

Training for the health sector



Occupational Risks for Children's Health

Children's Health and the Environment
CHEST Training Package for the Health Sector

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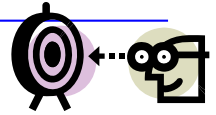
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LEARNING OBJECTIVES

After this presentation trainees will be able to:

- ❖ Understand the ways in which occupational risks can affect children's health
- ❖ Develop preventive strategies to manage occupational risks which can potentially affect children's health
- ❖ Provide advice to current and future parents about how to avoid and deal with occupational risks which can have an impact on their children

After this presentation, we hope that you will be able to:

- Explain how children's health can be damaged as a result of workplace exposures.
- Suggest several ways of protecting children's health from occupational risks, namely:
 - parents reproductive health
 - prenatal health
 - children's health
- Give advice to future and current parents on how to avoid work-related reproductive hazards and how protect their children from health risks arising from the workplace.

Exposure to occupational risks during the different phases of child development

- ❖ **Before birth** (before conception and during pregnancy) – parental exposures to mutagens and teratogens, neurotoxicants, psychological and mechanical risks
- ❖ **Infancy** – take home exposures, home work
- ❖ **Childhood** – take home exposures, home work, child labour
- ❖ **Adolescence** – home work, vocational training, apprenticeship, work

Most children do not work, however health risks from workplaces can affect their health and development in a number of ways.

Exposure of children to occupational risks can occur at any stage of their life, even before birth.

The exposure of future mothers and fathers to certain risks at the workplace can have a serious impact on the health of their unborn child. Occupational exposures before birth can occur before conception and during the whole period of pregnancy.

During the period of infancy children can be also exposed to different hazards related to work. Parents could bring such hazards home with contaminated working clothes (so called take-home exposures), or expose their children to such hazards when they are working at home

The most direct form of occupational exposure of children is child labour. Child labour which can damage health is prohibited by international law.

After the age of 15 children can work legally, but they can still be exposed to risks at the workplace which can harm their health and development.

Adolescents start learning work skills and preparing for future working life.

Therefore it is important that together with work skills they learn also how to protect themselves from occupational risks.

We will next explore how occupational risks can affect the health of children in the different stages of their life

Occupational exposures before conception

□ Future fathers

- Decreased sperm count - estrogens, heat stress, lead, ionising radiation, carbon disulfide, di-bromo-chloropropane
- Decreased sexual drive – chloroprene, stress
- Changes in genetic material (birth defects) – mutagens – carbon dioxide, ethylene dichloride, vinyl chloride, ionising radiation

□ Future mothers

- menstrual disorders – ionising radiation, shift work
- Reduced fertility or sterility – arsenic, benzene, carbon disulfide, carbon monoxide, epichlorhydrin, ethylene dibromide, lead, manganese, mercury, phosphorus, trichloroethylene, vinyl chloride
- Changes in genetic material (birth defects, miscarriages) – antimony, arsenic, cadmium, carbon disulphide, carbon dioxide, chlorinated hydrocarbons, ethylene compounds, lead, mercury, methyl-ethyl-ketone, nitrous oxides, trichloroethylene, vinyl chloride

Future parents can be exposed at their workplaces to many occupational health risks which can affect their ability to have children or the health of their future children

Both men and women can be affected by reproductive occupational health risks.

Exposures to some chemicals or to stressful conditions can cause both male and female workers to experience a decrease in their desire or ability to have sex. Occupational exposures can also cause menstrual problems, which may prevent ovulation from taking place. For example, chemicals which have depressant effects, such as certain solvents, may suppress the sex drive (the libido). Stress, working on shifts, or exposure to certain organic solvents can disrupt the normal menstrual cycle, which in turn can affect fertility.

Another possible effect of exposure to certain occupational hazards is their ability to cause direct damage to the germ cells (sperm and eggs). Radiation and certain chemicals can cause decreased fertility or even sterility. Occupational risks can reduce the number of sperm to a level below the minimal necessary for fertilization.

Certain occupational hazards can cause mutations in genetic material which can be passed on to future generations. Such hazards are called mutagens. Genetic mutations can result in birth defects, stillbirth or miscarriage, depending on the type of damage caused.

