Minimum Latency & Types or Categories of Cancer

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Note for May 1, 2013 Revision: As new scientific information becomes available to the Administrator of the World Trade Center (WTC) Program on minimum latencies for the types or categories of cancers on the List of WTC-Related Health Conditions found at 42 C.F.R. § 88.15, minimum latencies may be modified. This revision changes minimum latencies for mesothelioma and the category of lymphoproliferative and hematopoietic cancers.

Note for November 7, 2014 Revision: As new scientific information becomes available to the Administrator of the WTC Health Program on minimum latencies for the types of cancers on the List of WTC-Related Health Conditions (List) found at 42 C.F.R. § 88.15, minimum latencies may be modified. This revision incorporates newly published scientific information but does not change minimum latencies for any type or category of cancer.

Note for January 6, 2015 Revision: This revision adds a new section, Section IV. Impact of Several Factors on Latency addressing factors which have been suggested to decrease the latency of cancers including the intensity of exposure, the presence of pre-existing medical conditions, and the rarity of the cancer. Based on the best available scientific information, the Administrator determined that the selected latencies are sufficiently member-favorable to account for any potential reductions in latency associated with these factors. Therefore, the selected latency periods will not be adjusted for these factors in determining whether an individual's cancer is covered.

Note for March 31, 2025 Revision: This revision incorporates newly published scientific information and clarify the criteria used by the Administrator of the WTC Health Program to establish minimum

latencies. Previously cited references have been updated to include current literature. Minimum latencies did not change for any type or category of cancer.

Executive Summary

The Administrator of the WTC Health Program has determined minimum latencies for the following five types or categories of cancer eligible for coverage in the WTC Health Program:

(1) **Mesothelioma — 11 years**, based on direct observation after exposure to mixed forms of asbestos in case series;

(2) **All solid cancers (other than mesothelioma, lymphoproliferative, thyroid, and childhood cancers) — 4 years**, based on low estimates used for lifetime risk modeling of low-level ionizing radiation studies;

(3) **Lymphoproliferative and hematopoietic cancers (including all types of leukemia and lymphoma) — 0.4 years** (equivalent to 146 days), based on low estimates used for lifetime risk modeling of low-level ionizing radiation studies;

(4) **Thyroid cancer — 2.5 years,** based on low estimates used for lifetime risk modeling of low- level ionizing radiation studies; and

(5) **Childhood cancers (other than lymphoproliferative and hematopoietic cancers) — 1 year**, based on the National Academy of Sciences findings.

I. Introduction

Title I of the James Zadroga 9/11 Health and Compensation Act of 2010, as amended, revised the Public Health Service Act (PHS Act) to establish the World Trade Center (WTC) Health Program, which is administered by the National Institute for Occupational Safety and Health (NIOSH), within CDC.[1] The WTC Health Program provides medical monitoring and treatment for certified WTC-related health conditions to eligible responders to the September 11, 2001, terrorist attacks in New York City, at the Pentagon, and in Shanksville, Pennsylvania, and to eligible survivors of the New York City attacks. Pursuant to the PHS Act, the Administrator of the WTC

[1] Pub. L. 111-347, as amended by Pub. L. 114-113, 116-59, Pub. L. 117-328, and Pub. L. 118-31, codified at 42 U.S.C. §§ 300mm to 300mm-64.

Health Program may certify a member's health condition if it is included on the List of WTC-Related Health Conditions based on a physician's determination that an individual's 9/11 exposure is substantially likely to be a significant factor in aggravating, contributing to, or causing the individual's health condition. This determination must be made based on an assessment of the following: (1) the individual's exposure to airborne toxins, any other hazard, or any other adverse condition resulting from the terrorist attacks; and (2) the type of symptoms and temporal sequence of symptoms (42 U.S.C. § 300mm-22(a)(2)).

