

## **Appendix A. Air Quality Assessment: The PM Data**

## Appendix A. Air Quality Assessment: The PM Data

This Appendix describes the PM data for the urban counties used in the risk assessment (see Section 3 for selection of locations). The average ambient PM concentration in an assessment location on a given day is represented by the *average* of 24-hour average PM levels at the different monitors in that location that reported on that day. This approach is consistent with what has been done in epidemiological studies estimating PM C-R functions. Also, because people are often quite mobile (e.g., living in one part of a county and working in another), an area-wide average PM level may be a more meaningful measure of ambient PM concentration than PM levels at individual monitors. Ito et al. (1995), for example, found that averaging PM<sub>10</sub> concentrations reported at monitors in different places generally improved the significance of the association between PM<sub>10</sub> and mortality in Chicago, compared with using individual monitors.

In order for an urban area to be included in the PM<sub>2.5</sub> or PM<sub>10-2.5</sub> risk assessment the location must contain at least one monitor (for the PM<sub>10-2.5</sub> risk assessment, at least one pair of co-located PM<sub>10</sub> and PM<sub>2.5</sub> monitors) with 11 or more observations per quarter. Because there are substantially more monitoring data for PM<sub>2.5</sub> than for PM<sub>10</sub>, we added the additional criterion for the PM<sub>2.5</sub> risk assessment that there be at least 122 observations per year (1 in 3 day monitoring). Once the criteria for inclusion were met, all monitors with at least 11 observations per quarter were used for each location. The cutoff of 11 observations per quarter is based on EPA guidance on measuring attainment of the daily and annual particulate matter standards outlined in Appendix N of the July 18, 1997 Federal Register Notice (available on the web at [www.epa.gov/ttn/oarpg/t1pfpr.html](http://www.epa.gov/ttn/oarpg/t1pfpr.html)). The guidance requires that at least 75 percent of the scheduled sampling days for each quarter have valid data. Based on a one in six day sampling protocol, the minimum required number of observations would be 11 per quarter.

The numbers of days of observations by monitor and at the composite monitor, by quarter and for the year, along with annual averages and 98<sup>th</sup> and 99<sup>th</sup> percentile concentrations, are given in the exhibits below. In these exhibits the first five digits, which denote the FIPS code designation, are omitted in the legends. The annual average at each monitor, and at the composite monitor, is the average of the four quarterly averages at the monitor. The 98<sup>th</sup> and 99<sup>th</sup> percentiles at each monitor, and at the composite monitor, are calculated using the method used by EPA, as described in Appendix N of the July 18, 1997 Federal Register Notice (available on the web at [www.epa.gov/ttn/oarpg/t1pfpr.html](http://www.epa.gov/ttn/oarpg/t1pfpr.html)). The only difference between the method used in calculating the monitor-specific annual averages and 98<sup>th</sup> and 99<sup>th</sup> percentile values shown in the exhibits in this appendix and the standard EPA convention in calculating annual averages and 98<sup>th</sup> and 99<sup>th</sup> percentile values is that the EPA convention uses three years of data whereas the calculations here are based on only a single year of data.

### A.1. The PM<sub>2.5</sub> data

PM<sub>2.5</sub> data for each of the urban areas identified in Section 3 for the PM<sub>2.5</sub> risk assessment (Boston, Detroit, Los Angeles, Philadelphia, Phoenix, Pittsburgh, San Jose, Seattle, and St. Louis) were obtained for the years 1999 through 2003 from EPA's Air Quality System (AQS). For all urban areas except Phoenix, year 2003 data were used. For Phoenix there were no monitors in 2003 and only two monitors in 2002 that met the inclusion criterion. The number of days covered by the two 2002 monitors in Phoenix is 178 compared with 362 days covered in 2003. Because the annual averages in those two years in Phoenix were comparable and the 2001 data provided much better coverage of the year, we used the year 2001 data. The numbers of days of observations by monitor and at the composite monitor, by quarter and for the year, along with annual averages and 98<sup>th</sup> and 99<sup>th</sup> percentile concentrations, are given in Exhibits A.1 through A.9.

EPA design values (described in Section 2.3 of the report) are used to determine the percent rollback necessary to just meet annual, 98<sup>th</sup> percentile daily, and 99<sup>th</sup> percentile daily standards. Although the composite monitor is not used in determining the percent rollback in the PM risk assessment, the percent rollback to simulate just meeting alternative standards is applied to the composite monitor.

**Exhibit A.1. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. Boston, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 250250027881011	17	12	22	24	75	12.0	41.3	53.7
AQS 250250042881011	47	49	91	83	270	11.4	30.6	39.6
AQS 250250043881011	22	30	25	29	106	13.6	35.5	42.5
<b>Composite<sup>1</sup></b>	62	63	91	86	302	12.1	34.1	41.1
Design Values**	–	–	–	–	–	14.4	44	60

\*All concentrations are in µg/m<sup>3</sup>; includes Middlesex, Norfolk and Suffolk Counties.

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.2. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. Detroit, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 261630001881011	80	86	80	80	326	15.2	40.5	48.3
AQS 261630015881011	27	27	30	27	111	16.6	33.6	34.3
AQS 261630016881011	85	85	86	71	327	15.8	46.2	50.4
AQS 261630019881011	27	30	30	29	116	14.6	37.1	39.2
AQS 261630025881011	27	28	31	27	113	14.1	38.1	38.5
AQS 261630033881011	29	27	27	28	111	19.1	42.8	44.1
AQS 261630036881011	25	24	28	29	106	16.3	34.8	36.0
<b>Composite<sup>1</sup></b>	88	90	90	89	357	15.7	41.5	48.5
Design Values**	–	–	–	–	–	19.5	44.0	48

\*All concentrations are in µg/m<sup>3</sup>; includes Wayne County.

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.3. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. Los Angeles, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 060370002881011	87	79	80	68	314	19.3	55.5	63.9
AQS 060371002881011	30	23	28	11	92	22.1	60.1	120.6
AQS 060371103881011	80	85	85	75	325	21.4	61.3	68.9
AQS 060371201881011	29	30	31	25	115	16.5	44.7	45.0
AQS 060371301881011	29	29	31	28	117	20.3	52.4	53.3
AQS 060371601881011	29	27	27	28	111	20.5	50.4	51.1
AQS 060372005881011	29	28	29	24	110	18.6	48.4	51.3
AQS 060374002881011	81	84	78	81	324	18.0	46.5	51.4
AQS 060379033881011	30	30	31	29	120	9.4	17.0	21.0
<b>Composite<sup>1</sup></b>	90	91	92	92	365	19.1	55.0	60.4
Design Values**	–	–	–	–	–	23.6	62.0	96

\*All concentrations are in µg/m<sup>3</sup>; includes Los Angeles County.

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.4. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. Philadelphia, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 421010004881011	12	76	82	92	322	14.8	39.9	40.7
AQS 421010014881011	11	15	26	21	73	13.3	39.3	60.7
AQS 421010020881011	24	28	27	29	108	13.7	39.3	39.9
AQS 421010024881011	21	24	23	40	108	13.2	38.7	40.9
AQS 421010047881011	15	18	23	14	70	16.1	42.3	56.5
AQS 421010136881011	63	69	81	83	296	14.0	35.6	44.9
<b>Composite<sup>1</sup></b>	82	89	86	92	349	14.3	38.4	42.2
Design Values**	–	–	–	–	–	16.4	51.0	89

\*All concentrations are in µg/m<sup>3</sup>; includes Philadelphia County.

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.5. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. Phoenix, 2001\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 040130019881011	50	85	91	86	312	10.9	30.4	36.5
AQS 040139990881011	27	31	28	30	116	9.4	22.7	25
AQS 040139992881011	77	87	85	87	336	10.9	35.3	40.5
AQS 040139997881011	75	75	91	73	314	9.2	25.0	28.2
<b>Composite<sup>1</sup></b>	88	90	92	92	362	10.4	28.9	36.4
Design Values**	–	–	–	–	–	11.5	35.0	41

\*All concentrations are in µg/m<sup>3</sup>; includes Maricopa County.

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.6. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. Pittsburgh, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 420030008881011	84	90	88	90	352	15.2	35.9	39.5
AQS 420030021881011	23	29	26	30	108	14.6	30.7	40.0
AQS 420030064881011	86	91	90	92	359	20.2	66.6	76.1
AQS 420030067881011	26	28	19	26	99	13.2	42.1	52.0
AQS 420030095881011	12	12	15	14	53	15.7	38.6	53.7
AQS 420030116881011	26	27	28	27	108	15.3	42.9	45.9
AQS 420031008881011	25	27	29	30	111	15.5	41.9	44.5
AQS 420031301881011	20	28	30	26	104	16.8	38.3	50.4
AQS 420033007881011	15	14	16	15	60	12.0	58.8	59.3
AQS 420039002881011	13	13	16	15	57	16.0	33.4	58.6
<b>Composite<sup>1</sup></b>	89	91	91	92	363	16.9	43.9	55.1
Design Values**	–	–	–	–	–	21.2	63.0	70

\*All concentrations are in µg/m<sup>3</sup>; includes Allegheny County.

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.7. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. San Jose, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 60850005881011	87	14	17	87	205	11.7	40.1	45.5
AQS 60852003881011	85	19	18	79	201	10.1	36.9	37.5
<b>Composite<sup>1</sup></b>	89	19	19	91	218	11.1	37.6	41
Design Values**	–	–	–	–	–	14.6	47.0	53

\*All concentrations are in µg/m<sup>3</sup>; includes Santa Clara County.

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.8. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. Seattle, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 530330017881011	18	15	16	14	63	10.3	10.9	12.6
AQS 530330024881011	30	28	30	29	117	10.8	28.2	31.7
AQS 530330037881011	17	12	14	15	58	7.8	17.6	30.7
AQS 530330057881011	34	30	31	28	123	8.3	28.4	28.6
AQS 530330080881011	88	85	92	92	357	8.6	20.5	22.9
AQS 530332004881011	29	30	29	28	116	10.3	28.4	30.2
<b>Composite<sup>1</sup></b>	89	87	92	92	360	8.3	21.7	23.8
Design Values**	–	–	–	–	–	11.1	41.0	48

\*All concentrations are in µg/m<sup>3</sup>; includes King County.

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.9. Number of Days on which PM<sub>2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>2.5</sub> Concentrations. St. Louis, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 171191007881011	29	30	26	28	113	17.5	40.8	41.7
AQS 171192009881011	29	29	30	29	117	14.0	31.5	36.1
AQS 171193007881011	29	29	30	29	117	14.0	31.6	32.7
AQS 171630010881011	26	28	31	25	110	14.8	32.6	32.9
AQS 171634001881011	29	22	31	30	112	14.3	34.2	36.2
AQS 290990012881011	85	87	88	88	348	13.9	34.2	36.3
AQS 291831002881011	30	29	31	30	120	14.0	35.5	37.9
AQS 291890004881011	29	28	30	29	116	13.0	30.5	36.2
AQS 291892003881011	88	89	82	89	348	13.6	31.5	32.4
AQS 295100007881011	88	87	86	90	351	14.4	33.2	34.8
AQS 295100085881011	90	91	89	92	362	14.1	32.0	33.5
AQS 295100086881011	90	91	88	86	355	13.5	31.5	33.8
AQS 295100087881011	82	91	90	90	353	14.7	33.2	34.5
<b>Composite<sup>1</sup></b>	90	91	92	92	365	14.0	30.6	33.7
Design Values**	–	–	–	–	–	17.5	42	46

\*All concentrations are in µg/m<sup>3</sup>; includes St. Louis (MO), Franklin (MO), Jefferson (MO), St. Charles (MO), Clinton (IL), Madison (IL), Monroe (IL), and St. Clair (IL) Counties and St. Louis City (MO).

\*\* The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**A.2. The PM<sub>10-2.5</sub> data**

PM<sub>10-2.5</sub> data for each of the urban areas identified in Section 3 for the PM<sub>10-2.5</sub> risk assessment (Detroit, Seattle, and St. Louis) were calculated based on data obtained from EPA's Air Quality System (AQS) for 1999-2003. PM<sub>10</sub> and PM<sub>2.5</sub> monitoring data collected on the same day at the same site were used to calculate PM<sub>10-2.5</sub> levels. Year 2003 data were used for all three locations because not only is this the most recent year for which we have data, but data in 2003 were more complete for each location than in any of the other years.

In the AQS database, PM<sub>2.5</sub> data is collected and reported at local temperature and pressure. In order to calculate PM<sub>10-2.5</sub> levels using comparable data, PM<sub>10</sub> local condition data were obtained, when available, and PM<sub>10</sub> standard condition data were converted to PM<sub>10</sub> local condition data using site-specific algorithms.

The numbers of days of observations by monitor and at the composite monitor, by quarter and for the year, along with annual averages and maximum concentrations, are given in Exhibits A.10 through A.12 for each of the urban locations in the PM<sub>10-2.5</sub> risk assessment. Since PM<sub>10-2.5</sub> data are based on co-located monitors at a single site, the data are presented by site, rather than by monitor. As with the PM<sub>2.5</sub> data, the annual average at each site, and at the composite site, is the average of the four quarterly averages at the site.

**Exhibit A.10. Number of Days on which PM<sub>10-2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10-2.5</sub> Concentrations. Detroit, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 261630015	13	12	16	12	53	12.3	40.2	48.7
AQS 261630033	29	27	27	28	111	25.0	105.9	122.4
<b>Composite<sup>1</sup></b>	30	27	29	29	115	21.7	105.9	122.4
Design Values**	–	–	–	–	–	–	70.0	77.0

\*All concentrations are in µg/m<sup>3</sup>; includes Wayne County.

\*\*The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.11. Number of Days on which PM<sub>10-2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10-2.5</sub> Concentrations. Seattle, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 530330057	15	14	16	13	58	12.6	30.3	45.0
AQS 530332004	14	15	14	13	56	10.0	25.4	30.1
<b>Composite<sup>1</sup></b>	15	16	16	14	61	11.4	26.2	30.3
Design Values**	–	–	–	–	–	–	31.0	39.0

\*All concentrations are in µg/m<sup>3</sup>; includes King County.

\*\*The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit A.12. Number of Days on which PM<sub>10-2.5</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10-2.5</sub> Concentrations. St. Louis, 2003\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
AQS 171193007	13	15	15	15	58	10.6	24.2	42.8
AQS 295100086	15	15	16	14	60	10.1	24.7	34.9
AQS 295100087	15	15	15	15	60	14.9	33.3	47.0
<b>Composite<sup>1</sup></b>	15	15	16	15	61	12.0	24.1	41.6
Design Values**	–	–	–	–	–	–	33.0	47.0

\*All concentrations are in µg/m<sup>3</sup>; includes St. Louis (MO), Franklin (MO), Jefferson (MO), St. Charles (MO), Clinton (IL), Madison (IL), Monroe (IL), and St. Clair (IL) Counties and St. Louis City (MO).

\*\*The calculation of design values is described in Section 2.3 of this report.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Appendix B. Linear Trends in Historical PM<sub>2.5</sub> Data in Philadelphia and Los Angeles**



# *memorandum*

Environmental Research Area

4800 Montgomery Lane, Suite 600 ■ Bethesda, MD 20814-5341 ■ (301) 913-0500

**Abt Associates Inc.**

**Date** May 8, 2002

**To** Harvey Richmond, U.S. EPA/OAQPS

**From** Ellen Post, Abt Associates Inc.

**Subject** **Linear Trends in Historical PM<sub>2.5</sub> Data in Philadelphia and Los Angeles: Revision of November 26, 2001 Memo**

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The method used to simulate just meeting a standard in the 1995/96 PM risk analysis and proposed for the current risk analysis to “roll back” the anthropogenic portion of PM levels (i.e., the portion above background level) by the same percentage on each day. This method assumes that, all else held constant:

$$(y_i - B) = \beta * (x_i - B) ,$$

where<sup>1</sup>

- $x_i$  is the  $i$ th PM<sub>2.5</sub> concentration in a location before the standard is met,
- $y_i$  is the  $i$ th PM<sub>2.5</sub> concentration in that location when the standard is just met,
- $B$  is the background concentration in that location, and
- $\beta < 1$ .

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<sup>1</sup> We first examined the plausibility of this assumption in preparation for the PM risk analysis carried out in 1995/1996. At that time, we examined pairs of years of PM<sub>2.5</sub> data in several locations, but none of the data reflected efforts to meet PM<sub>2.5</sub> standards, because this exercise (and the data it used) preceded the setting of PM<sub>2.5</sub> standards. That investigation, however, found that the change in the distribution of PM<sub>2.5</sub> concentrations from one year to another year in the same location tended to be linear. This is described in Section 8.2 of Abt Associates Inc., 1996. “A Particulate Matter Risk Assessment for Philadelphia and Los Angeles.”

We don't have data on PM<sub>2.5</sub> concentrations in any location before and after the PM<sub>2.5</sub> standards have just been met, so we cannot directly test whether this "rollback" assumption accurately models how PM<sub>2.5</sub> concentrations would change if a standard were just met. We can, however, examine historical changes in PM<sub>2.5</sub> concentrations for any location for which we have sufficient data to determine if the proportional rollback model is consistent with these historical changes. We currently have sufficient data in each of two locations, Philadelphia and Los Angeles, to compare the distribution of daily PM<sub>2.5</sub> concentrations in the year 2000 with the distribution in an earlier year. In each location, we compared the two distributions to see if the change was well described as proportional. The method and results are described below.

In Philadelphia we have 353 days of observations in a year which crosses calendar years 1992 and 1993, and 296 days of observations in the year 2000. In Los Angeles we have 214 days of observations in 1995 and 357 days of observations in 2000. We first grouped the PM<sub>2.5</sub> concentrations in each distribution into deciles and averaged the concentrations within each decile.<sup>2</sup> These average concentrations within deciles are shown in Exhibit B.1 and in graph form in Exhibits B.2 and B.3, for Philadelphia and Los Angeles, respectively.

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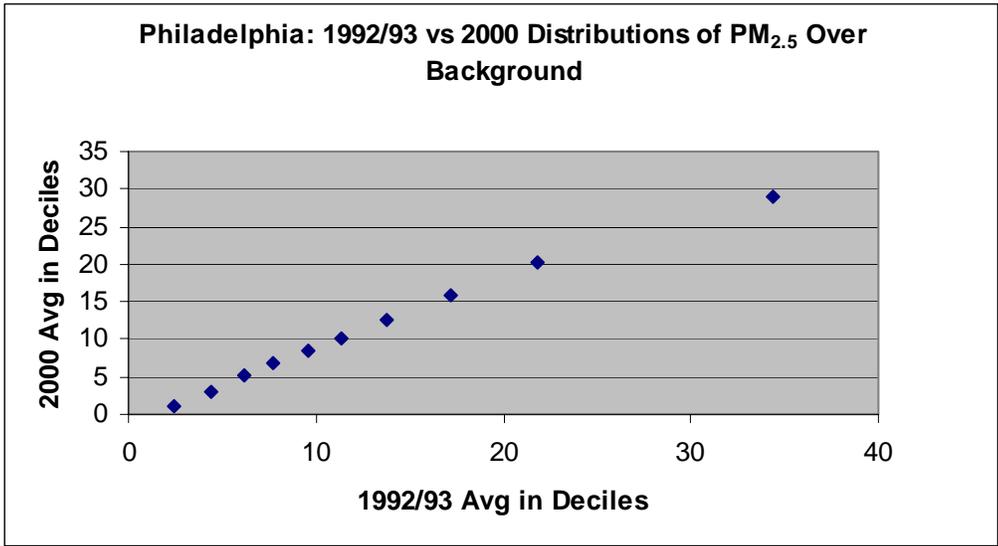
<sup>2</sup> We considered using the decile points themselves rather than the averages within deciles. However, the decile points would be expected to be less stable from one year to another than the averages of the concentrations within deciles. A comparison of the averages within deciles from one year to another is therefore likely to give a more accurate picture of how the distribution has changed from one year to another. This is the method that was used in the earlier comparison for the 1995/96 PM risk assessment.

**Exhibit B.1. Average PM<sub>2.5</sub> Concentrations (µg/m<sup>3</sup>) in Each Decile of Earlier Year and Year 2000 Distributions at Composite Monitors in Philadelphia and Los Angeles\***

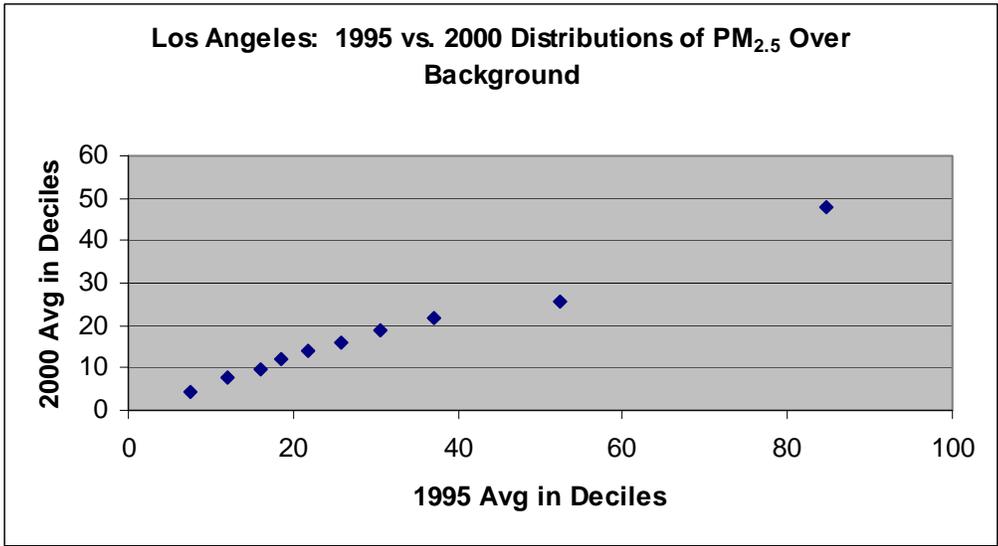
Decile*	Philadelphia		Los Angeles	
	1992/93	2000	1995	2000
1	5.91	4.62	10.02	6.67
2	7.94	6.58	14.62	10.19
3	9.71	8.82	18.50	12.39
4	11.19	10.25	21.06	14.59
5	13.07	12.07	24.19	16.59
6	14.87	13.72	28.40	18.55
7	17.23	16.01	32.96	21.27
8	20.67	19.4	39.72	24.22
9	25.34	23.77	54.77	28.27
10	37.90	32.58	87.12	50.50

\*The first decile is the tenth percentile, the second decile is the twentieth percentile, and so on. The average concentration in the nth decile is the average of those values that are greater than the (n-1)st decile point and less than or equal to the nth decile point.

**Exhibit B.2**



**Exhibit B.3**



To examine how reasonable the proportional rollback hypothesis is we estimated the following regression equation separately for Philadelphia and for Los Angeles:

$$(y_i - B) = \alpha + \beta*(x_i - B) + \varepsilon_i$$

where now,

- $y_i$  is the average  $PM_{2.5}$  concentration in the  $i$ th decile of the distribution of  $PM_{2.5}$  concentrations in the location in the year 2000,
- $x_i$  is the average  $PM_{2.5}$  concentration in the  $i$ th decile of the distribution of  $PM_{2.5}$  concentrations in that location in an earlier year (1995 for Los Angeles and 1992/93 for Philadelphia),
- $B$  is the background concentration in that location ( $2.5 \mu\text{g}/\text{m}^3$  in Los Angeles and  $3.5 \mu\text{g}/\text{m}^3$  in Philadelphia), and
- $\varepsilon_i$  is an error term.

If the change in  $PM_{2.5}$  concentrations from the earlier year to the year 2000 is consistent with a proportional rollback model, we would expect

- the linear fit to be good,
- the slope ( $\beta$ ) to be less than one, and
- the intercept ( $\alpha$ ) to be close to zero

The results of the regressions in Philadelphia and Los Angeles do support the hypothesis underlying the proportional rollback method, as shown in Exhibit B.4. In both cases, the linear fit is very good ( $R^2 = 0.992$  in Philadelphia and  $0.986$  in Los Angeles), the slopes are less than 1.0, and the intercepts are close to zero.<sup>3</sup> This supports the hypothesis that, at least in these two locations, the change in daily  $PM_{2.5}$  concentrations that would result if a  $PM_{2.5}$  standard were just met is reasonably modeled as a proportional rollback.

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<sup>3</sup> Because decile points are not independent observations, the usual test of statistical significance are not valid. What is most important, however, is that the linear relationship is very good and the intercept is near zero.