Ref:

US Navy Environmental Health Centre (2001), "Reproductive and developmental hazards: a guide for occupational health professionals," available at [www-nehc.med.navy.mil/downloads/occmdev/Reprodev2001.pdf](http://www.nehc.med.navy.mil/downloads/occmdev/Reprodev2001.pdf)

ILO, *Male and Female Reproductive Hazards in the Workplace*, available at www.itcilo/english/actrav/telearn/osh/rep/prod.htm

Occupational exposures during pregnancy

Occupational hazards

- Chemical risks – cancer treatment drugs, ethylene-glycol ethers, carbon disulfide, lead
- Physical agents – radiation (x-rays and gamma rays)
- Biological agents – cytomegalovirus, hepatitis B virus, HIV, Rubella, Toxoplasmosis, Varicella-zoster virus
- Strenuous physical labour – prolonged standing, heavy lifting, twisting movements of the torso

Health effects

- Birth defects
- Low birth weight and premature birth
- Complications of pregnancy
- Miscarriages
- Developmental disorders
- Childhood cancer



Once fertilization has taken place, some harmful substances from the working environment can pass through the mother to the developing embryo or foetus. The foetus is at greatest risk during the first 14 to 60 days of the pregnancy when the major organs are being formed. However, depending on the type and amount of exposure, a foetus can be damaged at any time during pregnancy. For example, exposure to a particular hazard at one time in a pregnancy may result in organ damage and at another time in the pregnancy could cause death of the foetus and miscarriage.

Occupational hazards that prevent the normal development of a foetus are called teratogens. Teratogenic substances can pass from the blood of the mother to the blood of the foetus, across the placenta.

There are a number of chemicals, biological agents (such as bacteria and viruses), and physical agents (such as radiation) used in a variety of workplaces that are known to cause birth defects. Birth defects can include a wide range of physical abnormalities, such as bone or organ deformities, or behavioural and learning problems, such as a mental retardation. Exposures to some chemicals during pregnancy can lead to the development of cancer later in the life of the child. Such chemicals are called transgenerational carcinogens

Exposure to occupational hazards during the second and the third trimester of a pregnancy can lead to slow foetal growth and result in low birth weight. Low birth weight is a serious risk factor for the health of the child and is one of the leading causes of under-five mortality rate in developed countries.

Work-related factors that cause stress, such as repetitive work, lack of breaks and constant demands on pregnant workers can be directly related to premature birth.

Ref:

NIOSH (1999) "The effects of workplace hazards on female reproductive health" DHHS (NIOSH Publication No. 99-104, Cincinnati, OH

Drozdowsky, Sharon L. and Stephen G. Whittaker (1999) "Workplace hazards to reproduction and development: a resource for workers, employers, health care providers, and health & safety personnel," Washington State Department of Labour and Industries, Olympia, WA

The role of health care providers

□ Answering workers questions

- Identify hazards
- Estimate patients exposure
- Get professional help, e.g. from occupational health experts

□ Planning the pregnancy

- Potential reproductive hazards
- Planned conception
- Prevention of exposure

□ Evaluating patient risk

- High concern
- Moderate concern
- Low concern
- No concern

□ Make recommendations to employer/worker

Health care providers are frequently asked whether certain workplace risks pose a threat to the ability of men and women to have a healthy child. While the assessment of workplace risks is the primary responsibility of the employer, health care providers are responsible for advising patients and answering their health related questions.

When faced with concerns about the health effects of the workplace, the health care provider can consult an expert in occupational health. Such experts usually work in the occupational health services of the enterprises, or in the district public health centres.

Health care provides can also consult some of the manuals on occupational health developed for primary health care workers. For example the WHO Regional Office for the Eastern Mediterranean has developed such manual to assist health providers in the primary health care settings in addressing the occupational health concerns of their patients and in assisting them to solve their problems.

Planning pregnancy is often associated with considering many aspects, for example finances, age of other children, living arrangements etc. It is very important to consider also work issues when planning to have a child because exposure to harmful substances is often preventable. For example, men who want to be fathers have to find out whether they are exposed to certain substances at their workplace which may affect their ability to have children or the health of their future child. Because sperm cells renovate every three months, it is usually enough to discontinue the exposure to reproductive hazards several months before the planned conception. However, this is not the case of future mothers. Women are born with the whole number of eggs which they will produce throughout their life and the damage of these eggs may be irreversible. However, most hazardous exposures before conception and during pregnancy can be avoided.

In evaluating patient risks it is important for the health care provider to consider both work-related and non work-related risks, for example age, lifestyle factors, and personal or family history of adverse outcomes.

