VETERANS HEALTH

Information About Veterans' Exposure to Open-Air Burning in Vietnam

Report to Congressional Committees

July 2025
GAO-25-107504
United States Government Accountability Office

Accessible Version

GAO Highlights

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Highlights of GAO-25-107504, a report to congressional committees.
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Why This Matters

Open-air burning emits toxins that can be harmful. The U.S. military's use of open-air burning in certain operations since 1990 is well documented. Federal law granted presumptive coverage for specified conditions to veterans of these operations due to their exposures, simplifying the disability claims process. However, little has been reported about open-air burning during the Vietnam War.

GAO Key Takeaways

Military archives we reviewed and a nongeneralizable sample of 145 veterans we interviewed, who served in Vietnam from 1964 to 1975, indicate that the military commonly used open-air burning to dispose of waste. Nearly all (90 percent) of these veterans cited concerns about their exposure.

As of May 2025, the Department of Veterans Affairs' Veterans Health Administration (VHA) has not specifically researched whether there is any association between veterans' health effects and exposure to open-air burning in Vietnam. Historically, research on health effects from exposures that occurred in Vietnam has focused on herbicide use (such as Agent Orange). VHA officials said their ongoing reviews of available information have not indicated that exposure to open-air burning was a major contributor to Vietnam veterans' long-term health.

Officials also said additional data that would be needed to inform research, such as data on the extent to which veterans were exposed to open-air burning, are not available. Thus, VHA would need to collect self-reported data from Vietnam veterans on their exposure to inform any future needed research. Officials cautioned that this would be limited by recall bias, or veterans' potentially inaccurate recollection of past events, among other challenges.

Burnout Latrines in Vietnam. Accelerants Were Used to Burn Human Waste in 55-gallon Drums. (1967)

Source: Philip Varsel Collection, Vietnam Center and Sam Johnson Vietnam Archive, Texas Tech University (1967). Photo used with permission. | GAO-25-107504

How GAO Did This Study

We reviewed military archives from the Vietnam War and interviewed a nongeneralizable sample of 145 veterans who reported exposure to open-air burning in Vietnam. We also reviewed relevant VHA documents and spoke with VHA officials and other agencies about researching health effects related to open-air burning.

Service Members in Vietnam Burn a Range of Waste in 55-gallon Drums Called Burn Barrels. (Year Unknown)

Source: Donald L. Swafford Collection, Vietnam Center and Sam Johnson Vietnam Archive, Texas Tech University (year unknown). Photo used with permission. | GAO-25-107504

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Abbreviations

- PACT Act: Sergeant First Class Heath Robinson Honoring our Promise to Address Comprehensive Toxins Act of 2022
- VA: Department of Veterans Affairs
- VHA: Veterans Health Administration
- VHA HOME: VHA Health Outcomes Military Exposures

July 31, 2025

The Honorable John Boozman
Chair
The Honorable Jon Ossoff
Ranking Member
Subcommittee on Military Construction, Veterans Affairs, and Related Agencies
Committee on Appropriations
United States Senate

The Honorable John Carter
Chairman
The Honorable Debbie Wasserman Schultz
Ranking Member
Subcommittee on Military Construction, Veterans Affairs, and Related Agencies
Committee on Appropriations
House of Representatives

Historically, the U.S. military disposed of trash and other waste it generated during operations around the world by burning it in an open-air environment, including through the use of burn pits. Veterans, including veterans of the Vietnam War, have expressed concerns about toxic exposure to smoke and fumes from such open-air burning during their military service.[1] However, while the use of burn pits in military operations that occurred in Southwest Asia since 1990 (such as in Iraq) is well documented, little has been reported about the use of open-air burning in the Vietnam War.

Depending on a variety of factors, veterans may be at risk for experiencing adverse health outcomes related to exposure to open-air burning, according to the Department of Veterans Affairs (VA). Within VA, the Veterans Health Administration (VHA) is responsible for providing health care to more than 9 million veterans. The Veterans Benefits Administration is responsible for providing a variety of benefits and services to service members, veterans, and their families, such as disability compensation for veterans with service-related disabilities.

VHA is also responsible for identifying health effects related to exposure to open-air burning and other airborne hazards during veterans' military service. Specifically, VHA's Health Outcomes Military Exposures (VHA HOME) office studies the health of veteran populations to better understand the patterns and causes of illnesses specific to toxic exposures—including, but not limited to, exposure to open-air burning. VHA HOME

[1]The Vietnam War refers to U.S. military operations that took place in the Republic of Vietnam, Cambodia, Thailand, and Laos, which are collectively known as the Vietnam War theater. U.S. involvement in the Vietnam War began in November 1955 and lasted until May 1975, according to the Department of Defense. Veterans who served in the Vietnam era (beginning November 1, 1955, and ending on May 7, 1975, for veterans who served in the Republic of Vietnam, and beginning on August 5, 1964, and ending May 7, 1975, in all other cases) are eligible for VA benefits, according to VA officials. Throughout this report, we use "Vietnam" to collectively refer to veterans who deployed to or events that occurred in any of these four countries during the war.

conducts these activities with the aim of helping VA and Congress improve health care practices and policies for veterans.

In particular, VHA research activities informed Congress in passing the Sergeant First Class Heath Robinson Honoring our Promise to Address Comprehensive Toxins Act of 2022 (PACT Act). Among other things, the PACT Act legislated veterans benefit coverage to veterans who served in Southwest Asia since 1990 for specific conditions (such as respiratory cancers) that are presumed to be related to their exposure to burn pits or other airborne hazards; it also expanded eligibility for health care coverage for veterans who served in this area since 1990.[2] Presumptive service connection simplifies the process for these veterans to file a VA disability claim and receive VHA health care for these conditions. However, presumptive service connection has not been extended to Vietnam veterans for health conditions that may be related to their exposure to open-air burning.[3] In a 2024 congressional hearing, a veterans service organization that represents Vietnam veterans raised the issue of providing presumptive service connection to those veterans.[4]

The House Report accompanying the Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2024 includes a provision for us to report on the health outcomes of veterans exposed to burn pits and other methods of open-air burning in Vietnam.[5] In this report, we describe

1. what military archives and veterans report about the use of open-air burning in Vietnam, and
2. the extent to which VHA has conducted research to evaluate veterans' health effects related to exposure to open-air burning in Vietnam.

