Minimum Latency & Types of Cancer

World Trade Center Health Program

According to the James Zadroga 9/11 Health and Compensation Act of 2010 ("Act"), a determination that an individual's 9/11 exposure is substantially likely to be a significant factor in aggravating, contributing to, or causing a type of cancer must be made based on an assessment of the individual's exposure to airborne toxins, any other hazard, or any other adverse condition resulting from the terrorist attacks and the type of symptoms and temporal sequence of symptoms.[*] With regard to the temporal sequence of symptoms, cancers do not occur immediately after exposure to a causative agent, but can take months or years to manifest clinically. Based on the latency (temporal sequence of symptoms) requirement in the Act, the Administrator has determined that a minimum time period (latency) must have elapsed between the initial date of exposure and the date of initial diagnosis of the individual's cancer for the condition to be certified.

The scientific literature assessing latency periods is scarce, and is available for only a few of the cancers that the Administrator has added to the List of World Trade Center-Related Health Conditions eligible for coverage under the World Trade Center (WTC) Health Program. The assessment of cancer latency is straightforward for exposures occurring at a single point in time and even for those of constant intensity for all exposed individuals. However, most human carcinogenic exposures are variable over time, making the determination of latency periods difficult. Estimates of minimum latency are available in the scientific literature for only a small number of the covered cancers resulting from exposure to agents present in the aftermath of the 9/11 attacks. Therefore, the Administrator derived minimum latencies using different methods, based on available information for each type of cancer.

For chrysotile asbestos-related mesothelioma, a minimum latency of 14 years has been observed.[1, 2] Shorter minimum latencies have been reported for mesothelioma resulting from exposure to other forms of asbestos.[3] The Administrator selected a minimum latency of 14 years for certification of this covered cancer, as chrysotile asbestos was the only form of asbestos identified in all settled surface dust samples at the WTC.[4] This minimum latency estimate was also selected since several recent studies have more precisely documented the latency between initial exposure to asbestos and the development of malignant mesothelioma.

For other solid cancers, latency estimates based on direct observation have been reported:

- the minimum reported interval between the onset of gastro-esophageal reflux disease (GERD) and esophageal cancer is 20 years;[5]
- for liver cancer associated with vinyl chloride exposure, a minimum latency of 12 years has been reported;[6]
- for lung cancer, minimum latency estimates have been provided in the literature for exposure to asbestos (19 years),[7-9] to chromium (5 years),[9] and to soot (9 years).[10]

These latencies have been observed in studies based on a small number of observations, and therefore their generalizability is questionable.

[*] 42 U.S.C. Section 300mm-22(a)(2).

For other covered solid cancers, latency estimates are available in the scientific literature for agents not known to be present at the sites of the 9/11 terrorist attacks:

- for chlorinated biphenyl-related melanoma, a minimum latency estimate of 20 years has been reported;[11]
- a minimum estimate of 4 years has been reported for urinary bladder cancer associated with aromatic amine exposure.[12, 13]

For some covered cancers, latency estimates found in the scientific literature were developed based on statistical modeling in epidemiologic studies of associations between an exposure and disease. These estimates are not based on direct observation of the onset of disease after exposure; rather an investigator may "lag" or exclude exposure periods that occurred in the months or years preceding the exposure under the assumption that they represent a latency period.[14] These time intervals, referred to as lag periods, have been reported for:

- nasopharyngeal cancer associated with formaldehyde exposure (15 years);[15]
- asbestos-related cancer of the pleura (30 years).[7]

Finally, for several covered cancers, latency estimates are not provided in the scientific literature. Because of the uncertainty of the available information, the Administrator selected a minimum latency for solid cancers of 4 years based on lifetime risk modeling of low-level ionizing radiation.[16, 17] The use of a radiation-induced cancer latency estimate is supported by scientific literature indicating shared mechanisms of carcinogenesis that apply to most solid tumors.[16] Additionally, this estimate is similar to available estimates in the scientific literature for some cancers arising from exposures to chemical agents.

For leukemia, direct observation of latency is not available in the literature; only lag estimates such as those described above are available. The reported minimum latency estimate for benzene exposure is 1 year, and 2 years for formaldehyde exposure. A minimum latency of 0.4 years for leukemia (including those occurring in children), as reported for low-level ionizing radiation,[17] was selected by the Administrator, with the assumption that an agent present at the 9/11 terrorist sites could share a mechanism of carcinogenesis with radiation.[16] For other lymphopoietic cancers (Hodgkin disease, non-Hodgkin lymphoma and multiple myeloma), the Administrator selected the minimum latency estimate of 4 years, based on reported estimates of 10 years for radiation-induced lymphoma and multiple myeloma.[18-20]

For thyroid cancer, the only latency information available was from radiation studies in children, with a reported minimum latency of 4 years.[21] The Administrator selected a minimum latency of 2.5 years for thyroid cancer, based on lifetime risk modeling of low-level ionizing radiation.[17]

Overall, the Administrator selected minimum latencies, informed by the available science, that allow an individual whose cancer arose as a result of exposures from the 9/11 terrorist attacks to be appropriately covered by the program; i.e., the Administrator erred on the member-favorable side to ensure no false negatives for coverage.

In summary, the Administrator has determined the following latencies: (1) *mesothelioma,* which has typical reported latency periods of 20 to 30 years, has a minimum reported latency of 14 years;[2] (2) *all types of leukemia* (including childhood leukemia), 0.4 years (146 days), based on estimates obtained from radiation studies;[17] (3) *all types of thyroid cancer,* 2.5 years based on estimates obtained from radiation studies;[17] (4) *all solid tumors and lymphoma and multiple myeloma,* 4 years based on estimates obtained from radiation studies;[17] and (5) *for childhood cancers*, a minimum latency estimate of 1 year as reported by the National Academy of Sciences.[22]

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