As of January 18, 2023, all types of cancer are included on the List of WTC-Related Health Conditions and are eligible for coverage by the WTC Health Program if determined to be related to 9/11 exposures. Cancer development is a complex process that involves multiple mutations in many genes involved in controlling the growth of cells (initiation), as well as metabolic changes in tumor cells and the tumor microenvironment that facilitate or accelerate the ultimate growth of the cancer (progression) (Golemis et al. 2018). As a result of this temporal sequence of events, cancers do not occur immediately after exposure to a causative agent; they usually take many years up to several decades to manifest clinically. The time between initial exposure to a carcinogen and cancer diagnosis is referred to as the latent period or "latency." Based on the requirement in the Act to consider the temporal sequence of symptoms, the Administrator determined that a minimum latency must have elapsed between the initial date of the individual's 9/11 exposure and the date of the initial diagnosis of the individual's cancer for the cancer to be certified.

Given wide variation in exposures, types of cancers, and individual susceptibility, a precise determination of minimum latency is difficult. For example, Nadler and Zurbenko (2013) used information from observed cancer incidence to construct models that estimate the period from malignant cancer initiation to diagnosis. For the 44 types of cancer they investigated, their model indicated that cancer latency ranged from 2.2 years (for chronic lymphocytic leukemia) to 57 years (for cancer of the transverse colon). For the solid cancers they found a range of latencies from 6.6 years up to 57 years. For the lymphoproliferative and hematopoietic cancers, they found a range of latencies from 2.2 years to 35.7 years. In addition, a study of genomic changes in non-small cell lung cancer found that tumors in former smokers suggested a long period of latency that preceded clinical detection (de Bruin et al. 2014). Furthermore, a DNA analysis of primary pancreatic cancers and their metastatic lesions showed that tumors of the pancreas take nearly 18 years to become clinically evident after the first cancer initiating mutations (Yachida et al. 2010).

The basis for the Administrator's selection of minimum latencies for specific types or categories of cancer is described in the sections below. It is important to understand,

however, that the scientific literature assessing minimum latency periods for specific types of cancer is scarce.

Estimates of minimum latencies are available in the scientific literature for only a small number of cancers associated with exposure to carcinogens present in the aftermath of the 9/11 attacks. Similarly, observations of minimum latencies are available for only a few cancers associated with other carcinogens not known to be present in the aftermath of the 9/11 attacks. Therefore, the Administrator derived minimum latency estimates using several methods based on the best available scientific evidence for each type or category of cancer considered.

II. Methods Used to Determine Minimum Latency Estimates (*Latency Methods*)

The four specific methods used by the Administrator to select minimum latency estimates for types or categories of cancer are described below in order of the best available science, as judged by the Administrator. The methods are as follows:

***Latency Method 1**: Studies reporting minimum latency estimates for cancer from a 9/11 agent[2] based on direct observation of latencies.*

> In this approach, the population studied must be large enough to develop a reasonable estimate of the lower bound of the distribution of latencies. This lower bound will be used as the estimate of the minimum latency.

***Latency Method 2**: Authoritative Recommendations.*

> When estimates of minimum latency are not available using *Latency Method 1*, the Administrator will review available recommendations on minimum latency from authoritative bodies, such as the National Academy of Sciences.[3]

***Latency Method 3**: Studies reporting observed latencies for a cancer from carcinogens that are chemically or physically analogous to a 9/11 agent.*

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[2] 9/11 agents are chemical, physical, biological, or other hazards reported in a published, peer-reviewed exposure assessment study of responders, recovery workers, or survivors who were present in the New York City disaster area, or at the Pentagon site, or the Shanksville, Pennsylvania site, as those locations are defined in 42 C.F.R. § 88.1, as well as those hazards not identified in a published, peer-reviewed exposure assessment study, but which are reasonably assumed to have been present at any of the three sites. WTC Health Program, "Development of the Inventory of 9/11 Agents," published July 17, 2018, available at: https://www.cdc.gov/wtc/pdfs/policies/development_of_the_inventory_of_9-11_agents_20180717.pdf.

[3] An authoritative body is a source of reliable information such as the United States Department of Health and Human Services, National Toxicology Program, Food and Drug Administration and Centers for Disease Control and Prevention; the United States Environmental Protection Agency; the World Health Organization; and the European Union, European Chemicals Agency.

