

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

CDC--MOUNT ST. HELENS VOLCANO HEALTH REPORT #14

July 18, 1980

Earthquake Activity--Mount Hood, Oregon

On Friday, July 11, 1980, the U.S. Geological Survey (USGS) reported that a series of more than 50 earthquakes had been detected under Mount Hood (elevation 11,235 ft), a volcano in the Cascades Range situated about 50 miles E-SE of Portland and about 60 miles S-SE of Mount St. Helens. The major portion of the earthquake activity occurred on July 6 and 7, with a peak magnitude of 3.3 on the Richter Scale.

Verification of the earthquake activity followed reports of the July 6 tremors, which were felt by some local residents; USGS was able to review data from a remote network of seismographs used as part of the USGS Geothermal Research Program (these records are normally examined several days after being made). Since the detection of the earthquake swarm under Mount Hood, USGS has installed a group of portable seismic stations and a telemetered station at strategic points on the mountain to closely monitor any further activity. The quantity and magnitude of earthquake activity clearly diminished following the initial swarm on July 6 and 7 and ceased on July 12. Measurements instituted on July 12 above the mountain for SO₂, CO₂, and H₂ have not detected any emissions.

Although the eruption of Mount St. Helens on March 27 was preceded by an unusual number of earthquakes, the USGS stated that no immediate conclusions should be drawn about the possibility of an eruption of Mount Hood. The last major eruption of Mount Hood is reported by USGS to have occurred about 2,000 years ago; minor eruptions were described in Portland newspapers during the 19th century (last in 1865).

The USGS issued a formal hazard watch expressing heightened concern because of the earthquake activity but emphasized that the earthquake activity by itself could not be interpreted as a definite precursor to a volcanic eruption. Apparently, in the Mount Hood area episodes of earthquake activity unassociated with volcanic eruptions have occurred frequently in the past, although usually the number of earthquakes is much smaller.

Mount Hood is a major summer resort (including summer ski area), as well as a National Forest and timber industry area. The population on and near the mountain is greater than at Mount St. Helens and includes summer residents, skiers, tourists, loggers, and other visitors. It is estimated that approximately 20,000-30,000 individuals are in the Mount Hood area. The U.S. Forest Service did not curtail activities, although it did recommend that climbers avoid the top of

the mountain because of concerns about loose rocks from earthquakes and melting snow.

Contingency plans for volcanic activity at Mount Hood have been developed. Most directly involved in such plans are the State of Oregon (Emergency Sciences Division); Clackamas, Multnomah, and Hood River Counties; the City of Portland; and the U.S. Forest Service-Mount Hood National Forest. The CDC Mount St. Helens field unit has been in close contact with the Oregon State Health Department, the University of Oregon Health Services Center, and with involved federal agencies and local groups. Thirteen hospitals located in 8 counties surrounding Mount Hood National Forest were contacted and arrangements made to institute rapidly a surveillance system for these hospitals in the event of an eruption on Mount Hood.

CDC Hospital Surveillance

A. Hospital Emergency Room Visits in Yakima, Washington, May 4-June 21, 1980.

Yakima, located in central Washington, received about an inch of volcanic ash from the May 18, 1980, eruption. The increase in emergency room (ER) visits for eye conditions (foreign bodies, corneal abrasion, eye irritation, and conjunctivitis), respiratory problems (hyperventilation, airway irritation, sore throat, cough, shortness of breath, chronic obstructive pulmonary disease (COPD) or emphysema, asthma, and chest pain) in hospital #1 in Yakima (CDC Health Report #9, June 24, 1980) appears to have been transient. The number of weekly visits for these problems during the third to fifth post-eruption weeks (June 1-21, 1980) were comparable to those observed for the 2 weeks before the ashfall (Table 1).

Hospital #2 in Yakima also showed transient increases in ER visits for respiratory problems. Hyperventilation, shortness of breath, and asthma increased during the week after the ashfall (Table 2). ER visits for acute bronchitis and COPD/emphysema appeared to increase for several weeks following the ashfall, compared to the 2 preceding weeks. (The number of ER visits for asthma peaked in the week after the ashfall, although weekly fluctuations both before and after the ashfall complicate the interpretation.) There were little or no increases in visits due to chest pain or cardiac conditions. There were, however, at least 8 persons treated in the ER for ash-related eye problems.

The ER and hospital medical records for these patients with pulmonary and eye problems in Yakima are currently being reviewed in more detail to determine the nature and severity of these illnesses.