**Exhibit B.4. Results of Regressions of Year 2000 Average PM<sub>2.5</sub> Concentrations over Background on Earlier Year Average PM<sub>2.5</sub> Concentrations over Background.**

	Philadelphia	Los Angeles
Intercept	-0.136	1.387
Slope	0.886	0.537
R <sup>2</sup>	0.992	0.986

## **Appendix C. Study-Specific Information for the PM<sub>2.5</sub> and PM<sub>10-2.5</sub> Risk Assessments**

C.1. The PM<sub>2.5</sub> data

Exhibit C.1. Study-Specific Information for PM<sub>2.5</sub> Studies in Boston, MA

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations		Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
						min.	max.					
<b>Short-Term Exposure Total Mortality -- Single Pollutant Models</b>												
Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	< 800	all	log-linear, GAM (stringent)	none	0	70.8	mean of lag 0 & 1	2-day avg	0.00206	0.00139	0.00273
Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	< 800	all	log-linear, GAM (stringent)	none	0	174	mean of lag 0 & 1	2-day avg	0.00137	0.00098	0.00176
<b>Short-Term Exposure Cause-Specific Mortality -- Single Pollutant Models</b>												
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	COPD	490-492, 494-496	all	log-linear, GAM (stringent)	none	0	70.8	0 day	2-day avg	0.00276	-0.00131	0.00658
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Ischemic heart disease	410-414	all	log-linear, GAM (stringent)	none	0	70.8	0 day	2-day avg	0.00266	0.00149	0.00383
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Pneumonia	480-487	all	log-linear, GAM (stringent)	none	0	70.8	0 day	2-day avg	0.00573	0.00257	0.00871
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	COPD	490-492, 494-496	all	log-linear, GAM (stringent)	none	0	174	0 day	2-day avg	0.00227	0.00010	0.00440
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Ischemic heart disease	410-414	all	log-linear, GAM (stringent)	none	0	174	0 day	2-day avg	0.00178	0.00109	0.00247
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Pneumonia	480-487	all	log-linear, GAM (stringent)	none	0	174	0 day	2-day avg	0.00402	0.00188	0.00602

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Respiratory Symptoms and Illnesses* -- Single Pollutant Models</b>												
Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	n/a	7-14	logistic	none	N/A	N/A	1 day	1-day avg	0.01901	0.00696	0.03049
Schwartz and Neas (2000) -- 6 cities	Cough	n/a	7-14	logistic	none	N/A	N/A	0 day	3-day avg	0.00989	-0.00067	0.02050
<b>Respiratory Symptoms and Illnesses* -- Multi-Pollutant Models</b>												
Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	n/a	7-14	logistic	PM10-2.5	N/A	N/A	1 day	1-day avg	0.01698	0.00388	0.03007
Schwartz and Neas (2000) -- 6 cities	Cough	n/a	7-14	logistic	PM10-2.5	N/A	N/A	0 day	3-day avg	0.00451	-0.00702	0.01541
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - Six Cities	All cause	all	25+	log-linear	none	11	29.6	n/a	annual mean	0.01243	0.00414	0.02071
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.00463	0.00238	0.00710
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Krewski et al. (2000) - Six Cities	Cardiopulmonary	400-440, 485-495	25+	log-linear	none	11	29.6	n/a	annual mean	0.01693	0.00561	0.02789
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.00943	0.00606	0.01315
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.00812	0.00426	0.01164
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.00121	-0.00209	0.00499

\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

**Exhibit C.2. Study-Specific Information for PM<sub>2.5</sub> Studies in Detroit, MI**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Short-Term Exposure Total Mortality -- Single Pollutant Models</b>												
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Non-accidental	<800	all	log-linear, GAM (stringent)	none	4	86	3 day	1-day avg	0.00074	-0.00073	0.00221
<b>Short-Term Exposure Cause-Specific Mortality -- Single Pollutant Models</b>												
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Circulatory	390-459	all	log-linear, GAM (stringent)	none	4	86	1 day	1-day avg	0.00087	-0.00131	0.00305
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Respiratory	460-519	all	log-linear, GAM (stringent)	none	4	86	0 day	1-day avg	0.00090	-0.00438	0.00618
<b>Hospital Admissions -- Single Pollutant Models</b>												
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Pneumonia	480-486	65+	log-linear, GAM (stringent)	none	4	86	1 day	1-day avg	0.00398	0.00074	0.00725
Ito (2003) [reanalysis of Lippmann et al. (2000)]	COPD	490-496	65+	log-linear, GAM (stringent)	none	4	86	3 day	1-day avg	0.00117	-0.00287	0.00523
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Ischemic heart disease	410-414	65+	log-linear, GAM (stringent)	none	4	86	2 day	1-day avg	0.00143	-0.00082	0.00371
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Congestive heart failure	428	65+	log-linear, GAM (stringent)	none	4	86	1 day	1-day avg	0.00307	0.00055	0.00561
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Dysrhythmias	427	65+	log-linear, GAM (stringent)	none	4	86	1 day	1-day avg	0.00125	-0.00274	0.00523

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.00463	0.00238	0.00710
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.00943	0.00606	0.01315
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.00812	0.00426	0.01164
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.00121	-0.00209	0.00499

**Exhibit C.3. Study-Specific Information for PM<sub>2.5</sub> Studies in Los Angeles, CA**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Short-Term Exposure Total Mortality -- Single Pollutant Models</b>												
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GAM (stringent), 100 df	none	4	86	0 day	1-day avg	0.00032	-0.00023	0.00086
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GAM (stringent), 100 df	none	4	86	1 day	1-day avg	0.00010	-0.00046	0.00066
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GAM (stringent), 30 df	none	4	86	0 day	1-day avg	0.00054	-0.00007	0.00114
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GLM, 30 df	none	4	86	0 day	1-day avg	0.00040	-0.00034	0.00113
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GAM (stringent), 100 df	none	4	86	0 day	1-day avg	0.00032	-0.00023	0.00086
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GLM, 100 df	none	4	86	0 day	1-day avg	0.00030	-0.00043	0.00102
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GAM (stringent), 30 df	none	4	86	1 day	1-day avg	0.00059	0.00000	0.00117
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GLM, 30 df	none	4	86	1 day	1-day avg	0.00055	-0.00017	0.00126
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GAM (stringent), 100 df	none	4	86	1 day	1-day avg	0.00010	-0.00046	0.00066
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GLM, 100 df	none	4	86	1 day	1-day avg	-0.00001	-0.00099	0.00097

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Short-Term Exposure Cause-Specific Mortality -- Single Pollutant Models</b>												
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GAM (stringent), 30 df	none	4	86	0 day	1-day avg	0.00099	0.00010	0.00187
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GAM (stringent), 100 df	none	4	86	0 day	1-day avg	0.00097	0.00014	0.00179
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GLM, 100 df	none	4	86	0 day	1-day avg	0.00097	-0.00002	0.00195
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GAM (stringent), 30 df	none	4	86	1 day	1-day avg	0.00103	0.00016	0.00189
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GAM (stringent), 100 df	none	4	86	1 day	1-day avg	0.00080	-0.00003	0.00162
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GLM, 100 df	none	4	86	1 day	1-day avg	0.00069	-0.00032	0.00169
<b>Short-Term Exposure Total Mortality -- Multi-Pollutant Models</b>												
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GAM (stringent), 30 df	CO	4	86	1 day	1-day avg	-0.00053	-0.00132	0.00025
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GAM (stringent), 100 df	CO	4	86	1 day	1-day avg	-0.00033	-0.00105	0.00039
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	<800	all	log-linear, GLM, 100 df	CO	4	86	1 day	1-day avg	-0.00033	-0.00118	0.00051

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Short-Term Exposure Cause-Specific Mortality -- Multi-Pollutant Models</b>												
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GAM (stringent), 100 df	CO	4	86	0 day	1-day avg	0.00178	0.00076	0.00279
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GLM, 100 df	CO	4	86	0 day	1-day avg	0.00188	0.00068	0.00306
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GAM (stringent), 100 df	CO	4	86	1 day	1-day avg	0.00091	-0.00012	0.00193
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	390-429	all	log-linear, GLM, 100 df	CO	4	86	1 day	1-day avg	0.00091	-0.00034	0.00215
<b>Hospital Admissions -- Single Pollutant Models</b>												
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GAM (stringent), 30 df	none	4	86	0 day	1-day avg	0.00158	0.00091	0.00224
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GAM (stringent), 100 df	none	4	86	0 day	1-day avg	0.00116	0.00051	0.00181
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GLM, 100 df	none	4	86	0 day	1-day avg	0.00126	0.00045	0.00206
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GAM (stringent), 30 df	none	4	86	1 day	1-day avg	0.00139	0.00070	0.00208
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GAM (stringent), 100 df	none	4	86	1 day	1-day avg	0.00113	0.00047	0.00179
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GLM, 100 df	none	4	86	1 day	1-day avg	0.00120	0.00039	0.00200
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 30 df	none	4	86	0 day	1-day avg	0.00167	0.00069	0.00264

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations		Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
						min.	max.					
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 100 df	none	4	86	0 day	1-day avg	0.00138	0.00052	0.00223
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GLM, 100 df	none	4	86	0 day	1-day avg	0.00149	0.00042	0.00255
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 30 df	none	4	86	1 day	1-day avg	0.00119	0.00023	0.00214
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 100 df	none	4	86	1 day	1-day avg	0.00075	-0.00011	0.00160
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GLM, 100 df	none	4	86	1 day	1-day avg	0.00077	-0.00027	0.00180
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 30 df	none	4	86	2 day	1-day avg	0.00185	0.00084	0.00285
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 100 df	none	4	86	2 day	1-day avg	0.00114	0.00022	0.00205
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GLM, 100 df	none	4	86	2 day	1-day avg	0.00103	-0.00011	0.00216
<b>Hospital Admissions -- Single City, Multi-Pollutant Models</b>												
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GAM (stringent), 100 df	CO	4	86	0 day	1-day avg	0.00039	-0.00044	0.00121
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GLM, 100 df	CO	4	86	0 day	1-day avg	0.00058	-0.00041	0.00156
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GAM (stringent), 100 df	CO	4	86	1 day	1-day avg	0.00024	-0.00065	0.00112
Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	390-429	65+	log-linear, GLM, 100 df	CO	4	86	1 day	1-day avg	0.00027	-0.00075	0.00128

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 100 df	NO2	4	86	0 day	1-day avg	0.00042	-0.00091	0.00173
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 100 df	NO2	4	86	1 day	1-day avg	-0.00004	-0.00162	0.00152
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	490-496	all	log-linear, GAM (stringent), 100 df	NO2	4	86	2 day	1-day avg	0.00035	-0.00103	0.00171
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.00463	0.00238	0.00710
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.00943	0.00606	0.01315
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.00812	0.00426	0.01164
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.00121	-0.00209	0.00499

### Exhibit C.4. Study-Specific Information for Studies PM<sub>2.5</sub> in Philadelphia, PA

Study*	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Short-Term Exposure Cause-Specific Mortality -- Single Pollutant Models</b>												
Lipfert et al. (2000) -- 7 counties	Cardiovascular	390-448	all	linear	none	-0.6	72.6	1 day	1-day avg	0.10440	0.04983	0.15897
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.00463	0.00238	0.00710
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.00943	0.00606	0.01315
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.00812	0.00426	0.01164
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.00121	-0.00209	0.00499

\*The Lipfert et al. (2000) study does not provide the statistical uncertainties surrounding the PM<sub>2.5</sub> non-accidental mortality coefficients and the cardiovascular mortality multi-pollutant coefficient.

**Exhibit C.5. Study-Specific Information for PM<sub>2.5</sub> Studies in Phoenix, AZ**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations		Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
						min.	max.					
<b>Short-Term Exposure Cause-Specific Mortality -- Single Pollutant Models</b>												
Mar (2003) [reanalysis of Mar (2000)]	Cardiovascular	390-448.9	65+	log-linear, GAM (stringent)	none	0	42	0 day	1-day avg	0.00371	-0.00101	0.00843
Mar (2003) [reanalysis of Mar (2000)]	Cardiovascular	390-448.9	65+	log-linear, GAM (stringent)	none	0	42	1 day	1-day avg	0.00661	0.00193	0.01129
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.00463	0.00238	0.00710
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.00943	0.00606	0.01315
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.00812	0.00426	0.01164
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.00121	-0.00209	0.00499

**Exhibit C.6. Study-Specific Information for PM<sub>2.5</sub> Studies in Pittsburgh, PA**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations		Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
						min.	max.					
<b>Short-Term Exposure Total Mortality -- Single Pollutant Models</b>												
Chock et al. (2000)	Non-accidental	<800	<75	log-linear	none	3	86	0 day	1-day avg	0.00101	-0.00079	0.00281
Chock et al. (2000)	Non-accidental	<800	75+	log-linear	none	3	86	0 day	1-day avg	0.00059	-0.00125	0.00243
<b>Short-Term Exposure Total Mortality -- Multi-Pollutant Models</b>												
Chock et al. (2000)	Non-accidental	<800	<75	log-linear	CO, O3, SO2, NO2, PM10-2.5	3	86	0 day	1-day avg	0.00130	-0.00086	0.00346
Chock et al. (2000)	Non-accidental	<800	75+	log-linear	CO, O3, SO2, NO2, PM10-2.5	3	86	0 day	1-day avg	0.00040	-0.00178	0.00258
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.00463	0.00238	0.00710
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.00943	0.00606	0.01315
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.00812	0.00426	0.01164
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.00121	-0.00209	0.00499

**Exhibit C.7. Study-Specific Information for PM<sub>2.5</sub> Studies in San Jose, CA**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Short-Term Exposure Total Mortality -- Single Pollutant Models</b>												
Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	<800	all	log-linear, GAM (stringent)	none	2	105	0 day	1-day avg	0.00314	0.00064	0.00567
Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	<800	all	log-linear, GAM (stringent)	none	2	105	1 day	1-day avg	-0.00153	-0.00380	0.00071
<b>Short-Term Exposure Cause-Specific Mortality -- Single Pollutant Models</b>												
Fairley (2003) [reanalysis of Fairley (1999)]	Respiratory	11, 35, 472-519, 710.0, 710.2, 710.4	all	log-linear, GAM (stringent)	none	2	105	0 day	1-day avg	0.00446	-0.00416	0.01307
Fairley (2003) [reanalysis of Fairley (1999)]	Cardiovascular	390-459	all	log-linear, GAM (stringent)	none	2	105	0 day	1-day avg	0.00248	-0.00168	0.00666
<b>Short-Term Exposure Total Mortality -- Multi-Pollutant Models</b>												
Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	<800	all	log-linear, GAM (stringent)	NO2	2	105	0 day	1-day avg	0.00402	0.00106	0.00698
Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	<800	all	log-linear, GAM (stringent)	CO	2	105	0 day	1-day avg	0.00363	0.00085	0.00636
Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	<800	all	log-linear, GAM (stringent)	O3 - 8hr	2	105	0 day	1-day avg	0.00340	0.00085	0.00594
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.00463	0.00238	0.00710
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.00943	0.00606	0.01315
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.00812	0.00426	0.01164
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.00121	-0.00209	0.00499

**Exhibit C.8. Study-Specific Information for PM<sub>2.5</sub> Studies in Seattle, WA**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Hospital Admissions -- Single Pollutant Models</b>												
Sheppard (2003) [reanalysis of Sheppard et al. (1999)]*	Asthma	493	<65	log-linear, GAM (stringent)	none	2.5	96	1 day	1-day avg	0.00332	0.00084	0.00494
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070

\*Sheppard (2003) [reanalysis of Sheppard et al. (1999)] used daily PM2.5 values obtained from nephelometry measurements rather than from air quality monitors.

**Exhibit C.9. Study-Specific Information for PM<sub>2.5</sub> Studies in St. Louis, MO**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations		Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
						min.	max.					
<b>Short-Term Exposure Total Mortality -- Single Pollutant Models</b>												
Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	< 800	all	log-linear, GAM (stringent)	none	0.9	88.9	mean of lag 0 & 1	2-day avg	0.00102	0.00037	0.00167
Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	< 800	all	log-linear, GAM (stringent)	none	0	174	mean of lag 0 & 1	2-day avg	0.00137	0.00098	0.00176
<b>Short-Term Exposure Cause-Specific Mortality -- Single Pollutant Models</b>												
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	COPD	490-492, 494-496	all	Log-linear, GAM (stringent)	none	0.9	88.9	0 day	2-day avg	0.00060	-0.00294	0.00411
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Ischemic heart disease	410-414	all	Log-linear, GAM (stringent)	none	0.9	88.9	0 day	2-day avg	0.00129	0.00030	0.00237
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Pneumonia	480-487	all	Log-linear, GAM (stringent)	none	0.9	88.9	0 day	2-day avg	0.00109	-0.00253	0.00459
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	COPD	490-492, 494-496	all	Log-linear, GAM (stringent)	none	0	174	0 day	2-day avg	0.00227	0.00010	0.00440
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Ischemic heart disease	410-414	all	Log-linear, GAM (stringent)	none	0	174	0 day	2-day avg	0.00178	0.00109	0.00247
Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Pneumonia	480-487	all	Log-linear, GAM (stringent)	none	0	174	0 day	2-day avg	0.00402	0.00188	0.00602
<b>Respiratory Symptoms and Illnesses* -- Single Pollutant Models</b>												
Schwartz and Neas (2000) - 6 cities	Lower respiratory symptoms	n/a	7-14	logistic	none	N/A	N/A	1 day	1-day avg	0.01901	0.00696	0.03049
Schwartz and Neas (2000) - 6 cities	Cough	n/a	7-14	logistic	none	N/A	N/A	0 day	3-day avg	0.00989	-0.00067	0.02050

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min.	Observed Concentrations max.	Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
<b>Respiratory Symptoms and Illnesses* -- Multi-Pollutant Models</b>												
Schwartz and Neas (2000) - Lower respiratory symptoms - 6 cities		n/a	7-14	logistic	PM10-2.5	N/A	N/A	1 day	1-day avg	0.01698	0.00388	0.03007
Schwartz and Neas (2000) - - 6 cities	Cough	n/a	7-14	logistic	PM10-2.5	N/A	N/A	0 day	3-day avg	0.00451	-0.00702	0.01541
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - Six Cities	All cause	all	25+	log-linear	none	11	29.6	n/a	annual mean	0.01243	0.00414	0.02071
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.00463	0.00238	0.00710
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.00583	0.00198	0.01044
Krewski et al. (2000) - Six Cities	Cardiopulmonary	400-440, 485-495	25+	log-linear	none	11	29.6	n/a	annual mean	0.01693	0.00561	0.02789
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.00943	0.00606	0.01315
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.00862	0.00296	0.01484
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.01310	0.00392	0.02070
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.00812	0.00426	0.01164
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.00676	0.00389	0.00976
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.00121	-0.00209	0.00499

\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

**Exhibit C.10. Study-Specific Information for Studies on Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub>**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations		Lag	Exposure Metric	PM2.5 Coeff.	Lower Bound	Upper Bound
						min.	max.					
<b>Long-Term Exposure Mortality -- Single Pollutant Models</b>												
Krewski et al. (2000) - Six Cities	All cause	all	25+	log-linear	none	11	29.6	n/a	annual mean	0.012425	0.004138	0.020713
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	none	10	38	n/a	annual mean	0.004626	0.002378	0.007100
Pope et al. (2002) - ACS extended	All cause	all	30+	log-linear	none	7.5	30	n/a	annual mean	0.005827	0.001980	0.010436
Krewski et al. (2000) - Six Cities	Cardiopulmonary	400-440, 485-495	25+	log-linear	none	11	29.6	n/a	annual mean	0.016925	0.005611	0.027892
Krewski et al. (2000) - ACS	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	10	38	n/a	annual mean	0.009433	0.006058	0.013146
Pope et al. (2002) - ACS extended	Cardiopulmonary	401-440, 460-519	30+	log-linear	none	7.5	30	n/a	annual mean	0.008618	0.002956	0.014842
Pope et al. (2002) - ACS extended	Lung cancer	162	30+	log-linear	none	7.5	30	n/a	annual mean	0.013103	0.003922	0.020701
<b>Long-Term Exposure Mortality -- Multi-Pollutant Models</b>												
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	CO	10	38	n/a	annual mean	0.006756	0.003890	0.009756
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	NO2	10	38	n/a	annual mean	0.008116	0.004260	0.011640
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	O3	10	38	n/a	annual mean	0.006756	0.003890	0.009756
Krewski et al. (2000) - ACS	All cause	all	30+	log-linear	SO2	10	38	n/a	annual mean	0.001206	-0.002094	0.004988

C.2. The PM<sub>10-2.5</sub> data

**Exhibit C.11. Study-Specific Information for PM<sub>10-2.5</sub> Studies in Detroit, MI**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min. max.	Lag	Exposure Metric	PM Coarse Coefficient	Lower Bound	Upper Bound
<b>Short-Term Exposure Total Mortality -- Single Pollutant Models</b>											
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Non-accidental	<800	all	log-linear, GAM (stringent)	none	1 50	1 day	1-day avg	0.0012721	-0.0007568	0.0032838
<b>Short-Term Exposure Cause-Specific Mortality -- Single Pollutant Models</b>											
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Circulatory	390-459	all	log-linear, GAM (stringent)	none	1 50	1 day	1-day avg	0.0025848	-0.0004188	0.0055690
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Respiratory	460-519	all	log-linear, GAM (stringent)	none	1 50	2 day	1-day avg	0.0027021	-0.0039754	0.0093975
<b>Hospital Admissions -- Single Pollutant Models</b>											
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Pneumonia	480-486	65+	log-linear, GAM (stringent)	none	1 50	1 day	1-day avg	0.0037814	-0.0004188	0.0079769
Ito (2003) [reanalysis of Lippmann et al. (2000)]	COPD+	490-496	65+	log-linear, GAM (stringent)	none	1 50	3 day	1-day avg	0.0033223	-0.0019622	0.0085917
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Ischemic heart disease	410-414	65+	log-linear, GAM (stringent)	none	1 50	2 day	1-day avg	0.0038954	0.0009475	0.0068258
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Dysrhythmias	427	65+	log-linear, GAM (stringent)	none	1 50	0 day	1-day avg	0.0000416	-0.0052791	0.0053863
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Congestive heart failure	428	65+	log-linear, GAM (stringent)	none	1 50	0 day	1-day avg	0.0017142	-0.0016142	0.0050924

**Exhibit C.12. Study-Specific Information for PM<sub>10-2.5</sub> Studies in Seattle, WA**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations		Lag	Exposure Metric	PM Coarse Coefficient	Lower Bound	Upper Bound
						min.	max.					
<b>Hospital Admissions -- Single Pollutant Models</b>												
Sheppard (2003) [reanalysis of Sheppard et al. (1999)]*	Asthma	493	<65	log-linear, GAM (stringent)	none	N/A	88	1 day	1-day avg	0.0021293	0.0000000	0.0052463

\*Sheppard (2003) [reanalysis of Sheppard et al. (1999)] used daily PM<sub>2.5</sub> values obtained from nephelometry measurements rather than from air quality monitors.

**Exhibit C.13. Study-Specific Information for Studies in St. Louis, MO**

Study	Health Effect	ICD-9 Codes	Ages	Model	Other Pollutants in Model	Observed Concentrations min. max.	Lag	Exposure Metric	PM Coarse Coefficient	Lower Bound	Upper Bound
<b>Short-Term Exposure Total Mortality -- Single Pollutant Models</b>											
[reanalysis of Schwartz et al. (1996)]	Non-accidental	< 800	all	log-linear, penalized spline model	none	-2.3 102.6	0 day	2-day avg	0.0001090	-0.0008632	0.0010812
<b>Respiratory Symptoms and Illnesses* -- Single Pollutant Models</b>											
Schwartz and Neas, 2000 -- 6 cities	Lower respiratory symptoms	N/A	7-14	logistic	none	0 121	0 day	3-day avg	0.0163785	-0.0025253	0.0633522
Schwartz and Neas, 2000 -- 6 cities	Cough	N/A	7-14	logistic	none	0 121	0 day	3-day avg	0.0227902	0.0084573	0.0375131
<b>Respiratory Symptoms and Illnesses* -- Multi-Pollutant Models</b>											
Schwartz and Neas, 2000 -- 6 cities	Lower respiratory symptoms	N/A	7-14	logistic	PM2.5	0 121	0 day	3-day avg	0.0060988	-0.0131701	0.0258768
Schwartz and Neas, 2000 -- 6 cities	Cough	N/A	7-14	logistic	PM2.5	0 121	0 day	3-day avg	0.0206893	0.0049026	0.0365837

\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

**Appendix D. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub>  
Concentrations**

## D.1 Primary analysis

### Exhibit D.1. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub> Concentrations

Boston, MA, 2003

Health Effects*	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Specified Levels**		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>							
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1		390 (265 - 514)	14 (9 - 18)	1.8% (1.2% - 2.4%)
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1		261 (186 - 334)	9 (7 - 12)	1.2% (0.9% - 1.5%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	COPD	all	0 day		24 (-12 - 56)	1 (0 - 2)	2.4% (-1.2% - 5.6%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Ischemic heart disease	all	0 day		79 (44 - 112)	3 (2 - 4)	2.3% (1.3% - 3.3%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Pneumonia	all	0 day		36 (16 - 53)	1 (1 - 2)	4.9% (2.2% - 7.3%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	COPD	all	0 day		20 (1 - 38)	1 (0 - 1)	2.0% (0.1% - 3.8%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Ischemic heart disease	all	0 day		53 (33 - 73)	2 (1 - 3)	1.6% (1.0% - 2.1%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Pneumonia	all	0 day		25 (12 - 37)	1 (0 - 1)	3.5% (1.6% - 5.1%)
<b>Long-Term Exposure Mortality</b>	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - Six Cities	All cause	25+			1258 (427 - 2058)	45 (15 - 73)	5.6% (1.9% - 9.1%)
	Krewski et al. (2000) - ACS	All cause	30+			473 (245 - 722)	17 (9 - 26)	2.1% (1.1% - 3.2%)
	Krewski et al. (2000) - Six Cities	Cardiopulmonary	25+			626 (213 - 1007)	22 (8 - 36)	7.5% (2.6% - 12.1%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+			415 (269 - 574)	15 (10 - 20)	4.3% (2.8% - 5.9%)
	Pope et al. (2002) - ACS extended	All cause	30+			594 (204 - 1053)	21 (7 - 38)	2.7% (0.9% - 4.7%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+			380 (132 - 645)	14 (5 - 23)	3.9% (1.4% - 6.6%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+			91 (28 - 141)	3 (1 - 5)	5.9% (1.8% - 9.1%)

Health Effects*	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM2.5 Above Specified Levels**			
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence	
<b>Multi-Pollutant Models</b>									
	Krewski et al. (2000) - ACS	All cause	30+		CO	688 (399 - 986)	25 (14 - 35)	3.1% (1.8% - 4.4%)	
	Krewski et al. (2000) - ACS	All cause	30+		NO2	824 (436 - 1172)	29 (16 - 42)	3.7% (2.0% - 5.2%)	
	Krewski et al. (2000) - ACS	All cause	30+		O3	688 (399 - 986)	25 (14 - 35)	3.1% (1.8% - 4.4%)	
	Krewski et al. (2000) - ACS	All cause	30+		SO2	124 (-217 - 510)	4 (-8 - 18)	0.6% (-1.0% - 2.3%)	
<b>Single Pollutant Models</b>									
Respiratory Symptoms***	Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	7-14	1 day		7900 (3800 - 14500)	300 (100 - 500)	15.1% (7.3% - 27.9%)	
	Schwartz and Neas (2000) -- 6 cities	Cough	7-14	0 day		12500 (-900 - 24300)	400 (0 - 900)	8.3% (-0.6% - 16.1%)	
	<b>Multi-Pollutant Models</b>								
	Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	7-14	1 day	PM10-2.5	7100 (2200 - 14300)	300 (100 - 500)	13.7% (4.2% - 27.6%)	
	Schwartz and Neas (2000) -- 6 cities	Cough	7-14	0 day	PM10-2.5	5900 (-9900 - 18900)	200 (-400 - 700)	3.9% (-6.5% - 12.5%)	

\*Health effects are associated with short-term exposure to PM2.5 unless otherwise specified.