It is important to ask questions to evaluate historical and current occupational exposures. The health care provider may determine if there are any specific medical conditions or complications of pregnancy that might make a working pregnant mother unusually susceptible to any occupational health hazard. For instance, a patient with placenta previa or with threatened abortion should be advised to avoid lifting weights and prolonged standing. Also, a foetus that is already smaller for its gestational age would be at greater risk of further compromise by maternal exposure to developmental hazards

Situations of high concern include overexposure or substantial exposure to a known or probable human reproductive toxicant (human evidence).

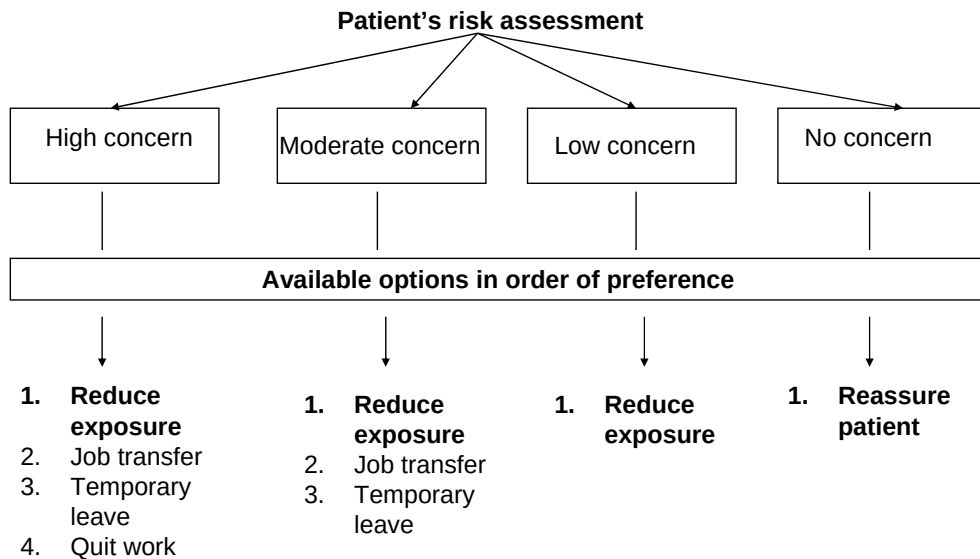
A moderate concern situation would be an on-going, frequent exposure to a probable or possible human reproductive toxicant (animal evidence).

Situations of low concern are usually infrequent, transient, low-level exposures to a possible reproductive toxicant.

Finally, situations with extremely low exposures to a substance unlikely to be harmful to human reproductions are of no concern

Ref: Drozdowsky, Sharon L. and Stephen G. Whittaker (1999) "Workplace hazards to reproduction and development: a resource for workers, employers, health care providers, and health & safety personnel," Washington State Department of Labour and Industries, Olympia, WA

Determining interventions



Workplace practices may need to be modified or eliminated to control reproductive or development risk. Based on the results of the risk assessment the health care provider can advise the patient on the level of risk. Several options are available to protect workers who are considered to be at risk. In order of preference these are:

1. Reducing the level of exposure
2. Temporary transfer to a job assignment with reduced exposure to hazardous agents
3. Compensated and uncompensated leave
4. Quitting work

Reducing the level of exposure is always the preferred alternative to any situation. This approach does not single out reproductive hazards that may affect individual worker or one sex more than the other and thus avoids discrimination. Moreover, European Union's law on health and safety at work stipulates that risk shall be avoided and that work shall be adapted to the individual.

Exposure to hazardous substances can be reduced through their replacement with less hazardous or non-hazardous, through ventilation, using safe work practices and finally through personal protective equipment. However, the use of personal protective equipment should be advised only as a last measure to control exposure. Moreover, such equipment, for example gas masks, may not be appropriate for pregnant women who have short breath. Measures to reduce exposure are usually developed by specialized occupational health services by safety engineer in the enterprises. However, the health care provider should notify the employer and the respective occupational health service that the individual workers is being considered at high risk of reproductive health effects.

Temporary transfer or compensated and uncompensated leave depend on the legal practice in each country. In many industrialized countries these options are available upon advice from healthcare providers.

Finally, whether a worker decides to quit work is a personal option. It is important that a worker be aware of the other options available and of the consequences of his or her decision.

