent UVR exposure (AGNIR, 2002).

Public concern about non-ionising radiation is focused on involuntary exposures from power lines, mobile phone base stations and voluntary exposures to mobile phones (HPA, 2005). Exposure to electric and magnetic fields (EMF) are a part of modern life, being produced wherever electricity is being used (HPA, 2005). Research has focussed on the carcinogenic potential of EMF with an emphasis on power frequency fields (50 Hz in the UK), though reproductive (and other) health outcomes have also been studied (AGNIR, 2001; IARC, 2002).

The introduction and expansion of mobile telecommunication systems has led to interest and concern about the health effects associated with radiofrequency (RF) fields, particularly in children (IEGMP, 2000; NRPB, 2004c). However, other sources of public exposure of RF, including radio and television signals, have been around for some time. A number of studies have been conducted on adults exposed to RF fields to identify the risks of exposure; the quality of these studies are variable and no consistent links have been identified (NRPB, 2004c). There is little convincing evidence that RF fields

increase the risk of cancer (NRPB, 2004c; IEGMP, 2000; AGNIR, 2001), but nor do they rule it out. In particular, long term risks have not yet been identified.

### 4.2 Epidemiology of skin cancer in the UK

Non melanoma skin cancers are relatively common in white populations although they are rarely fatal. An estimated 100,000 new cases of skin cancers other than malignant melanoma are diagnosed every year in the UK (Cancer Research UK, 2004). Malignant melanomas, though less common, are the main cause of skin cancer deaths, particularly in young people.¹ Incidence rates (all ages) for malignant melanomas are increasing steadily in the UK (Table 4.1).

#### Table 4.1 Incidence of malignant melanoma (all ages) by sex, England, Northern Ireland, Scotland and Wales, 2000–2004 Incidence rates per 100,000 population

<table>
<thead>
<tr>
<th>Region</th>
<th>Sex</th>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>Males</td>
<td></td>
<td>10.7</td>
<td>10.9</td>
<td>11.7</td>
<td>12.2</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>Females</td>
<td></td>
<td>13.0</td>
<td>13.6</td>
<td>14.1</td>
<td>14.6</td>
<td>15.9</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>Males</td>
<td></td>
<td>9.3</td>
<td>10.8</td>
<td>12.2</td>
<td>9.8</td>
<td>13.4</td>
</tr>
<tr>
<td></td>
<td>Females</td>
<td></td>
<td>12.2</td>
<td>14.9</td>
<td>16.8</td>
<td>14.8</td>
<td>16.7</td>
</tr>
<tr>
<td>Scotland</td>
<td>Males</td>
<td></td>
<td>11.5</td>
<td>12.8</td>
<td>14.3</td>
<td>13.2</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Females</td>
<td></td>
<td>14.3</td>
<td>15.3</td>
<td>18.8</td>
<td>16.8</td>
<td>n/a</td>
</tr>
<tr>
<td>Wales</td>
<td>Males</td>
<td></td>
<td>11.6</td>
<td>12.2</td>
<td>12.6</td>
<td>13.7</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>Females</td>
<td></td>
<td>13.3</td>
<td>13.5</td>
<td>16.7</td>
<td>15.8</td>
<td>15.3</td>
</tr>
</tbody>
</table>

n/a, not available

Data from:

Melanoma incidence has more than doubled in England and Wales in the past 20 years (Quinn et al, 2001) although mortality has levelled off or even fallen in recent years (HPA, 2005). The incidence of malignant melanoma varies geographically in the UK. For the period 1991–2000, the highest incidence rates of malignant melanoma occurred in south west England. Incidence rates were also high in Scotland (see also Table 4.1), south east England and, for females only, Northern Ireland (ONS, 2005). There was also a strong inverse relationship between the incidence of malignant melanoma and social deprivation (ONS, 2005). Whilst malignant melanoma is rare in children, between

1976 and 1999, incidence rates in young people aged 20–24 increased threefold and were approximately twice as high in females as in males.¹

4.3 Legislation

4.3.1 Ultraviolet radiation

There is no specific legislation concerning exposure of children to sunshine while at school or in other childcare settings, although DCFS guidance regarding school premises highlights that schools may wish to carry out a risk assessment relating to exposure to sunshine and consider how to manage the risks.² Guidance on the use of trees and other structures for providing shade is given in DCFS Building Bulletin 85 (DfEE, 1997). Additionally, under the Health and Safety at Work Act 1974 the education employer has a duty, so far as is reasonably practicable, to ensure the health and safety of pupils in school and on off site visits. This includes assessing the risk of all activities and introducing measures to manage those risks.

Sunbed devices are covered by the European product safety standard for sunbeds³ and guidelines on their use have been produced by HSE, including information for customers (HSE, 1995). Employers are required to carry out a risk assessment for employees and customers exposed to UVR and take measures to control the risks as far is practicable. However, there is no specific legislation regulating sunbed use, sunbed parlours or their use by children.

4.3.2 Electromagnetic fields

Whilst there is no specific legislation concerning exposure to electromagnetic fields, the EU published a recommendation on the limitation of exposure of the general public in 1999 (CEU, 1999), which was supported by the UK Government. This advocated the use of guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and set a framework for limiting public exposure to EMF, providing information to the public and undertaking research. As part of its on-going evaluation of scientific evidence and health risk assessment, NRPB reviewed its advice on limiting exposure to EMF, taking into particular consideration issues of uncertainty. This review included specific consideration of the risks posed to the foetus, infants and young children and resulted in the publication of revised UK advice on limiting exposure to EMF, which recommended adopting the guidelines developed by ICNIRP (NRPB, 2004a). This was adopted by Government with the expectation that the guidelines are implemented in line with the terms of the EU recommendation (i.e. that account is taken of the risks and benefits of action).⁴

4.3.3 Mobile phones and base stations
There is no specific legislation concerning exposures to mobile phones and base stations, however, the mobile phone industry has voluntarily adopted the ICNIRP reference levels for public exposure to radiofrequency fields.¹

4.4 Current status

4.4.1 Ultraviolet radiation
There is an on-going programme of solar radiation monitoring at seven sites in England, Scotland and Wales, initiated and managed by the HPA. Monitoring over the past 17 years has indicated that there is a small, but significant increase in the annual integrated radiant exposures in England and West Central Scotland of about 1.6–2.6% per year (Pearson et al., 2006). This is supported by a recent study in the Netherlands that found that the annual integrated UV exposure received at ground level for all weather conditions increased 5.5 ± 2% per decade between 1979 and 2003 (den Outer et al., 2005). One study in Reading found a non-statistically significant increase in UVB² of 4.3% between 1993 and 1997, with a decrease in stratospheric ozone of 5.9% (Barlett et al., 2000 cited in NRPB, 2002). Climate change scenarios for the UK predict that by the 2080s there will be large decreases in cloud cover, particularly in summer and in the South East, leading to increased solar radiation (Hulme et al., 2002).

The incidence of malignant melanoma (all ages) in England continues to show an upward trend, although incidence rates appear to have levelled out in recent years in the 20–24 year age group (Figure 4.1). In 2004, the three year rolling mean incidence in 20–24 year olds was 2.5 and 4.8 per 100,000 in males and females, respectively. The incidence of malignant melanomas in young people aged 20–24 is of particular relevance as causative exposures will have occurred during childhood. Figure 4.2 shows that there is a substantially higher incidence of malignant melanoma in 20–24 year olds in Scotland, compared with England, particularly amongst females.

² Human exposure to solar radiation to UVR is mostly (~95%) as UVA, i.e. 315 – 400 nm wave length, with a much smaller amount of UVB radiation (280 – 315 nm)
Figure 4.1 Incidence of malignant melanoma in England according to age and sex, 1994–2004

Note: the data for England include Wales until 1994, thereafter it is England only.

Data from: ONS 1998, 1999, 2000, 2001, 2002a & b, and the following web published data:

Several sun protection surveys have been conducted recently in the UK. In particular, a survey of young people from across England found that although there was wide acceptance of the link between sun exposure and skin cancer, the potential long-term risk of skin cancer was of limited interest and that there was a lack of awareness that cumulative episodes of intense sun exposure increases the risk of developing skin cancer.\(^1\) The survey also found that mothers typically take responsibility for sun protection for the whole family and are generally receptive to sun protection advice for their children. The study considered that encouraging younger teens to assume greater responsibility for their own sun protection may be an effective strategy to instil long-term sun protective habits. Suggested means of doing this included sunscreen products specifically aimed at teenagers and communication via schools in the form of curriculum guidance and school policies. In a similar survey amongst adults, over 82% thought that getting sunburnt as a child was either ‘Quite important’ or ‘Very important’ in increasing the risk of skin cancer, although younger people attributed significantly less importance to various risk factors that older people.\(^2\)

Several surveys of sunbed use have identified usage by under-16 year olds. One survey in Lanarkshire, Scotland, found that of 1405 primary school children (aged 8–11 years)

surveyed, 7% (96) had used a sunbed in the previous 6 months (Kennedy, 2004). In a similar survey in Knowsley, Merseyside, 8% of 11 and 12 year olds reported using sunbeds regularly. The Advisory Group on Non-ionising Radiation (AGNIR, 2002), WHO (2003), the International Commission on Non-Ionizing Radiation Protection (ICNIRP, 2003), the EU Scientific Committee on Consumer Products and the European Society of Skin Cancer Prevention all advise against the use of sunbeds by those under 18 years of age.

Figure 4.2 Incidence of malignant melanoma in 20–24 year olds in England and Scotland

Note: the data for England include Wales until 1994, thereafter it is England only.


4.4.2 Power frequency and electromagnetic fields
Exposures to power frequency EMF in the UK are generally low. Several studies have used personal dosimeters to estimate exposure. One study looked at 214 electricity supply staff and found exposures varied according to the type of dwelling they lived in from 0.109 microTesla (µT) in flats to 0.043 µT in detached dwellings (Merchant et al.,

High voltage lines of 132 kV and above were the dominant influence on exposure at distances within 100m of the lines. A similar study looked at 50 households in Avon and measured the exposure of mothers participating in a study of pregnancy and childhood. Average exposures were 0.067±0.08 µT (Preece et al., 1996 cited in NRPB, 2001). A more recent study, published in 2005, showed that a small fraction (<2.5%) of UK homes have background magnetic fields above 0.2 µT. The most common source of magnetic field exposure was currents flowing in the supply to the home and possible wiring faults (32%), followed by nearby high voltage power lines (20%). Currents in low voltage distribution mains cables located near to homes were also identified as a source of exposure (16%). For homes with exposure >0.4µT, the most common source of exposure was high voltage overhead power lines (Maslanyi et al., 2005).

There have been concerns about cancer risks and EMF for a number of years, particularly in relation to children. This has recently been reviewed by the HPA\(^1\) and an extract from this review is reproduced below:

“There is evidence that exposure to power frequency magnetic fields above 0.4 µT (microtesla) is associated with a small increase in the absolute risk of leukaemia in children, from about 1 in 20,000 to 1 in 10,000 per year. However, these levels of exposure are seldom encountered by the general public in the UK, and the raised risk, if it were real, would correspond roughly to an additional two cases of childhood leukaemia per year in the UK, compared with an annual total of around 500 cases nationally (AGNIR, 2001a). For the vast majority of children, who are exposed to time-weighted average residential magnetic fields less than 0.4 µT, there is little evidence of any increased risk of leukaemia. One recent study (Draper et al., 2005) suggested that proximity of residence at the time of birth to high voltage power lines was associated with an increased risk of childhood leukaemia (by a factor of about 1.7 if born within 200 m from a power line). If real, this would correspond to roughly an extra five cases of childhood leukaemia per year in the UK (about 1% of all cases). There is no convincing evidence linking EMF with other cancers, and in particular with lymphoma and brain tumours in children, and with leukaemia, brain tumours or breast cancer in adults (AGNIR, 2001a). The results of studies of childhood cancer and parental occupational exposure are inconsistent and unconvincing (Ahlbom et al., 2000).