TABLE 1. ER Visits for Respiratory Diagnoses in Yakima Hospital #1

<u>Respiratory Diagnosis</u>	<u>May</u> <u>4-10</u>	<u>May</u> <u>11-17</u>	<u>*May</u> <u>18-24</u>	<u>May</u> <u>25-31</u>	<u>June</u> <u>1-7</u>	<u>June</u> <u>8-14</u>	<u>June</u> <u>15-21</u>
Airway Irritation	0	0	8	2	1	1	0
Cough	2	5	10	8	4	0	4
Wheezing	0	1	1	1	2	0	0
Hyperventilation	0	0	6	3	0	0	0
Shortness of Breath	1	7	16	7	5	4	6
Bronchitis, with URI or Otitis	4	2	4	4	2	3	4
Bronchitis	5	6	9	3	7	8	3
Bronchitis, Chronic	1	0	0	1	0	0	1
Asthma	3	2	20	6	12	9	5
COPD/Emphysema	3	2	8	5	1	3	1
<u>Subtotal</u>	<u>19</u>	<u>25</u>	<u>82</u>	<u>40</u>	<u>34</u>	<u>28</u>	<u>24</u>
Other Respiratory †	55	46	61	51	62	74	61
<u>Total</u>	<u>74</u>	<u>71</u>	<u>143</u>	<u>91</u>	<u>96</u>	<u>102</u>	<u>85</u>

TABLE 2. ER Visits for Respiratory Diagnoses in Yakima Hospital #2

<u>Respiratory Diagnosis</u>	<u>May</u> <u>4-10</u>	<u>May</u> <u>11-17</u>	<u>*May</u> <u>18-24</u>	<u>May</u> <u>25-31</u>	<u>June</u> <u>1-7</u>	<u>June</u> <u>8-14</u>	<u>June</u> <u>15-21</u>
Airway Irritation	0	0	1	0	0	0	0
Cough	0	0	1	0	1	3	0
Wheezing	1	0	2	0	1	3	1
Hyperventilation	0	0	4	1	2	1	3
Shortness of Breath	3	1	7	1	0	2	0
Bronchitis, with URI or Otitis	6	1	3	1	3	3	1
Bronchitis	5	3	11	12	9	10	9
Bronchitis, Chronic	1	1	0	0	0	0	0
Asthma	14	2	18	9	5	8	4
COPD/Emphysema	0	1	4	3	2	5	3
<u>Subtotal</u>	<u>30</u>	<u>9</u>	<u>51</u>	<u>27</u>	<u>23</u>	<u>35</u>	<u>21</u>
Other Respiratory †	47	32	38	52	47	64	67
<u>Total</u>	<u>77</u>	<u>41</u>	<u>89</u>	<u>79</u>	<u>70</u>	<u>99</u>	<u>88</u>

* First eruption, May 18, had primary impact in eastern Washington.

† Other Respiratory includes epistaxis, fever only, hay fever/allergy, URI/ cold/viral syndrome, tonsillitis, oral thrush, pharyngitis/laryngitis, sore throat, pneumonia, pneumonitis, pneumothorax, hemoptysis, other upper respiratory, and other pulmonary.

B. Hospital Emergency Room Visits in Centralia and Chehalis, Washington, May 4-June 14, 1980.

Centralia and Chehalis received from 1/2 to 1 inch of ash from the second major eruption on May 25, 1980. These 2 western Washington cities are located in close proximity to each other. The combined number of ER visits at 2 hospitals for May 4-June 14, 1980, are shown in Table 3.

TABLE 3. ER Visits for Respiratory Diagnoses in Centralia and Chehalis, Washington (Combined data)

<u>Respiratory Diagnosis</u>	<u>May 4-10</u>	<u>May 11-17</u>	<u>May 18-24</u>	<u>*May 25-31</u>	<u>June 1-7</u>	<u>June 8-14</u>
Airway Irritation	0	0	0	1	0	0
Cough	3	3	1	6	1	0
Wheezing	0	0	0	0	0	0
Hyperventilation	1	0	0	1	1	0
Shortness of Breath	3	1	3	7	0	2
Bronchitis, with URI or Otitis	2	0	1	0	0	0
Bronchitis	3	4	2	13	9	3
Bronchitis, Chronic	0	0	1	0	1	0
Asthma	8	3	6	15	6	7
COPD/Emphysema	0	2	3	7	1	3
<u>Subtotal</u>	<u>20</u>	<u>13</u>	<u>17</u>	<u>50</u>	<u>19</u>	<u>15</u>
<u>Other Respiratory †</u>	<u>38</u>	<u>40</u>	<u>31</u>	<u>37</u>	<u>32</u>	<u>29</u>
<u>Total</u>	<u>58</u>	<u>53</u>	<u>48</u>	<u>87</u>	<u>51</u>	<u>44</u>

* Second eruption, May 25, affected western Washington.