Ref:

Drozdowsky, Sharon L. and Stephen G. Whittaker (1999) "Workplace hazards to reproduction and development: a resource for workers, employers, health care providers, and health & safety personnel," Washington State Department of Labour and Industries, Olympia, WA

Occupational exposures during infancy

□ Exposure through breast milk

- Polychlorinated biphenyls (PCBs), polybrominated biphenyls (PBBs), DDT, organic solvents, lindane, methylene chloride, phthalates, perchloroethylene, mercury, lead

□ Take-home exposures

- Industrial chemicals, pesticides, fibres, metal dusts or biological agents brought home from a work site by a parent (lead, cadmium, mercury, fiberglass, asbestos, bacteria)

□ In-home exposures

- Hazards associated with work conducted by parents in a home setting – e.g. kitchen table assembly of radar detectors (lead), backyard work on car batteries (lead, cadmium), home manufacture of methamphetamine (volatile solvents, corrosive materials), accidental poisoning from chemicals stored at home (pesticides)

During the first five years the child can be usually indirectly exposed to occupational health risks. Some toxic chemicals concentrate in fat tissue once they are absorbed into the body. Since breast milk is rich in fats, a breast feeding infant can be exposed to these toxic chemicals. However, because breastfeeding has many benefits, a woman who is exposed to reproductive hazards at work should consult with her healthcare provider before deciding whether or not to breastfeed.

Children and/ or other family members can be exposed to workplace chemicals if they are brought home on skin or working clothes. If laundry facilities are not provided at the enterprise, workers may bring their working clothes to wash at home. Such clothes can be contaminated with chemicals from the workplace and when washed together with the children's clothes can expose children in the family to industrial and agrochemicals. Examples of such take-home exposures are lead, cadmium, mercury, fiberglass, asbestos, pesticides, bacteria etc.

Parents who work at home can create many risks for their children. For example kitchen table assembly of radar detector is associated with dipping wires in lead. Backyard work on cars and recycling of batteries can also expose children in the family to risk of lead intoxication or inhalation of asbestos. Clandestine home manufacture of methamphetamine, an illicit drug, can expose children to carcinogens, neurotoxins and corrosive materials. Therefore it is very important to have a medical evaluation of children who are being removed from such homes and placed in foster care.

Ref: Drozdowsky, Sharon L. and Stephen G. Whittaker (1999) "Workplace hazards to reproduction and development: a resource for workers, employers, health care providers, and health & safety personnel," Washington State Department of Labour and Industries, Olympia, WA

American Academy of Pediatrics Committee on Environmental Health. *Workplaces*. In Etzel, RA. ed. *Pediatric Environmental Health*. 2nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003: 493-513

The worst forms of child labour

- ❑ Slavery, trafficking of children, forced labour, child soldiers
- ❑ Child prostitution, use of children in pornography
- ❑ Involving children in illicit activities, e.g. production and trafficking of illicit drugs
- ❑ **Hazardous child labour** - work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety and morals of children.

All these forms of child labour are prohibited by international law
(ILO Convention No. 182 ratified by 130 countries)

Some legal facts about child labour:

The 1948 Universal Declaration on the Rights of the Child recognized the right of children to an education and freedom from exploitation.

The International Labor Organization's Minimum Age Convention of 1973 (Convention 138) defines "child labor" as most work performed by children under the age of 15.

Child labour under the age of 15 is prohibited by international law. In the age interval 15-18 years children can work legally, but not in hazardous conditions

The ILO Convention No. 182 from 1999 Concerning the Prohibition and Immediate Action for the Elimination of the Worst form of Child Labour calls on ratifying states to take immediate and effective measures to prohibit and eliminate all worst forms of child labour (under the age of 18).

What are these forms?

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However, data from the International Labour Organization show that globally, over 211 million children from 5-14 years old are economically active and of these 111.3 million (52%) work in conditions hazardous to their health. The ILO emphasizes that no country is immune to the problem of child labour.

Hazardous work under the age of 18 is the most widespread form (62%) of the worst forms of child labour. It is difficult to estimate the magnitude of this problem in the European Region as a whole since the data are very scarce. However some figures suggest that it may be a problem across the Region. For example, of the 1.6 million children in Turkey who are economically active, 310,400 (19.4%) have experienced work accidents and other health problems related to work. In Ukraine 147,000 (42%) of the 350,000 economically active children work in hazardous conditions with heavy physical load, excessive concentration, eye strain, dust, fumes and noise. In Portugal between 43,000 and 82,000 children (4-7% of all children 5-14 years of age) are working and 2% of these suffered accidents or sickness related to their work. In Italy alone, about 17,000 work accidents are being registered annually where the victim is under 17 years of age

Hazardous child labour (below 18 years of age)

□ **Most often in rural and informal sectors, varies according to countries**

- Small factories, enterprises, cottage industries, family trade, farms
- Services (domestic help, construction)

The elder ones in the field or construction sites, where the younger ones (even babies!) play alongside...