In the absence of clear evidence of a carcinogenic effect in adults, or of a plausible explanation from experiments on animals or cells, the epidemiological evidence is currently not strong enough to justify a firm conclusion that magnetic fields cause leukaemia in children (AGNIR, 2001a). Nevertheless, the International Agency for Research on Cancer judged that this finding provided limited evidence for an excess risk in humans, and it evaluated power frequency magnetic fields as being “possibly carcinogenic” to humans (IARC, 2002). In addition, IARC considered the evidence for excess cancer risks of all other kinds,

in children and adults, as a result of exposure to electric and magnetic fields to be inadequate."

“The overall evidence from studies of maternal exposure to EMF in the workplace does not indicate an association with adverse pregnancy outcomes (Ahlbom et al, 2001) while studies of maternal exposure in the home are difficult to interpret (NRBP, 2004a). Results from the few studies of male fertility and of birth outcome and childhood cancer in relation to parental occupational exposure to EMF have been variable and do not provide convincing evidence of an association (NRPB, 2004a).”

“Overall, the only consistent finding is that prolonged exposure to high magnetic fields in the home may be associated with a small absolute raised risk of leukaemia in children (an approximate doubling of the relative risk), corresponding roughly to an extra 2–5 cases per year in the UK, although this estimate is subject to uncertainty.

It is not possible to specify whether inequalities exist with any certainty but living close to high voltage power lines may represent an increased burden. It has been estimated that about 4% of children in England and Wales live within 600m of high voltage lines at birth (Draper et al, 2005). However some homes in the UK that are not close to power lines also have high ambient fields.”

4.4.3 Mobile phones and base stations
In 2004, there were approximately 65 million mobile phones in the UK and 40,000 base stations (NRPB, 2004b). In 1999, the UK Government set up the Independent Expert Group on Mobile Phones which considered the potential health risks from mobile phone use (IEGMP, 2000). The group concluded that the balance of evidence suggested that exposures to RF radiation below ICNIRP guidelines do not cause adverse health effects in the general population, but that a precautionary approach should be taken in light of evidence suggesting biological effects may occur at exposures below ICNIRP guidelines. The group also considered that children might be more vulnerable to any effects arising from mobile phone use due to their developing nervous system, the greater absorption of energy in the tissues of the head and the longer lifetime of exposure, and recommended that their exposure be minimised. This was supported by DH and the advice subsequently incorporated in a DH leaflet (published in 2000 and revised in 2005) on mobile phones and health, jointly published with the National Assembly for Wales, Northern Ireland Executive and Scottish Executive (Department of Health, 2005a). A companion leaflet on mobile phone base stations and health has also been published (Department of Health, 2005b). The issue of mobile phone technology and health was further reviewed by the AGNIR in 2003 and concluded that the weight of evidence does not suggest that there are adverse health effects from exposures to radiofrequency fields below guideline levels, but that continued research is needed (NRPB, 2004b). As a result, the NRPB recommended that a precautionary approach should continue to be adopted and that limiting mobile phone use by children remains appropriate (NRPB, 2004b).
4.5 Current and planned initiatives

4.5.1 Ultraviolet radiation
Public health campaigns in the UK started in earnest in the early 1990s (HPA, 2005) and there are a number of on-going initiatives aimed at promoting protection from UVR. The UK’s current national skin cancer prevention programme, SunSmart, funded by DH and run by Cancer Research UK, has been running since 2003. The campaign aims to: increase knowledge of the causes of skin cancer and actions that can be taken to help prevent it, to have a positive influence on attitudes towards and sun protection behaviour; and to support sustained behaviour change by encouraging the development of sun protective environments.¹ The effectiveness and impact of the SunSmart campaign are evaluated through twice yearly surveys, carried out by the Office for National Statistics, aimed at measuring knowledge about skin cancer prevention, attitudes towards tanning, and self-reported sun protection behaviour.² A number of SunSmart activities have been child-focused. Specifically, SunSmart has had an ongoing schools programme, which has included providing sun protection guidelines to schools and encouraging nurseries, primary schools and secondary schools to develop a sun protection policy, incorporate sun protection education into the school curriculum, provide sufficient shade, warn parents of the risks of too much sun exposure and organise events to promote sun protection.³ An evaluation in 2005 of the SunSmart in Schools programme found that of 822 nurseries and primary schools 26% had a sun protection policy in place and that 37% were in the process of developing one.⁴ No data were reported regarding secondary schools. The evaluation also found that schools with a sun protection policy were more likely to encourage children to adopt measures to reduce sun exposure.

In Northern Ireland there has been a long-running Care in the Sun campaign. The campaign was launched in 1991 and a formal strategy for the prevention and treatment of malignant melanomas in Northern Ireland was published in 1997.⁵ The strategy and campaign has had a focus on schools, including specific aims to see Care in the Sun integrated into the school curriculum, that each school has its own policy for Care in the Sun derived from sun protection guidelines issued by the Northern Ireland Department for Education, and in providing teaching resources.⁶ The strategy also included a specific aim to eliminate the use of artificial tanning equipment. Part of the Care in the Sun campaign has included the Living Willows for Shade Project, a Big Lottery Fund funded project that seeks to stimulate and support nurseries and primary schools in

⁵ A Strategy for the Prevention, Diagnosis and Treatment of Malignant Melanoma and Other Skin Cancers in Northern Ireland, available [Dec 2006] at: http://www.careinthesun.org/
developing Care in the Sun policies and to create living willow structures in 48 school
grounds in eastern and northern parts of Northern Ireland to provide areas of shade for
play and outside classroom work.¹

The Chartered Institute for Environmental Health has also recently published a toolkit,
aimed at local authorities and Primary Care Trusts, local health boards and partner
agencies, to help them develop strategies to tackle the increasing incidence of skin
cancer (CIEH, 2005). The toolkit provides an evidence base to support action, guidance
on initiatives, case studies and links to useful resources.

There are also a large number of local initiatives in the UK that aim to increase
awareness of the risks of skin cancer and promote sun protection behaviour. Examples
of some of these initiatives are presented in Box 4.1.

Box 4.1 Protecting children from the sun – local initiatives
There are a large number of local initiatives and campaigns throughout the UK aimed at developing greater
awareness of the risks of skin cancer and the need for good sun protection behaviour. Many of the
initiatives and campaigns include an element that is specifically child focused. Examples of initiatives and
campaigns (taken from CIEH, 2005) are highlighted below.

- **Sefton Living Shade Project** – part of the Sefton Sunwise Campaign, this project focused on children
  and young people and aimed to develop shade provision and raise knowledge of safer sun behaviour.
  Between 1999 and 2004 the project has planted over 50 living willow structures to provide shade in
  childcare settings.

- **Blackpool Shun the Sun Campaign** – A sun awareness campaign run in 2003 by health visitors in
  Blackpool. Health visitors targeted families of children under 5, giving them promotional packs at the
  18–24 and 36–42 month contacts, held public health events throughout the school holidays in shopping
  centres and along the beach, and provided leaflets to a National Health Service Walk in Centre, for
distribution to families with a child under 16 attending.

- **CIEH Beat the Burn** – The Chartered Institute of Environmental Health worked with seven Welsh local
  authorities in 2004 to support a series of skin cancer awareness campaigns to promote the SunSmart
  code, targeting young people and parents in recreational and primary school settings. Activities
  included: a focus on beaches in Anglesey, in which boards giving sun protection messages were
  posted on the slip roads of all beaches; a series of events in Wrexham where sun protection messages
  were promoted, including National Play Day attended by over 500 children; and Merthyr Tydfil Pink
  Nose Day, which involved 13 schools and encouraged children to apply pink sunscreen on their nose
  for the day. The campaign was supported by the Welsh Assembly and Lloyds Pharmacy.

- **NHS Fife & NHS Tayside Keep Yer Shirt on Project** – aims to raise awareness of the importance of
  skin cancer prevention and reduce the risk of sunburn in pre-school children. The project has included:
  workshops for nursery staff and other child carers (over 400 staff representing 185 childcare
  organisations have attended); working with parents of pre-school children; encouraging pre-school
  childcare establishments to develop and implement sun awareness policies; and providing shade
  structures in nurseries and playgroups.

- **Birmingham City Council Sun Safety Campaign** – This is an annual campaign. In 2004, the
  campaign targeted children between the ages of 0–3, mainly through nursery schools. Activities
  included a survey of measures being taken by nurseries to protect children from the sun, provision of
  resources to nurseries, and the inclusion of sun safety by environmental health practitioners in their
  annual inspections of nurseries.

There are various information resources published in the UK to enable members of the public to make informed choices regarding sun protection behaviour. Whilst not specifically aimed at children, they may, nevertheless, be used to inform decisions regarding the protection of children from UVR exposure. These resources include:

**UV solar index forecast**

This is published by the UK Met Office for the UK and Europe, giving information on the forecasted strength of UV solar radiation, taking into account sun position, cloud cover and stratospheric ozone.

**UV Index Graphs**

Real-time UV solar index measurements from seven sites, at intervals of approximately two degrees latitude, across the UK are published on the HPA and Met Office websites.

There have been a number of calls to introduce licensing of tanning parlours, including measures to ban use by children. In particular, a proposal has recently been put forward to introduce licensing of tanning parlours in Scotland and ban their use by children. There has been a public consultation process which has received broad support from a range of respondents. The British Medical Association Cymru Wales has proposed that the National Assembly for Wales pass a bill to regulate sunbed parlours in Wales, including preventing the use of sunbeds by children, in order to reduce the incidence of skin cancer in Wales. The Chartered Institute of Environmental Health has also called for tanning parlours to be licensed. The Committee on the Medical Aspects of Radiation in the Environment is due to consider the safe use of sunbeds in the UK (at the request of all four UK Health Departments).

Legislation governing the operation of tanning parlours is recommended by the WHO (WHO, 2003). The European Society of Skin Cancer Prevention has published a Code of Practice aimed at achieving a European consensus on protecting the user of sunbeds in commercial parlours, and states that allowing use of sunbeds by children or young people would not be in compliance with the Code.

### 4.5.2 Electromagnetic fields

A number of activities are currently underway regarding the health impacts of EMF that are of relevance to children. Following the adoption of revised advice on limiting exposure to EMF (NRPB, 2004a), which recommend that the need for further precautionary measures should be considered, the Government set up the Stakeholder Advisory Group on extremely low frequency (ELF) EMF (SAGE). The aim of SAGE is: “To bring together a range of stakeholders to identify and explore the implications for a

---

precautionary approach to ELF EMF and make practical recommendations for precautionary measures.”1 As part of the process, two working groups have been set up looking at power lines and property, and electrical installations and equipment. SAGE has recently published a First Interim Assessment of possible precautionary measures with respect to home wiring, domestic appliances and high voltage powerlines. Where applicable, issues for educational establishments, nurseries, etc. have been identified.

4.5.3 Mobile phones and base stations

The Independent Expert Group on Mobile Phones found no evidence to conclude that there was any risk to public health from mobile phone base stations; however, following a precautionary approach it recommended that an independent audit of base stations should be conducted (IEGMP, 2000). This is being undertaken, on behalf of the Government, by the Office of Communications (formerly the Radiocommunications Agency) and has specifically focussed on base stations sited on or near school premises.2 Between 2001 and June 2006, the audit monitored 330 school premises across the UK. The highest recorded Total Band Exposure Quotient3 was approximately 1/280th of the ICNIRP maximum guideline reference level for public exposure,4 typical measured Total Band Exposure Quotients were several thousandths of the ICNIRP maximum guideline reference level, suggesting exposures in and around school premises in the UK are very low. The audit is on-going.