To describe what military archives and veterans report about the use of open-air burning in Vietnam, we reviewed military archives from the Vietnam War that we obtained from the Department of Defense, The Vietnam Center and Sam Johnson Vietnam Archive at Texas Tech University, and the National Archives.[6]

[2]Pub. L. No. 117-168, § 406, 126 Stat. 1759, 1783 (2022) (codified at 38 U.S.C. § 1120).

[3]Presumptive service connection for diseases associated with exposure to burn pits and other toxins covers 14 enumerated diseases and any other disease for which the Secretary determines, pursuant to regulations, that presumptive service connection is warranted. 38 U.S.C. § 1120(b). Specifically, the PACT Act extended this coverage to veterans who performed active military, naval, air, or space service while assigned to a duty station (1) on or after August 2, 1990, in Bahrain, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, Somalia, or the United Arab Emirates; or (2) on or after September 11, 2001, in Afghanistan, Djibouti, Egypt, Jordan, Lebanon, Syria, Yemen, or Uzbekistan. 38 U.S.C. § 1119(c).

[4]See Jack McManus, National President, Vietnam Veterans of America, *Legislative Priorities & Policy Initiatives for the 118th Congress*, testimony before the House and Senate Veterans Affairs Committees, 118th Cong., 2nd sess., March 13, 2024. Veterans service organizations aide and serve veterans, service members, dependents, and survivors. Some veterans service organizations are congressionally chartered or recognized by VA to help veterans apply for benefits, such as by helping veterans file disability claims.

[5]H.R. Rep. No. 118-122 at 38 (June 27, 2023) accompanying the Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2024, enacted as Div. A of the Consolidated Appropriations Act, 2024, Pub. L. No. 118-42, 138 Stat. 25, 27 (2024).

[6]The Vietnam Center and Sam Johnson Vietnam Archive at Texas Tech University collects and preserves documentary records of the Vietnam War and supports and encourages research and education regarding all aspects of the American Vietnam Experience, according to its website. In addition, its website says it is the largest non-governmental Vietnam War archive.

Further, we interviewed officials from four veterans service organizations with knowledge of Vietnam veterans or burn pit exposure.[7]

We also interviewed a nongeneralizable sample of 145 veterans who reported exposure to open-air burning in Vietnam.[8] We conducted these interviews to learn about veterans' experiences with the methods of open-air burning used during the Vietnam War and their exposure to open-air burning while deployed to Vietnam, among other things. We coordinated with three veterans service organizations to publicize that we were conducting these interviews, and then interested Vietnam veterans contacted us to participate in a phone interview. Information we obtained from these interviews cannot be generalized to all veterans who deployed to Vietnam because it is unclear to what extent the experiences of respondents are shared by non-respondents. These interviews were intended to provide illustrative examples of veterans' experiences. Further, we obtained information from a Department of Defense database on the use of open-air burning in Vietnam. We also asked officials from the Army, Marine Corps, Navy, and Air Force about this, obtaining such information when available.

To describe the extent to which VHA has conducted research to evaluate veterans' health effects related to exposure to open-air burning in Vietnam, we interviewed VHA HOME officials and reviewed related documents.[9] For example, we reviewed a report issued in August 2023 by VHA HOME on prevalent health conditions among veterans that may be related to their military service toxic exposures. We also reviewed records from meetings between VHA HOME and veterans service organizations about research priorities, and a list of research completed by VHA's Airborne Hazards and Burn Pits Center of Excellence. Further, we obtained information from Department of Defense officials about any available Defense Health Agency, Army, Marine Corps, Navy, or Air Force data that VA could use to inform this type of research.

For context, we interviewed officials from the Environmental Protection Agency's Office of Research and Development to better understand methods for researching potential health effects from exposure. In addition, we reviewed reports from the National Academies of Sciences, Engineering, and Medicine about health effects

[7]We interviewed officials from the Vietnam Veterans of America, Disabled American Veterans, Veterans of Foreign Wars, and The American Legion. We selected these four organizations because they are recognized by VA, chartered by Congress, and have specific interests related to Vietnam veterans or burn pit exposure.

[8]Findings are from 145 interviewees who reported serving in Vietnam between 1964 and 1975 on land and reported exposure to open-air burning. We interviewed an additional 11 veterans who served only at sea (seven veterans) during the Vietnam War or served in a country other than Vietnam that was not part of the Vietnam War, such as Germany (four veterans). Thus, we excluded information shared by these 11 veterans from our related analysis.

[9]We also interviewed Veterans Benefits Administration officials about data they have on veteran benefits claims related to military service-connected illnesses or injuries that could be used to research health effects Vietnam veterans may experience from exposure to open-air burning. Veterans Benefits Administration officials told us disability claims can be analyzed by specific health condition (such as asthma) and certain other information (such as service-era). However, claims cannot be readily analyzed by the event (such as open-air burning) that contributed to the condition because the Veterans Benefits Administration does not track this information, according to officials.

related to military service toxic exposures and spoke to researchers who worked on these reports.[10] We also conducted a search for literature on this topic specific to Vietnam veterans and exposure to open-air burning.[11]

We conducted this performance audit from March 2024 to July 2025 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

VHA has reported that approximately 2.7 million service members deployed to Vietnam during the Vietnam War, from 1961 to 1975. According to VHA officials, as of December 2021, there were an estimated 1.4 million living veterans who deployed to Vietnam.[12] These veterans are part of an aging population: A service member who was 21 years old in 1969 while deployed to Vietnam will turn 77 in 2025.[13] As with other military operations, veterans who deployed to Vietnam may have been exposed to a variety of environmental and chemical hazards during their military service that carry potential health risks, according to VHA, which could include airborne hazards.

Use of Open-Air Burning

Historically, the U.S. military used multiple methods of open-air burning to dispose of waste (such as chemicals, petroleum, plastics, rubber, or human waste, such as feces) during military operations around the world. These methods released emissions made up of a variety of toxins directly into the air and include the following examples:

- **Burnout latrines.** 55-gallon drums that may be cut in half and filled with human waste, such as feces, which were burned with accelerants such as diesel fuel.

