

Neighborhood Cancer Rate Evaluation

Elevated Environmental Cadmium Levels

North Portland, Multnomah County, 2009–2013

March 14, 2016

1. HISTORY

In February 2016, as part of a larger investigation into elevated environmental levels of heavy metals (e.g. cadmium and arsenic) in the Portland metro area, the Multnomah County Health Department (MCHD) released maps showing elevations in estimated levels of cadmium in the air near North Kerby Avenue and North Thompson Street in North Portland. While environmental sampling found both cadmium and arsenic levels to be elevated in an area of inner SE Portland, no elevated environmental levels of arsenic have been reported to date in this area of North Portland.

Estimates of elevated cadmium in the air were based on cadmium concentration data from moss samples collected and analyzed by the U.S. Forest Service. These air estimates were developed through collaboration between the U.S. Forest Service and the Oregon Department of Environmental Quality (DEQ). Oregon DEQ concluded that the cadmium levels in moss samples and the estimated air cadmium concentrations were likely related to emissions from the Uroboros Glass Studio facility located at 2139 North Kerby Avenue.

Response to these findings has been a collaborative effort among various Oregon agencies, including DEQ, the Oregon Health Authority (OHA), the Multnomah County Health Department (MCHD), and the U.S. Forest Service. One of OHA's roles in this response is to assess the public health risk posed by these air toxics. Although only estimated environmental cadmium levels have been reported as elevated in the North Portland area, we analyzed cancers that are associated with both cadmium and arsenic exposure to be consistent with the previous evaluation of cancer rates in SE Portland.

2. BACKGROUND

Cadmium and arsenic are both recognized human carcinogens.^{1,2}

With regard to cadmium, there is suggestive evidence of an increased risk of lung cancer in humans following prolonged inhalation exposure.

With regard to arsenic, there is evidence from many epidemiological studies that inhalation exposure to inorganic arsenic increases the risk of lung cancer. In addition, there is convincing evidence that oral ingestion of inorganic arsenic is associated with an increased risk of skin cancer, and growing evidence that it is associated with bladder cancer.

Neighborhood Cancer Rate Evaluation North Portland, 2009-2013



The Oregon State Cancer Registry (OSCaR), established by the Oregon State Legislature in 1995, collects data on newly-diagnosed cancers among Oregon residents. Data for this neighborhood cancer rate evaluation are available in the OSCaR registry for lung and bladder cancers; the types of skin cancers associated with arsenic exposure are not reportable to OSCaR.

3. SUMMARY FINDINGS

Based on available cancer data, initial analyses indicate that there was no increase in rates of either lung or bladder cancer during 2009–2013 in the areas of North Portland identified as having elevated environmental levels of cadmium.

The results of the analysis presented in this document should be considered in the context of the preliminary environmental assessment performed by the U. S. Forestry Service and DEQ.

4. METHODS

A. Identifying Census tracts for neighborhood cancer rate evaluations

Environmental monitoring information was used to identify the Census tracts that would be the focus of neighborhood cancer rate evaluations. To date, environmental monitoring information for the North Portland neighborhoods near North Kerby Avenue and North Thompson Street is based entirely on heavy metal concentrations in moss samples collected from the area by the U.S. Forest Service. Air and soil sampling data for cadmium and arsenic in this area are currently being collected and analyzed. For this evaluation, we used the preliminary environmental monitoring information that is currently available to guide the selection of Census tracts for cancer rate analyses.

Preliminary environmental monitoring information came from two sources:

1. The map of estimated levels of cadmium in the air, released by MCHD on February 11, 2016:
<http://multco.maps.arcgis.com/apps/SimpleViewer/index.html?appid=fc1b6465dfad408281c37f6301d756ac>.
2. The map of estimated levels of arsenic in moss, provided by MCHD, dated February 17, 2016 (see Exhibit 1, Appendix).

Neighborhood Cancer Rate Evaluation North Portland, 2009-2013



Figures 1 and 2 below show the relationship between Census tracts in the area, estimated air concentrations of cadmium (Figure 1), and estimated levels of arsenic in moss collected from the area (Figure 2).