Studies reporting observed latencies for a cancer from another agent, with preference given to agents chemically analogous to a 9/11 agent.

In this approach, the population studied must be large enough to develop a reasonable estimate of the lower bound of the distribution of latencies. This lower bound will be used as the estimate of the minimum latency.

***Latency Method 4**: Statistical Modeling*

When estimates of minimum latency are not available from studies with direct observations of minimum latencies [*Latency Methods 1 and 3*], or from authoritative recommendations [*Latency Method 2*], the Administrator will estimate minimum latency using information from statistical models that examined cancer latency published in the scientific literature. The two modeling approaches are described below.

4A: Estimates of cancer latency obtained by statistical modeling in epidemiologic studies of the association between exposure to a 9/11 agent and a type of cancer.

Using this method, an investigator excludes exposure for some period (e.g., 10 or 20 years) before diagnosis is made. Exposure time is excluded because any exposure that occurs *after* a cancer develops in an individual does not contribute to the developmental time for that cancer. Several time periods may be tested, and the period that yields the strongest association between exposure and the cancer is used as the estimate of the minimum latency period (Rothman and Greenland 1998).[4]

4B: Estimates of cancer latency obtained from statistical models used to estimate the lifetime risk of low-level ionizing radiation-related cancers.

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 (Baba and Câtoi 2007). Furthermore, cancers that may develop as a result of radiation exposure are indistinguishable from those that occur as a result of exposure to other carcinogens (U.S. Nuclear Regulatory Commission 2011).

[4] This procedure is referred to as "lagging" in epidemiologic studies.

For all four latency methods, if multiple estimates of minimum latency based on the given method are available in the scientific literature, and the studies are of comparable quality, the Administrator's policy is to resolve any uncertainties inherent in the method in favor of the WTC Health Program member by selecting the shortest latency period.

III. Basis for Selecting Minimum Latencies for Specific Categories of Cancer

An update to the literature search conducted in 2012 was performed using the Elsevier Scopus database, covering the years 2014 to 2024. Search terms included "latency" and "cancer" or "malignant neoplasm." The search yielded 2,472 references. The abstract of each article was reviewed for relevant or potentially relevant information.

The weight of the available scientific evidence for estimates of minimum latency for each type of cancer or category of cancer was evaluated using the methods described above. The Administrator selected minimum latencies for use for specific categories of cancer and those latencies will be applied in the WTC Health Program's evaluation of a member's cancer for certification in the Program.

The Administrator decided not to rely upon studies providing only range values to establish a minimum latency estimate. In contrast to studies providing a lower bound greater than zero, some studies report latency estimates within a range of values. The actual latency estimate reported in such studies may fall within any of the values in the range presented and a reasonable lower bound representative of a minimum latency cannot be determined.

In limited instances, the Administrator decided to rely on direct observation of latency in case series of persons exposed to a carcinogenic agent and the development of cancer. A case series is a descriptive epidemiologic study and is not used to establish causality. Nonetheless, case series were used for asbestos-related mesothelioma, skin cancer (non-melanoma, squamous cell carcinoma) resulting from non-healing burns, and liver cancer (angiosarcoma) resulting from vinyl chloride exposure, because these cancers are almost exclusively caused by these carcinogenic agents and the studies carefully document the time since initial exposure to cancer diagnosis. In addition, the Administrator does not base latency estimates on a single case.

A. Mesothelioma

Asbestos, in chrysotile and amphibole forms, is a 9/11 agent. Exposure to chrysotile asbestos, which was the only form of asbestos identified in any of

the settled surface dust samples in the New York City disaster area (New York City Department of Health and Mental Hygiene and Agency for Toxic Substances and Disease Registry 2002), was the basis for adding mesothelioma to the List of WTC-Related Health Conditions.[5] However, a literature search did not identify any studies which reported a minimum latency that was specific for chrysotile exposure [*Latency Method 1*] for more than a few individuals. All reported latencies in these studies were greater than 20 years. Also, the Administrator was unable to find recommendations on minimum latency from other authoritative sources [*Latency Method 2*]. Therefore, the Administrator has decided to rely on estimates of latency in the scientific literature for exposures to mixed forms of asbestos [*Latency Method 3*].