[10]VA has entered into agreements with the National Academies of Sciences to assess the link between certain exposures and illnesses experienced by veterans and has used the Academies' findings to inform its lists of presumptive conditions. For example, in 2009 and 2018, VA entered into agreements with the National Academies to review the effects of exposure to burn pits and airborne hazards in Southwest Asia. See National Academies of Sciences, Engineering, and Medicine, *Respiratory Health Effects of Airborne Hazards Exposures in the Southwest Asia Theater of Military Operations (2020)* (Washington, D.C.: National Academies Press, 2020), and Institute of Medicine, *Long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan (2011)* (Washington, D.C.: National Academies Press, 2011). Note that the Institute of Medicine is now known as the National Academy of Medicine and is part of the National Academies of Sciences, Engineering, and Medicine.

[11]We also asked officials from the Centers for Disease Control and Prevention about any research they have completed, ongoing, or planned specific to health effects among veterans exposed to open-air burning in Vietnam. Agency officials told us they had no relevant information to share related to the topic.

[12]VHA officials said they used the Centers for Disease Control and Prevention's National Death Index to determine the estimated number of living veterans. The National Death Index provides selected mortality data from death certificates and is available to researchers in public health and medical studies for statistical purposes. According to VHA officials, this estimate is based off the most recent data available to VHA as of May 2025 in the National Death Index.

[13]The peak of U.S. troop deployment to Vietnam occurred in 1969, and 61 percent of service members who died in Vietnam were 21 or younger, according to a veterans service organization.

- **Burn pits.** An excavation or other area of land filled with a wide range of waste, such as trash, batteries, and rubber tires, which were burned with accelerants such as jet or diesel fuel.
- **Burn barrels.** 55-gallon drums filled with a wide range of waste, such as trash, plastics, and solvents, which were burned with accelerants such as diesel fuel.

It is well documented that the U.S. military commonly used burn pits during operations that occurred in Southwest Asia since 1990 (before the Department of Defense began prohibiting the use of open-air burning in 2011).[14] For example, as of May 2025, VA's website on airborne hazards states that veterans may have been exposed to burn pits and other methods of open-air burning, specifically indicating that the U.S. military commonly used open-air burning in Afghanistan, Iraq, and other areas of Southwest Asia beginning in 1990. However, little has been publicly reported about the use of open-air burning during the Vietnam War and VA's website does not address the use of open-air burning during the War.

Factors Affecting Health Risk from Exposure to Open-Air Burning

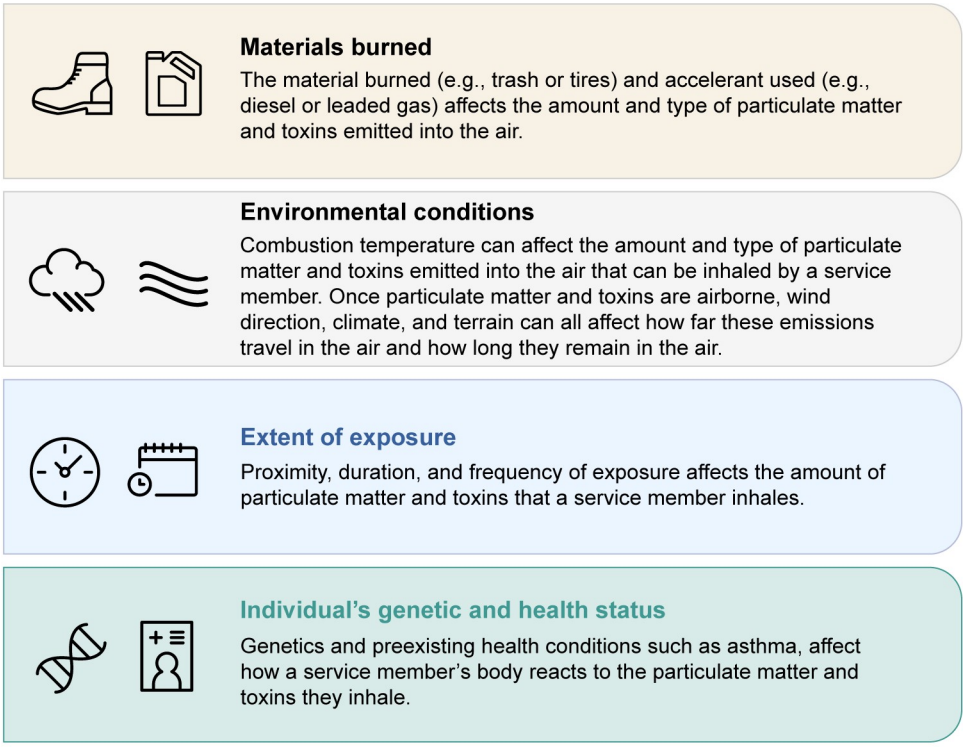
Emissions produced by open-air burning can include toxins (such as lead or other heavy metals) that are carried in the air by particulate matter, according to the Environmental Protection Agency.[15] Such particulate matter can be inhaled and may be hazardous to human health. For example, particulate matter can negatively affect human organ systems, including the respiratory system and cardiovascular system.

An individual's health risk from exposure to open-air burning depends on multiple factors, including the type of burned material and accelerant used, environmental conditions, the extent of exposure to an individual, and the individual's genetics and health status (see fig. 1).

[14]In 2011, the Department of Defense issued an instruction prohibiting the disposal of specific waste in open-air burn pits during contingency operations unless no alternative disposal method is feasible and requiring open-air burn pits be operated in a manner that prevents or minimizes risks to the health and safety of Department of Defense personnel when they are used. See Department of Defense, *Instruction 4715.19: Use of Open-Air Burn Pits in Contingency Operations* (February 15, 2011). Subsequent memos and instructions from the Department of Defense have further restricted the use of burn pits. For example, a 2022 memo prohibits open-air burn pit disposal of all waste generated by U.S. forces located outside of the United States, except when the Secretary of Defense grants an exemption requested by a combatant, who must first determine that no alternative disposal method is feasible. See Department of Defense, *Interim Policy on Solid waste Disposal Outside of the United States* (October 13, 2022).