Based on the available environmental data, Census tracts 23.03 and 22.03 were considered for this evaluation. Census tract 23.03 was identified as the primary area of interest, based on data showing the highest estimated cadmium concentrations in the air in this neighborhood (Figure 1).

Census tract 22.03 was also identified for evaluation because estimated cadmium concentrations in the air were elevated in limited geographic areas, although maximum estimated cadmium concentrations were lower than in Census tract 23.03.

The two identified Census tracts also include locations of particular community concern. These include the Harriet Tubman School and the Boise-Eliot/Humboldt Elementary School.

In 2010, the population for Census tract 23.03 was 1,996, and the population for the two Census tracts combined (Census tracts 23.03 and 22.03) was 5,203.

Figure 1 also shows one Census tract immediately to the northwest of Census tracts 23.03 and 22.03. Census tract 9800 is not included in the neighborhood cancer rate evaluation because it represents an industrial area with virtually no residential population.

B. Identifying cancer types for neighborhood cancer rate evaluations

Consistent with the previous evaluation of cancer rates in SE Portland, lung and bladder cancer were considered for this evaluation. These cancers were identified based on reference documents from the Agency for Toxic Substances and Disease Registry (ATSDR)^{1,2} that review and summarize scientific evidence on the health effects of cadmium and arsenic exposure.

As previously noted, no elevated environmental levels of arsenic have been reported to date in this area of North Portland. However, OHA included an evaluation of rates of bladder cancer, which is associated with exposures to arsenic, for the sake of consistency with the evaluation done for SE Portland. Results from the SE Portland evaluation were published on February 18, 2016.³

Neighborhood Cancer Rate Evaluation North Portland, 2009-2013



C. Selecting observed cancer cases from the Oregon State Cancer Registry (OSCaR)

Newly-diagnosed cases of lung and bladder cancer among residents of Multnomah County were identified from the Oregon State Cancer Registry (OSCaR) database for the 5-year period of 2009–2013. Residence on the date of cancer diagnosis was used for case assignment to county and Census tract.

D. Estimating expected numbers of cancer cases for the selected Census tracts

Rates of lung and bladder cancer in Multnomah County for 2009–2013 were used to estimate the expected number of cases for these cancers in the identified Census tracts in North Portland during the same time.

Observed cases of lung and bladder cancer in Multnomah County for 2009–2013 were identified in OSCaR, as noted above. Rates for these cancers in Multnomah County were then calculated using population data from the 2010 U.S. Census (Multnomah County population for all ages in 2010 was 735,334).