The Administrator decided to rely on direct observation of latency in case series of persons exposed to asbestos (in mixed form or in any individual form) [*Latency Method 1*] in determining the minimum latency for mesothelioma. Since exposure to asbestos is the primary risk factor for mesothelioma (Carbone et al. 2019), it is unlikely that mesothelioma cases reported in these studies were the result of other exposures.

The Administrator used a review of 21 studies by Lanphear and Buncher (1992) as the basis for a minimum latency of 11 years for mesothelioma. The review covered a large variety of occupations and identified 1,105 cases of asbestos-related mesothelioma, reporting a median latency period of 32 years, with 96% of cases diagnosed at least 20 years following initial exposure and 33% of cases diagnosed 40 years after initial exposure, as well as a minimum latency of 11 years. The minimum latencies of malignant mesothelioma reported in other case series of exposures to mixed forms of asbestos had values that ranged across studies from 13 to 20 years (Bianchi et al. 1997; Bianchi and Bianchi 2009; D'Agostin et al. 2017; Dalsgaard et al. 2019; Kamp 2009; Linton et al. 2012; Selikoff et al. 1980; Vimercati et al. 2019; Vimercati et al. 2020; Durmus et al. 2020; Brims et al. 2023; Moline et al. 2023). One study reported a latency estimate that could fall within a range of 10-20 years (An et al. 2018) and another in which the estimate could be less than 20 years (Ferrante et al. 2023) and thus were not considered.

[5] HHS, CDC. World Trade Center Health Program; Addition of Certain Types of Cancer to the List of WTC-Related Health Conditions, Final rule. 77 Fed. Reg. 56138 (Sept. 12, 2012), available at: https://www.govinfo.gov/content/pkg/FR-2012-09-12/pdf/2012-22304.pdf; HHS, CDC. World Trade Center Health Program; Addition of Certain Types of Cancer to the List of WTC-Related Health Conditions, Final rule; correction. 77 Fed. Reg. 62167 (Oct. 12, 2012), available at: https://www.govinfo.gov/content/pkg/FR-2012-10-12/pdf/2012-25142.pdf.

In a cancer incidence study among 28,729 members of the WTC General Responder Cohort, Shapiro et al. (2020) reported a median time between September 11, 2001, to mesothelioma diagnosis of 6.5 years. However, the authors did not verify the absence of exposure to asbestos prior to 9/11 and no information on the occupation of study participants was provided. Since these are responders and recovery workers, asbestos exposure prior to 9/11 is possible. As such, this study does not provide sufficient information upon which to base the minimum latency period.

Therefore, based on the best available scientific evidence and following the methodology presented in this revised *Minimum Latency & Types or Categories of Cancer* policy, the Administrator has decided to maintain the minimum latency for use in the evaluation of a case of mesothelioma for certification in the WTC Health Program of 11 years. For a cancer occurring in a person less than 20 years of age, see Section III, E.

B. Solid Cancers (other than mesothelioma, lymphoproliferative, thyroid, and childhood cancers)

Latency estimates based on a small number of individuals in direct observational studies have been reported for a few of the solid cancers included on the List. Those latency estimates are as follows:

1. Esophageal cancer: The minimum interval between the onset of gastro-esophageal reflux disease (GERD) and diagnosis of esophageal cancer (latency) has been reported to be 20 years [*Latency Method 1*] (den Hoed et al. 2011). However, in individuals with GERD who have also been exposed to carcinogenic 9/11 agents, whether acting as cancer initiators or promoters, the Administrator notes that the minimum latency may be significantly shortened.