\*\*For the short-term exposure studies, incidence was quantified down to the estimated policy relevant background level of 3.5 µg/m3. For the long-term exposure studies, incidence was quantified down to 7.5 ug/m3, which was the lowest of the lowest measured levels in the long-term exposure studies. Incidences are rounded to the nearest whole number, except respiratory symptoms incidences which are rounded to the nearest 100; percents are rounded to the nearest tenth.

\*\*\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit D.2a. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub> Concentrations  
Los Angeles, CA, 2003**

Health Effects*	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background or Lowest Measured Level**		
							Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		494 (-62 - 1038)	5 (-1 - 11)	0.9% (-0.1% - 1.9%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		540 (2 - 1067)	6 (0 - 11)	1.0% (0.0% - 1.9%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 30 df	0 day		321 (33 - 601)	3 (0 - 6)	1.6% (0.2% - 3.1%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 30 df	1 day		334 (52 - 608)	4 (1 - 6)	1.7% (0.3% - 3.1%)
	<b>Multi-Pollutant Models (Total Mortality)</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day	CO	-492 (-1235 - 232)	-5 (-13 - 2)	-0.9% (-2.2% - 0.4%)
	<b>Multi-Pollutant Models (Cause-Specific Mortality)</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 100 df	0 day	CO	572 (249 - 884)	6 (3 - 9)	2.9% (1.3% - 4.5%)
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 100 df	1 day	CO	296 (-40 - 620)	3 (0 - 7)	1.5% (-0.2% - 3.1%)	
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+	log-linear			2945 (1534 - 4456)	31 (16 - 47)	5.2% (2.7% - 7.9%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+	log-linear			3097 (2028 - 4225)	33 (21 - 44)	10.4% (6.8% - 14.2%)
	Pope et al. (2002) - ACS extended	All cause	30+	log-linear			3684 (1280 - 6426)	39 (13 - 68)	6.6% (2.3% - 11.4%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+	log-linear			2842 (1007 - 4725)	30 (11 - 50)	9.5% (3.4% - 15.9%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+	log-linear			450 (142 - 681)	5 (1 - 7)	14.1% (4.5% - 21.4%)
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		CO	4249 (2487 - 6031)	45 (26 - 63)	7.6% (4.4% - 10.7%)
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		NO <sub>2</sub>	5065 (2718 - 7119)	53 (29 - 75)	9.0% (4.8% - 12.7%)
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		O <sub>3</sub>	4249 (2487 - 6031)	45 (26 - 63)	7.6% (4.4% - 10.7%)
Krewski et al. (2000) - ACS	All cause	30+	log-linear		SO <sub>2</sub>	783 (-1386 - 3169)	8 (-15 - 33)	1.4% (-2.5% - 5.6%)	

\*Health effects are associated with short-term exposure to PM<sub>2.5</sub> unless otherwise specified.

\*\* For the short-term exposure studies, health effects incidence was quantified down to the estimated policy relevant background level of 2.5 µg/m<sup>3</sup>. For the long-term exposure studies, health effects incidence was quantified down to 7.5 µg/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.2b. Estimated Annual Health Risks of Hospital Admissions Associated with "As Is" PM<sub>2.5</sub> Concentrations  
Los Angeles, CA, 2003**

Health Effects	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background*		
							Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Hospital Admissions	<b>Single Pollutant Models</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 30 df	0 day		1787 (1042 - 2516)	19 (11 - 26)	2.6% (1.5% - 3.6%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 30 df	1 day		1576 (795 - 2339)	17 (8 - 25)	2.3% (1.2% - 3.4%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	0 day		824 (346 - 1286)	9 (4 - 14)	2.7% (1.1% - 4.3%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	1 day		591 (115 - 1050)	6 (1 - 11)	2.0% (0.4% - 3.5%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	2 day		911 (417 - 1387)	10 (4 - 15)	3.0% (1.4% - 4.6%)
	<b>Multi-Pollutant Models</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 100 df	0 day	CO	448 (-512 - 1380)	5 (-5 - 14)	0.7% (-0.7% - 2.0%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 100 df	1 day	CO	276 (-755 - 1276)	3 (-8 - 13)	0.4% (-1.1% - 1.8%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 100 df	0 day	NO <sub>2</sub>	210 (-464 - 855)	2 (-5 - 9)	0.7% (-1.5% - 2.8%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 100 df	1 day	NO <sub>2</sub>	-20 (-833 - 750)	0 (-9 - 8)	-0.1% (-2.8% - 2.5%)
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 100 df	2 day	NO <sub>2</sub>	176 (-524 - 842)	2 (-6 - 9)	0.6% (-1.7% - 2.8%)	

\*Health effects are associated with short-term exposure to PM<sub>2.5</sub> unless otherwise specified.

\*\*Health effects incidence was quantified down to the estimated policy relevant background level of 2.5 µg/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.3. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub> Concentrations  
Philadelphia, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM2.5 Above Specified Levels*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Lipfert et al. (2000) -- 7 counties	Cardiovascular	all	1 day		412 (197 - 628)	27 (13 - 41)	2.5% (1.2% - 3.9%)
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+			518 (268 - 789)	34 (18 - 52)	3.1% (1.6% - 4.7%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+			462 (300 - 636)	30 (20 - 42)	6.2% (4.1% - 8.6%)
	Pope et al. (2002) - ACS extended	All cause	30+			650 (224 - 1146)	43 (15 - 76)	3.9% (1.3% - 6.9%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+			424 (148 - 714)	28 (10 - 47)	5.7% (2.0% - 9.6%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+			94 (29 - 144)	6 (2 - 10)	8.6% (2.6% - 13.2%)
	<b>Multi-Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+		CO	751 (437 - 1074)	50 (29 - 71)	4.5% (2.6% - 6.4%)
	Krewski et al. (2000) - ACS	All cause	30+		NO2	899 (478 - 1273)	59 (31 - 84)	5.4% (2.9% - 7.6%)
	Krewski et al. (2000) - ACS	All cause	30+		O3	751 (437 - 1074)	50 (29 - 71)	4.5% (2.6% - 6.4%)
Krewski et al. (2000) - ACS	All cause	30+		SO2	137 (-240 - 558)	9 (-16 - 37)	0.8% (-1.4% - 3.3%)	

\*For the short-term exposure studies, incidence was quantified down to the estimated policy relevant background level of 3.5 µg/m<sup>3</sup>. For the long-term exposure studies, incidence was quantified down to 7.5 ug/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

Note 2: Multi-county short-term exposure C-R functions were applied only to counties included among those used to estimate the function.

**Exhibit D.4. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub> Concentrations  
Phoenix, AZ, 2001**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Specified Levels*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Mar (2003) [reanalysis of Mar (2000)]	Cardiovascular	65+	0 day		185 (-52 - 407)	6 (-2 - 13)	2.9% (-0.8% - 6.3%)
	Mar (2003) [reanalysis of Mar (2000)]	Cardiovascular	65+	1 day		323 (97 - 536)	11 (3 - 17)	5.0% (1.5% - 8.3%)
<b>Long-Term Exposure Mortality</b>	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+			277 (143 - 424)	9 (5 - 14)	1.3% (0.7% - 2.0%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+			259 (167 - 360)	8 (5 - 12)	2.7% (1.7% - 3.8%)
	Pope et al. (2002) - ACS extended	All cause	30+			349 (119 - 620)	11 (4 - 20)	1.7% (0.6% - 3.0%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+			237 (82 - 405)	8 (3 - 13)	2.5% (0.9% - 4.2%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+			48 (14 - 74)	2 (0 - 2)	3.7% (1.1% - 5.8%)
	<b>Multi-Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+			CO 404 (233 - 580)	13 (8 - 19)	1.9% (1.1% - 2.8%)
	Krewski et al. (2000) - ACS	All cause	30+			NO <sub>2</sub> 484 (255 - 690)	16 (8 - 22)	2.3% (1.2% - 3.3%)
	Krewski et al. (2000) - ACS	All cause	30+			O <sub>3</sub> 404 (233 - 580)	13 (8 - 19)	1.9% (1.1% - 2.8%)
Krewski et al. (2000) - ACS	All cause	30+			SO <sub>2</sub> 73 (-127 - 299)	2 (-4 - 10)	0.4% (-0.6% - 1.4%)	

\*For the short-term exposure studies, incidence was quantified down to the estimated policy relevant background level of 2.5 µg/m<sup>3</sup>. For the long-term exposure studies, incidence was quantified down to 7.5 ug/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.  
Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.5. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub> Concentrations  
Pittsburgh, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Specified Levels*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>							
	Chock et al. (2000)	Non-accidental	<75	0 day		69 (-55 - 188)	5 (-4 - 15)	1.4% (-1.1% - 3.7%)
	Chock et al. (2000)	Non-accidental	75+	0 day		77 (-166 - 311)	6 (-13 - 24)	0.8% (-1.7% - 3.2%)
	<b>Multi-Pollutant Models (Total Mortality)</b>							
	Chock et al. (2000)	Non-accidental	<75	0 day	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10-2.5</sub>	88 (-60 - 230)	7 (-5 - 18)	1.7% (-1.2% - 4.5%)
	Chock et al. (2000)	Non-accidental	75+	0 day	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10-2.5</sub>	52 (-238 - 330)	4 (-19 - 26)	0.5% (-2.4% - 3.4%)
<b>Long-Term Exposure Mortality</b>	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+			651 (338 - 988)	51 (26 - 77)	4.3% (2.2% - 6.5%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+			626 (408 - 857)	49 (32 - 67)	8.5% (5.6% - 11.7%)
	Pope et al. (2002) - ACS extended	All cause	30+			816 (282 - 1430)	64 (22 - 112)	5.4% (1.9% - 9.4%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+			574 (202 - 960)	45 (16 - 75)	7.8% (2.8% - 13.1%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+			116 (36 - 177)	9 (3 - 14)	11.6% (3.6% - 17.8%)
	<b>Multi-Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+		CO	942 (550 - 1341)	73 (43 - 105)	6.2% (3.6% - 8.8%)
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub>	1124 (601 - 1586)	88 (47 - 124)	7.4% (3.9% - 10.4%)
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub>	942 (550 - 1341)	73 (43 - 105)	6.2% (3.6% - 8.8%)
Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub>	173 (-304 - 701)	13 (-24 - 55)	1.1% (-2.0% - 4.6%)	

\*For the short-term exposure studies, incidence was quantified down to the estimated policy relevant background level of 3.5 µg/m<sup>3</sup>. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.6. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub> Concentrations  
San Jose, CA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Specified Levels*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>							
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day		218 (45 - 387)	13 (3 - 23)	2.6% (0.5% - 4.7%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	1 day		-110 (-278 - 50)	-7 (-17 - 3)	-1.3% (-3.4% - 0.6%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Fairley (2003) [reanalysis of Fairley (1999)]	Respiratory	all	0 day		32 (-32 - 88)	2 (-2 - 5)	3.7% (-3.7% - 10.2%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Cardiovascular	all	0 day		72 (-50 - 188)	4 (-3 - 11)	2.1% (-1.5% - 5.4%)
	<b>Multi-Pollutant Models (Total Mortality)</b>							
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	NO <sub>2</sub>	277 (74 - 472)	16 (4 - 28)	3.3% (0.9% - 5.7%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	CO	251 (60 - 432)	15 (4 - 26)	3.0% (0.7% - 5.2%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	O <sub>3</sub> - 8hr	236 (60 - 404)	14 (4 - 24)	2.8% (0.7% - 4.9%)
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+			137 (71 - 210)	8 (4 - 12)	1.6% (0.8% - 2.5%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+			137 (88 - 190)	8 (5 - 11)	3.3% (2.1% - 4.6%)
	Pope et al. (2002) - ACS extended	All cause	30+			172 (59 - 306)	10 (4 - 18)	2.1% (0.7% - 3.6%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+			125 (43 - 213)	7 (3 - 13)	3.0% (1.1% - 5.1%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+			23 (7 - 35)	1 (0 - 2)	4.6% (1.4% - 7.1%)
	<b>Multi-Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+		CO	199 (115 - 287)	12 (7 - 17)	2.4% (1.4% - 3.4%)
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub>	239 (126 - 341)	14 (8 - 20)	2.9% (1.5% - 4.1%)
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub>	199 (115 - 287)	12 (7 - 17)	2.4% (1.4% - 3.4%)
Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub>	36 (-63 - 148)	2 (-4 - 9)	0.4% (-0.8% - 1.8%)	

\*For the short-term exposure studies, incidence was quantified down to the estimated policy relevant background level of 2.5 µg/m<sup>3</sup>. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.7. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub> Concentrations  
Seattle, WA, 2003**

Health Effects*	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Specified Levels**			
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence	
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+			40 (20 - 61)	2 (1 - 3)	0.4% (0.2% - 0.6%)	
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+			36 (23 - 50)	2 (1 - 3)	0.7% (0.5% - 1.0%)	
	Pope et al. (2002) - ACS extended	All cause	30+			50 (17 - 89)	3 (1 - 5)	0.5% (0.2% - 0.8%)	
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+			33 (11 - 57)	2 (1 - 3)	0.7% (0.2% - 1.1%)	
	Pope et al. (2002) - ACS extended	Lung cancer	30+			8 (2 - 12)	0 (0 - 1)	1.0% (0.3% - 1.6%)	
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+			CO	58 (33 - 83)	3 (2 - 5)	0.5% (0.3% - 0.8%)
	Krewski et al. (2000) - ACS	All cause	30+			NO <sub>2</sub>	69 (36 - 99)	4 (2 - 6)	0.6% (0.3% - 0.9%)
	Krewski et al. (2000) - ACS	All cause	30+			O <sub>3</sub>	58 (33 - 83)	3 (2 - 5)	0.5% (0.3% - 0.8%)
	Krewski et al. (2000) - ACS	All cause	30+			SO <sub>2</sub>	10 (-18 - 43)	1 (-1 - 2)	0.1% (-0.2% - 0.4%)
Hospital Admissions	<b>Single Pollutant Models</b>								
	Sheppard (2003) [reanalysis of Sheppard et al. (1999)]***	Asthma	<65	1 day		30 (8 - 45)	2 (0 - 3)	1.9% (0.5% - 2.8%)	

\*Health effects are associated with short-term exposure to PM<sub>2.5</sub> unless otherwise specified.

\*\*For the short-term exposure studies, incidence was quantified down to the estimated policy relevant background level of 2.5 µg/m<sup>3</sup>. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

\*\*\*Sheppard (2003) [reanalysis of Sheppard et al. (1999)] used daily PM<sub>2.5</sub> values obtained from nephelometer measurements rather than from air quality monitors.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.8. Estimated Annual Health Risks Associated with "As Is" PM<sub>2.5</sub> Concentrations  
St. Louis, MO, 2003**

Health Effects*	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Specified Levels**		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>							
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1		233 (86 - 379)	9 (3 - 15)	1.1% (0.4% - 1.7%)
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1		312 (224 - 401)	12 (9 - 16)	1.4% (1.0% - 1.8%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	COPD	all	0 day		6 (-31 - 42)	0 (-1 - 2)	0.6% (-3.2% - 4.2%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Ischemic heart disease	all	0 day		70 (16 - 127)	3 (1 - 5)	1.4% (0.3% - 2.5%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Pneumonia	all	0 day		8 (-18 - 31)	0 (-1 - 1)	1.1% (-2.7% - 4.7%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	COPD	all	0 day		23 (1 - 44)	1 (0 - 2)	2.4% (0.1% - 4.5%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Ischemic heart disease	all	0 day		96 (59 - 132)	4 (2 - 5)	1.9% (1.1% - 2.6%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Pneumonia	all	0 day		28 (13 - 41)	1 (1 - 2)	4.1% (2.0% - 6.1%)
<b>Long-Term Exposure Mortality</b>	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - Six Cities	All cause	25+			1773 (606 - 2878)	70 (24 - 114)	7.8% (2.7% - 12.6%)
	Krewski et al. (2000) - ACS	All cause	30+			671 (348 - 1022)	27 (14 - 41)	3.0% (1.5% - 4.5%)
	Krewski et al. (2000) - Six Cities	Cardiopulmonary	25+			1028 (353 - 1636)	41 (14 - 65)	10.4% (3.6% - 16.6%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+			659 (428 - 907)	26 (17 - 36)	6.0% (3.9% - 8.2%)
	Pope et al. (2002) - ACS extended	All cause	30+			842 (290 - 1486)	33 (12 - 59)	3.7% (1.3% - 6.6%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+			603 (211 - 1018)	24 (8 - 40)	5.5% (1.9% - 9.2%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+			125 (38 - 192)	5 (2 - 8)	8.2% (2.5% - 12.6%)

Health Effects*	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM2.5 Above Specified Levels**			
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence	
<b>Multi-Pollutant Models</b>									
	Krewski et al. (2000) - ACS	All cause	30+		CO	973 (566 - 1392)	39 (22 - 55)	4.3% (2.5% - 6.2%)	
	Krewski et al. (2000) - ACS	All cause	30+		NO2	1164 (619 - 1651)	46 (25 - 66)	5.2% (2.7% - 7.3%)	
	Krewski et al. (2000) - ACS	All cause	30+		O3	973 (566 - 1392)	39 (22 - 55)	4.3% (2.5% - 6.2%)	
	Krewski et al. (2000) - ACS	All cause	30+		SO2	177 (-310 - 723)	7 (-12 - 29)	0.8% (-1.4% - 3.2%)	
<b>Single Pollutant Models</b>									
Respiratory Symptoms***	Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	7-14	1 day		10800 (4300 - 16300)	400 (200 - 600)	19.2% (7.7% - 28.9%)	
	Schwartz and Neas (2000) -- 6 cities	Cough	7-14	0 day		17600 (-1300 - 34000)	700 (-100 - 1300)	10.7% (-0.8% - 20.7%)	
	<b>Multi-Pollutant Models</b>								
	Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	7-14	1 day	PM10-2.5	9800 (2500 - 16100)	400 (100 - 600)	17.4% (4.4% - 28.6%)	
Schwartz and Neas (2000) -- 6 cities	Cough	7-14	0 day	PM10-2.5	8300 (-14000 - 26400)	300 (-600 - 1000)	5.1% (-8.5% - 16.0%)		

\*Health effects are associated with short-term exposure to PM2.5 unless otherwise specified.

\*\* For the short-term exposure studies, incidence was quantified down to the estimated policy relevant background level of 3.5 µg/m3. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m3, which was the lowest of the lowest measured levels in the long-term exposure studies. Incidences are rounded to the nearest whole number, except respiratory symptoms incidences which are rounded to the nearest 100; percents are rounded to the nearest tenth.

\*\*\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit D.9. Estimated Annual Mortality Associated with Short-Term and Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Assuming Various Cutpoint Levels\* Boston, MA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>2.5</sub> Assuming Various Cutpoint Levels**			
						(95% Confidence Interval)			
						Percent of Total Incidence (95% Confidence Interval)			
				Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =15 µg/m <sup>3</sup>	Cutpoint =20 µg/m <sup>3</sup>		
<b>Single Pollutant Models (Total Mortality)</b>									
Short-Term Exposure Mortality	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1	390 (265 - 514) 1.8% (1.2% - 2.4%)	173 (118 - 228) 0.8% (0.5% - 1.1%)	82 (56 - 109) 0.4% (0.3% - 0.5%)	41 (28 - 53) 0.2% (0.1% - 0.2%)	
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1	261 (186 - 334) 1.2% (0.9% - 1.5%)	109 (78 - 140) 0.5% (0.4% - 0.6%)	49 (35 - 63) 0.2% (0.2% - 0.3%)	23 (16 - 29) 0.1% (0.1% - 0.1%)	
Long-Term Exposure Mortality					Cutpoint = 7.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =12 µg/m <sup>3</sup>		
	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - Six Cities	All cause	25+		1258 (427 - 2058) 5.6% (1.9% - 9.1%)	661 (222 - 1091) 2.9% (1.0% - 4.8%)	44 (15 - 73) 0.2% (0.1% - 0.3%)		
	Krewski et al. (2000) - ACS	All cause	30+		473 (245 - 722) 2.1% (1.1% - 3.2%)	238 (123 - 364) 1.1% (0.6% - 1.6%)	15 (8 - 23) 0.1% (0.0% - 0.1%)		
	Pope et al. (2002) - ACS extended	All cause	30+		594 (204 - 1053) 2.7% (0.9% - 4.7%)	309 (106 - 551) 1.4% (0.5% - 2.5%)	20 (7 - 36) 0.1% (0.0% - 0.2%)		
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO	688 (399 - 986) 3.1% (1.8% - 4.4%)	347 (200 - 499) 1.6% (0.9% - 2.2%)	22 (13 - 32) 0.1% (0.1% - 0.1%)	
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub>	824 (436 - 1172) 3.7% (2.0% - 5.2%)	416 (219 - 594) 1.9% (1.0% - 2.7%)	26 (14 - 38) 0.1% (0.1% - 0.2%)	
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub>	688 (399 - 986) 3.1% (1.8% - 4.4%)	347 (200 - 499) 1.6% (0.9% - 2.2%)	22 (13 - 32) 0.1% (0.1% - 0.1%)	
	Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub>	124 (-217 - 510) 0.6% (-1.0% - 2.3%)	62 (-109 - 257) 0.3% (-0.5% - 1.2%)	4 (-7 - 16) 0.0% (0.0% - 0.1%)	

\*For the short-term exposure studies, incidence was quantified down to policy relevant background level of 3.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, the lowest of the lowest measured levels in the long-term exposure studies, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit D.10. Estimated Annual Health Risks of Short-Term and Long-Term Exposure Mortality Associated with "As Is" PM<sub>2.5</sub> Concentrations Assuming Various Cutpoint Levels\* Los Angeles, CA, 2003**

Health Effects	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>2.5</sub> Assuming Various Cutpoint Levels** (95% Confidence Interval)				
							Percent of Total Incidence (95% Confidence Interval)				
							Policy Relevant Background =2.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =15 µg/m <sup>3</sup>	Cutpoint =20 µg/m <sup>3</sup>	
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>										
	Moolgavkar (2003) [reanalysis of Moolgavkar]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		494 (-62 - 1038) 0.9% (-0.1% - 1.9%)	308 (-38 - 647) 0.6% (-0.1% - 1.2%)	212 (-26 - 445) 0.4% (-0.1% - 0.8%)	146 (-18 - 306) 0.3% (0.0% - 0.6%)	
	Moolgavkar (2003) [reanalysis of Moolgavkar]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		540 (2 - 1067) 1.0% (0.0% - 1.9%)	336 (1 - 665) 0.6% (0.0% - 1.2%)	231 (1 - 457) 0.4% (0.0% - 0.8%)	159 (0 - 314) 0.3% (0.0% - 0.6%)	
	<b>Multi-Pollutant Models (Total Mortality)</b>										
	Moolgavkar (2003) [reanalysis of Moolgavkar]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day	CO	-492 (-1235 - 232) -0.9% (-2.2% - 0.4%)	-306 (-770 - 144) -0.6% (-1.4% - 0.3%)	-211 (-531 - 99) -0.4% (-1.0% - 0.2%)	-145 (-366 - 68) -0.3% (-0.7% - 0.1%)	
							Cutpoint = 7.5 µg/m <sup>3</sup>	Cutpoint = 10 µg/m <sup>3</sup>	Cutpoint = 12 µg/m <sup>3</sup>		
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>										
	Krewski et al. (2000) - ACS	All cause	30+	log-linear			2945 (1534 - 4456) 5.2% (2.7% - 7.9%)	2528 (1314 - 3834) 4.5% (2.3% - 6.8%)	2134 (1108 - 3242) 3.8% (2.0% - 5.8%)		
	Pope et al. (2002) - ACS extended	All cause	30+	log-linear			3684 (1280 - 6426) 6.6% (2.3% - 11.4%)	3267 (1132 - 5715) 5.8% (2.0% - 10.2%)	2846 (984 - 4994) 5.1% (1.8% - 8.9%)		
	<b>Multi-Pollutant Models</b>										
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		CO	4249 (2487 - 6031) 7.6% (4.4% - 10.7%)	3654 (2134 - 5199) 6.5% (3.8% - 9.3%)	3089 (1800 - 4406) 5.5% (3.2% - 7.8%)		
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		NO <sub>2</sub>	5065 (2718 - 7119) 9.0% (4.8% - 12.7%)	4360 (2332 - 6147) 7.8% (4.2% - 10.9%)	3691 (1968 - 5217) 6.6% (3.5% - 9.3%)		
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		O <sub>3</sub>	4249 (2487 - 6031) 7.6% (4.4% - 10.7%)	3654 (2134 - 5199) 6.5% (3.8% - 9.3%)	3089 (1800 - 4406) 5.5% (3.2% - 7.8%)		
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		SO <sub>2</sub>	783 (-1386 - 3169) 1.4% (-2.5% - 5.6%)	671 (-1183 - 2722) 1.2% (-2.1% - 4.8%)	565 (-993 - 2298) 1.0% (-1.8% - 4.1%)		