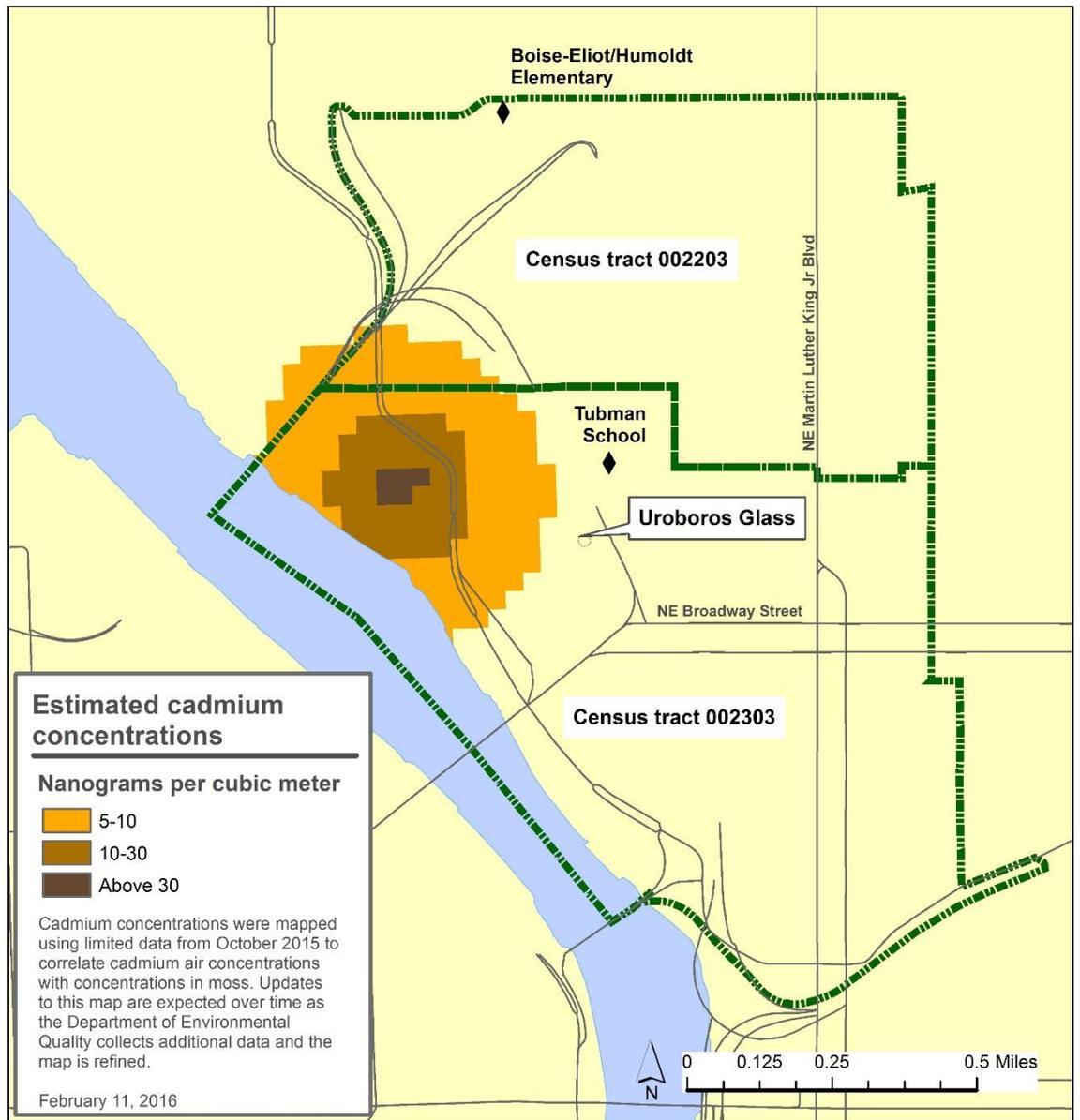
Multnomah County lung and bladder cancer rates were then extrapolated to the identified Census tracts in North Portland to estimate the expected number of cases of these cancers in these Census tracts from 2009–2013.

Standardized Incidence Ratios (SIR)* were calculated by comparing the observed number of cases of a particular cancer identified in OSCaR for the selected Census tract to the expected number of cases calculated for the same area ($SIR = \text{Observed cases} \div \text{Expected cases}$).

* Standardized Incidence Ratios (SIR) indicate whether the number of cancer cases observed in a particular area is less than, equal to, or greater than the expected number of cases in that area during a specific time period. An SIR less than 1.0 indicates that the number of cases is less than expected. An SIR greater than 1.0 indicates that the number of cases is greater than expected. The SIR is considered statistically significant when the 95% confidence interval does not include the number 1.0.