2. Liver cancer: A minimum latency of 12 years has been reported in a case series study for liver cancer associated with exposure to vinyl chloride. Vinyl chloride is not a 9/11 agent, but is considered chemically analogous to 1,1,2-trichloroethane (vinyl trichloride), a 9/11 agent [*Latency Method 3*] (Lelbach 1996). Another study of vinyl chloride exposure reported a minimum latency of 24 years for liver cancer (Collins et al. 2014). Minimum latency estimates for other 9/11 agents or carcinogens that are chemically or physically analogous to a 9/11 agent that are known to cause liver cancer [*Latency Methods 1* and *3*] or authoritative recommendations [*Latency Method 2*] have not been found reported in the scientific literature.

3. Lung cancer: Minimum latency estimates have been reported in the literature for lung cancer associated with exposure to asbestos (ranging from 7 to 40+ years) (Ahn et al. 2014; An et al. 2018; Harding et al. 2009; Magnani et al. 2008; Selikoff et al. 1980), to chromium (9 years) (Ahn et al. 2014), to soot and combustion products (9 years) (Bottai et al. 2015) [all *Latency Method 1*]. Additional 9/11 agents or carcinogens that are chemically or physically analogous to a 9/11 agent are known to cause lung cancer, however, direct observations of latency [*Latency Methods 1 and 3*] or authoritative recommendations [*Latency Method 2*] are not available for those carcinogenic agents.

   Two case series of WTC survivors reported times from September 11, 2001, to lung cancer diagnoses of 3.3 years (Durmus et al. 2020; Shum et al. 2022). The Administrator did not use these studies in the determination of minimum latency with the exceptions noted in Section III, because case series do not establish associations, and prior exposures to other lung carcinogens could have been responsible for the initiation of those cancers.

4. Skin cancer (melanoma and non-melanoma): A minimum latency of 20 years has been reported for chlorinated biphenyl-related melanoma [*Latency Method 1*] (Loomis et al. 1997). A minimum latency estimate that could fall within 0 to 5 years has been reported in the literature for skin cancer (non-melanoma, squamous cell carcinoma) resulting from non-healing burns (Das et al. 2015); while other studies have reported average latencies of 32.4 years and 11 years for squamous cell carcinoma resulting from exposure to fire and hot surfaces (Ehsani et al. 2016; Kumar et al. 2024, respectively) [*Latency Method 1*]. Fire and hot surfaces are 9/11 agents. Additional 9/11 agents, or carcinogens that are chemically or physically analogous to a 9/11 agent, are known to cause skin cancer, however, direct observations of latency [*Latency Methods 1* and *3*] or authoritative recommendations [*Latency Method 2*] are not available for those carcinogenic agents.

5. Soft tissue cancer: A minimum latency falling within the range of 10–15 years has been reported for soft tissue cancer in a WTC responder (Shemen et al. 2015). As noted in Section III, the Administrator does not base latency estimates on a single case. Multiple 9/11 agents, or carcinogens that are chemically or physically analogous to a 9/11 agent, are suspected of causing soft tissue cancer; however, direct observations of latency [*Latency Methods 1 and 3*] or authoritative recommendations [*Latency Method 2*] are not available for those carcinogenic agents.

Durmus et al. (2020) reported the observed time between September 11, 2001, and diagnosis for several solid cancers, on a case series of 2,561 survivors with cancer. These cancers included breast, ovary, prostate, testis, kidney, bladder, and head and neck. Graber et al. (2018) also reported the time between September 11, 2001, and diagnosis of head and neck cancer in a case series of 16 WTC responders. As indicated earlier, case series do not establish associations, and environmental and occupational exposures that occurred outside the September 11, 2001, terrorist attacks and their aftermath could have contributed to the development of these cancers. Therefore, the Administrator did not use these findings to determine a minimum latency for these cancers.

Latency estimates are available in the scientific literature for other covered solid cancers associated with exposures to agents not known to be present at the sites of the 9/11 terrorist attacks. For example, a minimum latency of 20 years has been reported for chlorinated biphenyl-related melanoma (Loomis et al. 1997), and a minimum latency of 16–28 years (Nakano et al. 2018) has been reported for urinary bladder cancer associated with aromatic amine exposure. Specific 9/11 agents are known to cause melanoma and bladder cancer, however direct observations of latency [*Latency Methods 1* and *3*] or authoritative recommendations [*Latency Method 2*] are not available.

