

on the average, more than four times as much radium as the clinic patients. Third, the Elgin patients, in spite of their higher radium doses, survived more than twice as long as the clinic patients.

The Elgin patients' treatment was described in the literature in 1933 (Schlundt et al. 1933). Most were still institutionalized in the 1950s and thus were easily located when the radium studies were initiated at Argonne. In contrast, eight clinic patients were treated with radium water (doses not recorded) in 1922, and the remainder received intravenous injections in 1925-1928. An account of some of the latter treatments, for hypertension and pain, was published by Allen et al. (1927), but this publication was unknown to CHR personnel until the 1970s. The patient records were not obtained until 1972 or later, when Professor Evans, then retired and working for the CHR, received approval to examine the clinic's files. By this time most of the patients were deceased, and those still living were very difficult to locate.

The Elgin patients received radium injections that we now know were within a range making the probability of radium-induced malignancy high, but the injections were not large enough to produce any somatic effects. These patients received radium in an attempt to alleviate a mental problem, not a physical disease. The reduced survival of the clinic patients probably had nothing to do with their radium exposures, because they were already sick at the time of their treatments. Fourteen of them survived less than a year after their treatment at the clinic.

Industrial experience was more likely to yield useful lists of those potentially exposed. The MIT group obtained an excellent list of workers at the Waterbury Clock Company, in Waterbury, Connecticut. C.E. Miller had obtained photographs of employees of the Radium Dial Company plant in Ottawa, Illinois, from which identities of almost all workers in the pictures were established. The medical assistants searched through the city directories of the Illinois cities in which dial painting plants were located to find the names of employees. From such sources some lists were developed, and it is of interest to see how many of the employees on such lists have been studied. Table 6 shows, for four of the largest dial painting plants, the number of female dial workers identified from employment lists, city directories, or photographs and the fraction of the workers studied.

A number of employees from the Luminous Processes plant are apparently still alive and unmeasured; they could be added to the totals in Table 6, but only a few still survive from the other listed plants. More than 10% of the total number of workers in the Luminous Processes plant started