\*For the short-term exposure studies, incidence was quantified down to policy relevant background level of 2.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, the lowest of the lowest measured levels in the long-term exposure studies, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth. Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.11. Estimated Annual Mortality Associated with Short-Term and Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations Assuming Various Cutpoint Levels\* Philadelphia, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>2.5</sub> Assuming Various Cutpoint Levels** (95% Confidence Interval)			
						Percent of Total Incidence (95% Confidence Interval)			
						Policy Relevant Background = 3.5 µg/m <sup>3</sup>	Cutpoint = 10 µg/m <sup>3</sup>	Cutpoint = 15 µg/m <sup>3</sup>	Cutpoint = 20 µg/m <sup>3</sup>
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Lipfert et al. (2000) -- 7 counties	Cardiovascular	all	1 day		412 (197 - 628) 2.5% (1.2% - 3.9%)	231 (110 - 352) 1.4% (0.7% - 2.2%)	141 (67 - 215) 0.9% (0.4% - 1.3%)	83 (40 - 127) 0.5% (0.2% - 0.8%)
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>								
						Cutpoint = 7.5 µg/m <sup>3</sup>	Cutpoint = 10 µg/m <sup>3</sup>	Cutpoint = 12 µg/m <sup>3</sup>	
	Krewski et al. (2000) - ACS	All cause	30+			518 (268 - 789) 3.1% (1.6% - 4.7%)	359 (186 - 548) 2.2% (1.1% - 3.3%)	209 (108 - 319) 1.3% (0.6% - 1.9%)	
	Pope et al. (2002) - ACS extended	All cause	30+			650 (224 - 1146) 3.9% (1.3% - 6.9%)	466 (160 - 825) 2.8% (1.0% - 4.9%)	280 (96 - 497) 1.7% (0.6% - 3.0%)	
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO	751 (437 - 1074) 4.5% (2.6% - 6.4%)	522 (303 - 749) 3.1% (1.8% - 4.5%)	304 (176 - 437) 1.8% (1.1% - 2.6%)	
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub>	899 (478 - 1273) 5.4% (2.9% - 7.6%)	625 (331 - 889) 3.8% (2.0% - 5.3%)	364 (192 - 520) 2.2% (1.2% - 3.1%)	
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub>	751 (437 - 1074) 4.5% (2.6% - 6.4%)	522 (303 - 749) 3.1% (1.8% - 4.5%)	304 (176 - 437) 1.8% (1.1% - 2.6%)	
	Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub>	137 (-240 - 558) 0.8% (-1.4% - 3.3%)	94 (-165 - 387) 0.6% (-1.0% - 2.3%)	55 (-95 - 225) 0.3% (-0.6% - 1.4%)	

\*For the short-term exposure studies, incidence was quantified down to policy relevant background level of 3.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, the lowest of the lowest measured levels in the long-term exposure studies, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit D.12. Estimated Annual Health Risks of Short-Term and Long-Term Exposure Mortality Associated with "As Is" PM<sub>2.5</sub> Concentrations Assuming Various Cutpoint Levels\* Phoenix, AZ, 2001**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>2.5</sub> Assuming Various Cutpoint Levels** (95% Confidence Interval)			
						Percent of Total Incidence (95% Confidence Interval)			
						Policy Relevant Background = 2.5 µg/m <sup>3</sup>	Cutpoint = 10 µg/m <sup>3</sup>	Cutpoint = 15 µg/m <sup>3</sup>	Cutpoint = 20 µg/m <sup>3</sup>
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Mar (2003) [reanalysis of Mar (2000)]	Cardiovascular	65+	1 day		323 (97 - 536) 5.0% (1.5% - 8.3%)	86 (26 - 143) 1.3% (0.4% - 2.2%)	56 (17 - 93) 0.9% (0.3% - 1.4%)	39 (12 - 63) 0.6% (0.2% - 1.0%)
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>								
						Cutpoint = 7.5 µg/m <sup>3</sup>	Cutpoint = 10 µg/m <sup>3</sup>	Cutpoint = 12 µg/m <sup>3</sup>	
	Krewski et al. (2000) - ACS	All cause	30+			277 (143 - 424) 1.3% (0.7% - 2.0%)	42 (22 - 65) 0.2% (0.1% - 0.3%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	Pope et al. (2002) - ACS extended	All cause	30+			349 (119 - 620) 1.7% (0.6% - 3.0%)	55 (19 - 98) 0.3% (0.1% - 0.5%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO	404 (233 - 580) 1.9% (1.1% - 2.8%)	62 (36 - 89) 0.3% (0.2% - 0.4%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub>	484 (255 - 690) 2.3% (1.2% - 3.3%)	74 (39 - 106) 0.4% (0.2% - 0.5%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub>	404 (233 - 580) 1.9% (1.1% - 2.8%)	62 (36 - 89) 0.3% (0.2% - 0.4%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub>	73 (-127 - 299) 0.4% (-0.6% - 1.4%)	11 (-19 - 46) 0.1% (-0.1% - 0.2%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	

\*For the short-term exposure studies, incidence was quantified down to policy relevant background level of 2.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, the lowest of the lowest measured levels in the long-term exposure studies, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit D.13. Estimated Annual Mortality Associated with Short-Term and Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations Assuming Various Cutpoint Levels\* Pittsburgh, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>2.5</sub> Assuming Various Cutpoint Levels**			
						(95% Confidence Interval)			
						Percent of Total Incidence (95% Confidence Interval)			
				Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =15 µg/m <sup>3</sup>	Cutpoint =20 µg/m <sup>3</sup>		
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Chock et al. (2000)	Non-accidental	<75	0 day		69 (-55 - 188) 1.4% (-1.1% - 3.7%)	43 (-34 - 117) 0.8% (-0.7% - 2.3%)	28 (-22 - 76) 0.5% (-0.4% - 1.5%)	18 (-14 - 48) 0.4% (-0.3% - 1.0%)
	Chock et al. (2000)	Non-accidental	75+	0 day		77 (-166 - 311) 0.8% (-1.7% - 3.2%)	48 (-103 - 193) 0.5% (-1.1% - 2.0%)	31 (-67 - 125) 0.3% (-0.7% - 1.3%)	20 (-43 - 80) 0.2% (-0.4% - 0.8%)
	<b>Multi-Pollutant Models (Total Mortality)</b>								
	Chock et al. (2000)	Non-accidental	<75	0 day	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10-2.5</sub>	88 (-60 - 230) 1.7% (-1.2% - 4.5%)	55 (-37 - 143) 1.1% (-0.7% - 2.8%)	36 (-24 - 92) 0.7% (-0.5% - 1.8%)	23 (-15 - 59) 0.5% (-0.3% - 1.2%)
	Chock et al. (2000)	Non-accidental	75+	0 day	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10-2.5</sub>	52 (-238 - 330) 0.5% (-2.4% - 3.4%)	32 (-148 - 204) 0.3% (-1.5% - 2.1%)	21 (-96 - 133) 0.2% (-1.0% - 1.4%)	14 (-62 - 85) 0.1% (-0.6% - 0.9%)
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>								
						Cutpoint = 7.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =12 µg/m <sup>3</sup>	
	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+			651 (338 - 988) 4.3% (2.2% - 6.5%)	524 (272 - 797) 3.4% (1.8% - 5.2%)	403 (209 - 614) 2.6% (1.4% - 4.0%)	
	Pope et al. (2002) - ACS extended	All cause	30+			816 (282 - 1430) 5.4% (1.9% - 9.4%)	678 (234 - 1193) 4.5% (1.5% - 7.8%)	539 (185 - 951) 3.5% (1.2% - 6.2%)	
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO	942 (550 - 1341) 6.2% (3.6% - 8.8%)	759 (442 - 1084) 5.0% (2.9% - 7.1%)	585 (340 - 838) 3.8% (2.2% - 5.5%)	
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub>	1124 (601 - 1586) 7.4% (3.9% - 10.4%)	907 (483 - 1284) 6.0% (3.2% - 8.4%)	700 (372 - 994) 4.6% (2.4% - 6.5%)	
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub>	942 (550 - 1341) 6.2% (3.6% - 8.8%)	759 (442 - 1084) 5.0% (2.9% - 7.1%)	585 (340 - 838) 3.8% (2.2% - 5.5%)	
	Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub>	173 (-304 - 701) 1.1% (-2.0% - 4.6%)	138 (-243 - 564) 0.9% (-1.6% - 3.7%)	106 (-186 - 434) 0.7% (-1.2% - 2.9%)	

\*For the short-term exposure studies, incidence was quantified down to policy relevant background level of 3.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, the lowest of the lowest measured levels in the long-term exposure studies, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit D.14. Estimated Annual Health Risks of Short-Term and Long-Term Exposure Mortality Associated with "As Is" PM<sub>2.5</sub> Concentrations Assuming Various Cutpoint Levels\* San Jose, CA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>2.5</sub> Assuming Various Cutpoint Levels**					
						(95% Confidence Interval)					
						Percent of Total Incidence (95% Confidence Interval)					
Policy Relevant Background =2.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =15 µg/m <sup>3</sup>	Cutpoint =20 µg/m <sup>3</sup>								
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>										
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day		218 (45 - 387) 2.6% (0.5% - 4.7%)	80 (17 - 141) 1.0% (0.2% - 1.7%)	44 (9 - 77) 0.5% (0.1% - 0.9%)	28 (6 - 50) 0.3% (0.1% - 0.6%)		
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	1 day		-110 (-278 - 50) -1.3% (-3.4% - 0.6%)	-41 (-103 - 18) -0.5% (-1.2% - 0.2%)	-22 (-57 - 10) -0.3% (-0.7% - 0.1%)	-14 (-37 - 7) -0.2% (-0.4% - 0.1%)		
	<b>Multi-Pollutant Models (Total Mortality)</b>										
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	NO <sub>2</sub>	277 (74 - 472) 3.3% (0.9% - 5.7%)	101 (27 - 172) 1.2% (0.3% - 2.1%)	56 (15 - 94) 0.7% (0.2% - 1.1%)	36 (10 - 60) 0.4% (0.1% - 0.7%)		
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	CO	251 (60 - 432) 3.0% (0.7% - 5.2%)	92 (22 - 158) 1.1% (0.3% - 1.9%)	51 (12 - 86) 0.6% (0.2% - 1.0%)	32 (8 - 55) 0.4% (0.1% - 0.7%)		
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	O <sub>3</sub> - 8hr	236 (60 - 404) 2.8% (0.7% - 4.9%)	86 (22 - 148) 1.0% (0.3% - 1.8%)	47 (12 - 81) 0.6% (0.2% - 1.0%)	30 (8 - 52) 0.4% (0.1% - 0.6%)		
							<b>Cutpoint = 7.5 µg/m<sup>3</sup></b>	<b>Cutpoint =10 µg/m<sup>3</sup></b>	<b>Cutpoint =12 µg/m<sup>3</sup></b>		
	Long-Term Exposure Mortality	<b>Single Pollutant Models</b>									
		Krewski et al. (2000) - ACS	All cause	30+			137 (71 - 210) 1.6% (0.8% - 2.5%)	45 (23 - 68) 0.5% (0.3% - 0.8%)	0 (0 - 0) 0.0% (0.0% - 0.0%)		
Pope et al. (2002) - ACS extended		All cause	30+			172 (59 - 306) 2.1% (0.7% - 3.6%)	58 (20 - 104) 0.7% (0.2% - 1.2%)	0 (0 - 0) 0.0% (0.0% - 0.0%)			
<b>Multi-Pollutant Models</b>											
Krewski et al. (2000) - ACS		All cause	30+		CO	199 (115 - 287) 2.4% (1.4% - 3.4%)	65 (38 - 94) 0.8% (0.5% - 1.1%)	0 (0 - 0) 0.0% (0.0% - 0.0%)			
Krewski et al. (2000) - ACS		All cause	30+		NO <sub>2</sub>	239 (126 - 341) 2.9% (1.5% - 4.1%)	78 (41 - 112) 0.9% (0.5% - 1.3%)	0 (0 - 0) 0.0% (0.0% - 0.0%)			
Krewski et al. (2000) - ACS		All cause	30+		O <sub>3</sub>	199 (115 - 287) 2.4% (1.4% - 3.4%)	65 (38 - 94) 0.8% (0.5% - 1.1%)	0 (0 - 0) 0.0% (0.0% - 0.0%)			
Krewski et al. (2000) - ACS		All cause	30+		SO <sub>2</sub>	36 (-63 - 148) 0.4% (-0.8% - 1.8%)	12 (-20 - 48) 0.1% (-0.2% - 0.6%)	0 (0 - 0) 0.0% (0.0% - 0.0%)			

\*For the short-term exposure studies, incidence was quantified down to policy relevant background level of 2.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, the lowest of the lowest measured levels in the long-term exposure studies, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit D.15. Estimated Annual Health Risks of Short-Term and Long-Term Exposure Mortality Associated with "As Is" PM<sub>2.5</sub> Concentrations Assuming Various Cutpoint Levels\*  
Seattle, WA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>2.5</sub> Assuming Various Cutpoint Levels** (95% Confidence Interval)			
						Percent of Total Incidence (95% Confidence Interval)			
Long-Term Exposure Mortality						Cutpoint = 7.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =12 µg/m <sup>3</sup>	
	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+			40 (20 - 61) 0.4% (0.2% - 0.6%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	Pope et al. (2002) - ACS extended	All cause	30+			50 (17 - 89) 0.5% (0.2% - 0.8%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO	58 (33 - 83) 0.5% (0.3% - 0.8%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub>	69 (36 - 99) 0.6% (0.3% - 0.9%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub>	58 (33 - 83) 0.5% (0.3% - 0.8%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	
	Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub>	10 (-18 - 43) 0.1% (-0.2% - 0.4%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	0 (0 - 0) 0.0% (0.0% - 0.0%)	

\*For the short-term exposure studies, incidence was quantified down to policy relevant background level of 2.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, the lowest of the lowest measured levels in the long-term exposure studies, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit D.16. Estimated Annual Mortality Associated with Short-Term and Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations Assuming Various Cutpoint Levels\*  
St. Louis, MO, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>2.5</sub> Assuming Various Cutpoint Levels** (95% Confidence Interval)			
						Percent of Total Incidence (95% Confidence Interval)			
						Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =15 µg/m <sup>3</sup>	Cutpoint =20 µg/m <sup>3</sup>
<b>Single Pollutant Models (Total Mortality)</b>									
Short-Term Exposure Mortality	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1	233 (86 - 379) 1.1% (0.4% - 1.7%)	114 (42 - 185) 0.5% (0.2% - 0.8%)	55 (20 - 89) 0.3% (0.1% - 0.4%)	23 (8 - 38) 0.1% (0.0% - 0.2%)	
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1	312 (224 - 401) 1.4% (1.0% - 1.8%)	146 (105 - 188) 0.7% (0.5% - 0.9%)	68 (49 - 87) 0.3% (0.2% - 0.4%)	28 (20 - 35) 0.1% (0.1% - 0.2%)	
Long-Term Exposure Mortality					Cutpoint = 7.5 µg/m <sup>3</sup>	Cutpoint =10 µg/m <sup>3</sup>	Cutpoint =12 µg/m <sup>3</sup>		
	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - Six Cities	All cause	25+		1773 (606 - 2878) 7.8% (2.7% - 12.6%)	1247 (423 - 2041) 5.5% (1.9% - 9.0%)	706 (238 - 1165) 3.1% (1.0% - 5.1%)		
	Krewski et al. (2000) - ACS	All cause	30+		671 (348 - 1022) 3.0% (1.5% - 4.5%)	453 (234 - 691) 2.0% (1.0% - 3.1%)	246 (127 - 376) 1.1% (0.6% - 1.7%)		
	Pope et al. (2002) - ACS extended	All cause	30+		842 (290 - 1486) 3.7% (1.3% - 6.6%)	587 (201 - 1041) 2.6% (0.9% - 4.6%)	330 (113 - 587) 1.5% (0.5% - 2.6%)		
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO 973 (566 - 1392) 4.3% (2.5% - 6.2%)	658 (381 - 944) 2.9% (1.7% - 4.2%)	358 (207 - 516) 1.6% (0.9% - 2.3%)		
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub> 1164 (619 - 1651) 5.2% (2.7% - 7.3%)	788 (417 - 1122) 3.5% (1.9% - 5.0%)	430 (227 - 614) 1.9% (1.0% - 2.7%)		
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub> 973 (566 - 1392) 4.3% (2.5% - 6.2%)	658 (381 - 944) 2.9% (1.7% - 4.2%)	358 (207 - 516) 1.6% (0.9% - 2.3%)		
	Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub> 177 (-310 - 723) 0.8% (-1.4% - 3.2%)	119 (-208 - 488) 0.5% (-0.9% - 2.2%)	64 (-112 - 265) 0.3% (-0.5% - 1.2%)		

\*For the short-term exposure studies, incidence was quantified down to policy relevant background level of 3.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the long-term exposure studies, incidence was quantified down to 7.5 µg/m<sup>3</sup>, the lowest of the lowest measured levels in the long-term exposure studies, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

D.2 Sensitivity analyses

**Exhibit D.17. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level Boston, MA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM2.5 Above Policy Relevant Background of: *					
						2 ug/m3		3.5 ug/m3		5 ug/m3	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>										
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1		455 (310 - 600)	2.1% (1.4% - 2.8%)	390 (265 - 514)	1.8% (1.2% - 2.4%)	325 (221 - 428)	1.5% (1.0% - 2.0%)
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1		304 (218 - 390)	1.4% (1.0% - 1.8%)	261 (186 - 334)	1.2% (0.9% - 1.5%)	217 (155 - 278)	1.0% (0.7% - 1.3%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>										
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	COPD	all	0 day		28 (-14 - 66)	2.8% (-1.4% - 6.5%)	24 (-12 - 56)	2.4% (-1.2% - 5.6%)	20 (-10 - 47)	2.0% (-1.0% - 4.6%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Ischemic heart disease	all	0 day		92 (52 - 131)	2.7% (1.5% - 3.8%)	79 (44 - 112)	2.3% (1.3% - 3.3%)	66 (37 - 93)	1.9% (1.1% - 2.7%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Pneumonia	all	0 day		42 (19 - 62)	5.7% (2.6% - 8.5%)	36 (16 - 53)	4.9% (2.2% - 7.3%)	30 (14 - 44)	4.1% (1.9% - 6.1%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	COPD	all	0 day		23 (1 - 45)	2.3% (0.1% - 4.4%)	20 (1 - 38)	2.0% (0.1% - 3.8%)	17 (1 - 32)	1.6% (0.1% - 3.1%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Ischemic heart disease	all	0 day		62 (38 - 85)	1.8% (1.1% - 2.5%)	53 (33 - 73)	1.6% (1.0% - 2.1%)	44 (27 - 61)	1.3% (0.8% - 1.8%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Pneumonia	all	0 day		30 (14 - 44)	4.0% (1.9% - 5.9%)	25 (12 - 37)	3.5% (1.6% - 5.1%)	21 (10 - 31)	2.9% (1.4% - 4.3%)
<b>Respiratory Symptoms**</b>	<b>Single Pollutant Models</b>										
	Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	7-14	1 day		9100 (4400 - 16700)	17.4% (8.5% - 32.1%)	7900 (3800 - 14500)	15.1% (7.3% - 27.9%)	6700 (3200 - 12300)	12.8% (6.1% - 23.6%)
	Schwartz and Neas (2000) -- 6 cities	Cough	7-14	0 day		14500 (-1100 - 28100)	9.6% (-0.7% - 18.6%)	12500 (-900 - 24300)	8.3% (-0.6% - 16.1%)	10500 (-800 - 20500)	6.9% (-0.5% - 13.5%)
	<b>Multi-Pollutant Models</b>										
	Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	7-14	1 day	PM10-2.5	8200 (2500 - 16500)	15.8% (4.8% - 31.7%)	7100 (2200 - 14300)	13.7% (4.2% - 27.6%)	6000 (1800 - 12100)	11.6% (3.5% - 23.3%)
Schwartz and Neas (2000) -- 6 cities	Cough	7-14	0 day	PM10-2.5	6900 (-11600 - 21800)	4.5% (-7.6% - 14.4%)	5900 (-9900 - 18900)	3.9% (-6.5% - 12.5%)	4900 (-8200 - 15800)	3.3% (-5.4% - 10.5%)	

\*Incidences are rounded to the nearest whole number, except respiratory symptoms incidences which are rounded to the nearest 100; percents are rounded to the nearest tenth.

\*\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function

**Exhibit D.18a. Sensitivity Analysis: Estimated Annual Mortality Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level Los Angeles, CA, 2003**

Health Effects	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Health Effects Associated with PM2.5 Above Policy Relevant Background of: *					
							1 ug/m3		2.5 ug/m3		4 ug/m3	
							Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Single Pollutant Models (Total Mortality)</b>												
Short-Term Exposure Mortality	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		539 (-67 - 1131)	1.0% (-0.1% - 2.1%)	494 (-62 - 1038)	0.9% (-0.1% - 1.9%)	450 (-56 - 945)	0.8% (-0.1% - 1.7%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		588 (2 - 1162)	1.1% (0.0% - 2.1%)	540 (2 - 1067)	1.0% (0.0% - 1.9%)	491 (1 - 971)	0.9% (0.0% - 1.8%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		539 (-67 - 1131)	1.0% (-0.1% - 2.1%)	494 (-62 - 1038)	0.9% (-0.1% - 1.9%)	450 (-56 - 945)	0.8% (-0.1% - 1.7%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		588 (2 - 1162)	1.1% (0.0% - 2.1%)	540 (2 - 1067)	1.0% (0.0% - 1.9%)	491 (1 - 971)	0.9% (0.0% - 1.8%)
<b>Single Pollutant Models (Cause-Specific Mortality)</b>												
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 30 df	0 day		350 (36 - 654)	1.8% (0.2% - 3.3%)	321 (33 - 601)	1.6% (0.2% - 3.1%)	292 (30 - 547)	1.5% (0.2% - 2.8%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 30 df	1 day		364 (56 - 662)	1.9% (0.3% - 3.4%)	334 (52 - 608)	1.7% (0.3% - 3.1%)	304 (47 - 554)	1.5% (0.2% - 2.8%)
<b>Multi-Pollutant Models (Total Mortality)</b>												
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day	CO	-536 (-1347 - 252)	-1.0% (-2.4% - 0.5%)	-492 (-1235 - 232)	-0.9% (-2.2% - 0.4%)	-447 (-1123 - 211)	-0.8% (-2.0% - 0.4%)
<b>Multi-Pollutant Models (Cause-Specific Mortality)</b>												
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 100 df	0 day	CO	623 (271 - 963)	3.2% (1.4% - 4.9%)	572 (249 - 884)	2.9% (1.3% - 4.5%)	521 (226 - 806)	2.6% (1.2% - 4.1%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 100 df	1 day	CO	322 (-44 - 675)	1.6% (-0.2% - 3.4%)	296 (-40 - 620)	1.5% (-0.2% - 3.1%)	269 (-37 - 564)	1.4% (-0.2% - 2.9%)

\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

**Exhibit D.18b. Sensitivity Analysis: Estimated Annual Morbidity Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level  
Los Angeles, CA, 2003**

Health Effects	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background of:*					
							1 ug/m3		2.5 ug/m3		4 ug/m3	
							Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Hospital Admissions</b>	<b>Single Pollutant Models</b>											
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 30 df	0 day		1947 (1135 - 2740)	2.8% (1.6% - 4.0%)	1787 (1042 - 2516)	2.6% (1.5% - 3.6%)	1627 (949 - 2291)	2.4% (1.4% - 3.3%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 30 df	1 day		1717 (866 - 2547)	2.5% (1.3% - 3.7%)	1576 (795 - 2339)	2.3% (1.2% - 3.4%)	1435 (724 - 2130)	2.1% (1.0% - 3.1%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	0 day		897 (377 - 1400)	3.0% (1.3% - 4.6%)	824 (346 - 1286)	2.7% (1.1% - 4.3%)	750 (315 - 1171)	2.5% (1.0% - 3.9%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	1 day		643 (125 - 1144)	2.1% (0.4% - 3.8%)	591 (115 - 1050)	2.0% (0.4% - 3.5%)	538 (105 - 957)	1.8% (0.4% - 3.2%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	2 day		992 (454 - 1511)	3.3% (1.5% - 5.0%)	911 (417 - 1387)	3.0% (1.4% - 4.6%)	829 (380 - 1264)	2.7% (1.3% - 4.2%)
	<b>Multi-Pollutant Models</b>											
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 100 df	0 day	CO	488 (-558 - 1503)	0.7% (-0.8% - 2.2%)	448 (-512 - 1380)	0.7% (-0.7% - 2.0%)	407 (-466 - 1256)	0.6% (-0.7% - 1.8%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 100 df	1 day	CO	301 (-823 - 1390)	0.4% (-1.2% - 2.0%)	276 (-755 - 1276)	0.4% (-1.1% - 1.8%)	251 (-687 - 1161)	0.4% (-1.0% - 1.7%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 100 df	0 day	NO <sub>2</sub>	229 (-506 - 931)	0.8% (-1.7% - 3.1%)	210 (-464 - 855)	0.7% (-1.5% - 2.8%)	192 (-422 - 778)	0.6% (-1.4% - 2.6%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 100 df	1 day	NO <sub>2</sub>	-22 (-909 - 817)	-0.1% (-3.0% - 2.7%)	-20 (-833 - 750)	-0.1% (-2.8% - 2.5%)	-18 (-758 - 682)	-0.1% (-2.5% - 2.3%)
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 100 df	2 day	NO <sub>2</sub>	191 (-571 - 917)	0.6% (-1.9% - 3.0%)	176 (-524 - 842)	0.6% (-1.7% - 2.8%)	160 (-476 - 767)	0.5% (-1.6% - 2.5%)	

\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.19. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level Philadelphia, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background of: *					
						2 ug/m3		3.5 ug/m3		5 ug/m3	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Cause-Specific Mortality)</b>										
	Lipfert et al. (2000) -- 7 counties	Cardiovascular	all	1 day		469 (224 - 714)	2.9% (1.4% - 4.4%)	412 (197 - 628)	2.5% (1.2% - 3.9%)	357 (170 - 544)	2.2% (1.1% - 3.4%)

\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

Note 2: Multi-county short-term exposure C-R functions were applied only to counties included among those used to estimate the function.