For some types of solid cancers on the List, estimates of minimum latency were found in the scientific literature based on statistical modeling in epidemiologic studies of associations between exposure to an agent and cancer [*Latency Method 4A*]. Estimates of latency using this method have been reported for nasopharyngeal cancer associated with formaldehyde exposure (15 years) (Hauptmann et al. 2004), for asbestos-related cancer of the pleura (30 years) (Magnani et al. 2008), and for prostate cancer associated with radiation exposure (20 years) (Little et al. 2024).

For solid cancers as a group, an assumption used in statistical modeling of risk between exposure to low-level ionizing radiation and solid cancers provides an estimate of minimum latency of 4 years [*Latency Method 4B*] (Berrington de Gonzalez et al. 2012; Kocher et al. 2008; National Research Council, 2006).

The review of the literature did not reveal sufficient evidence to support a revision to the minimum latency period; therefore, based on the best available scientific evidence and following the methodology presented in this revised *Minimum Latency & Types or Categories of Cancer* policy, the Administrator maintains a minimum latency of 4 years, which is the minimum reported, for

use in the evaluation of all types and categories of solid cancers other than mesothelioma, lymphoproliferative, thyroid, and childhood cancers for certification in the WTC Health Program. For a cancer occurring in a person less than 20 years of age, see Section III, E.

C. Lymphoproliferative and Hematopoietic Cancers

Latency estimates vary widely for different lymphoproliferative and hematopoietic malignancies. A minimum latency of 15 years has been reported of acute myeloid leukemia as a result of exposure to styrene, a 9/11 agent [*Latency Method 1*] (Christensen et al. 2018). Case series by Moline et al (2009) and Durmus et al. (2020) reported the observed time between September 11, 2001, and diagnosis for lymphoma, myeloma, and leukemia. But as previously stated, the Administrator only uses case series findings to establish minimum latency estimates for specific cancer associations.

The Administrator was unable to find recommendations on minimum latency for lymphoproliferative and hematopoietic cancers from other authoritative sources [*Latency Method 2*]. Other estimates of minimum latency found in the scientific literature were based on values from statistical models in epidemiologic studies of associations between an exposure and cancer [*Latency Methods 4A* and *4B*]. The reported minimum latency estimate using statistical modeling in epidemiologic studies for acute non-lymphocytic leukemia and benzene exposure is 1.5 years (Hayes et al. 1997; Straube et al. 2010) [*Latency Method 4A*], and for lymphoproliferative and hematopoietic malignancies resulting from formaldehyde exposure is 2 years [*Latency Method 4A*] (Beane Freeman et al. 2009).

For chronic lymphocytic leukemia, a minimum latency estimate of 15 years has been reported for ionizing radiation exposure [Latency Method 4B] (Richardson et al. 2005). A minimum latency period of 2 years has been reported for non-Hodgkin lymphoma (Bennett et al. 1991) following treatment of Hodgkin disease with chemotherapy and radiotherapy, which is similar to the latency for secondary acute leukemia [*Latency Method 3*] (Nadler and Zurbenko 2013; Tucker et al. 1988).

Evaluation of the latencies of leukemias, including chronic lymphocytic leukemia, and lymphomas from exposures to occupational and environmental carcinogens is difficult for several reasons. First, the nomenclature used in the histological classification of these diseases is in flux (Arber et al. 2022). Second, a particular lymphoid neoplasm may manifest both lymphoid and leukemic features. Third, there is substantial overlap in the estimates of

latency periods for lymphomas, which range from 2 to 10 years, and leukemias, which range from 1.5 to 35 years. Although latencies based on direct observations for some types of lymphomas and leukemias have been reported in the scientific literature, the nomenclature, classification, and latency overlap issues discussed above cast doubt on the reliability of these observations for use in the WTC Health Program.