[15]See U.S. Environmental Protection Agency, Office of Research and Development, Center for Public Health and Environmental Assessment, *Integrated Science Assessment for Particulate Matter* (Research Triangle Park, N.C.: December 2019). Particulate matter is a mixture of very fine, small solid particles or liquid droplets that can be inhaled into the airways and lungs and potentially lead to health problems. Generally, particulate matter may be man-made or natural and can include acids, chemicals, and metals as well as soil and dust.

Figure 1: Factors Affecting Health Risk from Exposure to Open-Air Burning



Source: GAO review of reports from the Environmental Protection Agency, Veterans Health Administration, and National Academies of Science, Engineering, and Medicine. Interviews with officials from the Environmental Protection Agency and Department of Defense; GAO and RaulAlmu/stock.adobe.com (illustrations). | GAO-25-107504

Accessible Data for Figure 1: Factors Affecting Health Risk from Exposure to Open-Air Burning

- **Materials burned:** The material burned (e.g., trash or tires) and accelerant used (e.g., diesel or leaded gas) affects the amount and type of particulate matter and toxins emitted into the air.
- **Environmental conditions:** Combustion temperature can affect the amount and type of particulate matter and toxins emitted into the air that can be inhaled by a service member. Once particulate matter and toxins are airborne, wind direction, climate, and terrain can all affect how far these emissions travel in the air and how long they remain in the air.
- **Extent of exposure:** Proximity, duration, and frequency of exposure affects the amount of particulate matter and toxins that a service member inhales.
- **Individual's genetic and health status:** Genetics and preexisting health conditions such as asthma, affect how a service member's body reacts to the particulate matter and toxins they inhale.

Source: GAO review of reports from the Environmental Protection Agency, Veterans Health Administration, and National Academies of Science, Engineering, and Medicine. Interviews with officials from the Environmental Protection Agency and Department of Defense; GAO and RaulAlmu/stock.adobe.com (illustrations). I GAO-25-107504

Note: In addition to open-air burning, veterans may have been exposed to other airborne hazards that contribute to the overall amount of particulate matter and toxins in the air. This includes, for example, cigarette smoke, vehicle and aircraft exhaust, dirt and sand kicked up by vehicles, burning vegetation, and smoke from combat. Collectively, these sources increase a veteran's overall exposure to particulate matter and toxins during their military service, increasing the risk of negative health effects.

Determining whether exposures to open-air burning led to specific health effects for a population, such as the population of Vietnam veterans, requires having data related to the factors listed above as well as the service members' health status years later, according to VHA HOME officials and reports from the National Academies

of Sciences, Engineering, and Medicine.[16] This is because all of these factors and potential outcomes can vary considerably among individuals within an exposed population. These data could help researchers identify any patterns related to health effects, such as whether veterans more frequently exposed to open-air burning at a closer proximity have higher rates of certain health conditions. The possibility of identifying a specific health effect diminishes if all veterans deployed to an area, such as Vietnam, are treated as having the same level of exposure to, or risk from, open-air burning, according to the reports from the National Academies of Sciences, Engineering, and Medicine.

VHA HOME Responsibilities

VHA HOME is responsible for reviewing information on health conditions among various populations of veterans, including Vietnam veterans, and conducting research to identify and better understand any health effects related to their military service toxic exposures, including exposure to open-air burning.[17] According to VHA HOME documentation, findings from such research may be used to improve health care for veterans and inform policymaking. For example, VA may use VHA research findings, among other information, to support granting groups of veterans (such as those who served in a specific location at a specific time) presumptive service connection for specific conditions through regulatory action by VA or legislative action by Congress.

VA Presumptive Service Connection for Health Conditions Related to Exposure to Burn Pits

VA provides compensation benefits to veterans with disabling health conditions that were incurred or aggravated during active military service. Presumptive service connection simplifies the process for a veteran to file a disability compensation claims for certain health conditions, including VHA health care coverage for the condition, because veterans do not have to submit proof that the condition is related to their military service. Rather, VA assumes (or presumes) the condition was incurred in, or made worse by, the veteran's military service. However, VA requires proof of a veteran's diagnosis of a health condition and military service, for example, in a geographic location during a time when exposure to toxic substances is presumed.

VA may use findings from National Academies of Sciences, Engineering, and Medicine reports and other research to support the addition of presumptive service connection through regulation. National Academies of Sciences, Engineering, and Medicine reports requested by VA and released in 2011 and 2020 studied the health effects of burn pits and airborne hazards exposures in Iraq and Afghanistan and Southwest Asia, respectively.[18] Both studies generally found there was insufficient data available to conclusively determine if a link exists between exposure to burn pits or airborne hazards in Iraq and Afghanistan or Southwest Asia and specific health outcomes. The 2020 report emphasized that its finding of insufficient data should not be

[16]See, for example, National Academies of Sciences, Engineering, and Medicine, *Respiratory Health Effects of Airborne Hazards Exposures in the Southwest Asia Theater of Military Operations (2020)*, and Institute of Medicine, *Veterans and Agent Orange: Health Effects of Herbicides Used in Vietnam* (Washington, D.C.: National Academies Press, 1994).

[17]VHA HOME is also responsible for reviewing information related to toxic exposure to, for example, Agent Orange, depleted uranium, or drinking water contaminated by industrial solvents at a Marine Corps base camp among different populations of veterans.

[18]See National Academies of Sciences, Engineering, and Medicine, *Respiratory Health Effects of Airborne Hazards Exposures in the Southwest Asia Theater of Military Operations (2020)*, and Institute of Medicine, *Long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan (2011)*.

interpreted as meaning there is no association between health outcomes and deployment to Southwest Asia, but rather that the available data are of insufficient quality to make a scientific determination.

In 2022, the PACT Act legislated veterans benefit coverage to veterans who served in Southwest Asia since 1990 for specific conditions that are presumed to be related to their exposure to burn pits or other airborne hazards; it also expanded eligibility for health care coverage to veterans who served in this area since 1990.[19] For example, veterans who served in Afghanistan during Operation Enduring Freedom any time after October 7, 2001, now have presumptive service connection for numerous respiratory conditions and cancer types.