**Exhibit D.20. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level Phoenix, AZ, 2001**

Health Effects*	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background of: *					
						1 ug/m <sup>3</sup>		2.5 ug/m <sup>3</sup>		4 ug/m <sup>3</sup>	
						Incidence**	Percent of Total Incidence**	Incidence**	Percent of Total Incidence**	Incidence**	Percent of Total Incidence**
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Cause-Specific Mortality)</b>										
	Mar (2003) [reanalysis of Mar (2000)]	Cardiovascular	65+	0 day		219 (-62 - 483)	3.4% (-1.0% - 7.5%)	185 (-52 - 407)	2.9% (-0.8% - 6.3%)	150 (-42 - 331)	2.3% (-0.7% - 5.1%)
	Mar (2003) [reanalysis of Mar (2000)]	Cardiovascular	65+	1 day		383 (115 - 636)	5.9% (1.8% - 9.9%)	323 (97 - 536)	5.0% (1.5% - 8.3%)	262 (79 - 435)	4.1% (1.2% - 6.7%)

\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.21. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level  
Pittsburgh, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background of: *					
						2 ug/m3		3.5 ug/m3		5 ug/m3	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>										
	Chock et al. (2000)	Non-accidental	<75	0 day		71 (-57 - 195)	1.4% (-1.1% - 3.8%)	69 (-55 - 188)	1.4% (-1.1% - 3.7%)	61 (-49 - 168)	1.2% (-1.0% - 3.3%)
	Chock et al. (2000)	Non-accidental	75+	0 day		80 (-172 - 322)	0.8% (-1.8% - 3.3%)	77 (-166 - 311)	0.8% (-1.7% - 3.2%)	69 (-148 - 277)	0.7% (-1.5% - 2.8%)
	<b>Multi-Pollutant Models (Total Mortality)</b>										
	Chock et al. (2000)	Non-accidental	<75	0 day	CO, O3, SO2, NO2, PM10-2.5	92 (-62 - 238)	1.8% (-1.2% - 4.7%)	88 (-60 - 230)	1.7% (-1.2% - 4.5%)	79 (-53 - 205)	1.5% (-1.0% - 4.0%)
	Chock et al. (2000)	Non-accidental	75+	0 day	CO, O3, SO2, NO2, PM10-2.5	54 (-247 - 342)	0.6% (-2.5% - 3.5%)	52 (-238 - 330)	0.5% (-2.4% - 3.4%)	47 (-212 - 294)	0.5% (-2.2% - 3.0%)

\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.22. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level San Jose, CA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background of: *					
						1 ug/m3		2.5 ug/m3		4 ug/m3	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>										
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day		231 (48 - 409)	2.8% (0.6% - 4.9%)	218 (45 - 387)	2.6% (0.5% - 4.7%)	181 (37 - 320)	2.2% (0.5% - 3.9%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	1 day		-117 (-295 - 53)	-1.4% (-3.6% - 0.6%)	-110 (-278 - 50)	-1.3% (-3.4% - 0.6%)	-91 (-230 - 41)	-1.1% (-2.8% - 0.5%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>										
	Fairley (2003) [reanalysis of Fairley (1999)]	Respiratory	all	0 day		34 (-34 - 93)	3.9% (-3.9% - 10.8%)	32 (-32 - 88)	3.7% (-3.7% - 10.2%)	26 (-26 - 73)	3.1% (-3.0% - 8.4%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Cardiovascular	all	0 day		76 (-53 - 199)	2.2% (-1.5% - 5.7%)	72 (-50 - 188)	2.1% (-1.5% - 5.4%)	60 (-42 - 155)	1.7% (-1.2% - 4.5%)
	<b>Multi-Pollutant Models (Total Mortality)</b>										
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	NO <sub>2</sub>	293 (79 - 499)	3.5% (1.0% - 6.0%)	277 (74 - 472)	3.3% (0.9% - 5.7%)	229 (62 - 390)	2.8% (0.7% - 4.7%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	CO	266 (63 - 457)	3.2% (0.8% - 5.5%)	251 (60 - 432)	3.0% (0.7% - 5.2%)	208 (49 - 357)	2.5% (0.6% - 4.3%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	O <sub>3</sub> - 8hr	250 (63 - 428)	3.0% (0.8% - 5.2%)	236 (60 - 404)	2.8% (0.7% - 4.9%)	195 (49 - 335)	2.4% (0.6% - 4.0%)

\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.23. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level Seattle, WA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background of: *					
						1 ug/m <sup>3</sup>		2.5 ug/m <sup>3</sup>		4 ug/m <sup>3</sup>	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Single Pollutant Models</b>											
Hospital Admission	Sheppard (2003)	Asthma	<65	1 day		30	1.9%	30	1.9%	23	1.4%
	[reanalysis of Sheppard et al. (1999)]**					(8 - 45)	(0.5% - 2.8%)	(8 - 45)	(0.5% - 2.8%)	(6 - 34)	(0.4% - 2.1%)

\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

\*\*Sheppard (2003) [reanalysis of Sheppard et al. (1999)] used daily PM<sub>2.5</sub> values obtained from nephelometer measurements rather than from air quality monitors.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.24. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, Using Different Estimates of Policy Relevant Background Level  
St. Louis, MO, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background of: *					
						2 ug/m3		3.5 ug/m3		5 ug/m3	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>										
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1		266 (98 - 433)	1.2% (0.5% - 2.0%)	233 (86 - 379)	1.1% (0.4% - 1.7%)	200 (74 - 326)	0.9% (0.3% - 1.5%)
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1		357 (255 - 457)	1.6% (1.2% - 2.1%)	312 (224 - 401)	1.4% (1.0% - 1.8%)	268 (192 - 344)	1.2% (0.9% - 1.6%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>										
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	COPD	all	0 day		7 (-36 - 47)	0.7% (-3.6% - 4.8%)	6 (-31 - 42)	0.6% (-3.2% - 4.2%)	5 (-27 - 36)	0.5% (-2.7% - 3.6%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Ischemic heart disease	all	0 day		80 (19 - 145)	1.5% (0.4% - 2.8%)	70 (16 - 127)	1.4% (0.3% - 2.5%)	60 (14 - 109)	1.2% (0.3% - 2.1%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Pneumonia	all	0 day		9 (-21 - 36)	1.3% (-3.1% - 5.3%)	8 (-18 - 31)	1.1% (-2.7% - 4.7%)	7 (-16 - 27)	1.0% (-2.3% - 4.0%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	COPD	all	0 day		27 (1 - 51)	2.7% (0.1% - 5.1%)	23 (1 - 44)	2.4% (0.1% - 4.5%)	20 (1 - 38)	2.0% (0.1% - 3.9%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Ischemic heart disease	all	0 day		110 (68 - 151)	2.1% (1.3% - 2.9%)	96 (59 - 132)	1.9% (1.1% - 2.6%)	83 (51 - 114)	1.6% (1.0% - 2.2%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Pneumonia	all	0 day		31 (15 - 46)	4.7% (2.2% - 6.9%)	28 (13 - 41)	4.1% (2.0% - 6.1%)	24 (11 - 35)	3.5% (1.7% - 5.2%)
<b>Respiratory Symptoms**</b>	<b>Single Pollutant Models</b>										
	Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	7-14	1 day		12100 (4900 - 18100)	21.4% (8.6% - 32.1%)	10800 (4300 - 16300)	19.2% (7.7% - 28.9%)	9500 (3800 - 14400)	16.9% (6.7% - 25.6%)
	Schwartz and Neas (2000) -- 6 cities	Cough	7-14	0 day		19700 (-1400 - 37900)	12.0% (-0.9% - 23.0%)	17600 (-1300 - 34000)	10.7% (-0.8% - 20.7%)	15400 (-1100 - 29900)	9.4% (-0.7% - 18.2%)
	<b>Multi-Pollutant Models</b>										
	Schwartz and Neas (2000) -- 6 cities	Lower respiratory symptoms	7-14	1 day	PM10-2.5	11000 (2800 - 17900)	19.4% (4.9% - 31.7%)	9800 (2500 - 16100)	17.4% (4.4% - 28.6%)	8600 (2200 - 14300)	15.3% (3.8% - 25.3%)
Schwartz and Neas (2000) -- 6 cities	Cough	7-14	0 day	PM10-2.5	9400 (-15900 - 29500)	5.7% (-9.7% - 18.0%)	8300 (-14000 - 26400)	5.1% (-8.5% - 16.0%)	7200 (-12100 - 23200)	4.4% (-7.4% - 14.1%)	

\*Incidences are rounded to the nearest whole number, except respiratory symptoms incidences which are rounded to the nearest 100; percents are rounded to the nearest tenth.

\*\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit D.25. Sensitivity Analysis: Estimated Annual Health Risks of Short-Term Exposure Mortality Associated with "As Is" PM<sub>2.5</sub> Concentrations With Adjustments for the Estimated Increases in Incidence if Distributed Lag Models Had Been Estimated Boston, MA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM-2.5 Above Policy Relevant Background:*			
						Single Lag		Adjusted for Distributed Lag	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1		390 (265 - 514)	1.8% (1.2% - 2.4%)	761 (519 - 999)	3.5% (2.4% - 4.6%)
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1		261 (186 - 334)	1.2% (0.9% - 1.5%)	511 (367 - 654)	2.4% (1.7% - 3.0%)

\*Health effects incidence was quantified down to estimated policy relevant background level of 3.5 ug/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit D.26. Sensitivity Analysis: Estimated Mortality Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, With Adjustments for the Estimated Increases in Incidence if Distributed Lag Models Had Been Estimated Los Angeles, CA, 2003**

Health Effects	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background*			
							Single Lag		Adjusted for Distributed Lag	
							Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>									
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		494 (-62 - 1038)	0.9% (-0.1% - 1.9%)	971 (-122 - 2026)	1.8% (-0.2% - 3.7%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		540 (2 - 1067)	1.0% (0.0% - 1.9%)	1060 (3 - 2081)	1.9% (0.0% - 3.8%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		494 (-62 - 1038)	0.9% (-0.1% - 1.9%)	971 (-122 - 2026)	1.8% (-0.2% - 3.7%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		540 (2 - 1067)	1.0% (0.0% - 1.9%)	1060 (3 - 2081)	1.9% (0.0% - 3.8%)
	<b>Multi-Pollutant Models (Total Mortality)</b>									
Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day	CO	-492 (-1235 - 232)	-0.9% (-2.2% - 0.4%)	-979 (-2484 - 457)	-1.8% (-4.5% - 0.8%)	

\*Health effects incidence was quantified down to estimated policy relevant background level of 2.5 ug/m3. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.  
 Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.27. Sensitivity Analysis: Estimated Annual Mortality Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations With Adjustments for the Estimated Increases in Incidence if Distributed Lag Models Had Been Estimated Pittsburgh, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background*			
						Single Lag		Adjusted for Distributed Lag	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Chock et al. (2000)	Non-accidental	<75	0 day		69 (-55 - 188)	1.4% (-1.1% - 3.7%)	135 (-109 - 361)	2.6% (-2.1% - 7.1%)
	Chock et al. (2000)	Non-accidental	75+	0 day		77 (-166 - 311)	0.8% (-1.7% - 3.2%)	151 (-332 - 600)	1.6% (-3.4% - 6.2%)
	<b>Multi-Pollutant Models (Total Mortality)</b>								
	Chock et al. (2000)	Non-accidental	<75	0 day	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10-2.5</sub>	88 (-60 - 230)	1.7% (-1.2% - 4.5%)	172 (-119 - 439)	3.4% (-2.3% - 8.6%)
Chock et al. (2000)	Non-accidental	75+	0 day	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10-2.5</sub>	52 (-238 - 330)	0.5% (-2.4% - 3.4%)	103 (-480 - 635)	1.1% (-4.9% - 6.5%)	

\*Health effects incidence was quantified down to estimated policy relevant background level of 3.5 ug/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.  
 Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.28. Sensitivity Analysis: Estimated Annual Mortality Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, With Adjustments for the Estimated Increases in Incidence if Distributed Lag Models Had Been Estimated San Jose, CA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background*			
						Single Lag		Adjusted for Distributed Lag	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>								
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day		218 (45 - 387)	2.6% (0.5% - 4.7%)	422 (89 - 736)	5.1% (1.1% - 8.9%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	1 day		-110 (-278 - 50)	-1.3% (-3.4% - 0.6%)	-221 (-567 - 98)	-2.7% (-6.8% - 1.2%)
	<b>Multi-Pollutant Models (Total Mortality)</b>								
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	NO <sub>2</sub>	277 (74 - 472)	3.3% (0.9% - 5.7%)	533 (146 - 890)	6.4% (1.8% - 10.7%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	CO	251 (60 - 432)	3.0% (0.7% - 5.2%)	485 (118 - 818)	5.8% (1.4% - 9.8%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day	O <sub>3</sub> - 8hr	236 (60 - 404)	2.8% (0.7% - 4.9%)	456 (118 - 768)	5.5% (1.4% - 9.3%)

\*Health effects incidence was quantified down to estimated policy relevant background level of 2.5 ug/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth. Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.29. Sensitivity Analysis: Estimated Annual Mortality Associated with Short-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations, With Adjustments for the Estimated Increases in Incidence if Distributed Lag Models Had Been Estimated St. Louis, MO, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>2.5</sub> Above Policy Relevant Background*			
						Single Lag		Adjusted for Distributed Lag	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1		230 (90 - 380)	1.1% (0.4% - 1.7%)	460 (170 - 740)	2.1% (0.8% - 3.4%)
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1		310 (220 - 400)	1.4% (1.0% - 1.8%)	610 (440 - 780)	2.8% (2.0% - 3.6%)

\*Health effects incidence was quantified down to estimated policy relevant background level of 3.5 ug/m3. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit D.30. Sensitivity Analysis: The Effect of Assumptions About Historical Air Quality on Estimates of Mortality Associated with Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations  
Boston, MA, 2003**

Health Effects	Study	Type	Ages	Other Pollutants in Model	Percent of Total Incidence*		
					Base Case: Assuming AQ as Reported	Assuming relevant AQ 50% higher	Assuming relevant AQ twice as high
<b>Single Pollutant Models</b>							
<b>Long-Term Exposure Mortality</b>	Krewski et al. (2000) - Six Cities	All cause	25+		5.6% (1.9% - 9.1%)	3.8% (1.3% - 6.2%)	2.8% (1.0% - 4.7%)
	Krewski et al. (2000) - ACS	All cause	30+		2.1% (1.1% - 3.2%)	1.4% (0.7% - 2.2%)	1.1% (0.6% - 1.6%)
	Krewski et al. (2000) - Six Cities	Cardiopulmonary	25+		7.5% (2.6% - 12.1%)	5.1% (1.7% - 8.2%)	3.8% (1.3% - 6.3%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+		4.3% (2.8% - 5.9%)	2.9% (1.9% - 4.0%)	2.2% (1.4% - 3.0%)
	Pope et al. (2002) - ACS extended	All cause	30+		2.7% (0.9% - 4.7%)	1.8% (0.6% - 3.2%)	1.3% (0.5% - 2.4%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+		3.9% (1.4% - 6.6%)	2.6% (0.9% - 4.5%)	2.0% (0.7% - 3.4%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+		5.9% (1.8% - 9.1%)	4.0% (1.2% - 6.2%)	3.0% (0.9% - 4.7%)
	<b>Multi-Pollutant Models</b>						
	Krewski et al. (2000) - ACS	All cause	30+	CO	3.1% (1.8% - 4.4%)	2.1% (1.2% - 3.0%)	1.6% (0.9% - 2.2%)
	Krewski et al. (2000) - ACS	All cause	30+	NO2	3.7% (2.0% - 5.2%)	2.5% (1.3% - 3.5%)	1.9% (1.0% - 2.7%)
	Krewski et al. (2000) - ACS	All cause	30+	O3	3.1% (1.8% - 4.4%)	2.1% (1.2% - 3.0%)	1.6% (0.9% - 2.2%)
	Krewski et al. (2000) - ACS	All cause	30+	SO2	0.6% (-1.0% - 2.3%)	0.4% (-0.7% - 1.5%)	0.3% (-0.5% - 1.2%)

\* For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m3, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

**Exhibit D.31. Sensitivity Analysis: The Effect of Assumptions About Historical Air Quality on Estimates of Mortality Associated with Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations  
Los Angeles, CA, 2003**

Health Effects	Study	Type	Ages	Other Pollutants in Model	Percent of Total Incidence*		
					Base Case: Assuming AQ as Reported	Assuming relevant AQ 50% higher	Assuming relevant AQ twice as high
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>						
	Krewski et al. (2000) - ACS	All cause	30+		5.2% (2.7% - 7.9%)	3.5% (1.8% - 5.4%)	2.7% (1.4% - 4.1%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+		10.4% (6.8% - 14.2%)	7.1% (4.6% - 9.7%)	5.3% (3.5% - 7.4%)
	Pope et al. (2002) - ACS extended	All cause	30+		6.6% (2.3% - 11.4%)	4.4% (1.5% - 7.8%)	3.3% (1.2% - 5.9%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+		9.5% (3.4% - 15.9%)	6.5% (2.3% - 10.9%)	4.9% (1.7% - 8.3%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+		14.1% (4.5% - 21.4%)	9.7% (3.0% - 14.8%)	7.3% (2.3% - 11.3%)
	<b>Multi-Pollutant Models</b>						
	Krewski et al. (2000) - ACS	All cause	30+	CO	7.6% (4.4% - 10.7%)	5.1% (3.0% - 7.3%)	3.9% (2.2% - 5.5%)
	Krewski et al. (2000) - ACS	All cause	30+	NO2	9.0% (4.8% - 12.7%)	6.1% (3.3% - 8.6%)	4.6% (2.5% - 6.6%)
	Krewski et al. (2000) - ACS	All cause	30+	O3	7.6% (4.4% - 10.7%)	5.1% (3.0% - 7.3%)	3.9% (2.2% - 5.5%)
	Krewski et al. (2000) - ACS	All cause	30+	SO2	1.4% (-2.5% - 5.6%)	0.9% (-1.6% - 3.8%)	0.7% (-1.2% - 2.9%)

\* For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m3, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

**Exhibit D.32. Sensitivity Analysis: The Effect of Assumptions About Historical Air Quality on Estimates of Mortality Associated with Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations Philadelphia, PA, 2003**

Health Effects	Study	Type	Ages	Other Pollutants in Model	Percent of Total Incidence*		
					Base Case: Assuming AQ as Reported	Assuming relevant AQ 50% higher	Assuming relevant AQ twice as high
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>						
	Krewski et al. (2000) - ACS	All cause	30+		3.1% (1.6% - 4.7%)	2.1% (1.1% - 3.2%)	1.6% (0.8% - 2.4%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+		6.2% (4.1% - 8.6%)	4.2% (2.7% - 5.8%)	3.2% (2.0% - 4.4%)
	Pope et al. (2002) - ACS extended	All cause	30+		3.9% (1.3% - 6.9%)	2.6% (0.9% - 4.6%)	2.0% (0.7% - 3.5%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+		5.7% (2.0% - 9.6%)	3.8% (1.3% - 6.5%)	2.9% (1.0% - 4.9%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+		8.6% (2.6% - 13.2%)	5.8% (1.8% - 9.0%)	4.4% (1.3% - 6.8%)
	<b>Multi-Pollutant Models</b>						
	Krewski et al. (2000) - ACS	All cause	30+	CO	4.5% (2.6% - 6.4%)	3.0% (1.8% - 4.3%)	2.3% (1.3% - 3.3%)
	Krewski et al. (2000) - ACS	All cause	30+	NO <sub>2</sub>	5.4% (2.9% - 7.6%)	3.6% (1.9% - 5.2%)	2.7% (1.4% - 3.9%)
	Krewski et al. (2000) - ACS	All cause	30+	O <sub>3</sub>	4.5% (2.6% - 6.4%)	3.0% (1.8% - 4.3%)	2.3% (1.3% - 3.3%)
	Krewski et al. (2000) - ACS	All cause	30+	SO <sub>2</sub>	0.8% (-1.4% - 3.3%)	0.6% (-1.0% - 2.2%)	0.4% (-0.7% - 1.7%)

\* For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.33. Sensitivity Analysis: The Effect of Assumptions About Historical Air Quality on Estimates of Mortality Associated with Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations  
Phoenix, AZ, 2001**

Health Effects	Study	Type	Ages	Other Pollutants in Model	Percent of Total Incidence*		
					Base Case: Assuming AQ as Reported	Assuming Relevant AQ 50% higher	Assuming Relevant AQ Twice as High
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>						
	Krewski et al. (2000) - ACS	All cause	30+		1.3% (0.7% - 2.0%)	0.9% (0.5% - 1.4%)	0.7% (0.3% - 1.0%)
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+		2.7% (1.7% - 3.8%)	1.8% (1.2% - 2.5%)	1.4% (0.9% - 1.9%)
	Pope et al. (2002) - ACS extended	All cause	30+		1.7% (0.6% - 3.0%)	1.1% (0.4% - 2.0%)	0.8% (0.3% - 1.5%)
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+		2.5% (0.9% - 4.2%)	1.7% (0.6% - 2.8%)	1.2% (0.4% - 2.1%)
	Pope et al. (2002) - ACS extended	Lung cancer	30+		3.7% (1.1% - 5.8%)	2.5% (0.8% - 3.9%)	1.9% (0.6% - 3.0%)
	<b>Multi-Pollutant Models</b>						
	Krewski et al. (2000) - ACS	All cause	30+	CO	1.9% (1.1% - 2.8%)	1.3% (0.8% - 1.9%)	1.0% (0.6% - 1.4%)
	Krewski et al. (2000) - ACS	All cause	30+	NO2	2.3% (1.2% - 3.3%)	1.6% (0.8% - 2.2%)	1.2% (0.6% - 1.7%)
	Krewski et al. (2000) - ACS	All cause	30+	O3	1.9% (1.1% - 2.8%)	1.3% (0.8% - 1.9%)	1.0% (0.6% - 1.4%)
Krewski et al. (2000) - ACS	All cause	30+	SO2	0.4% (-0.6% - 1.4%)	0.2% (-0.4% - 1.0%)	0.2% (-0.3% - 0.7%)	

\* For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m3, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

**Exhibit D.34. Sensitivity Analysis: The Effect of Assumptions About Historical Air Quality on Estimates of Mortality Associated with Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations Pittsburgh, PA, 2003**