High risk sectors

AGRICULTURE

Metal work
Toy-making
Button-making
Meat processing
Deep-sea fishing
Dock work
Auto-repair

- Mining
- Brick-making
- Textile workshops
- Carpet-weaving
- Tanneries and footwear
- Matches and fireworks
- Paint shops
- Entertainment

The vast majority of working children are in the agricultural sector. A substantial number of children work in industry, services, small and medium size enterprises and the family business. The highest proportion of working children in the 5-15 age group work in the informal sector.

There are some sectors of economic activity where it is more likely to encounter hazardous child labour. These are:

READ HIGH RISK SECTORS FROM THE SLIDE

Hazards for working children

☐ Accident hazards

- Risk of falling, being stuck by objects, being caught in or between objects, being cut or burned

☐ Biological hazards

- Dangerous animals and insects, poisonous or sharp plants, exposure to bacteria, viruses, parasites

☐ Chemical hazards

- Dangerous gases, liquids, dust, agrochemicals, explosives, flammable or corrosive materials

☐ Ergonomic hazards

- Poorly designed workplaces, lifting, carrying or moving heavy loads, repetitive movements, awkward work postures

☐ Physical hazards

- Extreme temperatures, noise, vibrations, radiation

☐ Working conditions and psycho-social risks

- Stress, hard monotonous work, lack of control or choice, insecurity, harassment or abuse (sexual or violence), shiftwork, long working hours, night work or work in isolation, underground work and work at heights.

Working children can be exposed to the same hazards as working adults. However, in some cases children are more likely to be exposed to certain hazards than adults because of their physical and psychological differences.

For example children have difficulties in judging the risks to which they are exposed and they may be more likely to take risks or to ignore them. Also the smaller height of children makes them more vulnerable to exposure to vapours and gases which are heavier than air, particularly in cases of leakage and accidents.

Personal protective equipment, gas masks, earplugs, gloves, goggles etc. are developed for adults. They do not protect children.

The major hazards which can affect the health of working children are following:

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Some of these hazards have serious consequences for children's health. The health effects of other hazards are not so clear. Whether occupational hazards will affect children's health depends on:

1. activity, duration and intensity of the exposure
2. workplace – not all workplaces in agriculture are hazardous for children's health
3. working conditions – long hours, working in shifts, night work
4. individual health status of the child – malnourishment, anaemia, infectious and parasitic diseases may aggravate the effects of occupational hazards.

Ref: ILO "Eliminating hazardous child labour step by step", International Programme for Elimination of Child Labour, Geneva

Health effects of hazardous child labour

- **Acute poisonings**
 - Cleaning solutions, volatile solvents, pesticides
- **Injuries**
 - Cuts, fractures – fall from trees when picking fruit, traffic and agricultural accidents
 - Burns and scalds – firewood used for cooking or open fire
 - Animal bites – rabbits, dogs, cattle, poisonous snakes and insects
 - Drowning – in wells without protective barriers
- **Chronic effects**
 - Early hearing loss - noise
 - Contact dermatitis – corrosive or irritant substances, cold, heat, humidity
 - Infectious and parasitic diseases
 - Respiratory system diseases – from cotton, nitrous fumes, phosphorus, dust (silica, coal, asbestos)
 - Neurological impairment – lead, mercury, carbon monoxide
 - Anaemia – lead, benzene, malnutrition
 - Cancer – exposure to carcinogens
 - Psychological disorders – working in isolation, child abuse, harassment

These hazards have acute and chronic effects

The acute effects are acute poisonings and injuries and develop immediately after the exposure, while the chronic effect need some time to develop. In some cases, the effects of child labour can develop during the adult life, as it is in the case of cancer.