† Other Respiratory includes epistaxis, fever only, hay fever/allergy, URI/cold/viral syndrome, tonsillitis, oral thrush, pharyngitis/laryngitis, sore throat, pneumonia, pneumonitis, pneumothorax, hemoptysis, other upper respiratory, and other pulmonary.

Three persons, who were close to Mount St. Helens during the May 25 eruption, were treated for eye irritation at one ER. Otherwise, there appears to be no increase in ER visits for eye conditions.

There were increases in the number of ER visits for patients with cough, shortness of breath, asthma, bronchitis, and COPD for the week after the ashfall (May 25-31, 1980). Other than for COPD, however, there were no increases in hospital admissions for these pulmonary conditions. The increase in ER visits is partly due to multiple visits by an asthmatic patient the week after the ashfall.

There were more ER visits for complaints of chest pain the week after the ashfall. Otherwise, there appears to be little or no indication of an increase in visits for cardiac problems for the 3 weeks after the second eruption.

A multicar highway accident occurred on May 25, 1980, shortly after the ashfall. This resulted in 18 persons being seen in the ER of one of the hospitals. For the rest of the week, there were more motor vehicle injuries seen in these ER than in any of the 3 weeks preceding the ashfall.

Note - In Tables 1-3 respiratory diagnoses largely related to airway problems have been separated from other respiratory illnesses (mostly upper respiratory and infectious). It is clearly difficult to discriminate between diagnoses recorded as "wheezing", "hyperventilation", or "asthma", especially as terminology undoubtedly differs within and between hospitals. It is therefore instructive to look at aggregated categories. There appear to be rapid and transient ash-related increases in ER visits for the subgroup of diagnoses that include asthma, bronchitis, and other "airway" problems; there is no apparent relationship for the subgroup of other respiratory illnesses.

These findings are similar to those in air pollution health studies which have shown that the greatest impact of exposure to total suspended particulates (TSP) and sulfur dioxide (SO₂) is on the large and small airways of the respiratory system. In many of these studies it was not possible to distinguish between effects from exposure to SO₂ and TSP since both were elevated. The communities in the Mount St. Helens health surveillance network have had exposure to high levels of TSP but to relatively low levels of SO₂. Unfortunately, EPA does not have air monitoring stations in all of the Mount St. Helens surveillance communities so that precise measurements of TSP and SO₂ are not always available.

Findings of ER visits, as above, from nearly all hospitals in the Mount St. Helens health surveillance network will be included in future reports and will allow an assessment of the consistency of the findings reported here. They will also be correlated with ashfall level and with TSP data where available.

Update on CDC/NIOSH Evaluation of Timberworkers

On June 5, 1980, the International Woodworkers of America and the Weyerhaeuser Corporation asked the Division of Respiratory Disease Studies (DRDS) of NIOSH to carry out a Health Hazard Evaluation (HHE) of the potential adverse health effects of the Mount St. Helens volcanic ash on timberworkers. Volcanic hazards experts of USGS have emphasized that there is a strong likelihood of continued periodic eruptions of this volcano for an unpredictable period of time. Based on preliminary data on the composition of the ash, and even if further eruptions do not occur, the NIOSH hypothesis is that timberworkers in forests affected by the first 3 major eruptions represent the group at highest risk for acute or chronic respiratory effects unless properly fitting NIOSH-approved respiratory protection is used to mitigate exposure. Preliminary air-sampling measurements indicate that some loggers receive transient unmitigated exposure to levels of

free (crystalline) silica as much as 10 times the NIOSH recommended occupational standard.

Biologically plausible adverse pulmonary effects include acute mucosal irritation of the nasopharynx, tracheobronchial tree, or small airways; exacerbation of pre-existing chronic respiratory disease; "industrial" chronic bronchitis after prolonged and frequent unmitigated exposures to sufficiently high airborne concentrations of respirable-size particles; and silicosis if the latter particles contain sufficient free (crystalline) silica.

The NIOSH approach to this evaluation involves 1) interim prudent recommendations for the use of fitted, multiple-use respirators by timberworkers when exposure to visible dust is unavoidable; 2) an environmental survey of exposures to total and respirable dust and to respirable free silica as much as 10 times the NIOSH recommended occupational standard characterized by job categories; size, location, and foliage of harvested timber; and by seasonal and meteorologic variations; 3) baseline chest roentgenogram, pulmonary function test (PFT), and humoral tests of immunocompetency; 4) administration of a modification of the 1978 American Thoracic Society (ATS) adult respiratory disease questionnaire, including an occupational and smoking history, post-eruption symptoms, queries on the pattern of use of respiratory protective equipment, and on community exposures; 5) a limited number of shift studies of lung function to evaluate complaints of acute effects; and 6) a plan to institute periodic follow-up medical surveillance by questionnaire and PFT beginning at 6 to 12 months and followed at appropriate intervals with the addition of repeat chest roentgenograms, depending on the periodic environmental survey data and a review of health and safety records.