Veterans who deployed to Vietnam do not have presumptive service connection for conditions associated with exposure to open-air burning during their military service in Vietnam. As a result, these veterans must submit proof of the following when filing claims for disability benefits, including health care coverage: that (1) the veteran is currently diagnosed with the claimed condition (such as asthma) or ongoing symptom; (2) the veteran experienced an in-service event (such as exposure to burnout latrine), injury, or disease; and (3) there is a link—or medical nexus—between the veteran's condition or ongoing symptom and an in-service event, injury, or disease.[20] VA requires that veterans submit this information for any claimed condition for which presumptive service connection has not been granted.

Military Archives and Veteran Reports About the Use of Open-Air Burning in Vietnam

The archives we reviewed and the nongeneralizable sample of 145 veterans we interviewed, who served in Vietnam from 1964 to 1975, indicate that the military commonly used open-air burning in Vietnam to dispose of waste. Specifically, documents published throughout the Vietnam War; photos taken by service members in Vietnam; and our interviews with these veterans indicate that service members commonly used burnout latrines, burn pits, and burn barrels in Vietnam.

Military Archives

More than 40 military archives we reviewed from the Army, Air Force, and Marine Corps (such as a medical newsletter, training documents, and command reports) included information about the purpose for using open-air burning or descriptions of open-air burning. For instance, some archives indicated service members were instructed to use open-air burning in Vietnam to reduce the amount of space needed to dispose of waste, protect groundwater from contamination, prevent disease, or to discourage scavenging by the opposition, among other reasons. Many of the archives we reviewed contain descriptions of using open-air burning in Vietnam. For example,

- An Army medical newsletter from 1966 stated, "this office recommends the burn and fill method; burn everything that is combustible in a pit, and then cover it up."[21]

[19]Pub. L. No. 117-168, § 406, 136 Stat. 1759, 1783 (2022) (codified at 38 U.S.C. § 1120).

[20]Department of Veterans Affairs, M21-1 Adjudication Procedures Manual, V.ii.2.A.1.a (June 5, 2024).

[21]Headquarters United States Army Vietnam, *Medical Newsletter, August – September 1966,* Volume 1, Number 6, 14.

- A Marine Corps training document for its engineers about lessons learned in Vietnam between 1965-1969 advised that burning human waste, such as feces produced by a company requires approximately 100 gallons of diesel fuel and two people working 10 hours.[22] Regarding burnout latrines, it warned "excessive air pollution (characteristic black smoke train) is generated which is detrimental to the health of the personnel in the immediate area."
- A command chronology report from 1968 stated "personal and official mail must be burned. Burn barrels are available in the Battalion Area."[23]

Archived Photos of Open-Air Burning in Vietnam

Photos taken by service members in Vietnam, as archived in The Vietnam Center and Sam Johnson Vietnam Archive at Texas Tech University, illustrate the use of open-air burning at specific locations in Vietnam, as shown in figure 2.

Figure 2: Photos of Burnout Latrines, a Burn Pit, and Burn Barrels in Vietnam

Source: Philip Varsel, Donald L. Swafford, and Kenneth B. & Wanda J. Kothmann Collections, Vietnam Center and Sam Johnson Vietnam Archive, Texas Tech University. Photos used with permission. | GAO-25-107504

[22]Marine Corps Development and Education Command, *Military Engineering: Lessons Learned in Vietnam, 1965-1969*, (Quantico, VA), 41.

[23]Headquarters and Service Battalion, Force Service Regiment, Force Logistic Command, Fleet Marine Force, Pacific, *Command Chronology, 1 to 31 May, 1968* (June, 1968), 80. According to the National Archives, command chronologies were used during the Vietnam War to periodically summarize a Marine Corps unit's experience. These summaries could be used to inform future planning and orientate new personnel.

Vietnam Veteran Interviews

According to the nongeneralizable sample of 145 Vietnam veterans we interviewed, a variety of open-air burning methods—including burnout latrines, burn pits, and burn barrels—were commonly used throughout the Vietnam War. These veterans reported serving in many roles and locations throughout Vietnam between 1964 and 1975.[24] Each veteran we interviewed described their personal experience related to some of the factors affecting the health risk from exposure to open-air burning, such as the materials that were burned and the extent (including proximity and duration) of their exposures.

Veterans reported a wide range of experiences related to their exposures from open-air burning (see table 1). Veterans also shared illustrative examples about their experiences with burnout latrines, burn pits, and burn barrels (see text box). Further, some veterans shared that they received no personal protective equipment, such as masks or gloves, to protect themselves from exposure to open-air burning, regardless of other aspects of their experience.

Table 1: Veteran Accounts About Their Exposure to Open-Air Burning in Vietnam from 1964 to 1975

Method of burning	Burnout latrines	Burn pits	Burn barrels
Veterans who reported exposure (N=145)	*138 (95%)*	*69 (48%)*	*42 (29%)*
Materials burned	Human feces burned using diesel fuel, leaded gas, and other accelerants.	Trash, rubber tires, batteries, plastics, electronics, vehicles, medical waste, food, spent ammunition, and other material burned using diesel fuel, a diesel and gas mixture, jet fuel, incendiary grenades, and other accelerants.	Trash, classified documents, and other material (such as food waste, materials made of rubber, plastics) burned using diesel fuel, leaded gas, and other accelerants.
Extent of exposure: *proximity*	Between less than 10 and several hundred yards away from their living quarters or work area.	Between 10 yards and 4 miles from their living quarters or work area.	Between less than 10 and 100 yards away from their living quarters or work area.
Extent of exposure: *duration*	Ranged from 5 minutes to 24 hours.	Ranged from 5 minutes to 24 hours.	Ranged from 15 minutes to 24 hours.
Extent of exposure: *frequency*	Ranged from less than once a month to every day, with the median frequency between 2-6 days per week.	Ranged from less than once a month to every day, with the median frequency between 2-6 days per week.	Ranged from less than once a month to every day, with the median frequency between 2-6 days per week.