The similarity in estimates of the minimum latencies for lymphoproliferative and hematopoietic malignancies as noted above is also demonstrated in risk models for radiation-induced leukemia, as well as acute non-lymphocytic leukemia from benzene exposure [*Latency Method 4B* and *4A*, respectively] (Hayes et al. 1997). Moreover, leukemia that develops after exposure to benzene is similar to atomic bomb irradiation or therapy-induced leukemia (Larson et al. 1996). For all lymphoproliferative and hematopoietic malignances, an assumed value used to describe a latency factor used in modeling of risk between exposure to low-level ionizing radiation and these cancers, provides an estimate of minimum latency of 0.4 years [*Latency Method 4B*] (Berrington de Gonzalez et al. 2012). Another assumed value for leukemia of 2 years, has been provided for risk models of space radiation on astronauts [*Latency Method 4B*] (Simonsen and Slaba, 2021)

Therefore, based on the best available scientific evidence and following the methods presented in this revised *Minimum Latency & Types or Categories of Cancer* policy, the Administrator maintains a latency of 0.4 years or 146 days, which is the minimum reported, for use in the evaluation of cases of lymphoproliferative and hematopoietic cancers for certification in the WTC Health Program. For a lymphoproliferative or hematopoietic cancer occurring in a person less than 20 years of age, the Administrator has also selected this minimum latency of 0.4 years, see Section III, E.

D. Thyroid Cancer

For thyroid cancer, direct observations or estimates of latency for 9/11 agents [*Latency Method 1*] or other carcinogens [*Latency Method 3*] are not available in the literature. Also, the Administrator was unable to find recommendations on minimum latency from other authoritative sources [*Latency Method 2*]. An estimate of minimum latency of 20 years, based on statistical modeling of the association between radiation and thyroid cancer was reported in the scientific literature [*Latency Method 4A*] (Little et al. 2024). An estimate of minimum latency based on an assumed value for statistical modeling of risk for the association between exposure to low-level

ionizing radiation and thyroid cancer of 2.5 years was reported in the scientific literature [*Latency Method 4B*] (Berrington de Gonzalez et al. 2012).

Therefore, based on the best available scientific evidence and following the methodology presented in this revised *Minimum Latency & Types or Categories of Cancer* policy, the Administrator maintains a minimum latency of 2.5 years for use in the evaluation of a case of thyroid cancer for certification in the WTC Health Program. For a cancer occurring in a person less than 20 years of age, see Section III, E.

E. Childhood Cancers

For purposes of the WTC Health Program, a childhood cancer means any type of cancer diagnosed in a person less than 20 years of age.[6] One of the differences between childhood cancers and adult cancers is that childhood cancers typically have a shorter latency period. The most common cancers in children (ages 0 to 14 years) and adolescents (ages 15–19 years) are leukemia (28% and 13%, respectively); brain, including benign and borderline malignant tumors (27% and 22%); and lymphoma (12% and 19%) (American Cancer Society 2025). A minimum latency estimate of 2 years has been reported for mesothelioma due to asbestos exposure in a person younger than 20 years [*Latency Method 1*] (Patra et al. 2015). Other estimates of minimum latency by *Latency Methods 1, 3,* and *4* are not available for this broad category of cancer types. However, the National Academy of Sciences has indicated that childhood cancers have a latency period of 1 to 10 years[7] [*Latency Method 2*] (National Research Council 2003).

Therefore, based on the best available scientific evidence and following the methodology presented in this revised *Minimum Latency & Types or Categories of Cancer* policy, the Administrator maintains a minimum latency of 1 year, which is the minimum reported, for use in the evaluation of cases of childhood cancer for certification in the WTC Health Program (excluding lymphoproliferative and hematopoietic cancers in children, for which the Administrator specified the minimum latency of 0.4 years).

IV. Impact of Several Factors on Latency

Several factors have been suggested to potentially result in shorter latency periods for the development of cancer in specific individuals. These factors include the

[6] 42 C.F.R. § 88.15(d)(24).

[7] This is not a range as described in Section II. This limit is the result of direct observation and reported by an authoritative source.

intensity of exposure, the presence of pre-existing medical conditions, a diagnosis earlier than the average age of diagnosis, and the rarity of the cancer. However, few, if any, studies have been published to address the relationships of these factors with latency of cancer.

