

were followed by members of the clothing trades, sanitation and medicine, lumber trades, etc., the farmers being well in the middle of the list, and workers employed in metallurgic, chemical, building and mining industries having the lowest cancer death rate. Oliver, in 1902, stated that glass makers, ironstone miners, tin miners, wool workers, shoemakers, and especially chimney sweeps display an excessive mortality from cancer, while miners in general were found to have a death rate 16 per cent below the average.

These few examples of the early efforts in this field may suffice, as the results obtained were not only contradictory (Jacobs), but the analyses were made without proper consideration of age groups and site of neoplasms, and were for this reason unreliable (Arnstein). Staemmler characterized these studies as defective and primitive beginnings in the establishment of interrelations between occupational exposures and cancer susceptibility by the statistical method. In commenting on these data, Koelsch called attention to several additional factors which made the information conveyed by these early investigations untrustworthy and misleading.

This investigator pointed out that it is difficult to obtain representative occupational groups, that is, groups of individuals exposed to the same occupational conditions to approximately the same degree and duration. A group such as "metal workers," for instance, includes persons having the most varied contact not only with different metals and metallic compounds, but also with numerous other substances, such as silica, lubricants, chemical fumes, and gases of varying kinds. Thus they form a group of individuals which is by far too crude and comprehensive for any significant and reliable statistical evaluation.

Similar, and perhaps even stronger, objections can be raised against the group of "chemical workers," as this is composed of individuals exposed to an even much greater number of substances possessing the most varied biological properties and acting at the same time under very different conditions and intensities upon the individual members of this group. Statistics on general cancer incidence, as well as organ cancer incidence based on an occupational grouping of such vagueness, are not infrequently absolutely valueless.

In addition to the lack of proper consideration given in these early studies to the age grouping in different professions, to the sites of the tumors and to the sex of the workers, practically no attention has been paid to the fact that many workers, especially the unskilled type, exhibit a more or less definite tendency to change the nature of their occupational activities. The inclusion of such workers and their relative proportion in the different occupational groups introduce additional sources of error, because these individuals are listed, as a rule, in that occupational group to which they were attached when the malignant neoplasms were first noted or to which they belonged at the time of their death. There are, moreover, certain non-occupational factors, such as condition of living quarters, diet, habits, hobbies, customs, and regional