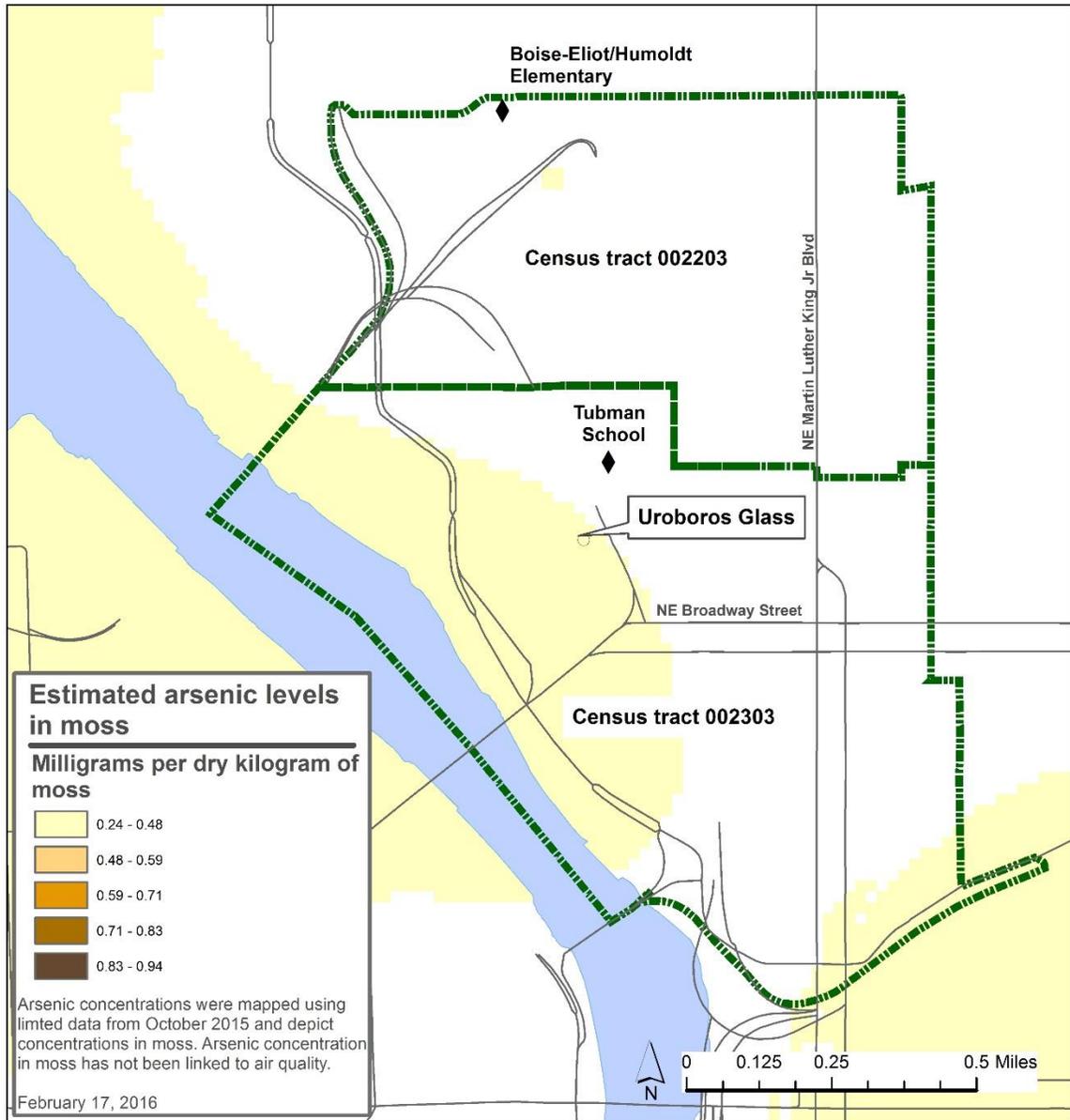
Neighborhood Cancer Rate Evaluation North Portland, 2009-2013

Figure 1. Estimated air concentrations of cadmium in identified Census tracts in North Portland



Neighborhood Cancer Rate Evaluation North Portland, 2009-2013

Figure 2. Estimated arsenic concentrations in moss in identified Census tracts in North Portland



Neighborhood Cancer Rate Evaluation

North Portland, 2009-2013



5. RESULTS

During 2009–2013, five cases of lung cancer were observed in Census tract 23.03, and 11 cases of lung cancer were observed in the two Census tracts combined (Census tracts 23.03 and 22.03; Table 1).

Using Multnomah County lung cancer rates, the expected number of lung cancer cases during this time was determined to be 7.5 for Census tract 23.03, and 13.4 for the two Census tracts combined (Table 1).

Comparing the observed versus expected number of lung cancer cases during this time resulted in a Standardized Incidence Ratio of 0.7 for Census tract 23.03, and 0.8 for the two Census tracts combined (Table 1).