Health Effects	Study	Type	Ages	Other Pollutants in Model	Percent of Total Incidence*			
					Base Case: Assuming AQ as Reported	Assuming relevant AQ 50% higher	Assuming relevant AQ twice as high	
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+		4.3% (2.2% - 6.5%)	2.9% (1.5% - 4.4%)	2.2% (1.1% - 3.3%)	
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+		8.5% (5.6% - 11.7%)	5.8% (3.7% - 7.9%)	4.4% (2.8% - 6.0%)	
	Pope et al. (2002) - ACS extended	All cause	30+		5.4% (1.9% - 9.4%)	3.6% (1.2% - 6.4%)	2.7% (0.9% - 4.8%)	
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+		7.8% (2.8% - 13.1%)	5.3% (1.8% - 8.9%)	4.0% (1.4% - 6.8%)	
	Pope et al. (2002) - ACS extended	Lung cancer	30+		11.6% (3.6% - 17.8%)	7.9% (2.4% - 12.2%)	6.0% (1.8% - 9.3%)	
	<b>Multi-Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+	CO	6.2% (3.6% - 8.8%)	4.2% (2.4% - 6.0%)	3.1% (1.8% - 4.5%)	
	Krewski et al. (2000) - ACS	All cause	30+	NO <sub>2</sub>	7.4% (3.9% - 10.4%)	5.0% (2.6% - 7.1%)	3.8% (2.0% - 5.4%)	
	Krewski et al. (2000) - ACS	All cause	30+	O <sub>3</sub>	6.2% (3.6% - 8.8%)	4.2% (2.4% - 6.0%)	3.1% (1.8% - 4.5%)	
	Krewski et al. (2000) - ACS	All cause	30+	SO <sub>2</sub>	1.1% (-2.0% - 4.6%)	0.8% (-1.3% - 3.1%)	0.6% (-1.0% - 2.3%)	

\* For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Exhibit D.35. Sensitivity Analysis: The Effect of Assumptions About Historical Air Quality on Estimates of Mortality Associated with Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations  
San Jose, CA, 2003**

Health Effects	Study	Type	Ages	Other Pollutants in Model	Percent of Total Incidence*			
					Base Case: Assuming AQ as Reported	Assuming relevant AQ 50% higher	Assuming relevant AQ twice as high	
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+		1.6% (0.8% - 2.5%)	1.1% (0.6% - 1.7%)	0.8% (0.4% - 1.3%)	
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+		3.3% (2.1% - 4.6%)	2.2% (1.4% - 3.1%)	1.7% (1.1% - 2.3%)	
	Pope et al. (2002) - ACS extended	All cause	30+		2.1% (0.7% - 3.6%)	1.4% (0.5% - 2.4%)	1.0% (0.4% - 1.8%)	
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+		3.0% (1.1% - 5.1%)	2.0% (0.7% - 3.5%)	1.5% (0.5% - 2.6%)	
	Pope et al. (2002) - ACS extended	Lung cancer	30+		4.6% (1.4% - 7.1%)	3.1% (0.9% - 4.8%)	2.3% (0.7% - 3.6%)	
	<b>Multi-Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+	CO	2.4% (1.4% - 3.4%)	1.6% (0.9% - 2.3%)	1.2% (0.7% - 1.7%)	
	Krewski et al. (2000) - ACS	All cause	30+	NO2	2.9% (1.5% - 4.1%)	1.9% (1.0% - 2.7%)	1.4% (0.8% - 2.1%)	
	Krewski et al. (2000) - ACS	All cause	30+	O3	2.4% (1.4% - 3.4%)	1.6% (0.9% - 2.3%)	1.2% (0.7% - 1.7%)	
	Krewski et al. (2000) - ACS	All cause	30+	SO2	0.4% (-0.8% - 1.8%)	0.3% (-0.5% - 1.2%)	0.2% (-0.4% - 0.9%)	

\*For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m3, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

**Exhibit D.36. Sensitivity Analysis: The Effect of Assumptions About Historical Air Quality on Estimates of Mortality Associated with Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations  
Seattle, WA, 2003**

Health Effects	Study	Type	Ages	Other Pollutants in Model	Percent of Total Incidence*			
					Base Case: Assuming AQ as Reported	Assuming relevant AQ 50% higher	Assuming relevant AQ twice as high	
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+		0.4% (0.2% - 0.6%)	0.2% (0.1% - 0.4%)	0.2% (0.1% - 0.3%)	
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+		0.7% (0.5% - 1.0%)	0.5% (0.3% - 0.7%)	0.4% (0.2% - 0.5%)	
	Pope et al. (2002) - ACS extended	All cause	30+		0.5% (0.2% - 0.8%)	0.3% (0.1% - 0.5%)	0.2% (0.1% - 0.4%)	
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+		0.7% (0.2% - 1.1%)	0.4% (0.2% - 0.8%)	0.3% (0.1% - 0.6%)	
	Pope et al. (2002) - ACS extended	Lung cancer	30+		1.0% (0.3% - 1.6%)	0.7% (0.2% - 1.1%)	0.5% (0.2% - 0.8%)	
	<b>Multi-Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+	CO	0.5% (0.3% - 0.8%)	0.4% (0.2% - 0.5%)	0.3% (0.2% - 0.4%)	
	Krewski et al. (2000) - ACS	All cause	30+	NO2	0.6% (0.3% - 0.9%)	0.4% (0.2% - 0.6%)	0.3% (0.2% - 0.5%)	
	Krewski et al. (2000) - ACS	All cause	30+	O3	0.5% (0.3% - 0.8%)	0.4% (0.2% - 0.5%)	0.3% (0.2% - 0.4%)	
	Krewski et al. (2000) - ACS	All cause	30+	SO2	0.1% (-0.2% - 0.4%)	0.1% (-0.1% - 0.3%)	0.1% (-0.1% - 0.2%)	

\*For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m3, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM2.5 coefficient.

**Exhibit D.37. Sensitivity Analysis: The Effect of Assumptions About Historical Air Quality on Estimates of Mortality Associated with Long-Term Exposure to "As Is" PM<sub>2.5</sub> Concentrations  
St. Louis, MO, 2003**

Health Effects	Study	Type	Ages	Other Pollutants in Model	Percent of Total Incidence*			
					Base Case: Assuming AQ as Reported	Assuming relevant AQ 50% higher	Assuming relevant AQ twice as high	
<b>Long-Term Exposure Mortality</b>	<b>Single Pollutant Models</b>							
	Krewski et al. (2000) - Six Cities	All cause	25+		7.8% (2.7% - 12.6%)	5.3% (1.8% - 8.6%)	4.0% (1.3% - 6.5%)	
	Krewski et al. (2000) - ACS	All cause	30+		3.0% (1.5% - 4.5%)	2.0% (1.0% - 3.0%)	1.5% (0.8% - 2.3%)	
	Krewski et al. (2000) - Six Cities	Cardiopulmonary	25+		10.4% (3.6% - 16.6%)	7.1% (2.4% - 11.4%)	5.4% (1.8% - 8.7%)	
	Krewski et al. (2000) - ACS	Cardiopulmonary	30+		6.0% (3.9% - 8.2%)	4.0% (2.6% - 5.6%)	3.0% (2.0% - 4.2%)	
	Pope et al. (2002) - ACS extended	All cause	30+		3.7% (1.3% - 6.6%)	2.5% (0.9% - 4.4%)	1.9% (0.6% - 3.3%)	
	Pope et al. (2002) - ACS extended	Cardiopulmonary	30+		5.5% (1.9% - 9.2%)	3.7% (1.3% - 6.2%)	2.8% (1.0% - 4.7%)	
	Pope et al. (2002) - ACS extended	Lung cancer	30+		8.2% (2.5% - 12.6%)	5.5% (1.7% - 8.6%)	4.2% (1.3% - 6.5%)	
	<b>Multi-Pollutant Models</b>							
	Krewski et al. (2000) - ACS	All cause	30+	CO	4.3% (2.5% - 6.2%)	2.9% (1.7% - 4.2%)	2.2% (1.3% - 3.1%)	
	Krewski et al. (2000) - ACS	All cause	30+	NO2	5.2% (2.7% - 7.3%)	3.5% (1.8% - 4.9%)	2.6% (1.4% - 3.7%)	
	Krewski et al. (2000) - ACS	All cause	30+	O3	4.3% (2.5% - 6.2%)	2.9% (1.7% - 4.2%)	2.2% (1.3% - 3.1%)	
Krewski et al. (2000) - ACS	All cause	30+	SO2	0.8% (-1.4% - 3.2%)	0.5% (-0.9% - 2.1%)	0.4% (-0.7% - 1.6%)		

\*For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>2.5</sub> coefficient.

**Appendix E. Estimated Annual Reduced Risks Associated with PM<sub>2.5</sub> Concentrations  
When the Current and Alternative Standards Are Just Met**

E.1 Primary analysis

**Exhibit E.1. Estimated Annual Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**Boston, MA, 2003**

(2003 As Is Levels = 12.1 ug/m3 Annual Average; 34.1 ug/m3 98th Percentile Daily Value)

Alternative Standards		Percent Reduction in Incidence from As Is Levels (95% Confidence Interval)			
		Percent Reduction in Incidence from As is Levels			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
15	65, 98th percentile value***	390 (265 - 514) 0.0%	173 (118 - 228) 0.0%	82 (56 - 109) 0.0%	41 (28 - 53) 0.0%
15	40, 98th percentile value	351 (239 - 462) 10.0%	139 (95 - 183) 19.7%	60 (41 - 79) 26.8%	27 (19 - 36) 34.1%
15	35, 98th percentile value	302 (206 - 398) 22.6%	99 (67 - 130) 42.8%	37 (25 - 48) 54.9%	16 (11 - 20) 61.0%
15	30, 98th percentile value	254 (173 - 334) 34.9%	63 (43 - 83) 63.6%	20 (14 - 26) 75.6%	7 (5 - 9) 82.9%
15	25, 98th percentile value	206 (140 - 270) 47.2%	35 (24 - 46) 79.8%	9 (6 - 12) 89.0%	2 (1 - 2) 95.1%
15	65, 99th percentile value	390 (265 - 514) 0.0%	173 (118 - 228) 0.0%	82 (56 - 109) 0.0%	41 (28 - 53) 0.0%
15	40, 99th percentile value	251 (171 - 330) 35.6%	61 (42 - 80) 64.7%	19 (13 - 25) 76.8%	6 (4 - 8) 85.4%
15	35, 99th percentile value	216 (147 - 284) 44.6%	40 (28 - 53) 76.9%	11 (7 - 14) 86.6%	2 (2 - 3) 95.1%
15	30, 99th percentile value	182 (124 - 239) 53.3%	24 (16 - 31) 86.1%	5 (3 - 7) 93.9%	1 (1 - 1) 97.6%
15	25, 99th percentile value	147 (100 - 193) 62.3%	11 (8 - 15) 93.6%	1 (1 - 2) 98.8%	0 (0 - 0) 100.0%
14	40, 98th percentile value	351 (239 - 462) 10.0%	139 (95 - 183) 19.7%	60 (41 - 79) 26.8%	27 (19 - 36) 34.1%
14	35, 98th percentile value	302 (206 - 398) 22.6%	99 (67 - 130) 42.8%	37 (25 - 48) 54.9%	16 (11 - 20) 61.0%
14	30, 98th percentile value	254 (173 - 334) 34.9%	63 (43 - 83) 63.6%	20 (14 - 26) 75.6%	7 (5 - 9) 82.9%
14	25, 98th percentile value	206 (140 - 270) 47.2%	35 (24 - 46) 79.8%	9 (6 - 12) 89.0%	2 (1 - 2) 95.1%
14	40, 99th percentile value	251 (171 - 330) 35.6%	61 (42 - 80) 64.7%	19 (13 - 25) 76.8%	6 (4 - 8) 85.4%
14	35, 99th percentile value	216 (147 - 284) 44.6%	40 (28 - 53) 76.9%	11 (7 - 14) 86.6%	2 (2 - 3) 95.1%
14	30, 99th percentile value	182 (124 - 239) 53.3%	24 (16 - 31) 86.1%	5 (3 - 7) 93.9%	1 (1 - 1) 97.6%

Alternative Standards		Percent Reduction in Incidence from As is Levels (95% Confidence Interval)			
		Percent Reduction in Incidence from As is Levels			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
14	25, 99th percentile value	147 (100 - 193) 62.3%	11 (8 - 15) 93.6%	1 (1 - 2) 98.8%	0 (0 - 0) 100.0%
13	40, 98th percentile value	339 (231 - 447) 13.1%	129 (88 - 170) 25.4%	54 (37 - 71) 34.1%	24 (16 - 32) 41.5%
13	35, 98th percentile value	302 (206 - 398) 22.6%	99 (67 - 130) 42.8%	37 (25 - 48) 54.9%	16 (11 - 20) 61.0%
13	30, 98th percentile value	254 (173 - 334) 34.9%	63 (43 - 83) 63.6%	20 (14 - 26) 75.6%	7 (5 - 9) 82.9%
13	25, 98th percentile value	206 (140 - 270) 47.2%	35 (24 - 46) 79.8%	9 (6 - 12) 89.0%	2 (1 - 2) 95.1%
13	40, 99th percentile value	251 (171 - 330) 35.6%	61 (42 - 80) 64.7%	19 (13 - 25) 76.8%	6 (4 - 8) 85.4%
13	35, 99th percentile value	216 (147 - 284) 44.6%	40 (28 - 53) 76.9%	11 (7 - 14) 86.6%	2 (2 - 3) 95.1%
13	30, 99th percentile value	182 (124 - 239) 53.3%	24 (16 - 31) 86.1%	5 (3 - 7) 93.9%	1 (1 - 1) 97.6%
13	25, 99th percentile value	147 (100 - 193) 62.3%	11 (8 - 15) 93.6%	1 (1 - 2) 98.8%	0 (0 - 0) 100.0%
12	40, 98th percentile value	303 (206 - 399) 22.3%	99 (68 - 131) 42.8%	37 (25 - 49) 54.9%	16 (11 - 21) 61.0%
12	35, 98th percentile value	302 (206 - 398) 22.6%	99 (67 - 130) 42.8%	37 (25 - 48) 54.9%	16 (11 - 20) 61.0%
12	30, 98th percentile value	254 (173 - 334) 34.9%	63 (43 - 83) 63.6%	20 (14 - 26) 75.6%	7 (5 - 9) 82.9%
12	25, 98th percentile value	206 (140 - 270) 47.2%	35 (24 - 46) 79.8%	9 (6 - 12) 89.0%	2 (1 - 2) 95.1%
12	40, 99th percentile value	251 (171 - 330) 35.6%	61 (42 - 80) 64.7%	19 (13 - 25) 76.8%	6 (4 - 8) 85.4%
12	35, 99th percentile value	216 (147 - 284) 44.6%	40 (28 - 53) 76.9%	11 (7 - 14) 86.6%	2 (2 - 3) 95.1%
12	30, 99th percentile value	182 (124 - 239) 53.3%	24 (16 - 31) 86.1%	5 (3 - 7) 93.9%	1 (1 - 1) 97.6%
12	25, 99th percentile value	147 (100 - 193) 62.3%	11 (8 - 15) 93.6%	1 (1 - 2) 98.8%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Schwartz (2003b).

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.2. Estimated Annual Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Los Angeles, CA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards			
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Policy Relevant Background =2.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =15 µg/m <sup>3</sup>	Cutpoint** =20 µg/m <sup>3</sup>
15	65, 98th percentile value***	292 (-37 - 612) 0.0%	115 (-14 - 240) 0.0%	58 (-7 - 121) 0.0%	29 (-4 - 61) 0.0%
15	40, 98th percentile value	292 (-37 - 612) 0.0%	115 (-14 - 240) 0.0%	58 (-7 - 121) 0.0%	29 (-4 - 61) 0.0%
15	35, 98th percentile value	269 (-34 - 564) 7.9%	96 (-12 - 200) 16.5%	45 (-6 - 94) 22.4%	22 (-3 - 46) 24.1%
15	30, 98th percentile value	228 (-28 - 476) 21.9%	65 (-8 - 135) 43.5%	26 (-3 - 54) 55.2%	12 (-2 - 25) 58.6%
15	25, 98th percentile value	186 (-23 - 389) 36.3%	39 (-5 - 80) 66.1%	13 (-2 - 27) 77.6%	5 (-1 - 11) 82.8%
15	65, 99th percentile value	292 (-37 - 612) 0.0%	115 (-14 - 240) 0.0%	58 (-7 - 121) 0.0%	29 (-4 - 61) 0.0%
15	40, 99th percentile value	197 (-25 - 413) 32.5%	45 (-6 - 94) 60.9%	16 (-2 - 33) 72.4%	7 (-1 - 14) 75.9%
15	35, 99th percentile value	171 (-21 - 358) 41.4%	30 (-4 - 63) 73.9%	10 (-1 - 20) 82.8%	3 (0 - 7) 89.7%
15	30, 99th percentile value	145 (-18 - 302) 50.3%	18 (-2 - 37) 84.3%	5 (-1 - 10) 91.4%	1 (0 - 3) 96.6%
15	25, 99th percentile value	118 (-15 - 247) 59.6%	9 (-1 - 18) 92.2%	2 (0 - 4) 96.6%	0 (0 - 1) 100.0%
14	40, 98th percentile value	269 (-34 - 562) 7.9%	96 (-12 - 199) 16.5%	45 (-6 - 93) 22.4%	22 (-3 - 45) 24.1%
14	35, 98th percentile value	269 (-34 - 562) 7.9%	96 (-12 - 199) 16.5%	45 (-6 - 93) 22.4%	22 (-3 - 45) 24.1%
14	30, 98th percentile value	228 (-28 - 476) 21.9%	65 (-8 - 135) 43.5%	26 (-3 - 54) 55.2%	12 (-2 - 25) 58.6%
14	25, 98th percentile value	186 (-23 - 389) 36.3%	39 (-5 - 80) 66.1%	13 (-2 - 27) 77.6%	5 (-1 - 11) 82.8%
14	40, 99th percentile value	197 (-25 - 413) 32.5%	45 (-6 - 94) 60.9%	16 (-2 - 33) 72.4%	7 (-1 - 14) 75.9%
14	35, 99th percentile value	171 (-21 - 358) 41.4%	30 (-4 - 63) 73.9%	10 (-1 - 20) 82.8%	3 (0 - 7) 89.7%
14	30, 99th percentile value	145 (-18 - 302) 50.3%	18 (-2 - 37) 84.3%	5 (-1 - 10) 91.4%	1 (0 - 3) 96.6%
14	25, 99th percentile value	118 (-15 - 247) 59.6%	9 (-1 - 18) 92.2%	2 (0 - 4) 96.6%	0 (0 - 1) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =2.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
13	40, 98th percentile value	245 (-31 - 513) 16.1%	77 (-10 - 161) 33.0%	34 (-4 - 69) 41.4%	16 (-2 - 33) 44.8%
13	35, 98th percentile value	245 (-31 - 513) 16.1%	77 (-10 - 161) 33.0%	34 (-4 - 69) 41.4%	16 (-2 - 33) 44.8%
13	30, 98th percentile value	228 (-28 - 476) 21.9%	65 (-8 - 135) 43.5%	26 (-3 - 54) 55.2%	12 (-2 - 25) 58.6%
13	25, 98th percentile value	186 (-23 - 389) 36.3%	39 (-5 - 80) 66.1%	13 (-2 - 27) 77.6%	5 (-1 - 11) 82.8%
13	40, 99th percentile value	197 (-25 - 413) 32.5%	45 (-6 - 94) 60.9%	16 (-2 - 33) 72.4%	7 (-1 - 14) 75.9%
13	35, 99th percentile value	171 (-21 - 358) 41.4%	30 (-4 - 63) 73.9%	10 (-1 - 20) 82.8%	3 (0 - 7) 89.7%
13	30, 99th percentile value	145 (-18 - 302) 50.3%	18 (-2 - 37) 84.3%	5 (-1 - 10) 91.4%	1 (0 - 3) 96.6%
13	25, 99th percentile value	118 (-15 - 247) 59.6%	9 (-1 - 18) 92.2%	2 (0 - 4) 96.6%	0 (0 - 1) 100.0%
12	40, 98th percentile value	222 (-28 - 464) 24.0%	61 (-8 - 126) 47.0%	24 (-3 - 50) 58.6%	11 (-1 - 23) 62.1%
12	35, 98th percentile value	222 (-28 - 464) 24.0%	61 (-8 - 126) 47.0%	24 (-3 - 50) 58.6%	11 (-1 - 23) 62.1%
12	30, 98th percentile value	222 (-28 - 464) 24.0%	61 (-8 - 126) 47.0%	24 (-3 - 50) 58.6%	11 (-1 - 23) 62.1%
12	25, 98th percentile value	186 (-23 - 389) 36.3%	39 (-5 - 80) 66.1%	13 (-2 - 27) 77.6%	5 (-1 - 11) 82.8%
12	40, 99th percentile value	197 (-25 - 413) 32.5%	45 (-6 - 94) 60.9%	16 (-2 - 33) 72.4%	7 (-1 - 14) 75.9%
12	35, 99th percentile value	171 (-21 - 358) 41.4%	30 (-4 - 63) 73.9%	10 (-1 - 20) 82.8%	3 (0 - 7) 89.7%
12	30, 99th percentile value	145 (-18 - 302) 50.3%	18 (-2 - 37) 84.3%	5 (-1 - 10) 91.4%	1 (0 - 3) 96.6%
12	25, 99th percentile value	118 (-15 - 247) 59.6%	9 (-1 - 18) 92.2%	2 (0 - 4) 96.6%	0 (0 - 1) 100.0%

\*This analysis used a C-R function from Moolgavkar (2003).

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.3. Estimated Annual Cardiovascular Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\* Philadelphia, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub>			
		(95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards			
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =15 µg/m <sup>3</sup>	Cutpoint** =20 µg/m <sup>3</sup>
15	65, 98th percentile value***	367 (175 - 560) 0.0%	189 (90 - 288) 0.0%	106 (51 - 162) 0.0%	57 (27 - 87) 0.0%
15	40, 98th percentile value	317 (151 - 482) 13.6%	143 (68 - 218) 24.3%	71 (34 - 107) 33.0%	34 (16 - 51) 40.4%
15	35, 98th percentile value	273 (130 - 416) 25.6%	106 (50 - 161) 43.9%	45 (22 - 69) 57.5%	18 (9 - 28) 68.4%
15	30, 98th percentile value	230 (110 - 350) 37.3%	71 (34 - 108) 62.4%	25 (12 - 38) 76.4%	7 (3 - 11) 87.7%
15	25, 98th percentile value	187 (89 - 284) 49.0%	41 (20 - 63) 78.3%	11 (5 - 16) 89.6%	2 (1 - 3) 96.5%
15	65, 99th percentile value	297 (142 - 451) 19.1%	126 (60 - 191) 33.3%	58 (28 - 89) 45.3%	26 (12 - 40) 54.4%
15	40, 99th percentile value	176 (84 - 268) 52.0%	35 (17 - 53) 81.5%	8 (4 - 12) 92.5%	1 (1 - 2) 98.2%
15	35, 99th percentile value	152 (72 - 231) 58.6%	22 (11 - 34) 88.4%	3 (2 - 5) 97.2%	0 (0 - 1) 100.0%
15	30, 99th percentile value	128 (61 - 195) 65.1%	12 (6 - 19) 93.7%	1 (1 - 2) 99.1%	0 (0 - 0) 100.0%
15	25, 99th percentile value	104 (49 - 158) 71.7%	5 (2 - 8) 97.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	336 (160 - 511) 8.4%	160 (76 - 243) 15.3%	83 (40 - 127) 21.7%	42 (20 - 63) 26.3%
14	35, 98th percentile value	317 (151 - 482) 13.6%	143 (68 - 218) 24.3%	71 (34 - 107) 33.0%	34 (16 - 51) 40.4%
14	30, 98th percentile value	273 (130 - 416) 25.6%	106 (50 - 161) 43.9%	45 (22 - 69) 57.5%	18 (9 - 28) 68.4%
14	25, 98th percentile value	230 (110 - 350) 37.3%	71 (34 - 108) 62.4%	25 (12 - 38) 76.4%	7 (3 - 11) 87.7%
14	40, 99th percentile value	187 (89 - 284) 49.0%	41 (20 - 63) 78.3%	11 (5 - 16) 89.6%	2 (1 - 3) 96.5%
14	35, 99th percentile value	176 (84 - 268) 52.0%	35 (17 - 53) 81.5%	8 (4 - 12) 92.5%	1 (1 - 2) 98.2%
14	30, 99th percentile value	152 (72 - 231) 58.6%	22 (11 - 34) 88.4%	3 (2 - 5) 97.2%	0 (0 - 1) 100.0%
14	25, 99th percentile value	128 (61 - 195) 65.1%	12 (6 - 19) 93.7%	1 (1 - 2) 99.1%	0 (0 - 0) 100.0%
13	40, 98th percentile value	104	5	0	0

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
		(49 - 158) 71.7%	(2 - 8) 97.4%	(0 - 0) 100.0%	(0 - 0) 100.0%
13	35, 98th percentile value	304 (145 - 462) 17.2%	132 (63 - 200) 30.2%	62 (30 - 95) 41.5%	29 (14 - 44) 49.1%
13	30, 98th percentile value	273 (130 - 416) 25.6%	106 (50 - 161) 43.9%	45 (22 - 69) 57.5%	18 (9 - 28) 68.4%
13	25, 98th percentile value	230 (110 - 350) 37.3%	71 (34 - 108) 62.4%	25 (12 - 38) 76.4%	7 (3 - 11) 87.7%
13	40, 99th percentile value	187 (89 - 284) 49.0%	41 (20 - 63) 78.3%	11 (5 - 16) 89.6%	2 (1 - 3) 96.5%
13	35, 99th percentile value	176 (84 - 268) 52.0%	35 (17 - 53) 81.5%	8 (4 - 12) 92.5%	1 (1 - 2) 98.2%
13	30, 99th percentile value	152 (72 - 231) 58.6%	22 (11 - 34) 88.4%	3 (2 - 5) 97.2%	0 (0 - 1) 100.0%
13	25, 99th percentile value	128 (61 - 195) 65.1%	12 (6 - 19) 93.7%	1 (1 - 2) 99.1%	0 (0 - 0) 100.0%
12	40, 98th percentile value	104 (49 - 158) 71.7%	5 (2 - 8) 97.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	272 (130 - 414) 25.9%	104 (50 - 159) 45.0%	44 (21 - 68) 58.5%	18 (9 - 27) 68.4%
12	30, 98th percentile value	272 (130 - 414) 25.9%	104 (50 - 159) 45.0%	44 (21 - 68) 58.5%	18 (9 - 27) 68.4%
12	25, 98th percentile value	230 (110 - 350) 37.3%	71 (34 - 108) 62.4%	25 (12 - 38) 76.4%	7 (3 - 11) 87.7%
12	40, 99th percentile value	187 (89 - 284) 49.0%	41 (20 - 63) 78.3%	11 (5 - 16) 89.6%	2 (1 - 3) 96.5%
12	35, 99th percentile value	176 (84 - 268) 52.0%	35 (17 - 53) 81.5%	8 (4 - 12) 92.5%	1 (1 - 2) 98.2%
12	30, 99th percentile value	152 (72 - 231) 58.6%	22 (11 - 34) 88.4%	3 (2 - 5) 97.2%	0 (0 - 1) 100.0%
12	25, 99th percentile value	128 (61 - 195) 65.1%	12 (6 - 19) 93.7%	1 (1 - 2) 99.1%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Lipfert et al. (2000).

