

#### 4 The Hazards of Internally Deposited Radium

The information in the following sections on the health status and mortality of radium-exposed individuals was derived from three sources. First, the cause of death for each deceased radium subject was coded according to the eighth revision of the *International Classification of Diseases, Adapted* (U.S. Public Health Service 1965). A death certificate has been obtained for almost every radium subject known to be deceased. Each certificate has been submitted to the National Center for Health Statistics, whose nosologists have provided the appropriate International Classification of Diseases (ICD) code number. Every subsequent reference to a coded cause of death refers to the cause designated by the ICD code number.

The second source of information is known as the SNOP (Systematized Nomenclature of Pathology [College of American Pathologists 1965]) file. The SNOP file is a very large database containing coded medical information. The coding process was described by Littman et al. (1973). Briefly, information from primary sources (autopsy, surgical reports, physical examination, death certificates) and secondary sources (physician letters, journal reports, family histories) is included. The source for each item of information is coded, as is the information itself. Each case may have any number of entries, depending on the number of sources of information available. Some cases do not appear in the SNOP file, while others have 1-100 or more entries. The file has entries for almost 5,700 radium, thorium, and other cases. Each medical event recorded is listed in a single record; more than 200,000 records are in this file. In spite of its size, this database is not suitable for epidemiologic surveillance of the population, because the uniformity of data gathering is unsatisfactory. However, the SNOP file does contain a wealth of information, and it may show trends that are suggestive even if they cannot be rigorously quantified.

The third source of information applies only to subjects with the known radium-induced malignancies (bone sarcomas and carcinomas arising in the paranasal sinuses and the mastoid air cells). These malignancies have been identified primarily by pathologic analysis of tissues or, in a few cases, by gross radiologic evidence from the primary cancer site. The subjects known to have these malignancies are identified specifically by a date of first diagnosis; they are included in the appropriate malignancy listing regardless of the coded cause of death.

Some of the several causes of death summarized here have been positively associated with internal radium by statistical analysis; these include bone sarcomas and head carcinomas. Other causes have yet to be proven to be associated with radium, but they have appeared in excess of expected