

concentration multiplied by the duration of exposure). At exposure levels below those allowed for asbestos workers, the risk of asbestosis is negligible. Some scarring of lung tissue may appear on X-rays after many years of low exposure, but no impairment of respiratory function is likely to occur. However, the incidence of lung cancer and mesothelioma exceeds baseline rates even at very low exposure levels. This conclusion is supported by the increased incidence of lung cancer for workers experiencing the equivalent of five years' exposure to airborne asbestos at the current federal workplace standard (USEPA 1982). In addition, mesothelioma has been found in persons whose only known exposure to asbestos was from living in a household with asbestos workers or in the neighborhood of asbestos mines, mills, or processing facilities (USEPA 1982).

Asbestos-related lung cancer usually appears after age 45, and its occurrence is heavily influenced by cigarette smoking. For example, in one study of asbestos workers, smokers experienced a fiftyfold increased incidence of lung cancer compared with similarly-aged workers who neither smoked nor were exposed to asbestos. Among the nonsmoking asbestos workers, only a fivefold increase in incidence was found (USEPA 1982).

The age at which asbestos exposure occurs is relatively unimportant for determining the lifetime risk of lung cancer for people less than 45 years old. Asbestos inhaled at age 15 has virtually the same effect in terms of lifetime risk as asbestos inhaled at age 40. In contrast with lung cancer, the age at which asbestos exposure occurs is very important in determining the lifetime risk of developing mesothelioma. This fact creates a special concern for asbestos exposure in children. Studies of workplace exposure indicate that, for persons exposed for several years, the probability of developing mesothelioma remains constant for an initial period and then increases continuously with time from onset of exposure. Since children have a greater remaining lifespan than adults, their lifetime risk should be greater. For example, asbestos workplace studies suggest that a child exposed from age 5 to 10 has at least 10 times the chance of developing mesothelioma as does an adult exposed to the same amount of asbestos between ages 35 and 40.*

1.2 EPA and OSHA Regulations Related to Asbestos

Both EPA and the Occupational Safety and Health Administration (OSHA) have published regulations to reduce exposure to asbestos. The EPA rules have focused on two aspects of asbestos in buildings: (1) the application of asbestos-containing materials in new or remodeled buildings, and (2) the identification of friable asbestos in schools. In addition to these rules, EPA has regulated the emission of asbestos fibers from the handling of asbestos in asbestos industries and the disposal of asbestos-containing waste. The OSHA regulations address worker protection in asbestos workplaces.

EPA has issued two sets of regulations. The first set was promulgated under the National Emission Standards for Hazardous Air Pollutants (NESHAPS) as authorized in the Clean Air Act. This set of regulations includes a 1973 ban on the use of spray-applied asbestos-containing materials in buildings for insulating or fireproofing purposes, except for equipment and machinery, as well as the specification of "no visible emissions" from permitted spraying, as published in the FEDERAL REGISTER (38 FR 8826).†† Methods of removing friable asbestos from buildings during demolition also were regulated at this time. The ban was amended in 1975 to include molded and wet-applied insulation, as published in the FEDERAL REGISTER (40 FR 48292). In addition, rules governing asbestos removal were broadened to include building renovation, and procedures for disposal of removed materials were defined. Finally, the ban on spraying asbestos-containing materials was broadened in 1978 to include

* Personal communication with William Nicholson, Mt. Sinai School of Medicine, 1982.

† The difference between friable and nonfriable materials is discussed in the introduction to Chapter 2.

†† Materials with less than 1 percent of asbestos by weight were excluded from the ban.