There is an ongoing research programme, the Mobile Telecommunications Health Research (MTHR) Programme which is jointly funded by the Government and industry and was set up to look at issues concerning mobile telecommunications and health. As part of this, a case-control study has been funded looking at residential exposure to RF from mobile phone base stations and early childhood cancers (in particular leukaemia and non-Hodgkin lymphomas).5 Cases are children aged 0–4 years who were diagnosed with cancer between 1999 and 2000 in England, Scotland and Wales. The MTHR Programme published a summary report in September 2007.6 The report concluded that the programme has reduced many of the concerns relating to short term use of mobile telecommunications and proposed a further programme of work to address longer term concerns.


3 The Total Band Exposure Quotient is the sum of the frequency exposure quotients for all the measured bands at a location. A Frequency Exposure Quotient is the ratio of the measured maximum power density to the ICNIRP limit at a given frequency.


The World Health Organization has recently published a revised research agenda for radio frequency fields.\(^1\) This agenda highlights that a number of studies are on-going in various countries, which specifically consider children. These studies include:

- a cohort study on 13 year olds looking at relationships between mobile phone use and endpoints such as cognitive and hearing function;
- effects of RF exposure on reaction times and memory performance in children;
- a study on cognition and thermophysiology in children; and
- modelling of specific absorption rate\(^2\) distribution in children and pregnant women.

### 4.6 Gaps and areas for concern

#### 4.6.1 Ultraviolet radiation

The continuing rise in the incidence of malignant melanomas in adults, particularly young adults, and the importance of childhood exposures indicates that there is a need to continue to improve sun protection knowledge and behaviour in children and young adults. The efficacy of campaigns such as SunSmart and Care in the Sun should continue to be evaluated to monitor levels of knowledge and actual sun protection behaviour and to identify means of improving the campaigns. There is a need to include children, teenagers and young adults in such surveys, as well as schools (both those with and without sun protection policies). Means of encouraging older children to develop long-term sun protective habits (or to maintain sun protective habits taught in the early years) should be investigated as many of the current initiatives appear to be aimed at primary schools. Local education authorities and schools should continue to be encouraged to develop and implement sun protection policies and the adoption and efficacy of such policies monitored in both primary and secondary schools.

Given the large number of campaigns and initiatives, it is important to assess the effectiveness and benefits and to learn lessons for future campaigns. Consideration should be given as to whether there is a requirement for a national strategy to coordinate skin cancer prevention initiatives, particularly focused at young people.

A number of professional bodies have voiced concerns regarding the use of tanning parlours and sunbeds by children. Means of controlling or preventing such use should be considered.

#### 4.6.2 Electromagnetic fields

There is a need for good quality internationally co-ordinated research to clarify the risks associated with magnetic fields from the electricity distribution system, especially with respect to exposure to children, pregnant women and foetuses. There is also a need to improve understanding of exposures and whether proximity to power lines is an adequate measure of exposure.

---


\(^2\) The Specific Absorption Rate is a measure used to describe the amount of radio wave energy received by the body from the use of mobile phones
4.6.3 **Radiofrequency fields**

The World Health Organization has highlighted the need for focused research on children in its research agenda for RF fields and, in particular, the need for a multinational case-control study of brain cancer risk in children and mobile phone use, and a prospective cohort study of child mobile phone users and all health outcomes.\(^1\) However, because of the large numbers of study participants required to achieve sufficient statistical power, such studies are more effectively done internationally. The WHO has also highlighted the need for surveys to characterize population exposures from all RF sources, to document the changing patterns of wireless communication usage and exposure of different parts of the body (especially for children and foetuses), and the further development of dosimetric models for children of different ages and of pregnant women. In addition, the MTHR Programme report has focussed on the need for further long-term studies of mobile phone users, particularly children, and studies aimed at understanding and improving risk communication.

5 NOISE

5.1 Background

Noise can cause annoyance and fatigue, interfere with communication and sleep and reduce efficiency and potentially damage hearing. The physiological effects of noise exposure include constriction of blood vessels, muscle tightening and changes in heart rate and blood pressure. Exposure to high noise levels can result in permanent damage to the structures of the ear, with such symptoms as loss of hearing sensitivity, worsening of the hearing thresholds so that soft sounds must be presented at a greater magnitude or strength to be just barely perceptible. There is little evidence to suggest that young children are more susceptible to noise-induced hearing loss than are older children and adults suggesting that methods for assessing risk based on adult data may be used to assess risk in children too.\(^1\)

Noise is measured in decibels (dB). An A-weighting, sometimes written as dB(A), is used to measure average noise levels, and a C-weighting or dB(C), to measure peak, impact or explosive noises. An increase of 3 dB doubles the noise, so small differences in the numbers can have a significant impact.\(^2\) World Health Organization (WHO) guidelines recommend a level of 30 dB LA for undisturbed sleep and a daytime outdoor sound level of 50 dB LA to prevent people from becoming moderately annoyed.\(^3\)

Sources of noise vary and include neighbourhood noise, neighbour or domestic noise, occupational noise and ambient or environmental noise. Neighbourhood noise is where the effects of the noise are confined within a small area and the source of the noise is usually easily identified, for example a small factory or building site. Neighbour or domestic noise is the most complained about with the most common complaints relating to loud music and dog barking. Sources of ambient or environmental noise include road, rail and air, with road being the biggest source of ambient noise.\(^4\)

5.2 Legislation

Noise regulations in the UK provide powers to local authorities to deal with complaints of excessive noise, investigate any complaints of noise nuisance, issue abatement notices and, if the offender fails to comply with the notice, take proceedings in the courts. The UK Regulations cover:

- noise from construction sites and certain street noise (Part III of the Control of Pollution Act of 1974; in Northern Ireland this is known as the Pollution Control and Local Government (NI) Order 1978 and also covers nuisance noise);

---


• night noise offence relating to domestic premises (Noise Act 1996);
• environmental noise from sources such as aircraft, traffic and railways (Environmental Noise (England) Act 2006 and the Environmental Noise Regulations (NI) 2006);
• domestic night noise offences (Anti-social Behaviour Act 2003, the Antisocial Behaviour etc. (Scotland) Act 2004 and The Anti-social Behaviour (NI) Order 2004) allowing local authorities to respond to night-noise and to provide a more cost-effective night time service suitable for the local community (in Scotland, the regulations are applicable 24 hours); and
• noise nuisances in the street including noise from vehicles, machinery and other equipment such as loudspeakers, car alarms and burglar alarms (Noise and Statutory Nuisance Act 1993).

In June 2002 the Environmental Noise Directive (CEU, 2002a) was adopted, the main aim of which is to provide a common basis for tackling noise issues across the EU. The main requirements of the Directive include:

• monitoring environmental noise by requiring competent authorities in Member States to draw up strategic noise maps for major roads, railways, airports and agglomerations (see Section 3.4 for details on noise mapping);
• informing and consulting the public about noise exposure, its effects and the measures considered to address noise;
• addressing local noise issues by requiring competent authorities to draw up action plans to reduce noise where necessary and to maintain environmental noise quality where it is good; and
• development of a long-term EU strategy which will include objectives to reduce the number of people affected by noise and to provide a framework for developing existing EC policy on noise reduction from source.

The Directive has been implemented in the UK through the Environmental Noise (England) Regulations 2006 and analogous legislation in the Devolved Administrations. The legislation will help to identify the extent to which people are exposed to high levels of noise, thus enabling the development of measures to protect exposed populations. Part of the Directive requires Member States to make Strategic Noise Maps for major agglomerations along major roads, major railways and major airports within their territories. Action plans will also have to be drawn up to manage noise issues and effects including noise reduction if necessary. The dates for the completion of the first round of maps and action plans are 30 June 2007 and 18 July 2008, respectively.

In addition to the above, there are two specific standards that apply specifically to children. These are outlined below.

**Current Standards for Classroom Acoustics**
The World Health Organization guideline values for schools recommend an indoor background noise level of 35 dB(A), based on the assumption of 55 dB(A) for a typical teacher’s voice level at a distance of 1m and the need for a signal to noise ratio of 15 dB. For outdoor noise levels a maximum of 55 dB(A) is recommended to be the same value as outdoor daytime levels in residential areas.
In the UK, although there has been guidance available regarding the acoustic design of schools since 1975, there were no legal requirements for compliance. From July 2003 however, acoustic design of schools is to be regulated under amendments to the Building Regulations. The standards are outlined in *Building Bulletin 93 Acoustic Design of Schools* and will have to be met in both new and refurbished schools (DfES, 2003a; Table 5.1).

<table>
<thead>
<tr>
<th>Table 5.1 Upper limits for indoor ambient noise levels and reverberation times for selected school rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indoor ambient noise level (dB L_{Aeq, 30min})</strong></td>
</tr>
<tr>
<td>Primary school classroom</td>
</tr>
<tr>
<td>Secondary school classrooms</td>
</tr>
<tr>
<td>Large (&gt;50 people) lecture room</td>
</tr>
<tr>
<td>Classrooms specifically for hearing impaired pupils</td>
</tr>
<tr>
<td>Library study area</td>
</tr>
<tr>
<td>Assembly hall</td>
</tr>
<tr>
<td>Science laboratory</td>
</tr>
<tr>
<td>Gymnasium</td>
</tr>
<tr>
<td>Dining room</td>
</tr>
</tbody>
</table>

Values in parentheses are corresponding values from Building Bulletin 87 (96)

In general the Building Bulletin 93 requirements are more stringent than the previous requirements (Table 6.1) to reflect the increase in awareness of the effects of noise and reverberation on children and particularly the needs of hearing impaired children. Building Bulletin 93 also specifies the required sound insulation between the various types of teaching spaces, as well as standards for open plan spaces.

In Scotland, the School Premises (General Requirements and Standards) (Scotland) Regulations 1967 cover noise in schools. Guidance has recently been published on the school environment that includes information on acoustic design.

*The British and European Standard for Toys*

Since 1990 the EC Directive for Toy Safety has set out the essential requirements to allow the legal sale of toys manufactured within the EC. In the UK this Directive is implemented through Toy (Safety) Regulations 1995 (SI 1995, No 204). The British and European Standard for toys (BS EN71-1:2005) states that children’s toys made or sold must not exceed 80 dB(A) when measured 50 cm from the ear, while the peak noise of level of a toy (excluding cap guns) should not exceed 110 dB(C). The peak noise of cap guns should not exceed 125 dB(C).

*Portable Audio Equipment and Headphone Noise*¹

Current EU legislation on the power output of ‘portable audio equipment’ with headphone use, means the maximum volume personal music players can reach is 100 dBA. Repeated exposure to music from personal music players, through headphones, at, or near to, maximum volume will be sufficient to cause permanent damage to hearing in some people. As a rule, if other people can hear the sound from a

¹ Portable Audio Equipment and Headphone Noise at: [http://www.deafnessresearch.org.uk/](http://www.deafnessresearch.org.uk/)
personal music player, then it is too loud. It is recommended that even if the volume on a personal music player is at about 60% of maximum, it shouldn't be listened to for more than an hour continuously a day.

5.3 Current status

Although some studies have been conducted to examine the effects of noise, only a few studies have specifically examined the effects on children’s health and well being. The following section outlines some recent studies looking at attitudes to noise (adults) and the effects of noise on children in the UK.