A study population of about 470 Weyerhaeuser-IWA loggers in the vicinity of the Mount St. Helens volcano is being compared with about 220 unexposed loggers in the area of Coos Bay, Oregon. Baseline findings and follow-up data will be evaluated on the basis of job categories and environmental exposure measurements as well as by demographic, age, race, height, smoking, prior occupational and medical history, and respiratory protection usage factors. The distribution of job (exposure) categories in the study and control groups are comparable. A similar proportion of the presumed heavily exposed loggers in each group were studied for acute effects by pre- and post-shift spirometry. The first follow-up environmental monitoring survey will be done in early September 1980. The results of the initial environmental survey and the baseline medical epidemiologic data should be available in about 6-8 weeks.

[Submitted by B. Bernstein, EIS, NIOSH/CDC, Morgantown, W.Va.]

Effect of Meteorologic Factors and Other Variables on the Level of Total Suspended Particulates

The city of Portland, Oregon, did not receive heavy ashfall from the volcanic eruptions of May 18 and 25, 1980. However, the prevailing winds at the time of the third eruption on June 12 carried the volcanic ash over Portland.

The Oregon Department of Environmental Quality has monitored ambient air particulate levels daily at existing air-quality monitoring stations in the Portland metropolitan area since the volcanic eruption on May 25. Particulate levels did not rise immediately following the June 12 eruption because of prevailing rainy conditions, but, at all monitoring sites, the highest levels of TSP were observed on a dry somewhat windy day, 5 days after the third eruption. Among the monitoring sites, the highest levels were measured in a high-traffic, industrial area ($>3,000 \text{ g/m}^3$). Reintroduction of particles into the air by wind, traffic, and other factors may lead to more potential for particulate exposures during the days following the ashfall than immediately after the actual ashfall event.

[This information was excerpted from "Oregon Communicable Disease Summary" for the week ending June 28, 1980.]

Atmospheric Effects of Mount St. Helens

A workshop, coordinated by NASA, was held at NASA Ames Research Center, Moffett Field, California, on July 11, 1980. The presented material related to measurements of aerosols, particulates, and gases in the stratosphere (as measured mainly from U2 aircraft) and in the troposphere (from B23 aircraft). The presentations were based on very preliminary data from study of the plumes of all 3 eruptions of Mount St. Helens and focused largely on meteorologic aspects. Peter Baxter, EIS, CDC, attended and briefly reviewed the health aspects.

A preliminary report suggested that some organic compounds such as methyl halides were adsorbed to the ash. (Reportedly, similar findings of organic compounds were also seen in analyses of gaseous volcanic emissions in Guatemala). We will attempt to review this issue in more detail in future reports.

Psychiatric Morbidity During Ashfall at Yakima

On May 18, the day of the cataclysmic eruption of Mount St. Helens, the town of Yakima, 85 miles away, experienced ashfall from approximately 9:30 a.m. to 5:30 p.m. For much of this time, the town was shrouded in darkness, and the ash-cloud was accompanied by lightning, booming thunder, and a smell of rotten eggs. Most of the people had little warning of the cloud's approach after the eruption an hour before, and many must have been alarmed and perplexed as to the nature of the event, at least initially. As none of the residents had previously experienced an ashfall there was considerable anxiety, particularly concerning the acute health effects.

The Central Washington Comprehensive Mental Health Program has a center in Yakima. Records are kept on "open-line" telephone calls, and these are classed by age, sex, type of problem, condition, and type of service provided. Monthly summaries show that there were no increases or unusual patterns for May compared with the previous 4 months of 1980. In particular, the cases of behavioral and emotional problems did not show any marked increase nor did the number requiring emotional support.

Yakima has 1 ward (17 beds) for acute psychiatric admissions at the Yakima Valley Memorial Hospital. About 50% of the admissions are involuntary. There were no increases in either voluntary or involuntary admissions following the ashfall. The clinical impression at the center was that the eruption had not been accompanied by a discernable increase in psychiatric morbidity.

(We thank Sue Warren, Ph.D., for assistance in preparing this report.)

NOTE: It is important to continue to evaluate such data because of the potential for recurrent and persistent problems caused by the volcano and associated social and economic disruptions. Anecdotally, problems to date appear greatest in areas closest to the mountain, and in isolated communities. Future trends will be watched closely.

CDC--Mount St. Helens Volcano Health Reports will until further notice be once a week. Information in these reports represents the latest data reported to CDC; much of the information is preliminary in nature and subject to confirmation and change. It is distributed for the purpose of providing up-to-date health data from CDC and the many other groups involved in public health assessment. We hope to continue to receive relevant reports and data from others working on this problem

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