READ SLIDE

Ref:

Forastieri, Valentina (2002) "Children at work: health and safety risks", International Labour Office, Geneva

Child labour - the role of health care providers

❑ Specific diagnostic methods

- Occupational history– parents workplaces, child work
- Biomonitoring - blood lead levels
- End-organ effects of exposure - hepatocellular enzymes
- Workplace risk assessment

❑ Treatment of clinical symptoms

- Determine and eliminate the source of exposure
- Specific antidotes (Poison control centre)
- Symptomatic treatment

In order to recognize the health effects of hazardous child labour it is necessary to take a thorough history (including occupational history) and to make a detailed physical examination. The effects of most occupational hazards are not easily detectable. Therefore asking purposefully questions whether the child has been doing any kind of work, or what are the parents working and where they carry out their work can be important to pinpoint whether occupational exposure is a problem. Examples of potential job-related exposures in developed countries which can affect children are: (1) working with hazardous machines in agriculture; (2) scavenging in landfills; (3) using cleaning agents in nursing homes, restaurants, and schools; (4) pesticides in lawn care work, farm work, and when buildings are sprayed; (5) isocyanites (pulmonary sensitizers) during autobody repair or roofing; (6) benzene when pumping gas; (7) lead from radiators in car repair or home renovation; (8) asbestos in autobrake repair, renovation/demolition of old buildings; (9) solvents in T-shirt screening; (10) asthma producing wood dusts in shop and furniture making; (11) welding fumes and eye exposure to UV; (12) tetanus and other biological hazards in farming (hypersensitivity pneumonitis), veterinary clinics, hospitals and nursing homes; (13) noise in farming and factory work; (14) working in smoking areas of bars and restaurants – exposure to environmental tobacco smoke.

In some cases, the hazardous substance can be measured in body fluids. Blood lead levels are very sensitive marker of recent and past exposure to lead. When the substance itself can not be measured, it might be possible to measure the effects of this substance on the end-organ, for example hepatocellular enzymes following solvent exposure. In cases of acute poisoning it is important to save the original container for analysis if needed. In some cases, knowing the substance can be crucial for the therapy as there might be specific antidotes.

The best treatment is to eliminate the source of exposure. It should be born in mind that the routes of exposure are different. There are dermal, oral, and inhalator exposures, and eliminating one route of exposure does not necessarily mean that the other possible routes are eliminated. For example, cleaning the air from exhaust gases may reduce exposure to lead through inhalation, but the soil may be still contaminated with lead and children playing nearby can ingest lead from the contaminated dirt.

Specific suggestions for medical treatment of the consequences of toxic exposures can be obtained from the poison control centres.

Ref: American Academy of Pediatrics Committee on Environmental Health. Workplaces. In Etzel, RA. ed. *Pediatric Environmental Health*. 2nd ed. Elk Grove Village, IL: American Acedemy of Pediatrics; 2003: 493-513

Child labour - the role of health care providers (2)

□ Prevention of exposure

- Training and engineering control
- Ergonomic adjustment
- Other occupational health and safety measures, if applicable

□ Help parents make informed decisions about the safety of their adolescents at work

- Individual fitness for work – medical certificates
- Medical contraindications for certain works
- Parents should be role models for protection of health and safety at work
- Involve schools in promoting preventive culture

Prevention of exposure can be achieved through training and engineering programmes. Usually such activities are carried out by specialists in occupational health and engineers who possess the necessary knowledge of substances and potential routes of exposure. However, some measures are not so complicated. For example chronic back problems of a lifting teenager may be prevented if the size of the load is matched to the size of the child. Another example would be a programme to prevent noise-induced hearing loss through yearly hearing tests accompanied by wearing hearing protection devices.

It is the duty of the healthcare provider to talk to parents about the potential risks and benefits of work for their adolescent. Certain medical conditions are contraindications for working with hazardous substances, loads, noise, etc. An existing bronchial asthma may seriously aggravate if the adolescent is exposed to certain substances at the workplace. Also teenagers who are small for their age may not be able to fit the personal protective equipment necessary for the job. Parents should be encouraged to be role models for protecting health and safety. Parents, for example, who are farmers can demonstrate to their children the safe use of different farm devices and the safe handling of agrochemicals.

Ref:

American Academy of Pediatrics Committee on Environmental Health. Workplaces. In Etzel, RA. ed. Pediatric Environmental Health. 2nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003: 493-513

*Work is the source of our subsistence. It can be also a fulfilling joy for both adults and young people.
You can help this happen !!!*



Picture by David L. Parker, M.D., M.P.H

To end this presentation, I would like to remind you that work can and should have positive effects on physical, psychological and social well-being, both in the current and in the future generations. It is possible to organize work in a way that will not harm our children and our future.

The experience from some countries and companies has shown that good health and safety measures at work leads to increased productivity, better health and quality of life. Good occupational health and safety also provides for long-term sustainability of companies and whole societies.

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