Source: GAO analysis of its semi-structured interviews with a nongeneralizable sample of 145 Vietnam veterans who reported being exposed to open-air burning while deployed to Vietnam. | GAO-25-107504

Note: The percentages of veterans who reported exposure to each method of open-air burning (burnout latrine, burn pits, burn barrels) do not total to 100 percent because some individuals reported being exposed to multiple methods of burning. According to VHA's Health Outcomes Military Exposures office, materials burned and extent of exposure (proximity, duration, and frequency) are some of the factors affecting health risk form exposure to open-air burning. Other factors include the environment in which the open-air burning occurred (such as the general climate and if there was any wind) and health of the exposed individual (such as the individual's genetics and any preexisting health conditions).

[24]We asked each veteran to describe their role or position while in Vietnam. Veterans provided a range of responses, such as combat medic, military police, rifleman, mechanic, and crew chief. We also asked each veteran to describe where they served in Vietnam. Veterans reported serving in a range of locations, such as near the Demilitarized Zone at Con Thien; in and around Da Nang; further south along the coast at Cam Ranh Bay and Phan Rang; and at Long Binh and other large bases near Saigon (now Ho Chi Minh City).

Examples of Veteran Experiences with the Use of Burnout Latrines, Burn Pits, and Burn Barrels in Vietnam

Burnout Latrines. These are 55-gallon drums that may be cut in half used to burn human feces.

- A radio operator said latrines were burned within 50 feet of his work area and sleeping quarters two-three times a week. Latrines were burned by U.S. service members or Vietnamese civilian staff who worked on base.
- A tank driver told us burnout latrines were burned four to five days a week when he was deployed to Cam Ranh Bay, Tan Son Nhut, and Bien Hoa. Burning latrines was either a volunteer or assigned duty and involved pulling out the barrels from the latrine house, pouring diesel or kerosene into the barrels, lighting them on fire, stirring them until only ash remained, and finally dumping the ashes.
- A combat medic told us he was exposed to smoke from burn pits and burnout latrines every day while resting at forward operating bases.

Burn Pits. An excavation, surface feature, or other area of land used for burning waste (such as trash, batteries, and rubber tires).

- A veteran who worked in military intelligence described a burn pit at Long Binh that was 8-10 acres in size and was constantly burning.
- An engineer told us his unit used a hole created by enemy artillery fire near Con Thien to burn trash three to four times a week. The veteran told us it was important to burn everything to deny the enemy material they could repurpose.
- A gunner for "Loach" scout helicopters described burn pits as big holes in the ground—about the size of a 2.5-ton truck. Material was dumped into the pit and lit on fire using diesel or incendiary grenades.

Burn Barrels. These are 55-gallon drums used to burn waste (such as trash, plastics, and solvents).

- A construction surveyor told us burn barrels were used to burn classified documents for 3-5 hours at a time, 5-6 days a week at Nha Trang.
- A military police officer said burn barrels were used to keep warm or for illumination, troops burned whatever was available to keep the fire going.

Source: GAO analysis of its semi-structured interviews with a nongeneralizable sample of 145 Vietnam veterans who reported exposure to open-air burning during their military service. | GAO-25-107504

In addition to exposures related to the use of burnout latrines, burn pits, and burn barrels, 63 (about 43 percent) of the 145 veterans we interviewed told us they were exposed to other sources of open-air burning. For example, veterans reported exposure to burning aircraft, vegetation, and ammunition depots (see fig. 3).[25]

Figure 3: Photos of a Napalm Airstrike Burning Vegetation and an Ammunition Depot Fire

Source: James A. Brosman and Dean H. Jones Collections, Vietnam Center and Sam Johnson Vietnam Archive, Texas Tech University. Photos used with permission. | GAO-25-107504

[25]Accounts from veterans are also described in military archives we reviewed. For example, the Army's 1st Infantry Division reports using thermite grenades and white phosphorus rockets to burn vegetation from potential landing zones. The document goes on to note that clouds of ash and dust created serious visibility challenges when inserting troops via helicopters into the pre-cleared landing zones. See U.S. Army, *Operational Report – Lessons Learned, Headquarters, 1st Infantry Division* (November 1967), 20.

Veterans also reported exposure to additional sources of air pollution, including emissions from diesel engines, aircrafts, and generators; burning the explosive C-4 to heat rations and coffee while in the field; and smoke from cigarettes (which were included with food rations).[26] These other sources of open-air burning and air pollution likely contributed to the overall amount of particulate matter and toxins in the air that a military service member could have inhaled (in addition to those from burnout latrines, burn pits, or burn barrels).

Nearly all (90 percent) of the 145 Vietnam veterans we interviewed said they are concerned about their exposure to emissions from open-air burning while deployed to Vietnam. This included concerns about whether their exposure contributed to their current health conditions and uncertainly about whether such exposure could negatively affect their future health. For example, a transportation specialist who deployed to Cam Ranh Bay and Long Binh between 1969 and 1970 told us "burning latrines was just a job in Vietnam, soldiers did what they were told," and that he "developed chronic shortness of breath soon after returning home from Vietnam."

Most (76 percent) of the 145 Vietnam veterans told us they have a diagnosed health condition they believe is related to their exposure to open-air burning in Vietnam. Conditions related to the respiratory system, including chronic obstructive pulmonary disease (a lung disease that makes it hard to breathe) and chronic rhinitis (persistent inflammation of the nasal passageways), were among the conditions most reported to us by Vietnam veterans we interviewed. As noted earlier, the respiratory system may be adversely affected by airborne hazards, such as emissions from open-air burning, depending upon multiple factors related to the exposure.[27] However, determining whether these veterans' exposure to open-air burning in Vietnam increased their risk of developing these reported conditions would require research, as discussed later in this report.

Some (10 percent) of the 145 Vietnam veterans we interviewed also told us they filed VA disability claims related to conditions they attributed to exposure to open-air burning in Vietnam. According to these veterans, VA denied most of these claims. Several of these veterans said claims were denied because no evidence linked the veteran's condition to exposure to open-air burning, among other reasons. About 66 percent of the 145 Vietnam veterans we interviewed told us that while they believe they have a condition that is related to their exposure to open-air burning in Vietnam, they have not filed claims for a variety of reasons.[28] For example, they said they believe that filing a claim for a condition that does not have presumptive service connection is likely to be denied and too much of a hassle.[29] One veteran, who served as a helicopter technical inspector and deployed in 1970, said he has not considered filing a claim because "VA has not acknowledged

[26]Accounts from veterans are also described in military archives we reviewed. For example, an entry in a daily staff journal from December 1969, describes equipment damaged by a fire started by C4 used to heat rations. See U.S. Army 3rd Infantry Division, *Daily Staff Journal or Duty Officer's Log* (December 1969), 58.