5.3.1 Survey of Attitudes to Environmental Noise

Currently in England and Wales domestic premises are the largest cause of complaints about noise, accounting for around three quarters of all complaints in recent years (Figure 5.1). Between 1984/5 and 2004/5, complaints about noise from this source increased almost five times. Complaints about road works and construction noise were 3.5 times greater in 2004/5 than 1984/5, and complaints regarding noise from industrial and commercial sources doubled over the same period. Road traffic noise complaints have dropped in recent years. The information reported to Environmental Health Officers is considered to give only an approximate indication of the trend in noise complaints from these sources.¹

![Figure 5.1 Noise complaints received by Environmental Health Officers, 1984/5–2004/5](image)


The Building Research Establishment conducted a UK survey of attitudes to environmental noise in 1999/2000, repeating a similar survey conducted in England and

Wales in 1991.\(^1\) Road traffic noise, aircraft noise and noise from neighbours and people nearby were the most commonly reported sources of noise (Figure 5.2); 84% of respondents reported hearing road traffic noise and 40% of those were bothered by the noise to some extent. The proportion of people reporting hearing road traffic noise rose from 48% to 54% from 1991 to 1999/2000, while the proportion of people reporting hearing noise from neighbours or other people also increased from 25% to 38%.

**Figure 5.2** People reporting hearing noise in the United Kingdom (1999 Questionnaire)

The percentage of people in England, Wales, Scotland and Northern Ireland who reported being disturbed by noise are represented in Figure 5.3. The patterns were similar across England and the Devolved Administrations, with road traffic noise, aircraft noise, neighbourhood noise accounting for most complaints.

Part of the survey attempted to gauge the effects of being exposed to noise and their emotional reactions to the noise. Respondents claimed that exposure to noise interfered with activities including sleeping, reading or writing, concentrating and having windows open. Emotional responses to such exposure included stress, irritation and anger. However, this study did not specifically consider children.

A similar survey, conducted in 2006 for the National Society for Clean Air, found that 30% of respondents throughout the UK were ‘annoyed’ by noise from their neighbours, with those in lower socio-economic groups more likely to be ‘annoyed’, as well as those living in social or privately rented accommodation.¹

5.3.2 Road Traffic and Aircraft Noise and Children’s Cognition and Health (RANCH) study

The RANCH study was carried out in 2002 and aimed to examine the effect of aircraft and road traffic noise on children’s cognition and health (Stansfeld et al., 2005). This was the largest study to examine the effects of noise on children’s health and specifically examined the effect of chronic exposure to aircraft and road traffic noise in children aged 9–10 years. Participants were chosen from the UK, Spain and the Netherlands, with schools selected on the basis of increasing levels of exposure to aircraft and road traffic noise.

The study found that chronic exposure to aircraft noise was related to impaired performance in reading comprehension and recognition memory. A 5 dB change in noise exposure delayed children’s reading age by up to two months in the UK. Noise exposure was also found to be associated with annoyance and impairment of quality of life in children.

5.3.3 The Effects of Noise on the Attainments and Cognitive Performance of Primary School Children

This study examined the effects of noise on the attainments and cognitive performance of primary school children. Levels of external and internal noise were measured in schools in three London boroughs representative of locations, demographics and results of Standard Assessment Tests (SATs) across London. The results showed that in all boroughs, measures outside primary schools exceeded WHO guideline values (55 dB(A) LAeq) for school playgrounds, with the most predominant sources of noise being road traffic and air traffic. In unoccupied classrooms the noise levels measured were 7 dB(A) above the level recommended by the DCFS and 12 dB(A) above WHO guidelines, with the average daily exposure to noise for a child at school being 72 dB(A) LAeq. The major factor in determining classroom noise was the level of activity: if children were engaged in quiet activities then the ambient noise level was closely related to the background and underlying levels outside.

Correlation between the indoor and outdoor noise levels with children’s performance on SAT’s at Key Stage 1 and Key Stage 2 was negative between objective noise levels and attainments, a relationship that was stronger for Key Stage 2 and for tests assessing English.

Children were found to be sensitive to and annoyed by specific noise sources. External noise levels accounted for a significant proportion of the variance in children’s responses to questions about sound sources. Teachers who answered the questionnaire reported awareness of environmental noise sources similar to that of the pupils. Teachers noted that pupils were distracted and disturbed by external noises and reported that there were not many strategies available to deal with high noise levels in classrooms.

5.4 Current and planned initiatives

The majority of current and planned initiatives do not have a child specific component, but they are expected to have a beneficial effect on children’s health and well-being.

Noise Action Week is an annual event that aims to give everyone involved in managing noise an opportunity to promote practical solutions to everyday noise problems. Noise Action Week is co-ordinated by the National Society for Clean Air. Those involved in noise management include local authority noise, housing and health teams, antisocial behaviour teams, housing organisations, mediation services, schools and others. During Noise Action Week they are encouraged to co-ordinate events at a local level to help

---

educate and inform people about noise, the impact it has and how to reduce it (e.g. Box 5.1). In 2006, more than 200 organisations across the UK registered to take part and events included:

- advice on reducing noise nuisance from pubs and clubs;
- talks, workshops and competitions in schools;
- promoting intruder alarm registration;
- local surveys identifying types of noise problems;
- promoting practical solutions to dog barking; and
- awareness raising on reducing noise around the home.

**Box 5.1 Noisy Times**

During Noise Action Week 2006 Huntingdonshire District Council published the 'Noisy Times'. Copies of the 'Noise Paper' were sent to every school, doctor's surgery and library in the district and there was a display in the District Council Office at Pathfinder House. The Noisy Times contained information on common sources of noise complaints and advice on how to address them, The 'Noise Paper' also included details of a competition comprising three parts:

- Find a new slogan for Noise Action Week 2007
- What's this Photo?
- Wordsearch

The competition and 'Noise Paper' was available on Huntingdonshire District Council's website during Noise Action Week.

The National Society for Clean Air has two teaching packs available for use in schools. These have been used successfully by local authorities working in schools and by teachers.

- **Sounding Off**, designed for secondary schools this pack looks at the science of sound and the impact of noise on quality of life; and
- **Hear This!** designed for junior schools, the pack contains a CD of sounds and activities on noise and the impacts of noise.

The **Noise Mapping Project** in England is part of the first stage of the development of the English National Ambient Noise Strategy. The project aims to gather data on ambient noise in England by determining the number of people affected by ambient noise and the location of the people affected.\(^2\) The results can then be shown on a noise map.

The first noise map in the UK was produced for Birmingham City and was completed in 1999 and examined noise from a variety of sources including road traffic, air traffic and railways. An example of the Birmingham noise map is presented below (Figure 5.4). The London road traffic noise map was completed in 2004 but only takes into account noise from road traffic.

---

In 2007 noise maps will be produced throughout the UK for major roads with more than 6 million vehicle passages per year, major railways with more than 60,000 passengers per year, major airports and agglomerations with a population of more than 250,000 people. In agglomerations the mapping will include airports that create more than 55 dB(A), industry and ports.

The noise mapping process will provide a sound basis to help future policy making and strategies for tackling noise. Noise maps are beneficial for a number of reasons, for example, they can be used to:

- establish a baseline for present noise levels;
- quantify the scale of public exposure to the main sources of environmental noise;
- identify hotspots of high noise levels and thus target measures to where they are most needed;
- test the effectiveness of noise reduction methods such as re-routing traffic or installing noise barriers; and
- monitor trends in environmental noise.
The **Noise Abatement Society**\(^1\) aims to eliminate excessive noise by campaigning to raise awareness, lobbying parliament and through education. The Society runs a noise telephone noise helpline and a members’ chat forum and provides a range of information such as advice how to complain about a noise problem, useful contacts for local councils and information on the legal aspects of noise nuisance. Advice is also provided on how to reduce your noise levels and be a considerate neighbour and possible approaches to resolving any issues with neighbours.

The **Community Buildings Noise Insulation Scheme**,\(^2\) developed by BAA Gatwick, offers acoustic insulation to certain noise sensitive buildings, such as hospitals, schools and libraries. The scheme covers 100% of the costs of insulating the buildings, including secondary glazing or high specification replacement windows. A home relocation scheme has also been designed, that offers assistance to homeowners living within the 69-dB noise contour area who wish to move away to a quieter location.

The **Train Horns Campaign**\(^3\) is a campaign initiated by Peter Ainsworth, an East Surrey MP, who tabled a motion in Parliament in 2005 as part of his campaign to reduce noise from train horns. In response to the motion the rail industry established a train horns steering group. The Group has reviewed the arrangements for the use and type of train horns and published its recommendations for the rail industry to consider.

## 5.5 Gaps and areas for concern

Current legislation for environmental noise in the UK is not specifically aimed at protecting the health of children as there appears to be little evidence that young children are any more susceptible to noise-induced hearing loss than older children or adults. Some studies however show that children are affected by noise and that their education suffers as a result of noise. There appears to be gap in the research in terms of examining the health effects other than hearing loss as well as the psychological effects of noise exposure on children.

Damage to hearing resulting in prolonged use of portable audio equipment, such as personal stereos, at high volumes may result in long term hearing damage.

---


\(^2\) Community Buildings Noise Insulation Scheme at: [http://www.rics.org/](http://www.rics.org/)

\(^3\) Train Horns Campaign at: [http://www.peterainsworth.com/](http://www.peterainsworth.com/)
6 BIOLOGICAL HAZARDS

6.1 Introduction

Biological hazards include infectious intestinal disease and zoonotic infections and can be transmitted by a variety of routes, including via food, water, person-to-person and direct contact. In the UK, food is thought to be the most common route of infection for zoonoses (Defra et al., 2006). Children may be more susceptible to acquiring infections due to their lower immunity as a result of not having been regularly exposed to infections and, when manifest, such infections can be more severe in children. A number of infections can be of specific concern to pregnant women and can result in complications in pregnancy.

Health surveillance data provides a picture of zoonotic infection in the population. However there is substantial under-reporting as many patients do not seek medical attention, their doctor does not request a laboratory investigation or a positive result is not notified (Defra et al., 2006). Sampling also tends to be biased towards more severe cases and high-risk groups, such as infants.

This section considers biological hazards from environmental and food sources (biological hazards from water sources are considered elsewhere (Capleton and Duarte-Davidson, 2007).

6.2 Foodborne disease

The majority of cases of foodborne disease are due to Infectious Intestinal Diseases (IID): a variety of communicable diseases and infections which gain entry by and/or affect the gastrointestinal tract. The Food Standards Agency (FSA) report of the Study of Infectious Intestinal Disease in England, 2000 stated that 20% of England’s population suffered from an IID each year, although not all of this is foodborne (FSA, 2000). Work by the Public Health Laboratory Service estimated that about 23% of cases were likely to be foodborne. Generally, the incidence of IIDs in infants and young children is much greater than in older age groups, with the most common type of pathogens in children under 5 being rotaviruses and noroviruses (common viral intestinal infections). Rotavirus infection is seldom foodborne and only a minority of norovirus infections are thought to be foodborne.

The most reliable estimates of foodborne disease are based on laboratory reports. Based on these, it is estimated that, in 2005, there were about 864,000 cases of foodborne disease acquired in the UK. In comparison, about 79,000 cases of food poisoning were formally notified or otherwise ascertained of which just over 20,000 occurred in children and young people (Figure 6.1). There has been a decreasing trend in food poisoning cases over the past 10 years in the UK although, in recent years, the number of cases appears to have levelled out. During the period 2000 to 2005, there

---

1 Zoonoses are defined as ‘diseases and infections which are transmitted naturally between vertebrate animals and man’
were 331 recorded outbreaks of foodborne illness in the UK of which seven occurred in schools and affected 243 people; the majority of these arose from a single *E. coli* outbreak in South Wales in 2005.\(^1\)

**Figure 6.1** Notifications of food poisoning (formally notified and otherwise ascertained) in children and young people in England and Wales, 1997–2006

![Figure 6.1](image-url)

Note: data for 2006 are provisional. Infections may not be directly linked to food, as only a small number of cases are investigated.


### 6.3 Non-foodborne disease

Not all IID are food (or water) borne. For example, of 18 outbreaks of *E.coli* (10) and *Cryptosporidium* (8) in 2005, four were associated with direct contact with animals or with farms (Defra *et al.*, 2006).