Because the observed versus expected number of lung cancer cases was very similar, with SIRs less than 1.0, and 95% confidence intervals for the calculated SIRs that include 1.0, these results indicate that there was no meaningful difference between the observed and expected number of lung cancer cases in these Census tracts during 2009–2013.

Table 1. Lung cancer, number of cases and Standardized Incidence Ratio (SIR),[#] 2009–2013

	Census Tract 23.03	Census Tracts 23.03 and 22.03
Observed lung cancer cases	5	11
Expected lung cancer cases	7.5	13.4
Standardized Incidence Ratio [#] (95% Confidence Interval)	0.7 (0.2, 1.6)	0.8 (0.4, 1.5)

[#]The Standardized Incidence Ratio (SIR) indicates whether the number of cancer cases observed in a particular area is less than, equal to, or greater than the number of cases expected for that area during a specific time period. An SIR less than 1.0 indicates that the number of cases is less than expected. An SIR greater than 1.0 indicates that the number of cases is greater than expected. The SIR is considered statistically significant when the 95% confidence interval does not include the number 1.0.

During 2009–2013, one case of bladder cancer was observed in Census tract 23.03, and 3 cases of bladder cancer were observed in the two Census tracts combined (Census tracts 23.03 and 22.03; Table 2).

Neighborhood Cancer Rate Evaluation North Portland, 2009-2013



Using Multnomah County bladder cancer rates, the expected number of bladder cancer cases during this time was determined to be 3.0 for Census tract 23.03, and 4.9 for the two Census tracts combined (Table 2).

Comparing the observed versus expected number of bladder cancer cases during this time resulted in a Standardized Incidence Ratio of 0.3 for Census tract 23.03, and 0.6 for the two Census tracts combined (Table 2).

Table 2. Bladder cancer, number of cases and Standardized Incidence Ratio (SIR),[#] 2009–2013

	Census Tract 23.03	Census Tracts 23.03 and 22.03
Observed bladder cancer cases	1	3
Expected bladder cancer cases	3.0	4.9
Standardized Incidence Ratio [#] (95% Confidence Interval)	0.3 (0.0, 1.8)	0.6 (0.1, 1.8)

[#]The Standardized Incidence Ratio (SIR) indicates whether the number of cancer cases observed in a particular area is less than, equal to, or greater than the number of cases expected for that area during a specific time period. An SIR less than 1.0 indicates that the number of cases is less than expected. An SIR greater than 1.0 indicates that the number of cases is greater than expected. The SIR is considered statistically significant when the 95% confidence interval does not include the number 1.0.

6. INTERPRETATION

There was no meaningful difference between the observed and expected number of lung or bladder cancer cases in these Census tracts during 2009–2013. This conclusion is supported by the fact that the observed versus expected number of cancer cases was very similar for both lung and bladder cancer, with SIRs less than 1.0, and 95% confidence intervals for the calculated SIRs that include 1.0.

7. CONCLUSIONS

There was no meaningful difference between the observed and expected number of lung or bladder cancer cases in the selected Census tracts during 2009–2013.

8. FOLLOW UP

Continue to follow rates of lung and bladder cancer in the area of interest, and in the state and county over time.

Neighborhood Cancer Rate Evaluation North Portland, 2009-2013



9. REFERENCES

1. Agency for Toxic Substances and Disease Registry (ATSDR). 2012. *Toxicological Profile for Cadmium*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.
2. Agency for Toxic Substances and Disease Registry (ATSDR). 2007. *Toxicological Profile for Arsenic*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.
3. Oregon State Cancer Registry (OSCaR). 2016. Elevated Environmental Arsenic and Cadmium Levels, Cancer Incidence Evaluation, Southeast Portland, Multnomah County, 2009-2013. Portland, OR. Public Health Division, Oregon Health Authority. (See: <http://public.health.oregon.gov/DiseasesConditions/ChronicDisease/Cancer/oscar/Documents/se-portland-cadmium-arsenic-report-2009-2013.pdf>).

Neighborhood Cancer Rate Evaluation North Portland, 2009-2013

10. APPENDIX

Exhibit 1.