The effect of increased intensity of exposure on cancer latency has been reported in a few studies. The results of these studies indicate that while increased exposure is known to cause cancer in more individuals (increased incidence), the evidence from human studies does not support the concept that increased intensity of exposure to carcinogens reduces the latency of cancer (Armenian 1987).

Some medical conditions increase the risk of certain types of cancer in an individual. For instance, persons with ulcerative colitis have an increased risk of developing bowel cancer. However, no information was found in the literature supporting a reduction in the latency of a cancer because of a pre-existing medical condition. Persons with pre-existing medical conditions which are not WTC-related health conditions and whose associated cancer is diagnosed earlier than the minimum latency selected latencies are unlikely to be associated with exposure to 9/11 agents. However, if the pre-existing medical condition is a covered WTC-related health condition, the associated cancer might be able to be covered under the *Health Conditions Medically Associated with World Trade Center-Related Health Conditions* policy and procedures.[8]

A systematic search of the scientific literature did not identify any studies addressing the concept that latency is reduced because a cancer is rare. The identified studies of rare cancer that addressed latency reported mean latency periods that are greater than the minimum latencies selected by the Administrator (Haber and Haber 2011; Lelbach 1996; Mayr et al. 2010; Recondo et al. 2014).

Based on the best available scientific information, the Administrator has determined that the selected latencies are sufficiently member-favorable to account for any potential reductions in latency associated with these factors. Therefore, the selected latency periods will not be adjusted for these factors in determining whether an individual's cancer may be certified.

V. Studies of Latency Among 9/11 Exposed Populations

Studies that explore the length of time to cancer diagnosis using piecewise exponential change point models in the WTC Combined Rescue/Recovery Cohort, have recently been published. This cohort combines data from three cohorts of WTC-exposed rescue/recovery workers: the Fire Department of the City of New York (FDNY), the

[8] https://www.cdc.gov/wtc/pdfs/policies/WTCHPMedicallyAssociatedHealthConditions7November2014-508.pdf.

World Trade Center Health Registry (WTCHR), and the General Responder Cohort (GRC) (Brackbill et al. 2021). The cancers explored include prostate cancer (Goldfarb et al. 2021a), melanoma (Boffetta et al. 2022), and thyroid cancer (Goldfarb et al. 2021b). These studies used an approach that provides a latency estimate between environmental carcinogen exposure and the appearance of elevated incidence of these cancers (i.e., change point) [*Latency Method 1*]. Based on an environmental exposure on September 11, 2001 through June 30, 2002, the change points were observed in 2006 for prostate cancer (approximate 5-year estimated latency), and in 2009 for melanoma (approximate 8-year estimated latency). A change point was also observed in 2004 for prostate cancer, but the results were limited by the small number of events in the period between 2002 and 2004; therefore, it was not considered in the latency determination. No significant change points were observed for thyroid cancer. None of the change points reported were lower than the minimum latency estimates currently used by the Program. Therefore, the Administrator decided to maintain the current minimum latency estimates of 4 years for solid cancers (including prostate cancer and melanoma) and 2.5 years for thyroid cancer.

Because of the uncertainty in the extrapolation of latency estimates from studies not conducted in 9/11 populations, the Administrator considers direct estimates derived from examining temporal patterns in cancer risk among the 9/11-exposed population the best scientific evidence for selecting minimum cancer latencies. Given the expanse of available research on the 9/11-exposed population, the Administrator has concluded that future reviews of cancer latency periods will give more weight to studies of 9/11-exposed populations.

VI. Summary

The Administrator has selected minimum latencies for the following five types or categories of cancer:

(1) **Mesothelioma —** 11 years;

(2) **All solid cancers (other than mesothelioma, lymphoproliferative, thyroid, and childhood cancers) —** 4 years;

(3) **Lymphoproliferative and hematopoietic cancers (including all types of leukemia and lymphoma) —** 0.4 years (146 days);

(4) **Thyroid cancer —** 2.5 years; and

(5) **Childhood cancers (other than lymphoproliferative and hematopoietic cancers) —** 1 year.

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