### 6.4 Infections of concern to pregnant women

A number of infections are also of specific concern to pregnant women. In particular, Chlamydiosis, listeriosis, Q fever and toxoplasmosis can all be passed on to the foetus and can result in complications in pregnancy, including low birth weight, premature birth and abortion.\(^2\)

---


6.5 Legislation

6.5.1 Food safety and hygiene legislation
The United Kingdom and the European Union (EU) have comprehensive legislation covering food safety and hygiene. The general principles and requirements of food law in the EU are laid down in European Commission (EC) Regulation 178/2002 (CEU, 2002). The main aim of this is to protect human health and consumers’ interests in relation to food and applies to all stages of production, processing and distribution of food. Food hygiene requirements are laid down in several EU regulations. The principal regulation is Regulation 852/2004, which, aims to offer a high level of protection of protection of human life and health.

The principal food safety legislation in Great Britain is the Food Safety Act 1990 and in Northern Ireland is the Food Safety Act (Northern Ireland) Order 1991. These have since been amended to bring them into line with EC Regulation 178/2002. In addition the Food and Environment Protection Act 1985, gives Ministers powers to make emergency orders to prohibit the distribution of food where they consider that it creates or may create a hazard to human health.

A number of EU implementing regulations have been published since EC 852/2004. In particular, Commission Regulation No. 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs set a number of standards for different foods and specifically considers infants in that it sets microbiological standards for ready-to-eat meals intended for infants and dried infant formulae intended for infants below six months of age.

6.5.2 Other legislation concerning biological hazards
Directive 2003/99/EC requires proper monitoring of zoonoses and zoonotic agents, and investigation into foodborne outbreaks. Reports are made annually to the EU, including the occurrence of selected zoonoses in humans by different age groups. Mandatory reporting of some zoonoses is required under The Public Health (Infectious Disease) Regulations 1988 (SI 1988, No. 1546) and the equivalent legislation in Northern Ireland and Scotland (SI 1988, No. 1550(S.155); SI 1989, No. 2205(S.149); SR 1990, No. 66).

Housing Health and Safety Rating System (England) Regulations 2005 provide a risk assessment tool to assess the health and safety of occupants in residential dwellings (DCLG, 2006). These specifically require that the risk of infection is assessed with respect to domestic and food hygiene, and pests with a view to protecting against health effects such as asthma and allergic rhinitis, food poisoning, gastrointestinal illness and other zoonotic infections.

Under the Health and Safety at Work Act the Control of Substances Hazardous to Health (COSHH) Regulations 2002 (SI 2002, No. 2677), specifically requires that the risk to health from biological agents is assessed and appropriate action is taken to prevent or adequately control exposure. Of relevance to children (and the general public) would be the control of biological hazards on open farms and the production of bioaerosols from composting facilities.
6.6 Current status

6.6.1 Foodborne biological hazards

Food hygiene inspections of food business operators are carried out by Environmental Health Officers to ensure compliance with the relevant legislation, identify potential risks and to offer advice about good food hygiene practices.

In 2001 the FSA Microbiological Foodborne Disease Strategy\(^1\) aimed to reduce the incidence of foodborne disease by 20% by April 2006. This included the development and implementation of training for key professionals (such as nurses, health visitors and teachers) and negotiating with DCFS regarding the inclusion of food hygiene in the school curriculum. The Strategy involved a number of initiatives specifically aimed at promoting food hygiene messages to children and schools. The evaluation programme found that the programmes aimed at children were particularly successful and that there was reported evidence that children were taking positive food hygiene messages back to their homes and thereby beneficially affecting food hygiene in the home.

The Advisory Committee on the Microbiological Safety of Food recently considered the risk of infant botulism and minimally processed infant weaning foods (ACMSF, 2006). The Committee concluded that chilled and frozen minimally processed baby foods did not seem to be at any greater risk of containing proteolytic \textit{C. botulinum} and that they are not a major source of exposure with regard to infant botulism.

The National Curriculum in England and Wales includes elements of food hygiene training. In particular, all children must work with food as part of the Design and Technology curriculum in primary schools, including learning about safe procedures for food safety and hygiene.\(^2\) Many schools also offer Food Technology as a GCSE, which includes hygienic practices in relation to food. In Northern Ireland, Home Economics is statutory at Key Stage 3 and includes the requirement that pupils develop practical skills in the safe and hygienic use of foods. There are also a number of other initiatives aimed at educating children and young people about food hygiene (Box 6.1).

---


Box 6.1 Getting the message across – teaching children and young people about food hygiene

There are a number of local initiatives aimed at teaching children about food hygiene. A number of these are highlighted below to give an indication of the breadth of these initiatives.

Supd’s Zone (http://www.spudszone.co.uk) – an interactive web page, developed by Nuneaton and Bedworth Borough Council in consultation with schools, to promote good food hygiene and food safety messages to children and young people. The website includes a range of games, quizzes and an interactive kitchen environment and has recorded over 470,000 hits.

Cooking Bus¹ – The Food Standard Agency’s (FSA) Cooking Bus aims to get food safety and health eating messages to school children. Since October 2003 it has involved over 18,000 children and 2400 teachers, with a particular focus on disadvantaged areas.

Elementary Food Hygiene Training² – South Ayrshire Council received FSA (Scotland) funding to conduct Royal Environmental Health Institute of Scotland Elementary Food Hygiene Certificate training of secondary school children. As of October 2005, 1228 pupils from nine secondary schools had passed, gaining a nationally recognised qualification.

Too Many Cooks – Oldham Metropolitan Borough Council were funded by the FSA to produce a play about the consequences of food poisoning. The play was produced by Oldham Theatre Workshop and toured Oldham High Schools in 2005. The play was well received and subsequently produced into a DVD which was distributed to schools during Food Safety Week 2006.

British Nutrition Foundation³ produce a range of educational materials to support food education in schools. In particular they have developed food and nutrition competencies which include food safety and hygiene.

6.6.2 Other biological hazards

A number of outbreaks of zoonoses, particularly Cryptosporidium and verocytotoxin-producing *E. coli*, have been associated with animals and visits to farms. The Health and Safety Executive (HSE) have produced specific guidance for open farms aimed at avoiding ill health (HSE, 2002), looking at farm layout, hygiene and washing facilities and specifically mentions the needs of children. There is a supplement providing advice to teachers and others who organise visits for children to farms and a short video.

In addition to this, a Schools Information Pack on *E. coli* O157 was produced by the Scottish Executive and sent to all schools in 2003.⁴ The pack contained copies of the HSE guidance, additional information on *E. coli* O157 and health tips for teachers leading school visits to farms.

6.7 Current and planned initiatives

6.7.1 Foodborne biological hazards

**Single Integrated National Control Plan** – Under EC Regulation 882/2004 on official controls each member state is required to prepare a three to five year national control plan describing the national food and feed, and animal health and welfare control arrangements and setting out objectives and priorities for the duration of the plan. The UK’s plan was published in 2006 by the FSA, Department of the Environment, Food and Rural Affairs (Defra), the Scottish Executive, Welsh Assembly Government and the Department of Agriculture and Rural Development, Northern Ireland and covers the period January 2007 to March 2011. Amongst its overall objectives the plan includes effective implementation and enforcement of food law. The specific objectives of the plan link closely with the FSA’s strategic plan, and similar plans of the other agencies involved, and include reducing foodborne illness. Progress in meeting the aims of the plan will be monitored and reported on annually. Whilst not specifically aimed at children, implementation of the plan does seek to safeguard public health and, as such, is likely to be of benefit to children as part of the general population.

**National Healthy Schools Programme** – A joint DCFS and the Department of Health (DH) initiative aiming to get every school working towards attaining Healthy School Status by 2009. Healthy Eating is one of the criteria used to assess schools and the ‘Food in Schools’ guidance includes food safety and hygiene.

**Scores on doors** – the FSA and local authorities, are piloting a scheme where food inspection information is displayed on the door or window in each food outlet, supported by information on a website. It includes food establishments popular with young people and will enable consumers, including parents, to make informed choices about where they choose to eat.

**Eat Safe** – The Eat Safe initiative, operating in Northern Ireland since 2003 and recently extended to Scotland, provides a recognisable sign of excellence for caterers who have high standards of food hygiene.

**Food Vision** – a food safety and healthy eating web-site supported by the FSA, Local Authorities Coordinators of Regulatory Services and the Local Government Association to promote safe, sustainable and nutritious food.

6.7.2 Food Safety and Hygiene Research

There is a considerable body of food safety and hygiene research on-going in the UK, mainly funded and managed by the FSA. Few projects specifically focus on children but all are of general public health interest and so likely to be of relevance to children.

---


Coordination of research in the UK regarding the microbiological safety of food is undertaken by the Microbiological Safety of Food Funders Group, which comprises officials from a range of Government departments, agencies and research councils.

6.7.3 Non-foodborne biological hazards

Advice to pregnant women during the lambing season — Seasonal notices are issued by Government departments (Defra and DH) and agencies (the Health Protection Agency (HPA) and HSE), and all four UK Chief Medical Officers advising pregnant women to avoid contact with animals during the lambing season to avoid contracting infections such as chlamydiosis, listeriosis, Q fever or toxoplasmosis.

Farms for Schools — A scheme aimed at ensuring that school trips to farms are safe, enjoyable and educationally worthwhile. Members are required to meet specified standards in the provision of facilities, including health and safety standards, the adequate provision of handwashing and toilet facilities, and adhere to a Charter of Good Practice.

Countryside Educational Visits Accreditation Scheme — An accreditation scheme for farms offering educational visits to schools, supported by the Defra and DCFS and covering health and safety of farm visits.

Guidance on Infection Control In Schools and other Child Care Settings — this HPA poster was distributed to schools across the UK and provides advice on: exclusion of children from school, nursery or child minders to prevent transmission of common infections, outbreaks, good hygiene practice, animals in school, farm visits and immunisation of staff, including pregnant staff.

6.8 Gaps and areas for concern

There have been some significant changes in legislation concerning food safety and hygiene in the past few years. There is a need to ensure it is properly implemented before an assessment is made as to its effectiveness.

Teaching food hygiene to children is an effective and long-term approach to improving food hygiene behaviour in the population. Means of ensuring that food hygiene is taught across the board and that specified levels of competency are achieved should be explored further.
The surveillance of foodborne and other zoonotic diseases remains critical to gaining an accurate picture of the burden of disease in the population and in evaluating measures to reduce foodborne disease. It is important to continue to ensure that surveillance data is of the highest quality and improve surveillance systems so that there is greater consistency and reporting.

Initiatives such as Scores on the Doors and Eatwell provide a unique means of enabling consumers, including children, to make informed choices about where they choose to eat based on food hygiene criteria. It is currently unclear where school kitchens and other similar catering establishment fit into such a scheme. This should be clarified in order to provide greater accountability with regards to school kitchens.
7 OCCUPATIONAL EXPOSURES

The UK has a comprehensive body of legislation controlling risks to health and safety from hazardous exposures in and from the workplace. Whilst young people can be employed once they reach the minimum school leaving age (MSLA, normally 16\(^1\)), it is beyond the scope of this document to address occupational exposures which concern adults and young people above the MSLA alike. Rather this section focuses on occupational hazards relevant to the health of pregnant women, the foetus, children under 16 years of age and hazards that are relevant specifically to those over the MSLA, but under 18 years of age (i.e. young workers). Issues related to physical injuries amongst children arising in or from the workplace are considered in Section 3.

7.1 Legislation

The Health and Safety at Work Act 1974 and the Management of Health and Safety at Work Regulations 1999 require employers to carry out a suitable and sufficient assessment of the risks associated with hazards arising from their work and to take the necessary precautions to protect themselves, employees and members of the public (including children) as far as is reasonably practicable.