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.4. Estimated Annual Cardiovascular Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**Phoenix, AZ, 2001**

**(2001 As Is Levels = 10.4 ug/m3 Annual Average; 28.9 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub>			
		(95% Confidence Interval)			
		Percent Reduction in Incidence from As Is Levels			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =2.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
15	65, 98th percentile value***	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
15	40, 98th percentile value	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
15	35, 98th percentile value	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
15	30, 98th percentile value	272 (82 - 449) 15.8%	78 (24 - 127) 32.2%	40 (13 - 64) 40.3%	22 (7 - 35) 48.8%
15	25, 98th percentile value	221 (67 - 363) 31.6%	48 (15 - 76) 58.3%	21 (7 - 33) 68.7%	8 (3 - 12) 81.4%
15	65, 99th percentile value	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
15	40, 99th percentile value	314 (94 - 521) 2.8%	109 (33 - 178) 5.2%	62 (19 - 101) 7.5%	39 (12 - 63) 9.3%
15	35, 99th percentile value	271 (82 - 447) 16.1%	78 (24 - 126) 32.2%	40 (13 - 64) 40.3%	22 (7 - 34) 48.8%
15	30, 99th percentile value	228 (69 - 375) 29.4%	52 (16 - 82) 54.8%	24 (8 - 37) 64.2%	10 (3 - 15) 76.7%
15	25, 99th percentile value	185 (56 - 304) 42.7%	30 (10 - 46) 73.9%	11 (4 - 16) 83.6%	4 (2 - 6) 90.7%
14	40, 98th percentile value	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
14	35, 98th percentile value	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
14	30, 98th percentile value	272 (82 - 449) 15.8%	78 (24 - 127) 32.2%	40 (13 - 64) 40.3%	22 (7 - 35) 48.8%
14	25, 98th percentile value	221 (67 - 363) 31.6%	48 (15 - 76) 58.3%	21 (7 - 33) 68.7%	8 (3 - 12) 81.4%
14	40, 99th percentile value	314 (94 - 521) 2.8%	109 (33 - 178) 5.2%	62 (19 - 101) 7.5%	39 (12 - 63) 9.3%
14	35, 99th percentile value	271 (82 - 447) 16.1%	78 (24 - 126) 32.2%	40 (13 - 64) 40.3%	22 (7 - 34) 48.8%
14	30, 99th percentile value	228 (69 - 375) 29.4%	52 (16 - 82) 54.8%	24 (8 - 37) 64.2%	10 (3 - 15) 76.7%
14	25, 99th percentile value	185 (56 - 304) 42.7%	30 (10 - 46) 73.9%	11 (4 - 16) 83.6%	4 (2 - 6) 90.7%
13	40, 98th percentile value	323	115	67	43

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)			
		Percent Reduction in Incidence from As Is Levels			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =2.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
		(97 - 536) 0.0%	(35 - 190) 0.0%	(21 - 109) 0.0%	(13 - 69) 0.0%
13	35, 98th percentile value	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
13	30, 98th percentile value	272 (82 - 449) 15.8%	78 (24 - 127) 32.2%	40 (13 - 64) 40.3%	22 (7 - 35) 48.8%
13	25, 98th percentile value	221 (67 - 363) 31.6%	48 (15 - 76) 58.3%	21 (7 - 33) 68.7%	8 (3 - 12) 81.4%
13	40, 99th percentile value	314 (94 - 521) 2.8%	109 (33 - 178) 5.2%	62 (19 - 101) 7.5%	39 (12 - 63) 9.3%
13	35, 99th percentile value	271 (82 - 447) 16.1%	78 (24 - 126) 32.2%	40 (13 - 64) 40.3%	22 (7 - 34) 48.8%
13	30, 99th percentile value	228 (69 - 375) 29.4%	52 (16 - 82) 54.8%	24 (8 - 37) 64.2%	10 (3 - 15) 76.7%
13	25, 99th percentile value	185 (56 - 304) 42.7%	30 (10 - 46) 73.9%	11 (4 - 16) 83.6%	4 (2 - 6) 90.7%
12	40, 98th percentile value	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
12	35, 98th percentile value	323 (97 - 536) 0.0%	115 (35 - 190) 0.0%	67 (21 - 109) 0.0%	43 (13 - 69) 0.0%
12	30, 98th percentile value	272 (82 - 449) 15.8%	78 (24 - 127) 32.2%	40 (13 - 64) 40.3%	22 (7 - 35) 48.8%
12	25, 98th percentile value	221 (67 - 363) 31.6%	48 (15 - 76) 58.3%	21 (7 - 33) 68.7%	8 (3 - 12) 81.4%
12	40, 99th percentile value	314 (94 - 521) 2.8%	109 (33 - 178) 5.2%	62 (19 - 101) 7.5%	39 (12 - 63) 9.3%
12	35, 99th percentile value	271 (82 - 447) 16.1%	78 (24 - 126) 32.2%	40 (13 - 64) 40.3%	22 (7 - 34) 48.8%
12	30, 99th percentile value	228 (69 - 375) 29.4%	52 (16 - 82) 54.8%	24 (8 - 37) 64.2%	10 (3 - 15) 76.7%
12	25, 99th percentile value	185 (56 - 304) 42.7%	30 (10 - 46) 73.9%	11 (4 - 16) 83.6%	4 (2 - 6) 90.7%

\*This analysis used a C-R function from Mar et al. (2003), 1-day lag model.

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.5. Estimated Annual Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Pittsburgh, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub>			
		(95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards			
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =15 µg/m <sup>3</sup>	Cutpoint** =20 µg/m <sup>3</sup>
15	65, 98th percentile value***	50 (-108 - 200) 0.0%	22 (-48 - 87) 0.0%	10 (-23 - 41) 0.0%	5 (-11 - 18) 0.0%
15	40, 98th percentile value	47 (-102 - 189) 6.0%	19 (-43 - 77) 13.6%	9 (-19 - 34) 10.0%	4 (-9 - 15) 20.0%
15	35, 98th percentile value	41 (-88 - 162) 18.0%	14 (-31 - 56) 36.4%	5 (-12 - 21) 50.0%	2 (-5 - 8) 60.0%
15	30, 98th percentile value	34 (-74 - 136) 32.0%	9 (-21 - 37) 59.1%	3 (-6 - 11) 70.0%	1 (-2 - 4) 80.0%
15	25, 98th percentile value	28 (-60 - 110) 44.0%	5 (-12 - 20) 77.3%	1 (-3 - 5) 90.0%	0 (-1 - 2) 100.0%
15	65, 99th percentile value	50 (-108 - 200) 0.0%	22 (-48 - 87) 0.0%	10 (-23 - 41) 0.0%	5 (-11 - 18) 0.0%
15	40, 99th percentile value	42 (-92 - 168) 16.0%	15 (-34 - 61) 31.8%	6 (-13 - 24) 40.0%	3 (-6 - 10) 40.0%
15	35, 99th percentile value	36 (-79 - 145) 28.0%	11 (-24 - 43) 50.0%	4 (-8 - 14) 60.0%	1 (-3 - 5) 80.0%
15	30, 99th percentile value	31 (-67 - 122) 38.0%	7 (-15 - 27) 68.2%	2 (-4 - 7) 80.0%	1 (-2 - 3) 80.0%
15	25, 99th percentile value	25 (-54 - 99) 50.0%	4 (-8 - 14) 81.8%	1 (-2 - 3) 90.0%	0 (-1 - 1) 100.0%
14	40, 98th percentile value	46 (-99 - 182) 8.0%	18 (-40 - 72) 18.2%	8 (-17 - 31) 20.0%	3 (-8 - 13) 40.0%
14	35, 98th percentile value	41 (-88 - 162) 18.0%	14 (-31 - 56) 36.4%	5 (-12 - 21) 50.0%	2 (-5 - 8) 60.0%
14	30, 98th percentile value	34 (-74 - 136) 32.0%	9 (-21 - 37) 59.1%	3 (-6 - 11) 70.0%	1 (-2 - 4) 80.0%
14	25, 98th percentile value	28 (-60 - 110) 44.0%	5 (-12 - 20) 77.3%	1 (-3 - 5) 90.0%	0 (-1 - 2) 100.0%
14	40, 99th percentile value	42 (-92 - 168) 16.0%	15 (-34 - 61) 31.8%	6 (-13 - 24) 40.0%	3 (-6 - 10) 40.0%
14	35, 99th percentile value	36 (-79 - 145) 28.0%	11 (-24 - 43) 50.0%	4 (-8 - 14) 60.0%	1 (-3 - 5) 80.0%
14	30, 99th percentile value	31 (-67 - 122) 38.0%	7 (-15 - 27) 68.2%	2 (-4 - 7) 80.0%	1 (-2 - 3) 80.0%
14	25, 99th percentile value	25 (-54 - 99) 50.0%	4 (-8 - 14) 81.8%	1 (-2 - 3) 90.0%	0 (-1 - 1) 100.0%
13	40, 98th percentile value	41	15	6	2

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
		(-90 - 165) 18.0%	(-32 - 58) 31.8%	(-13 - 22) 40.0%	(-5 - 9) 60.0%
13	35, 98th percentile value	41 (-88 - 162) 18.0%	14 (-31 - 56) 36.4%	5 (-12 - 21) 50.0%	2 (-5 - 8) 60.0%
13	30, 98th percentile value	34 (-74 - 136) 32.0%	9 (-21 - 37) 59.1%	3 (-6 - 11) 70.0%	1 (-2 - 4) 80.0%
13	25, 98th percentile value	28 (-60 - 110) 44.0%	5 (-12 - 20) 77.3%	1 (-3 - 5) 90.0%	0 (-1 - 2) 100.0%
13	40, 99th percentile value	41 (-90 - 165) 18.0%	15 (-32 - 58) 31.8%	6 (-13 - 22) 40.0%	2 (-5 - 9) 60.0%
13	35, 99th percentile value	36 (-79 - 145) 28.0%	11 (-24 - 43) 50.0%	4 (-8 - 14) 60.0%	1 (-3 - 5) 80.0%
13	30, 99th percentile value	31 (-67 - 122) 38.0%	7 (-15 - 27) 68.2%	2 (-4 - 7) 80.0%	1 (-2 - 3) 80.0%
13	25, 99th percentile value	25 (-54 - 99) 50.0%	4 (-8 - 14) 81.8%	1 (-2 - 3) 90.0%	0 (-1 - 1) 100.0%
12	40, 98th percentile value	37 (-80 - 147) 26.0%	11 (-25 - 44) 50.0%	4 (-8 - 15) 60.0%	1 (-3 - 6) 80.0%
12	35, 98th percentile value	37 (-80 - 147) 26.0%	11 (-25 - 44) 50.0%	4 (-8 - 15) 60.0%	1 (-3 - 6) 80.0%
12	30, 98th percentile value	34 (-74 - 136) 32.0%	9 (-21 - 37) 59.1%	3 (-6 - 11) 70.0%	1 (-2 - 4) 80.0%
12	25, 98th percentile value	28 (-60 - 110) 44.0%	5 (-12 - 20) 77.3%	1 (-3 - 5) 90.0%	0 (-1 - 2) 100.0%
12	40, 99th percentile value	37 (-80 - 147) 26.0%	11 (-25 - 44) 50.0%	4 (-8 - 15) 60.0%	1 (-3 - 6) 80.0%
12	35, 99th percentile value	36 (-79 - 145) 28.0%	11 (-24 - 43) 50.0%	4 (-8 - 14) 60.0%	1 (-3 - 5) 80.0%
12	30, 99th percentile value	31 (-67 - 122) 38.0%	7 (-15 - 27) 68.2%	2 (-4 - 7) 80.0%	1 (-2 - 3) 80.0%
12	25, 99th percentile value	25 (-54 - 99) 50.0%	4 (-8 - 14) 81.8%	1 (-2 - 3) 90.0%	0 (-1 - 1) 100.0%

\*This analysis used a C-R function from Chock et al. (2000), age 75+ model.

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.6. Estimated Annual Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**San Jose, CA, 2003**

(2003 As Is Levels = 11.1 ug/m3 Annual Average; 37.6 ug/m3 98th Percentile Daily Value)

Alternative Standards		Incidence Associated with PM <sub>2.5</sub>			
		(95% Confidence Interval)			
		Percent Reduction in Incidence from As Is Levels			
Annual (ug/m3)	Daily (ug/m3)	Policy Relevant Background =2.5 ug/m3	Cutpoint** =10 ug/m3	Cutpoint** =15 ug/m3	Cutpoint** =20 ug/m3
15	65, 98th percentile value***	218 (45 - 387) 0.0%	80 (17 - 141) 0.0%	44 (9 - 77) 0.0%	28 (6 - 50) 0.0%
15	40, 98th percentile value	183 (38 - 324) 16.1%	55 (11 - 96) 31.3%	29 (6 - 50) 34.1%	17 (3 - 29) 39.3%
15	35, 98th percentile value	158 (33 - 279) 27.5%	39 (8 - 68) 51.3%	20 (4 - 34) 54.5%	10 (2 - 17) 64.3%
15	30, 98th percentile value	134 (28 - 235) 38.5%	26 (6 - 45) 67.5%	12 (3 - 20) 72.7%	5 (1 - 8) 82.1%
15	25, 98th percentile value	109 (23 - 191) 50.0%	16 (3 - 27) 80.0%	6 (1 - 10) 86.4%	1 (0 - 2) 96.4%
15	65, 99th percentile value	218 (45 - 387) 0.0%	80 (17 - 141) 0.0%	44 (9 - 77) 0.0%	28 (6 - 50) 0.0%
15	40, 99th percentile value	161 (33 - 284) 26.1%	41 (9 - 71) 48.8%	21 (4 - 36) 52.3%	11 (2 - 18) 60.7%
15	35, 99th percentile value	139 (29 - 245) 36.2%	29 (6 - 50) 63.8%	13 (3 - 23) 70.5%	6 (1 - 10) 78.6%
15	30, 99th percentile value	118 (24 - 207) 45.9%	19 (4 - 33) 76.3%	8 (2 - 13) 81.8%	2 (0 - 4) 92.9%
15	25, 99th percentile value	96 (20 - 168) 56.0%	11 (2 - 20) 86.3%	3 (1 - 6) 93.2%	1 (0 - 1) 96.4%
14	40, 98th percentile value	183 (38 - 324) 16.1%	55 (11 - 96) 31.3%	29 (6 - 50) 34.1%	17 (3 - 29) 39.3%
14	35, 98th percentile value	158 (33 - 279) 27.5%	39 (8 - 68) 51.3%	20 (4 - 34) 54.5%	10 (2 - 17) 64.3%
14	30, 98th percentile value	134 (28 - 235) 38.5%	26 (6 - 45) 67.5%	12 (3 - 20) 72.7%	5 (1 - 8) 82.1%
14	25, 98th percentile value	109 (23 - 191) 50.0%	16 (3 - 27) 80.0%	6 (1 - 10) 86.4%	1 (0 - 2) 96.4%
14	40, 99th percentile value	161 (33 - 284) 26.1%	41 (9 - 71) 48.8%	21 (4 - 36) 52.3%	11 (2 - 18) 60.7%
14	35, 99th percentile value	139 (29 - 245) 36.2%	29 (6 - 50) 63.8%	13 (3 - 23) 70.5%	6 (1 - 10) 78.6%
14	30, 99th percentile value	118 (24 - 207) 45.9%	19 (4 - 33) 76.3%	8 (2 - 13) 81.8%	2 (0 - 4) 92.9%
14	25, 99th percentile value	96 (20 - 168) 56.0%	11 (2 - 20) 86.3%	3 (1 - 6) 93.2%	1 (0 - 1) 96.4%
13	40, 98th percentile value	183	55	29	17

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)			
		Percent Reduction in Incidence from As Is Levels			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =2.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
		(38 - 324) 16.1%	(11 - 96) 31.3%	(6 - 50) 34.1%	(3 - 29) 39.3%
13	35, 98th percentile value	158 (33 - 279) 27.5%	39 (8 - 68) 51.3%	20 (4 - 34) 54.5%	10 (2 - 17) 64.3%
13	30, 98th percentile value	134 (28 - 235) 38.5%	26 (6 - 45) 67.5%	12 (3 - 20) 72.7%	5 (1 - 8) 82.1%
13	25, 98th percentile value	109 (23 - 191) 50.0%	16 (3 - 27) 80.0%	6 (1 - 10) 86.4%	1 (0 - 2) 96.4%
13	40, 99th percentile value	161 (33 - 284) 26.1%	41 (9 - 71) 48.8%	21 (4 - 36) 52.3%	11 (2 - 18) 60.7%
13	35, 99th percentile value	139 (29 - 245) 36.2%	29 (6 - 50) 63.8%	13 (3 - 23) 70.5%	6 (1 - 10) 78.6%
13	30, 99th percentile value	118 (24 - 207) 45.9%	19 (4 - 33) 76.3%	8 (2 - 13) 81.8%	2 (0 - 4) 92.9%
13	25, 99th percentile value	96 (20 - 168) 56.0%	11 (2 - 20) 86.3%	3 (1 - 6) 93.2%	1 (0 - 1) 96.4%
12	40, 98th percentile value	171 (35 - 301) 21.6%	47 (10 - 81) 41.3%	24 (5 - 41) 45.5%	13 (3 - 22) 53.6%
12	35, 98th percentile value	158 (33 - 279) 27.5%	39 (8 - 68) 51.3%	20 (4 - 34) 54.5%	10 (2 - 17) 64.3%
12	30, 98th percentile value	134 (28 - 235) 38.5%	26 (6 - 45) 67.5%	12 (3 - 20) 72.7%	5 (1 - 8) 82.1%
12	25, 98th percentile value	109 (23 - 191) 50.0%	16 (3 - 27) 80.0%	6 (1 - 10) 86.4%	1 (0 - 2) 96.4%
12	40, 99th percentile value	161 (33 - 284) 26.1%	41 (9 - 71) 48.8%	21 (4 - 36) 52.3%	11 (2 - 18) 60.7%
12	35, 99th percentile value	139 (29 - 245) 36.2%	29 (6 - 50) 63.8%	13 (3 - 23) 70.5%	6 (1 - 10) 78.6%
12	30, 99th percentile value	118 (24 - 207) 45.9%	19 (4 - 33) 76.3%	8 (2 - 13) 81.8%	2 (0 - 4) 92.9%
12	25, 99th percentile value	96 (20 - 168) 56.0%	11 (2 - 20) 86.3%	3 (1 - 6) 93.2%	1 (0 - 1) 96.4%

\*This analysis used a C-R function from Fairley (2003).

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.7. Estimated Annual Hospital Admissions for Asthma (Age < 65) Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**Seattle, WA, 2003**

(2003 As Is Levels = 8.3 ug/m3 Annual Average; 21.7 ug/m3 98th Percentile Daily Value)

Alternative Standards		Incidence Associated with PM <sub>2.5</sub>			
		(95% Confidence Interval)			
		Percent Reduction in Incidence from As Is Levels			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =2.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
15	65, 98th percentile value***	30 (8 - 45) 0.0%	7 (2 - 11) 0.0%	3 (1 - 4) 0.0%	1 (0 - 1) 0.0%
15	40, 98th percentile value	29 (8 - 43) 3.3%	7 (2 - 10) 0.0%	2 (1 - 3) 33.3%	0 (0 - 1) 100.0%
15	35, 98th percentile value	25 (7 - 37) 16.7%	4 (1 - 7) 42.9%	1 (0 - 2) 66.7%	0 (0 - 0) 100.0%
15	30, 98th percentile value	21 (6 - 32) 30.0%	3 (1 - 4) 57.1%	0 (0 - 1) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	18 (5 - 26) 40.0%	1 (0 - 2) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	30 (8 - 45) 0.0%	7 (2 - 11) 0.0%	3 (1 - 4) 0.0%	1 (0 - 1) 0.0%
15	40, 99th percentile value	25 (6 - 37) 16.7%	4 (1 - 6) 42.9%	1 (0 - 2) 66.7%	0 (0 - 0) 100.0%
15	35, 99th percentile value	21 (6 - 32) 30.0%	3 (1 - 4) 57.1%	0 (0 - 1) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	18 (5 - 27) 40.0%	1 (0 - 2) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	15 (4 - 22) 50.0%	1 (0 - 1) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	29 (8 - 43) 3.3%	7 (2 - 10) 0.0%	2 (1 - 3) 33.3%	0 (0 - 1) 100.0%
14	35, 98th percentile value	25 (7 - 37) 16.7%	4 (1 - 7) 42.9%	1 (0 - 2) 66.7%	0 (0 - 0) 100.0%
14	30, 98th percentile value	21 (6 - 32) 30.0%	3 (1 - 4) 57.1%	0 (0 - 1) 100.0%	0 (0 - 0) 100.0%
14	25, 98th percentile value	18 (5 - 26) 40.0%	1 (0 - 2) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	25 (6 - 37) 16.7%	4 (1 - 6) 42.9%	1 (0 - 2) 66.7%	0 (0 - 0) 100.0%
14	35, 99th percentile value	21 (6 - 32) 30.0%	3 (1 - 4) 57.1%	0 (0 - 1) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	18 (5 - 27) 40.0%	1 (0 - 2) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 99th percentile value	15 (4 - 22) 50.0%	1 (0 - 1) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	29	7	2	0

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)			
		Percent Reduction in Incidence from As Is Levels			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =2.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
		(8 - 43) 3.3%	(2 - 10) 0.0%	(1 - 3) 33.3%	(0 - 1) 100.0%
13	35, 98th percentile value	25 (7 - 37) 16.7%	4 (1 - 7) 42.9%	1 (0 - 2) 66.7%	0 (0 - 0) 100.0%
13	30, 98th percentile value	21 (6 - 32) 30.0%	3 (1 - 4) 57.1%	0 (0 - 1) 100.0%	0 (0 - 0) 100.0%
13	25, 98th percentile value	18 (5 - 26) 40.0%	1 (0 - 2) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	25 (6 - 37) 16.7%	4 (1 - 6) 42.9%	1 (0 - 2) 66.7%	0 (0 - 0) 100.0%
13	35, 99th percentile value	21 (6 - 32) 30.0%	3 (1 - 4) 57.1%	0 (0 - 1) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	18 (5 - 27) 40.0%	1 (0 - 2) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	15 (4 - 22) 50.0%	1 (0 - 1) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	29 (8 - 43) 3.3%	7 (2 - 10) 0.0%	2 (1 - 3) 33.3%	0 (0 - 1) 100.0%
12	35, 98th percentile value	25 (7 - 37) 16.7%	4 (1 - 7) 42.9%	1 (0 - 2) 66.7%	0 (0 - 0) 100.0%
12	30, 98th percentile value	21 (6 - 32) 30.0%	3 (1 - 4) 57.1%	0 (0 - 1) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	18 (5 - 26) 40.0%	1 (0 - 2) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	25 (6 - 37) 16.7%	4 (1 - 6) 42.9%	1 (0 - 2) 66.7%	0 (0 - 0) 100.0%
12	35, 99th percentile value	21 (6 - 32) 30.0%	3 (1 - 4) 57.1%	0 (0 - 1) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	18 (5 - 27) 40.0%	1 (0 - 2) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	15 (4 - 22) 50.0%	1 (0 - 1) 85.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Sheppard (2003).