[27]See United States Environmental Protection Agency, Office of Research and Development, Center for Public Health and Environmental Assessment, *Integrated Science Assessment for Particulate Matter*. Again, these factors include the material burned, environmental conditions, extent of exposure, and an individual's genetics and health status.

[28]The remaining 24 percent of veterans we interviewed said they have no health conditions they attribute to exposure to open-air burning for which they would file a VA disability claim.

[29]A few veterans said a lack of information in their service records indicating exposure to open-air burning in Vietnam was a reason for not filing claims. Veterans Benefits Administration officials told us that a veteran's service record does not need to indicate they were exposed to open-air burning while in Vietnam. Officials indicated a claim could still be approved if veterans submit a statement in support of their claim or a lay or witness statement (also known as a "buddy statement") from others to corroborate their claim for exposure to open-air burning and a medical nexus is established.

that Vietnam veterans were exposed to open-air burning, and Vietnam veterans have no presumptive service connection for exposure to open-air burning."

Extent of VHA Research to Evaluate Veterans' Health Effects Related to Exposure to Open-Air Burning in Vietnam

As of May 2025, VHA has not conducted research specifically to study whether there is any association between Vietnam veterans' health effects and exposure to open-air burning in Vietnam, according to VHA HOME officials.[30] Historically, research has focused on health effects among Vietnam veterans that may be associated with exposure to herbicides used in Vietnam (such as Agent Orange)—which officials explained was of primary concern to this population of veterans.[31] Officials also agreed that exposure to airborne hazards—which could have included exposure to open-air burning—is possible in any deployment setting and generally may be a health risk.

However, VHA HOME officials explained that their ongoing reviews of available information have not indicated that exposure to open-air burning was a major contributor to Vietnam veterans' long-term health. Officials further noted that additional data—specifically individual-level data on the factors related to exposure to open-air burning for veterans of various military operations, not just Vietnam veterans—that are needed to inform such research do not readily exist.

Reviews of Vietnam veterans' health information. The PACT Act, enacted in 2022, requires VA to provide an annual report to Congress on the types of medical conditions diagnosed among veterans that may be related to their military service toxic exposures.[32] To implement this requirement, since 2023, VHA HOME officials have been periodically collecting and reviewing health information included in veterans' medical records to identify information on the prevalence (existing rate) and incidence (number of new cases) of health conditions that could be related to military service toxic exposures, including exposure to open-air burning. VHA HOME reports this information by veteran population, including the population of Vietnam veterans. If VHA HOME officials identify an elevated number of veterans diagnosed with health conditions that could be

[30]The Vietnam Era Health Retrospective Observational Study and the Vietnam Era Veterans Mortality Study examined health effects among Vietnam veterans related to their experiences deploying to Vietnam generally, according to VHA HOME officials. The former was initiated in 2014, according to VHA HOME officials, and involved approximately 43,000 veterans who completed a questionnaire on their military service, general health, aging, and lifestyle. As of May 2025, VHA is analyzing data from completed questionnaires. The latter was initiated in 2018, according to VHA HOME officials, and is a retrospective study of 2.5 million veterans who deployed to Vietnam during the war to identify deaths among this population that may be due to military environmental exposures. Articles published related to this study include the following: T. Bullman et al, "Cholangiocarcinoma (CCA) Mortality in Vietnam War Era Veterans," *Cancer Epidemiology*, vol. 94 (2025), and Tim Bullman et al, "Suicide Risk Among U.S. Veterans with Military Service During the Vietnam War," *JAMA Network Open*, vol. 6., no. 12 (2023).

[31]VA contracts with the National Academies of Sciences, Engineering, and Medicine to review the long-term health effects of Agent Orange and other herbicides on Vietnam veterans. The National Academies has published multiple reports on this topic, with the first report published in 1994 and the most recent report published in 2018. See National Academies of Sciences, Engineering, and Medicine, *Veterans and Agent Orange: (Update 11) (2018)* (Washington, D.C.: National Academies Press, 2018) for the 2018 report.

[32]See Pub. L. No. 117-168, § 502, 136 Stat. 1759, 1786-87 (2022) (codified at 38 U.S.C. § 527 note). Specifically, the PACT Act requires that VA analyze, on a continuous basis, clinical data that is likely to be useful in determining the association, if any, between veterans' medical conditions and toxic exposures. VA is to submit an annual report to Congress that includes an analysis of the data, a description of the types and incidences of such medical conditions and other explanations for the incidence of such conditions as VA considers reasonable, and VA's views on the validity of drawing conclusions from the incidence of such medical conditions regarding any association between such conditions and toxic exposure.

related to a military toxic exposure, officials may conduct research studies to determine if such an association exists, according to officials.

Specifically, as of May 2025, VHA HOME has completed reviews of veteran's health information to inform two reports:

- **First report (completed in August 2023).** This report included information on the most prevalent health conditions for the 10-year period from 2013 through 2022 among veterans who served in the military during various operations, including the Vietnam War.[33] The report also included information on the incidence of these conditions for each year from 2018 through 2022. However, this report only included data on veterans who deployed during various military operations, including the Vietnam War, and did not include data on veterans who did not deploy. Thus, VHA HOME officials would have been unable to compare diagnosed health conditions between Vietnam veterans based on their deployment status. Any differences identified by making such a comparison could indicate whether anything related to the experiences of veterans who deployed to Vietnam, including but not limited to possible exposure to open-air burning, could have affected their long-term health. VHA HOME would then need to conduct research to determine if the diagnosed health conditions among veterans who deployed to Vietnam are specifically associated with exposure to open-air burning.
- **Second report (pending, as of May 2025).** VHA HOME is finalizing a second report that will compare the most prevalent diagnosed health conditions, as well as their incidence, between deployed and non-deployed veterans of specific military operations, officials told us. For example, the forthcoming report will compare veterans who served in the military during the Vietnam War and deployed to Vietnam to veterans who did not deploy. Officials told us they submitted the report for VHA review in December 2024 and, as of May 2025, the report was pending final approval. Officials told us that they found no significant differences in the incidence or prevalence of diagnosed health conditions between deployed and non-deployed Vietnam veterans that would indicate a potential concern related to deployment exposures, which could include exposure to open-air burning, and warrant further investigation or research.[34]