In particular, the Management of Health and Safety at Work Regulations 1999 specifically requires employers to make a suitable and sufficient assessment of the risks to health and safety of their employees (including young people and expectant, new or breast-feeding mothers) and the risks to health and safety of persons not in their employment (including children) but which arise as a result of their business. Where employees include women of child-bearing age and/or new or expectant mothers, employers are required to assess the risks posed by any physical, biological or chemical agent and, specifically, assess the risks posed by agents, processes and work practices listed in Annex I and II of Council Directive 92/85/EEC (Table 7.1), where applicable.

---

\(^1\) In the UK, children are required by law to remain in education until the last Friday in June in the school year in which the child reaches 16 years of age.
Table 7.1 Agents that employers are specifically required to assess for women of child-bearing age and new or expectant mothers

<table>
<thead>
<tr>
<th>Physical agents</th>
<th>Biological agents</th>
<th>Chemical agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shocks, vibration or movement</td>
<td>Biological agents of risk groups 2, 3 and 3 within the meaning of Article 2(d) numbers 2, 3 and 4 of Directive 90/679/EEC, in so far as it is known that these agents or the therapeutic measures necessitated by such agents endanger the health of pregnant women and the unborn child and in so far as they do not yet appear in Annex II</td>
<td>Substances labelled R40, R45, R46 and R47 under Directive 67/548/EEC</td>
</tr>
<tr>
<td>Handling of loads entailing risks, particularly of a dorsolumbar nature</td>
<td></td>
<td>Chemical agents in Annex I to Directive 90/394/EEC</td>
</tr>
<tr>
<td>Noise</td>
<td></td>
<td>Mercury and mercury compounds</td>
</tr>
<tr>
<td>Ionising radiation</td>
<td></td>
<td>Antimitotic drugs</td>
</tr>
<tr>
<td>Non-ionising radiation</td>
<td></td>
<td>Carbon monoxide</td>
</tr>
<tr>
<td>Extremes of heat or cold</td>
<td></td>
<td>Chemical agents of known percutaneous absorption</td>
</tr>
<tr>
<td>Movements and postures, travelling –either inside or outside the establishment – mental and physical fatigue and other physical burdens connected with the activity of the worker within the meaning of Article 2 of the Directive</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Similarly, employers are specifically required to ensure that young persons are protected at work from any risks to their health and safety that are a consequence of their lack of experience. In particular, employers are prohibited from employing a young person in work involving exposure to several specific hazards, including:

- exposure to agents that are toxic, carcinogenic, cause heritable genetic damage, harm to the unborn child, or which may chronically affect human health;
- harmful exposure to radiation; and
- exposure to noise or vibration in which there is a risk to health.

Under the legislation, children below the MSLA cannot be employed in industrial undertakings, such as factories or construction sites, except when on work experience schemes. Local authorities have powers to make bylaws on the types and hours of work children aged between 13 and the MSLA can do. Children under 13 years of age are generally prohibited from any form of employment. Where children are employed, employers are required to assess the relevant risks and provide a parent of the child with comprehensive and relevant information on the risks to their health and safety and any necessary preventive and protective measures identified.

Additionally, there are a number of pieces of legislation that control hazards that are of specific relevance to pregnant or breastfeeding women or young people under 18 years of age. In particular:

- **The Control of Lead at Work Regulations 2000** which prohibit childbearing women and young men from working in lead smelting and refining and from most jobs in the manufacture of lead-acid batteries. The regulations also include specific action and suspension limits for women which are lower than for men.
- **The Ionising Radiation Regulations 1999** (SI 1999, No. 3232) contain specific requirements to protect women who are pregnant and breast-feeding, and for those under 18 (see Section 5.5.1 for further details).
The Plant Protection Products Regulations 2005\(^1\) require that an Acceptable Operator Exposure Levels need to be established for bystanders (i.e. those non-occupationally exposed from pesticide spraying activities), to protect their health from exposure to pesticides.

Ovine chlamydiosis (which can cause abortion in pregnant workers) is a reportable disease. As such, where a case of infection is identified, employers are legally obliged to report the occurrence to HSE.\(^2\)

There are a number of provisions of law aimed to prevent para-occupational exposure (i.e. non-occupational exposure of family members, including children, from sources such as workplace clothing taken home for laundering, etc.). These include the Control of Asbestos Regulations 2006 (SI 2006, No. 2739) which require employers to be responsible for the laundering of protective clothing.

#### 7.2 Current status

##### 7.2.1 Health effects

There are few statistics available concerning the health effects experienced by pregnant women, young people and children as a result of exposures to biological, chemical or physical agents in or from the workplace.

Statistics relating to medical surveillance as a result of exposure to lead are routinely recorded. In 2004/05 the total number of women and young people (all males) under medical surveillance for lead exposure in the UK were 419 and 26, respectively.\(^3\) Of these, 27 females had blood lead levels at or above the action level of 25 µg/100ml and six female workers were suspended from working with lead (i.e. as a result of blood lead levels above 30 µg/100ml). Whether the females concerned were of child-bearing age wasn’t specified.

Ovine chlamydiosis is a reportable disease under RIDDOR. There have been no reported cases of ovine chlamydiosis in recent years.

The Health and Safety Executive are also responsible for operating the Pesticides Incidents Appraisal Panel, which is responsible for investigating alleged incidents and complaints arising from exposures to pesticides. In the year 2005–06 there were 46 alleged ill-health incidents relating to non-occupational exposures of which only one was considered likely and for 26 there was insufficient information (the remainder were pending (12), unrelated (6) or not an incident (1)).\(^4\) The number (if any) of children or pregnant women involved was not specified.

The Health and Safety Executive have produced numerous leaflets communicating risks concerning pregnancy in the workplace (Box. 7.1).

\(^1\) Implementing Directive 91/414/EC

\(^2\) Report of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 1998


Box 7.1 Communicating risks – Health and Safety Executive leaflets concerning pregnancy in the workplace

Whilst health and safety legislation covers all hazards in the workplace, the Health and Safety Executive have issued advice concerning a number of specific hazards. These are outlined below:

**A guide for new and expectant mothers who work**¹ – a leaflet aimed at all new and expectant mothers who work, outlining what action the mother and employer need to take to protect their health and safety and that of their child. In particular, the leaflet highlights a number of common risks including; exposures to infectious diseases, lead, radioactive material and excessively noisy workplaces. It also highlights that working with organic mercury, radioactive material or being exposed to lead may be specific risks associated with breastfeeding that need to be assessed.

**Working safely with ionising radiation: Guidelines for expectant or breastfeeding mothers**² – the leaflet provides guidance for female employees who may be exposed during their work and, in particular, those who are thinking of having a baby, are already pregnant or breastfeeding. The leaflet outlines what should be done to protect the health of the baby and the relevant dose limits.

**Safe Handling of Cytotoxic Drugs**³ – this outlines the hazards associated with cytotoxic drugs and the precautions to take when handling them. In particular, the information sheet highlights that certain groups may be at particular risk, e.g. young workers and new and expectant mothers, and highlights that some drugs may be harmful to the unborn child.

**Drycleaners – Are you in control?**⁴ – this leaflet highlights that a recent study found that women operating drycleaning machines have an increased risk of miscarriage compared with those that don’t and that employers should control all possible risks to pregnant women, including keeping exposure to drycleaning solvents to a minimum.

**Common zoonoses in agriculture**⁵ – highlights the need to leave soiled workwear at the workplace so as to reduce the risk of wives/partners contracting Ovine chlamydiosis.

### 7.2.2 Other issues

Recently, the Royal Commission on Environmental Pollution (RCEP) were asked to look at the issue of crop spraying and the health of residents and bystanders. This resulted in publication of an extensive report that made a number of recommendations, including the introduction of 5m buffer zones around schools, residential properties and hospitals, the revision of exposure models to better take into account children’s exposures, and a review of the literature regarding pesticide spraying and human health (RCEP, 2005). The report was considered by a number of Government committees, including the Advisory Committee on Pesticides, the COT and a full response produced by Defra. The Government agreed with many of the recommendations of the RCEP report, including the need for a revised model for estimating exposures of bystanders from crop spraying, and the COT suggested there was a need for a review of the literature concerning para-

occupational exposure. The Government did not consider that there was a need to introduce 5m buffer zones alongside schools and residential properties to provide added protection against health risks, as it was considered that such action would not be a proportionate response to the scientific uncertainties involved.

7.3 Current and planned initiatives

There are a number of on-going initiatives that relate to protecting child health from hazardous biological, chemical and physical exposures experienced either in or from the workplace.

Parental exposure to solvents and the risk of childhood cancer – as part of the UK childhood cancer study, this project aims to assess the risk of childhood cancer from exposure of the child’s parents to chemicals around the time of the child’s conception. The project is funded by the HSE and is being undertaken at the University of Leeds. The project is due for completion in 2007.

Maternal radiation work and the risk of childhood cancer – an earlier study of cancer in the offspring of both male and female radiation workers (Draper et al, 1997) gave an indication of a raised cancer risk in the offspring of female radiation workers, but based on a small number of cases. A new study is examining whether this finding can be replicated using data for more recent years. The study is funded by DH and is being conducted by the Childhood Cancer Research Group and HPA Radiation Protection Division. A report is currently being prepared.

7.4 Gaps and areas for concern

No gaps or areas for concern have been identified.

---


8 EMERGENCY PREPAREDNESS

8.1 Background

Preparedness can be defined as a combination of structural and non-structural measures designed to reduce known risks but also to ensure effective responses to a range of threats. Emergencies, disease outbreaks and chemical incidents have the potential to cause severe disruption to communities on a large scale. Disease outbreaks and chemical incidents can develop very rapidly and so preparation and emergency planning are essential components in minimising the impact on the public.¹

8.2 Legislation

An number of pieces of legislation have been enacted to help ensure adequate preparations are made for unforeseen incidents. The main pieces of legislation are summarised below.

8.2.1 Civil Contingencies Act 2004

In 2001, a review of emergency planning arrangements was conducted which resulted in the development of The Civil Contingencies Act 2004², This delivers a single framework for civil protection in the UK (although arrangements differ in Northern Ireland) and is separated into two substantive parts:

- Part 1 focuses on local arrangements for civil protection and establishes a statutory framework of roles and responsibilities for local responders; and
- Part 2 focuses on emergency powers, establishing a modern framework for the use of special legislative measures that might be necessary to deal with the effects of the most serious emergencies.

The definition of an emergency in the Act concentrates on the consequences of emergencies and defines emergencies as:

- an event or situation which threatens serious damage to human welfare;
- an event or situation which threatens serious damage to the environment; or
- war, or terrorism, which threatens serious damage to security.

8.2.1.1 Part 1: Local Arrangements for Civil Protection

Part 1 of the Act establishes a statutory framework for civil protection at the local level, enhancing existing local arrangements by establishing a clear set of roles and responsibilities for local responders; giving greater structure and consistency to local civil protection activity and establishing a sound basis for performance management at a local level. Local responders are divided into two groups based on the extent of their involvement in civil protection work. Category 1 responders include emergency services

and local responders while category 2 responders include organisations such as the HSE, transport and utility companies. Category 1 responders are required to assess the risk of emergencies occurring and use the information to inform contingency planning and put emergency plans and Business Continuity Management arrangements in place as well as making arrangements to keep the public informed about civil protection matters and maintaining arrangements to warn, inform and advise the public in the event of an emergency. They must share information with other local responders to enhance coordination and cooperate with other local responders to enhance coordination and efficiency. Local authorities have an additional duty to provide advice and assistance to businesses and voluntary organisations regarding business continuity management.

Category 2 organisations are "cooperating bodies" that are less likely to be involved in the heart of planning work but will be heavily involved in accidents or incidents that affect their sector. They have a lesser set of duties – co-operating and sharing relevant information with category one responders and other category 2 responders.

8.2.1.2 Part 2: Emergency Powers

In the UK emergency powers allow the making of special temporary legislation to deal with the most serious of emergencies requiring urgent response. The powers can be used on a regional and/or devolved administration basis, ensuring that any special temporary legislation will apply only to the part of the UK affected by the emergency. Part 2 of the Act came into force on 10 December 2004.

Emergency powers are a reserved matter but Part 2 of the Act ensures the Devolved Administrations will be consulted if emergency powers are to be used in their territory.

8.2.2 Terrorism legislation

There are a number of pieces of legislation that aim to help reduce the threat of terrorism and, in doing so, reduce the risk of major incidents taking place that may impact the health of the general public, including children.\(^1\)

8.2.3 Control of Major Accident Hazards Regulations

The Control of Major Accident Hazards (COMAH) Regulations 1999 (SI 1999, No.743), as amended, and equivalent legislation in Northern Ireland, implement the Seveso II Directive except for land use planning requirements (which are implemented by changes to planning legislation). The Regulations came into force in April 1999 and aim to prevent and mitigate the effects of major industrial accidents that involve dangerous substances.

The Regulations are enforced by the Health and Safety Executive (HSE) and the Environment Agency in England and Wales, HSE and the Scottish Environment Protection Agency in Scotland, and HSE (Northern Ireland) and the Department of the Environment in Northern Ireland.

8.2.4 UK Central Government Concept of Operations

Concept of Operations (CONOPS) outline arrangements for the response to an emergency (irrespective of cause) requiring coordinated UK central government action and describes how central government response will be organised, establishing the relationship between central, regional and local tiers in England and Devolved Administrations. Strategic objectives for the initial central Government response within the scope of CONOPS are to:

- protect human life, and as far as possible property and alleviate suffering,
- support the continuity of everyday activity and the restoration of disrupted services at the earliest opportunity; and
- uphold the rule of law and the democratic process.

8.3 Current status

8.3.1 Chemical Incidents in Schools and School Emergency Plans

Between 1998 and September 2004 there were 234 chemical incidents in schools in Great Britain recorded in the Chemical Hazards and Poisons Division (London) database (Asgari-Jirhandeh, 2005). These comprised 2.6% of all recorded chemical incidents overall and included a range of different types of incident including: air (52), food and drink (15), lean/spill (70), malicious (31) and unknown (13). The number of children affected wasn’t reported, although it is likely to be low as the majority of incidents were minor.

The Department for Children, Families and Schools has issued guidance to help schools draw up plans for responding to a range of incidents that schools may experience. The guidance provides a range of advice including where to obtain advice when developing an emergency plan, dealing with different types of emergency, evacuation procedures, dealing with media interest and communicating with parents. The guidance also provides links to various resources which schools can use in the development of their emergency plan.

8.3.2 NHS Emergency Planning Guidance

The NHS Emergency Planning Guidance provides a platform of general principles to guide all NHS organisations in England in developing their ability to respond to a major incident within the context of the requirements of the Civil Contingencies Act 2004. Equivalent guidance is issued by the Devolved Administrations for the NHS in Wales, Scotland and Northern Ireland. Within the scope of the NHS, a major incident is described as: “any occurrence that presents serious threat to the health of the community, disruption to the service or causes (or is likely to cause) such numbers or

---

types of casualties as to require special arrangements to be implemented by hospitals, ambulance trusts or primary care organisations."

National Health Service organisations are required to ensure they have robust command and control mechanisms, enabling them to plan for and respond to major incidents of differing sizes (Box 8.1), linked with health and multi-agency command and control arrangements at local and regional or Devolved Administration level. Chief Executive Officers within NHS organisations are required to ensure there is adequate training, exercising and testing of emergency planning arrangements.

Box 8.1 Levels of incident for which the National Health Service is required to develop plans

There are several levels of incident for which National Health Service (NHS) organisations are required to develop emergency preparedness arrangements. These are:

- **Major** – Relatively small events (involving tens of people) where individual ambulance trusts and acute trusts are well versed in handling incidents within major incidents plans (i.e. multi-vehicle motorway crashes).
- **Mass** – Larger scale events potentially affecting hundreds, possibly involving the closure or evacuation of a major facility (i.e. due to fire/contamination) or persistent disruption over many days. Such incidents require a collective response by several or neighbouring trusts.
- **Catastrophic** – Severe disruption of health and social care and other functions (i.e. mass casualties, power and water) that exceed even collective local capability within the NHS.

In addition, there are pre-planned major events that require planning, i.e. demonstrations, sports fixtures and air shows that may require a response.

It is also the responsibility of NHS organisations to ensure Independent Sector Treatment Centres and equivalents are also involved in the processes for developing plans and responses to major incidents.

The NHS Emergency Planning Guidance specifically refers to the needs of children and other vulnerable groups and highlights that specific guidance regarding children is in preparation. There are also available specialist disrobing packs for children for mass decontamination incidents.

8.3.3 UK Resilience

UK Resilience is a Government website that provides a resource for civil protection practitioners supporting work across the UK to improve emergency preparedness. The website provides advice on emergency preparedness, emergency response and recovery as well as background information on the Cabinet Office Civil Contingencies Secretariat.

8.3.4 UK Health Departments

The four UK Health departments are accountable to their Ministers, advising on the development of policy, ensuring NHS and social care preparedness and contributing to the central agenda. They have written guidelines and policies to assist the NHS in planning for incidents of serious proportions and have provided information about specific substances or agents that could be used in terrorist attacks. They oversee and support the response of the NHS and partners to ensure the resilience of the NHS and

---

partner organisations. The DH would take command of the NHS in England during a national complex health emergency and would lead the central government response (e.g. COBR). Working with the devolved administrations, the DH are responsible for coordinating UK reserve national stock for major incidents.

### 8.3.5 Health Protection Agency

The Health Protection Agency provides expert advice to DH and Devolved Administrations on health protection policies and specialist advice and training for NHS organisations (Box 8.2). In England, the HPA provides emergency planning advice to the NHS, and resources and support for the provision and delivery of health advice to Strategic Coordinating Groups (SCGs) and Regional Civil Contingencies Committee’s (CCC). In Wales, the National Public Health Service provides health advice to SCGs and the CCC.

**Box 8.2 Emergo-Application Course**

The Emergo-Application course is a two day exercise designed in real-time for Accident and Emergency staff and staff from other hospital departments to test their emergency plans and capabilities for dealing with major incidents. The Emergo-Application System is used as a training and exercise tool for decision making in complex emergencies in planning and managing the response to a major incident. The system tests operational response, casualty management, hospital management and includes other aspects such as environmental pollution, staff welfare and short and long-term hospital needs.

### 8.3.6 The Emergency Planning Society

The Emergency Planning Society primary aims are to promote effective emergency planning and management, and promote the professional interests of its members. The Society promotes the views of its members in all issues relating to emergency planning and management and provides a forum for the study of the most effective means of planning and managing local emergency preparation and response, and dissemination of good practice. The Emergency Planning Society can also influence policy related to emergency planning and encourage the professional development of its members.

### 8.3.7 The Emergency Planning College

The Emergency Planning College is situated at the heart of Government, within the Civil Contingencies Secretariat of the Cabinet Office. Since 1989, it has been the Government's centre for running short seminars, workshops and courses on an inter-agency basis in the field of crisis management and emergency planning.

### 8.3.8 The Radioactive Incident Monitoring Network

In January 1988, following the review of the Chernobyl accident, the Government published a National Response Plan to deal with overseas radiation incidents that have the potential to impact on the UK. A central part of this plan is the Radioactive Incident Monitoring Network, which consists of 92 monitoring sites throughout the UK, which are designed to detect radioactivity from any overseas accident. The network supplies

---

hourly readings and an alert is raised if an abnormal reading is recorded. Arrangements set up by the International Atomic Energy Agency and the EC provide for the UK to receive early notification of overseas nuclear incidents involving significant releases of radioactivity.

8.3.9 Sampling After a Chemical Incident
A manual aimed at providing practical guidance about how to implement an environmental sampling programme following a chemical accident has been published by Defra (DETR, 1999a). The manual highlights the importance of sampling at sites which might be considered important because of potential human exposure to chemicals released, in addition to sites where the environment might have been affected. These sites are referred to here as ‘sensitive’ sites and they include schools, crèches (nurseries), housing estates, parks, playing fields.

8.3.10 Flooding and Weather Related Incidents
The Department for Environment, Food and Rural Affairs has policy responsibility for flood and coastal erosion risk management in England. Delivery on the ground is the responsibility of operating authorities such as the Environment Agency, local authorities and internal drainage boards. The Environment Agency is the principal flood risk management operating authority with the majority of its flood related work funded by Defra. It has permissive powers to manage flood risk from designated main rivers and the sea and is also responsible for raising public awareness of flood risk, providing flood forecasts and warnings as well as for the general supervision of all matters relating to flood risk management. The Environment Agency provides flood maps for the general public, which provide up to date flood warnings thus enabling the public to better respond to flood risk.¹

The Department of Health has published a Heatwave Plan for England² which outlines what needs to be done by health and social care services and aims to raise awareness of the risks associated with a heatwave. In particular, the plan highlights the vulnerability of babies and young children (as they produce more metabolic heat, have a reduced capacity to sweat, and have a core body temperature that rises faster than adults when dehydrated) and recommends specific measures at NHS and local levels necessary to minimise adverse health effects of a heatwave. Similar arrangements have been implemented for Wales³.

8.4 Current Initiatives

8.4.1 Emergency Planning Exercises
Within the NHS emergency planning exercises are required to be carried out on a regular basis to ensure arrangements are operating properly are well practiced. The minimum requirements within the NHS Emergency Planning guidelines require:

• a bi-annual test of communication cascades;
• an annual ‘table top’ exercise; and
• a live exercise every three years.

A number of exercises are carried out each year throughout the UK to test the preparedness of different responders to incidents that they may encounter. These exercises include looking at the potential consequences of incidents involving chemical, radiological or biological agents (either deliberately released, naturally occurring or released as a result of an accident). The outcomes from the exercises are reviewed and lessons identified are taken into account when revising emergency preparedness arrangements. Recent exercises carried out within the UK include:

• Exercise Winter Willow – this exercise tested the Government’s ability to manage the effects of an influenza pandemic.
• Exercise Young Neptune – a decontamination exercise specifically involving children (Box 8.3)
• Exercise Green Goblin – an emergency planning exercise held in the East Midlands and Eastern Region to evaluate the ability of the health communities and emergency services to deal with a no-notice terrorist attack involving a release of chlorine gas.
• Exercise Argonaut – an emergency planning exercise held in Devon and Exeter to explore the response and recovery in the region following a severe flooding event.
Box 8.3 Exercise Young Neptune – managing children in major incidents

Exercise Young Neptune resulted from discussions of the Department of Health working group on the management of children in major incidents. It was agreed that children needed to be more involved in major incident rehearsals and that they should be routinely involved where appropriate in national and local exercises.

Young Neptune was held in December 2006 to examine the effectiveness of the mass decontamination process with regard to children and, within the limitations of the exercise, the behavioural and psychological impact on children undergoing the process. The exercise sought particularly to identify any specific needs of children and sought to include young children and to allow for the possibility of cold weather conditions.

Sixty-five children, aged between 6 and 14 years, were recruited locally from St John Ambulance, Scouting and Guiding groups, together with children of Health Protection Agency and Defence Science and Technology Laboratory employees. As far as possible, comparable numbers of children were taken from all age groups and sexes, and informed consent from participants and parents was obtained using age appropriate information leaflets. Personnel from the UK Fire and Rescue New Dimensions programme, UK National Health Service Ambulance Service and Police Chemical, Biological, Radiation and Nuclear teams participated in the exercise.