Stakeholder input and other sources of information. VHA HOME—as well as VHA more broadly—also obtains periodic input from, or conducts periodic reviews of, other sources of information that could indicate whether there may be a need to further investigate or research whether there is any association between Vietnam veterans' health effects and exposure to open-air burning in Vietnam, officials said. This includes, for example

- quarterly discussions with veterans service organizations on issues related to evaluating selected military service toxic exposures and adverse health outcomes;
- discussions with Vietnam veterans who were members of a steering committees that advised VHA studies in 2014 and 2018 on such veterans' general health and well-being or mortality; and

[33]See Department of Veterans Affairs, *Congressionally Mandated Report: Treatment of Veterans for Medical Conditions Related to Toxic Exposure* (August 2023). VA reported that the top five most prevalent diagnoses among Vietnam veterans from 2013-2022 were hypertension, diabetes, posttraumatic stress disorder, depression, and coronary artery disease. VA also reported that hypertension and diabetes are associated with exposure to Agent Orange and are recognized to increase with age, regardless of whether veterans experienced toxic exposures.

[34]According to VHA HOME officials, they used an adjusted relative risk and confidence intervals to determine whether there were any significant differences in diagnosed health conditions between these two populations of veterans.

- reviews of literature searches conducted daily by a VHA librarian, inclusive of a review of media reports.[35]

Data to inform research. Researching whether there is any association between Vietnam veterans' health effects and exposure to open-air burning in Vietnam would require VHA HOME or other VHA officials to work with veterans to collect self-reported data on veterans' exposures to inform such research. This is because VHA HOME officials stated that they do not have necessary individual-level data on most of the factors that could affect a Vietnam veteran's health risk from exposure to inform such research.

As described previously, this includes, for example, individual-level data on the types of materials that were burned, the environment in which the burning occurred, and the extent to which individual veterans were exposed to the burning of those materials during their military service.[36] Certain information related to the use of open-air burning during the Vietnam War, such as records of open-air burning events that would detail what was burned or data from environmental monitoring, was either not recorded or maintained, according to VHA HOME and Department of Defense officials. Notably, there is also a lack of information characterizing individual exposure to open-air burning among veterans who served in Southwest Asia since 1990, not just Vietnam veterans.[37]

Environmental Protection Agency officials and a researcher we interviewed also commented on the need for individual-level data to investigate possible connections between open-air burning and veterans' health effects. Specifically, officials said that determining whether Vietnam veterans are at risk for experiencing long-term health effects from exposure to hazardous amounts of particulate matter from open-air burning would be dependent on having data on the proximity, duration, and frequency of individuals' exposures in relation to the types of materials burned in particular.

However, the researcher, who has studied the health effects of exposure to burn pits among veterans who served in Southwest Asia during post-September 11th military operations, told us that these data can be difficult to obtain. While data had been collected by other sources on this post-September 11th population of veterans, the researcher said that these data were fragmented or not well organized, not always available in electronic format, and often based on volumes of anecdotal information. Research on the health effects of Vietnam veterans' exposure to open-air burning likely would be more difficult, this researcher explained, particularly given there are limited data sources pertaining to the Vietnam War.

To collect self-reported data from veterans, VHA HOME officials said researchers could gather descriptive information from veterans on their experiences related to such exposure, such as the method of open-air

[35]The PACT Act also requires VA to collaborate and partner at least quarterly with veterans service organizations. See Pub. L. No. 117-168, § 202, 136 Stat. 1759, 1766 (2022) (codified at 38 U.S.C. § 1172(a)(3)(B)). The two VHA studies are the Vietnam Era Health Retrospective Observational Study and the Vietnam Era Veterans Mortality Study, according to VHA HOME officials.

[36]This also includes data on individuals' health. VHA HOME officials stated they could obtain data on veterans' health outcomes or mortality. However, these officials stated that absent data on the other factors, they would have to use veterans' deployment status as a proxy for exposure. According to the National Academies of Sciences Engineering, and Medicine, using deployment status as the only measure of exposure may diminish the possibility of identifying a specific health effect because veterans with different levels of exposure are grouped together for analysis. See National Academies of Sciences, Engineering, and Medicine, *Respiratory Health Effects of Airborne Hazards Exposures in the Southwest Asia Theater of Military Operations (2020)*.

[37]The National Academies of Sciences, Engineering, and Medicine has reported that there is a lack of good information characterizing the exposure of veterans of military operations in Southwest Asia since 1990 to airborne hazards, including exposure to open-air burning. This includes, for example, information on the extent of exposure. See National Academies of Sciences, Engineering, and Medicine, *Respiratory Health Effects of Airborne Hazards Exposures in the Southwest Asia Theater of Military Operations (2020)*.

burning used and the location, or environment, in which the open-air burning occurred (similar to the information described above, in table 1). This initial gathering of descriptive information could enable researchers to identify a sample of veterans that reflects the broader at-risk population and develop and implement survey methods to research potential health effects resulting from reported exposures, according to officials. Officials cautioned that these methods would be limited by recall bias, or veterans' potentially inaccurate recollection of past events or experiences, among other challenges.

Agency Comments

We provided a draft of this report to VA and the Department of Defense for review and comment. VA provided technical comments, which we incorporated as appropriate. The Department of Defense did not have comments on this report.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Veterans Affairs and the Secretary of the Department of Defense, and other interested parties. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at hundrupa@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix I.

//SIGNED//

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Appendix I: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, Hernán Bozzolo (Assistant Director), Karen Belli (Analyst-in-Charge), Rob Dougherty, Tim Jackson, and Melissa Trinh-Duong Ostergard made key contributions to this report. Also contributing were Sam Amrhein, Jieun Chang, Eliot Fletcher, Cory Gerlach, Cynthia Khan, Guy LoFaro, Monica Perez Nelson, Ethiene Salgado-Rodriguez, Michael Walton, James Whitcomb, and Sirin Yaemsiri.

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