On completion of the exercise, feedback was received from the participating children by using questionnaires and small group discussion. This feedback from the young users perspective, together with the formal exercise evaluation, will help to inform emergency responders when reviewing operational procedures.

8.4.2 The Scientific and Technical Advice Cell

Where there is a need for coordinated scientific and technical advice during a major incident, then this would be provided by the establishment of a Scientific and Technical Advice Cell (STAC). The STAC brings together technical experts operating under the direction of the SCG and advises on issues such as the impact on the health of the population, public safety, environmental protection, and sampling and monitoring of contaminants. The composition and function of the STAC is incident specific, but is always likely to include specialists in:

- Health – a Director of Public Health, the HPA and, where relevant, Health Protection Scotland or the National Public Health Service for Wales;
- the environment – the Environment Agency (England and Wales), the Scottish Environmental Protection Agency or the Environment and Heritage Service Northern Ireland; and
- site specific concerns.

Other members of the STAC are likely to include the Cell Lead, Secretariat, Gold Liaison, emergency service technical advisors, FSA, HSE, the Met Office, Government Decontamination Service, operational partners of Defra, and other agencies, as required. In providing advice to the SCG, the STAC would take into consideration whole population issues, including taking into account specific vulnerable groups such as children, although this would be incident specific.

8.5 Gaps and areas for concern

The specific needs of children and young people are recognised in NHS Emergency Planning Guidance and the development of further guidance is in preparation. However, to date, only one emergency planning exercise has specifically focused on the needs of children. Future exercises should look to at least include children amongst those participating in order that a better understanding of children’s specific needs can be developed and measures introduced to meet children’s specific needs in such situations.
REFERENCES


Defra (2004c) *Radon – you can test for it!* London, UK, Department for Environment, Food and Rural Affairs


Department of Health (2005b) *Mobile Phone Base Stations and Health*. London, UK, Department of Health


DETR (2000b) *The Radioactive Substances (Basic Safety Standards) (England and Wales) Direction 2000*


HSE (2002) Avoiding ill health at open farms – Advice to farmers (with teachers’ supplement). HSE Information Leaflet AIS23(rev1). Sudbury, UK, Health and Safety Executive


NRPB (2004a) Advice on Limiting Exposure to Electromagnetic Fields (0–300 GHz). Documents of the NRPB Vol. 15 No. 2. Chilton, UK, National Radiological Protection Board

NRPB (2004c) Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0–300 GHz) Documents of the NRPB Vol. 15 No. 3. Chilton, UK, National Radiological Protection Board


REFERENCES


RCEP (2005) Crop Spraying and the Health of Residents and Bystanders. London, UK, Royal Commission on Environmental Pollution


Statutory Instrument (1986) No. 902 The Control of Pollution (Supply and Use of Injurious Substances) Regulations 1986


VRC (2002) *Annual Report on Surveillance for Veterinary Residues in the UK, 2001*. Tables Containing all the Results from the National Surveillance Scheme and the Non-statutory Surveillance Scheme. Addleston, UK, Veterinary Residue Committee
VRC (2003) *Annual Report on Surveillance for Veterinary Residues in the UK, 2002*. Tables Containing all the Results from the National Surveillance Scheme and the Non-statutory Surveillance Scheme. Addleston, UK, Veterinary Residue Committee
Wagland L (2005) High radon results found in Kerrier District. *Environmental Radon Newsletter, 42*, 3
<table>
<thead>
<tr>
<th>National legislation</th>
<th>Date in force</th>
<th>European legislation</th>
<th>Provisions and relevance to children</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Contaminants in Food (England) Regulations 2007</td>
<td>1 March 2007</td>
<td>Commission Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs</td>
<td>The regulations set maximum levels for a range of contaminants in various foodstuffs. Levels are set specifically for infant formula and foods for infants and young children or, on a precautionary basis, to specifically protect the health of children (e.g. tin). The regulations also enable Member States to set stricter levels for foods for infants and young children if not already covered by Community legislation. The Commission Regulations commit to review whether there is a need to set lower maximum levels for dioxins and dioxin-like PCBs in foods for infants and young children by 31 December 2008.</td>
<td>CEC, 2006; SI 2007, No. 210</td>
</tr>
<tr>
<td>Arsenic in Food Regulations 1959</td>
<td>1959</td>
<td>N/A</td>
<td>Sets a general limit of 1 mg/kg for arsenic in food.</td>
<td>SI 1959, No. 958</td>
</tr>
<tr>
<td>The Materials and Articles in Contact with Food (England) Regulations 2005</td>
<td>29 April 2005</td>
<td>Regulation (EC) No. 1935/2004 of the European Parliament and Council on materials and articles intended to come into contact with food</td>
<td>Require that all food contact materials should not transfer their constituents to food in quantities which could endanger human health.</td>
<td>SI 2005, No. 898</td>
</tr>
<tr>
<td>The Plastic Materials and Articles in Contact with Food (England) (No. 2) Regulations 2006</td>
<td>19 November 2006</td>
<td>Directive 2002/72/EC as amended by Directive 2005/79/EC</td>
<td>Requires that plastic articles and materials shall not transfer their constituents to foodstuffs above a set limit and that only listed monomers and additives are used in the manufacturer of articles intended to come into contact with foodstuffs.</td>
<td>SI 2006, No. 2687</td>
</tr>
<tr>
<td>National legislation</td>
<td>Date in force</td>
<td>European legislation</td>
<td>Provisions and relevance to children</td>
<td>References</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>The Processed Cereal-Based Foods and Baby Foods for Infants and Young Children</td>
<td>6 March 2005</td>
<td>Commission Directive 96/5/EC on processed cereal-based foods and baby foods for infants and young children Amended by Commission Directive 1998/36/EC, 1999/39/EC and 2003/13/EC</td>
<td>Specify manufacturing and compositional requirements of cereal-based foods and baby foods for infants and young children. In particular, the regulations prohibit the sale of processed cereal-based foods and baby foods for infants and young children if the foods contain pesticide residues above certain specified levels.</td>
<td>CEC, 1996; SI 20003, No. 3207</td>
</tr>
<tr>
<td>National legislation</td>
<td>Date in force</td>
<td>European legislation</td>
<td>Provisions and relevance to children</td>
<td>References</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>---------------</td>
<td>----------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>The Extraction Solvents in Food (Amendment) Regulations 1998</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Chloroform in Food Regulations 1980</td>
<td>1980</td>
<td>N/A</td>
<td>Prohibits the sale or import of food containing added chloroform</td>
<td>SI 1980, No. 36</td>
</tr>
<tr>
<td>The Mineral Hydrocarbon in Food Regulations 1966</td>
<td>1966</td>
<td>N/A</td>
<td>Prohibits hydrocarbons in the composition or preparation of food and lays down specifications for mineral hydrocarbon, including testing requirements</td>
<td>SI 1966, No. 1073</td>
</tr>
</tbody>
</table>
**APPENDIX B**

<table>
<thead>
<tr>
<th>Children's Environment and Health Action Plan Regional Priority Goal</th>
<th>Lead Government body</th>
<th>Current actions</th>
<th>Gaps/Further actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Priority Goal IV. We commit ourselves to reducing the risk of disease and disability arising from exposure to hazardous chemicals (such as heavy metals), physical agents (e.g. excessive noise) and biological agents and to hazardous working environments during pregnancy, childhood and adolescence. We will aim to reduce the proportion of children with birth defects, mental retardation and developmental disorders, and to decrease the incidence of melanoma and non-melanoma skin cancer in later life and other childhood cancers by:- (a) passing and enforcing legislation and regulations and implementing national and international conventions and programmes to: (i) reduce exposure of children and pregnant women to hazardous chemical, physical and biological agents to levels that do not produce harmful effects on children’s health;</td>
<td>Department for the Environment, Food and Rural Affairs (Defra)</td>
<td>Overarching strategy: Securing the Future: UK Government Sustainable Development Strategy (2005)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communities and Local Government</td>
<td>Housing Health and Safety Rating System (England) Regulations 2005</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Department for Business, Enterprise and Regulatory Reform (BERR)</td>
<td>The Home Information Pack Regulations 2006</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Health and Safety Executive (HSE)</td>
<td>The General Product Safety Regulations 2005</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Toy Safety Regulations 1995</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dangerous Substances and Preparations (Safety) Regulations 2006</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Controls on Dangerous Substances and Preparations Regulations 2006</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Control of Asbestos Regulations 2006</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UK Chemicals Strategy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food Standards Agency (FSA)</td>
<td>The Control of Substances Hazardous to Health (Amendment) Regulations 2004</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Ionising Radiation (Medical Exposures) Regulations 2000 (as amended)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Ionising Radiations Regulations 1999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSA Strategic Plan to 2010</td>
<td></td>
</tr>
</tbody>
</table>
Children's Environment and Health Action Plan Regional Priority Goal | Lead Government body | Current actions | Gaps/Further actions |
---|---|---|---|
(ii) protect children from exposure to harmful noise (such as aircraft noise) at home and at school | Welsh Assembly Government | Chemicals in Wales Network – Compact Agreement (‘an effective and coordinated public health Network of expertise that will enhance the protection of public health in Wales from chemical events in Wales’) |  |
| Scottish Environment Protection Agency | Regulations effecting industrial noise and associated transport |  |
| Welsh Assembly Government | Environmental Noise Directive (END) (AEQ Branch (Wales) is mapping environmental noise in Wales to comply with END and an action plan will be formulated based on the outcomes) |  |
(iii) ensure appropriate information on and/or testing for effects on the health of developing organisms of chemicals, products and technologies before their marketing and release into the environment; | Defra | Registration, Evaluation and Authorisation of Chemicals Regulations (EC Regulation 1907/2006) |  |
| Scottish Executive | The Environment and Health Surveillance System for Scotland |  |
(iv) ensure the safe collection, storage, transportation, recovery, disposal and destruction of non-hazardous and hazardous waste, with particular attention to toxic waste; | Defra | Waste Strategy for England and Wales (2000) – currently under review |  |
| | Scottish Executive | The General Product Safety Regulations 2005 |  |
| | Health Protection Agency | National Environmental Public Health Tracking System – will feed into EHIS |  |
| | FSA | UK Children’s Biomonitoring Forum (established in 2006) |  |
(v) monitor in a harmonized way the exposure of children, as well as men and women of reproductive age, to hazardous chemical, physical and biological agents; | FSA | FSA Strategic Plan to 2010 |  |
<table>
<thead>
<tr>
<th>Children's Environment and Health Action Plan Regional Priority Goal</th>
<th>Lead Government body</th>
<th>Current actions</th>
<th>Gaps/Further actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HSE</td>
<td>Regulation (EC) No 304/2003 concerning the export and import of dangerous chemicals</td>
<td>Implements the Rotterdam Convention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regulation (EC) No 1013/2006 on shipments of waste</td>
<td>Implements the Basel Convention</td>
</tr>
<tr>
<td>(b) implementing policies to raise awareness and endeavour to ensure reduction of exposure to UV radiation, particularly in children and adolescents;</td>
<td>Department for Children, Schools and Families</td>
<td>Standards for School Premises (DfES, 2000)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Northern Ireland Executive</td>
<td>SunSmart Campaign</td>
<td></td>
</tr>
<tr>
<td>(c) promoting programmes, including those for the adequate dissemination of information to the public, that will prevent and minimize the consequences of natural disasters and major industrial and nuclear accidents such as Chernobyl and that take into consideration the needs of children and people of reproductive age.</td>
<td>Cancer Research UK</td>
<td>Care in the Sun campaign and Northern Ireland Melanoma Strategy (1998)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Northern Ireland Executive</td>
<td>Civil Contingencies Act 2004</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Control of Major Accident Hazards (COMAH) Regulations 1999</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Radiation (Emergency Preparedness and Public Information) Regulations 2001</td>
<td></td>
</tr>
</tbody>
</table>