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.8. Estimated Annual Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
St. Louis, MO, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards			
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =15 µg/m <sup>3</sup>	Cutpoint** =20 µg/m <sup>3</sup>
15	65, 98th percentile value***	191 (70 - 311) 0.0%	75 (28 - 122) 0.0%	29 (11 - 46) 0.0%	9 (3 - 14) 0.0%
15	40, 98th percentile value	191 (70 - 311) 0.0%	75 (28 - 122) 0.0%	29 (11 - 46) 0.0%	9 (3 - 14) 0.0%
15	35, 98th percentile value	190 (70 - 310) 0.5%	75 (27 - 121) 0.0%	28 (10 - 46) 3.4%	8 (3 - 14) 11.1%
15	30, 98th percentile value	160 (59 - 260) 16.2%	49 (18 - 80) 34.7%	14 (5 - 23) 51.7%	3 (1 - 4) 66.7%
15	25, 98th percentile value	130 (48 - 211) 31.9%	28 (10 - 45) 62.7%	5 (2 - 8) 82.8%	1 (0 - 1) 88.9%
15	65, 99th percentile value	191 (70 - 311) 0.0%	75 (28 - 122) 0.0%	29 (11 - 46) 0.0%	9 (3 - 14) 0.0%
15	40, 99th percentile value	191 (70 - 311) 0.0%	75 (28 - 122) 0.0%	29 (11 - 46) 0.0%	9 (3 - 14) 0.0%
15	35, 99th percentile value	172 (63 - 280) 9.9%	59 (22 - 96) 21.3%	19 (7 - 31) 34.5%	5 (2 - 7) 44.4%
15	30, 99th percentile value	145 (53 - 235) 24.1%	38 (14 - 62) 49.3%	9 (3 - 14) 69.0%	2 (1 - 3) 77.8%
15	25, 99th percentile value	118 (43 - 191) 38.2%	20 (7 - 33) 73.3%	3 (1 - 4) 89.7%	0 (0 - 1) 100.0%
14	40, 98th percentile value	175 (64 - 284) 8.4%	61 (22 - 99) 18.7%	20 (7 - 33) 31.0%	5 (2 - 8) 44.4%
14	35, 98th percentile value	175 (64 - 284) 8.4%	61 (22 - 99) 18.7%	20 (7 - 33) 31.0%	5 (2 - 8) 44.4%
14	30, 98th percentile value	160 (59 - 260) 16.2%	49 (18 - 80) 34.7%	14 (5 - 23) 51.7%	3 (1 - 4) 66.7%
14	25, 98th percentile value	130 (48 - 211) 31.9%	28 (10 - 45) 62.7%	5 (2 - 8) 82.8%	1 (0 - 1) 88.9%
14	40, 99th percentile value	175 (64 - 284) 8.4%	61 (22 - 99) 18.7%	20 (7 - 33) 31.0%	5 (2 - 8) 44.4%
14	35, 99th percentile value	172 (63 - 280) 9.9%	59 (22 - 96) 21.3%	19 (7 - 31) 34.5%	5 (2 - 7) 44.4%
14	30, 99th percentile value	145 (53 - 235) 24.1%	38 (14 - 62) 49.3%	9 (3 - 14) 69.0%	2 (1 - 3) 77.8%
14	25, 99th percentile value	118 (43 - 191) 38.2%	20 (7 - 33) 73.3%	3 (1 - 4) 89.7%	0 (0 - 1) 100.0%
13	40, 98th percentile value	158	47	13	3

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
		(58 - 256) 17.3%	(17 - 77) 37.3%	(5 - 21) 55.2%	(1 - 4) 66.7%
13	35, 98th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%
13	30, 98th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%
13	25, 98th percentile value	130 (48 - 211) 31.9%	28 (10 - 45) 62.7%	5 (2 - 8) 82.8%	1 (0 - 1) 88.9%
13	40, 99th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%
13	35, 99th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%
13	30, 99th percentile value	145 (53 - 235) 24.1%	38 (14 - 62) 49.3%	9 (3 - 14) 69.0%	2 (1 - 3) 77.8%
13	25, 99th percentile value	118 (43 - 191) 38.2%	20 (7 - 33) 73.3%	3 (1 - 4) 89.7%	0 (0 - 1) 100.0%
12	40, 98th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%
12	35, 98th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%
12	30, 98th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%
12	25, 98th percentile value	130 (48 - 211) 31.9%	28 (10 - 45) 62.7%	5 (2 - 8) 82.8%	1 (0 - 1) 88.9%
12	40, 99th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%
12	35, 99th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%
12	30, 99th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%
12	25, 99th percentile value	118 (43 - 191) 38.2%	20 (7 - 33) 73.3%	3 (1 - 4) 89.7%	0 (0 - 1) 100.0%

\*This analysis was performed using Schwartz (2003b).

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.9. Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**Boston, MA, 2003**

**(2003 As Is Levels = 12.1 ug/m3 Annual Average; 34.1 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	594 (204 - 1053) 0.0%	309 (106 - 551) 0.0%	20 (7 - 36) 0.0%
15	40, 98th percentile value	484 (166 - 855) 18.5%	185 (63 - 328) 40.1%	0 (0 - 0) 100.0%
15	35, 98th percentile value	346 (119 - 611) 41.8%	30 (10 - 53) 90.3%	0 (0 - 0) 100.0%
15	30, 98th percentile value	209 (72 - 368) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	73 (25 - 129) 87.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	594 (204 - 1053) 0.0%	309 (106 - 551) 0.0%	20 (7 - 36) 0.0%
15	40, 99th percentile value	200 (69 - 352) 66.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	103 (35 - 180) 82.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	6 (2 - 10) 99.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	484 (166 - 855) 18.5%	185 (63 - 328) 40.1%	0 (0 - 0) 100.0%
14	35, 98th percentile value	346 (119 - 611) 41.8%	30 (10 - 53) 90.3%	0 (0 - 0) 100.0%
14	30, 98th percentile value	209 (72 - 368) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 98th percentile value	73 (25 - 129) 87.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	200 (69 - 352) 66.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	103 (35 - 180) 82.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	30, 99th percentile value	6 (2 - 10) 99.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	451 (155 - 796) 24.1%	147 (50 - 262) 52.4%	0 (0 - 0) 100.0%
13	35, 98th percentile value	346 (119 - 611) 41.8%	30 (10 - 53) 90.3%	0 (0 - 0) 100.0%
13	30, 98th percentile value	209 (72 - 368) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 98th percentile value	73 (25 - 129) 87.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	200 (69 - 352) 66.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	103 (35 - 180) 82.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	6 (2 - 10) 99.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	348 (120 - 615) 41.4%	33 (11 - 58) 89.3%	0 (0 - 0) 100.0%
12	35, 98th percentile value	346 (119 - 611) 41.8%	30 (10 - 53) 90.3%	0 (0 - 0) 100.0%
12	30, 98th percentile value	209 (72 - 368) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	73 (25 - 129) 87.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	200 (69 - 352) 66.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	103 (35 - 180) 82.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	6 (2 - 10) 99.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.10. Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Los Angeles, CA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	1507 (531 - 2587) 0.0%	823 (290 - 1415) 0.0%	138 (48 - 237) 0.0%
15	40, 98th percentile value	1507 (531 - 2587) 0.0%	823 (290 - 1415) 0.0%	138 (48 - 237) 0.0%
15	35, 98th percentile value	1265 (446 - 2168) 16.1%	553 (195 - 949) 32.8%	0 (0 - 0) 100.0%
15	30, 98th percentile value	829 (293 - 1416) 45.0%	65 (23 - 111) 92.1%	0 (0 - 0) 100.0%
15	25, 98th percentile value	396 (140 - 675) 73.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	1507 (531 - 2587) 0.0%	823 (290 - 1415) 0.0%	138 (48 - 237) 0.0%
15	40, 99th percentile value	514 (182 - 876) 65.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	240 (85 - 408) 84.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	1259 (444 - 2158) 16.5%	546 (192 - 937) 33.7%	0 (0 - 0) 100.0%
14	35, 98th percentile value	1259 (444 - 2158) 16.5%	546 (192 - 937) 33.7%	0 (0 - 0) 100.0%
14	30, 98th percentile value	829 (293 - 1416) 45.0%	65 (23 - 111) 92.1%	0 (0 - 0) 100.0%
14	25, 98th percentile value	396 (140 - 675) 73.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	514 (182 - 876) 65.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	240 (85 - 408) 84.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	1013 (358 - 1732) 32.8%	270 (95 - 463) 67.2%	0 (0 - 0) 100.0%
13	35, 98th percentile value	1013 (358 - 1732) 32.8%	270 (95 - 463) 67.2%	0 (0 - 0) 100.0%
13	30, 98th percentile value	829 (293 - 1416) 45.0%	65 (23 - 111) 92.1%	0 (0 - 0) 100.0%
13	25, 98th percentile value	396 (140 - 675) 73.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	514 (182 - 876) 65.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	240 (85 - 408) 84.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	767 (271 - 1310) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	767 (271 - 1310) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	767 (271 - 1310) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	396 (140 - 675) 73.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	514 (182 - 876) 65.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	240 (85 - 408) 84.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.11. Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\* Philadelphia, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	536 (185 - 943) 0.0%	338 (116 - 597) 0.0%	137 (47 - 244) 0.0%
15	40, 98th percentile value	408 (141 - 716) 23.9%	194 (67 - 341) 42.6%	0 (0 - 0) 100.0%
15	35, 98th percentile value	299 (104 - 524) 44.2%	72 (25 - 126) 78.7%	0 (0 - 0) 100.0%
15	30, 98th percentile value	191 (67 - 334) 64.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	84 (29 - 146) 84.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	357 (124 - 626) 33.4%	137 (47 - 241) 59.5%	0 (0 - 0) 100.0%
15	40, 99th percentile value	58 (20 - 101) 89.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	456 (157 - 799) 14.9%	247 (85 - 435) 26.9%	37 (13 - 65) 73.0%
14	35, 98th percentile value	408 (141 - 716) 23.9%	194 (67 - 341) 42.6%	0 (0 - 0) 100.0%
14	30, 98th percentile value	299 (104 - 524) 44.2%	72 (25 - 126) 78.7%	0 (0 - 0) 100.0%
14	25, 98th percentile value	191 (67 - 334) 64.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	84 (29 - 146) 84.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	58 (20 - 101) 89.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 98th percentile value	375 (130 - 657) 30.0%	157 (54 - 276) 53.6%	0 (0 - 0) 100.0%
13	30, 98th percentile value	299 (104 - 524) 44.2%	72 (25 - 126) 78.7%	0 (0 - 0) 100.0%
13	25, 98th percentile value	191 (67 - 334) 64.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	84 (29 - 146) 84.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	58 (20 - 101) 89.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	295 (102 - 516) 45.0%	67 (23 - 118) 80.2%	0 (0 - 0) 100.0%
12	30, 98th percentile value	295 (102 - 516) 45.0%	67 (23 - 118) 80.2%	0 (0 - 0) 100.0%
12	25, 98th percentile value	191 (67 - 334) 64.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	84 (29 - 146) 84.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	58 (20 - 101) 89.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.12. Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\* Phoenix, AZ, 2001 (2001 As Is Levels = 10.4 ug/m3 Annual Average; 28.9 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
15	40, 98th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
15	35, 98th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
15	30, 98th percentile value	202 (69 - 358) 42.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 98th percentile value	56 (19 - 100) 84.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	65, 99th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
15	40, 99th percentile value	324 (111 - 576) 7.2%	27 (9 - 48) 50.9%	0 (0 - 0) ---
15	35, 99th percentile value	200 (69 - 355) 42.7%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 99th percentile value	77 (26 - 136) 77.9%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 98th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
14	35, 98th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
14	30, 98th percentile value	202 (69 - 358) 42.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	25, 98th percentile value	56 (19 - 100) 84.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 99th percentile value	324 (111 - 576) 7.2%	27 (9 - 48) 50.9%	0 (0 - 0) ---
14	35, 99th percentile value	200 (69 - 355) 42.7%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	30, 99th percentile value	77 (26 - 136) 77.9%	0 (0 - 0) 100.0%	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 98th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
13	35, 98th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
13	30, 98th percentile value	202 (69 - 358) 42.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 98th percentile value	56 (19 - 100) 84.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 99th percentile value	324 (111 - 576) 7.2%	27 (9 - 48) 50.9%	0 (0 - 0) ---
13	35, 99th percentile value	200 (69 - 355) 42.7%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 99th percentile value	77 (26 - 136) 77.9%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 98th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
12	35, 98th percentile value	349 (119 - 620) 0.0%	55 (19 - 98) 0.0%	0 (0 - 0) ---
12	30, 98th percentile value	202 (69 - 358) 42.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 98th percentile value	56 (19 - 100) 84.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 99th percentile value	324 (111 - 576) 7.2%	27 (9 - 48) 50.9%	0 (0 - 0) ---
12	35, 99th percentile value	200 (69 - 355) 42.7%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 99th percentile value	77 (26 - 136) 77.9%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.13. Estimated Annual Mortality Associated with Long-Term Exposure to PM2.5 When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\* Pittsburgh, PA, 2003**

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	403 (141 - 699) 0.0%	215 (75 - 373) 0.0%	25 (9 - 43) 0.0%
15	40, 98th percentile value	361 (126 - 626) 10.4%	168 (58 - 291) 21.9%	0 (0 - 0) 100.0%
15	35, 98th percentile value	264 (93 - 456) 34.5%	59 (21 - 102) 72.6%	0 (0 - 0) 100.0%
15	30, 98th percentile value	168 (59 - 289) 58.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	72 (25 - 124) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	403 (141 - 699) 0.0%	215 (75 - 373) 0.0%	25 (9 - 43) 0.0%
15	40, 99th percentile value	287 (100 - 495) 28.8%	84 (29 - 145) 60.9%	0 (0 - 0) 100.0%
15	35, 99th percentile value	200 (70 - 345) 50.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	114 (40 - 197) 71.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	29 (10 - 50) 92.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	338 (118 - 585) 16.1%	141 (49 - 245) 34.4%	0 (0 - 0) 100.0%
14	35, 98th percentile value	264 (93 - 456) 34.5%	59 (21 - 102) 72.6%	0 (0 - 0) 100.0%
14	30, 98th percentile value	168 (59 - 289) 58.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 98th percentile value	72 (25 - 124) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	287 (100 - 495) 28.8%	84 (29 - 145) 60.9%	0 (0 - 0) 100.0%
14	35, 99th percentile value	200 (70 - 345) 50.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	114 (40 - 197) 71.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	29 (10 - 50) 92.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	273 (96 - 471) 32.3%	68 (24 - 118) 68.4%	0 (0 - 0) 100.0%
13	35, 98th percentile value	264 (93 - 456) 34.5%	59 (21 - 102) 72.6%	0 (0 - 0) 100.0%
13	30, 98th percentile value	168 (59 - 289) 58.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 98th percentile value	72 (25 - 124) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	273 (96 - 471) 32.3%	68 (24 - 118) 68.4%	0 (0 - 0) 100.0%
13	35, 99th percentile value	200 (70 - 345) 50.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	114 (40 - 197) 71.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	29 (10 - 50) 92.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	208 (73 - 358) 48.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	208 (73 - 358) 48.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	168 (59 - 289) 58.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	72 (25 - 124) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	208 (73 - 358) 48.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	200 (70 - 345) 50.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	114 (40 - 197) 71.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	29 (10 - 50) 92.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.14. Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
San Jose, CA, 2003  
(2003 As Is Levels = 11.1 ug/m3 Annual Average; 37.6 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	172 (59 - 306) 0.0%	58 (20 - 104) 0.0%	0 (0 - 0) ---
15	40, 98th percentile value	107 (37 - 189) 37.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	35, 98th percentile value	60 (21 - 106) 65.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 98th percentile value	14 (5 - 24) 91.9%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	65, 99th percentile value	172 (59 - 306) 0.0%	58 (20 - 104) 0.0%	0 (0 - 0) ---
15	40, 99th percentile value	65 (22 - 115) 62.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	35, 99th percentile value	24 (8 - 43) 86.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 98th percentile value	107 (37 - 189) 37.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	35, 98th percentile value	60 (21 - 106) 65.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	30, 98th percentile value	14 (5 - 24) 91.9%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 99th percentile value	65 (22 - 115) 62.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	35, 99th percentile value	24 (8 - 43) 86.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 98th percentile value	107 (37 - 189) 37.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	35, 98th percentile value	60 (21 - 106) 65.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 98th percentile value	14 (5 - 24) 91.9%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 99th percentile value	65 (22 - 115) 62.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	35, 99th percentile value	24 (8 - 43) 86.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 98th percentile value	83 (28 - 146) 51.7%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	35, 98th percentile value	60 (21 - 106) 65.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 98th percentile value	14 (5 - 24) 91.9%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 99th percentile value	65 (22 - 115) 62.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	35, 99th percentile value	24 (8 - 43) 86.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.15. Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Seattle, WA, 2003  
(2003 As Is Levels = 8.3 ug/m3 Annual Average; 21.7 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	50 (17 - 89) 0.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	40, 98th percentile value	40 (14 - 72) 20.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	65, 99th percentile value	50 (17 - 89) 0.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	40, 98th percentile value	40 (14 - 72) 20.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	40, 98th percentile value	40 (14 - 72) 20.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	40, 98th percentile value	40 (14 - 72) 20.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.16. Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
St. Louis, MO, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	596 (206 - 1047) 0.0%	311 (107 - 548) 0.0%	23 (8 - 40) 0.0%
15	40, 98th percentile value	596 (206 - 1047) 0.0%	311 (107 - 548) 0.0%	23 (8 - 40) 0.0%
15	35, 98th percentile value	592 (204 - 1039) 0.7%	306 (105 - 539) 1.6%	17 (6 - 30) 26.1%
15	30, 98th percentile value	414 (144 - 726) 30.5%	107 (37 - 188) 65.6%	0 (0 - 0) 100.0%
15	25, 98th percentile value	239 (83 - 417) 59.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	596 (206 - 1047) 0.0%	311 (107 - 548) 0.0%	23 (8 - 40) 0.0%
15	40, 99th percentile value	596 (206 - 1047) 0.0%	311 (107 - 548) 0.0%	23 (8 - 40) 0.0%
15	35, 99th percentile value	486 (168 - 853) 18.5%	188 (65 - 330) 39.5%	0 (0 - 0) 100.0%
15	30, 99th percentile value	327 (113 - 571) 45.1%	8 (3 - 15) 97.4%	0 (0 - 0) 100.0%
15	25, 99th percentile value	168 (58 - 293) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	498 (172 - 874) 16.4%	201 (69 - 354) 35.4%	0 (0 - 0) 100.0%
14	35, 98th percentile value	498 (172 - 874) 16.4%	201 (69 - 354) 35.4%	0 (0 - 0) 100.0%
14	30, 98th percentile value	414 (144 - 726) 30.5%	107 (37 - 188) 65.6%	0 (0 - 0) 100.0%
14	25, 98th percentile value	239 (83 - 417) 59.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	498 (172 - 874) 16.4%	201 (69 - 354) 35.4%	0 (0 - 0) 100.0%
14	35, 99th percentile value	486 (168 - 853) 18.5%	188 (65 - 330) 39.5%	0 (0 - 0) 100.0%
14	30, 99th percentile value	327 (113 - 571) 45.1%	8 (3 - 15) 97.4%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	168 (58 - 293) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%
13	35, 98th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%
13	30, 98th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%
13	25, 98th percentile value	239 (83 - 417) 59.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%
13	35, 99th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%
13	30, 99th percentile value	327 (113 - 571) 45.1%	8 (3 - 15) 97.4%	0 (0 - 0) 100.0%
13	25, 99th percentile value	168 (58 - 293) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	239 (83 - 417) 59.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	168 (58 - 293) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.17. Estimated Annual Cardiopulmonary Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Boston, MA, 2003  
(2003 As Is Levels = 12.1 ug/m3 Annual Average; 34.1 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	380 (132 - 645) 0.0%	198 (68 - 339) 0.0%	13 (4 - 22) 0.0%
15	40, 98th percentile value	309 (108 - 523) 18.7%	118 (41 - 202) 40.4%	0 (0 - 0) 100.0%
15	35, 98th percentile value	221 (77 - 372) 41.8%	19 (7 - 33) 90.4%	0 (0 - 0) 100.0%
15	30, 98th percentile value	133 (47 - 224) 65.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	47 (16 - 78) 87.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	380 (132 - 645) 0.0%	198 (68 - 339) 0.0%	13 (4 - 22) 0.0%
15	40, 99th percentile value	127 (45 - 214) 66.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	65 (23 - 110) 82.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	4 (1 - 6) 98.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	309 (108 - 523) 18.7%	118 (41 - 202) 40.4%	0 (0 - 0) 100.0%
14	35, 98th percentile value	221 (77 - 372) 41.8%	19 (7 - 33) 90.4%	0 (0 - 0) 100.0%
14	30, 98th percentile value	133 (47 - 224) 65.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 98th percentile value	47 (16 - 78) 87.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	127 (45 - 214) 66.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	65 (23 - 110) 82.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	30, 99th percentile value	4 (1 - 6) 98.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	288 (100 - 487) 24.2%	94 (33 - 161) 52.5%	0 (0 - 0) 100.0%
13	35, 98th percentile value	221 (77 - 372) 41.8%	19 (7 - 33) 90.4%	0 (0 - 0) 100.0%
13	30, 98th percentile value	133 (47 - 224) 65.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 98th percentile value	47 (16 - 78) 87.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	127 (45 - 214) 66.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	65 (23 - 110) 82.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	4 (1 - 6) 98.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	222 (78 - 375) 41.6%	21 (7 - 35) 89.4%	0 (0 - 0) 100.0%
12	35, 98th percentile value	221 (77 - 372) 41.8%	19 (7 - 33) 90.4%	0 (0 - 0) 100.0%
12	30, 98th percentile value	133 (47 - 224) 65.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	47 (16 - 78) 87.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	127 (45 - 214) 66.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	65 (23 - 110) 82.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	4 (1 - 6) 98.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.18. Estimated Annual Cardiopulmonary Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Los Angeles, CA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	1151 (416 - 1873) 0.0%	629 (227 - 1025) 0.0%	105 (38 - 172) 0.0%
15	40, 98th percentile value	1151 (416 - 1873) 0.0%	629 (227 - 1025) 0.0%	105 (38 - 172) 0.0%
15	35, 98th percentile value	966 (350 - 1567) 16.1%	422 (153 - 686) 32.9%	0 (0 - 0) 100.0%
15	30, 98th percentile value	632 (230 - 1020) 45.1%	50 (18 - 80) 92.1%	0 (0 - 0) 100.0%
15	25, 98th percentile value	301 (110 - 485) 73.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	1151 (416 - 1873) 0.0%	629 (227 - 1025) 0.0%	105 (38 - 172) 0.0%
15	40, 99th percentile value	391 (143 - 630) 66.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	182 (67 - 292) 84.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	961 (348 - 1559) 16.5%	417 (151 - 677) 33.7%	0 (0 - 0) 100.0%
14	35, 98th percentile value	961 (348 - 1559) 16.5%	417 (151 - 677) 33.7%	0 (0 - 0) 100.0%
14	30, 98th percentile value	632 (230 - 1020) 45.1%	50 (18 - 80) 92.1%	0 (0 - 0) 100.0%
14	25, 98th percentile value	301 (110 - 485) 73.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	391 (143 - 630) 66.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	182 (67 - 292) 84.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	772 (280 - 1250) 32.9%	206 (75 - 334) 67.2%	0 (0 - 0) 100.0%
13	35, 98th percentile value	772 (280 - 1250) 32.9%	206 (75 - 334) 67.2%	0 (0 - 0) 100.0%
13	30, 98th percentile value	632 (230 - 1020) 45.1%	50 (18 - 80) 92.1%	0 (0 - 0) 100.0%
13	25, 98th percentile value	301 (110 - 485) 73.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	391 (143 - 630) 66.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	182 (67 - 292) 84.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	584 (213 - 943) 49.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	584 (213 - 943) 49.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	584 (213 - 943) 49.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	301 (110 - 485) 73.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	391 (143 - 630) 66.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	182 (67 - 292) 84.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.19. Estimated Annual Cardiopulmonary Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\* Philadelphia, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	349 (122 - 586) 0.0%	220 (77 - 372) 0.0%	90 (31 - 153) 0.0%
15	40, 98th percentile value	265 (93 - 443) 24.1%	126 (44 - 212) 42.7%	0 (0 - 0) 100.0%
15	35, 98th percentile value	194 (69 - 324) 44.4%	47 (16 - 78) 78.6%	0 (0 - 0) 100.0%
15	30, 98th percentile value	124 (44 - 206) 64.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	54 (19 - 90) 84.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	232 (82 - 387) 33.5%	89 (31 - 149) 59.5%	0 (0 - 0) 100.0%
15	40, 99th percentile value	37 (13 - 62) 89.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	296 (104 - 496) 15.2%	161 (56 - 271) 26.8%	24 (8 - 41) 73.3%
14	35, 98th percentile value	265 (93 - 443) 24.1%	126 (44 - 212) 42.7%	0 (0 - 0) 100.0%
14	30, 98th percentile value	194 (69 - 324) 44.4%	47 (16 - 78) 78.6%	0 (0 - 0) 100.0%
14	25, 98th percentile value	124 (44 - 206) 64.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	54 (19 - 90) 84.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	37 (13 - 62) 89.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 98th percentile value	243 (86 - 407) 30.4%	102 (36 - 171) 53.6%	0 (0 - 0) 100.0%
13	30, 98th percentile value	194 (69 - 324) 44.4%	47 (16 - 78) 78.6%	0 (0 - 0) 100.0%
13	25, 98th percentile value	124 (44 - 206) 64.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	54 (19 - 90) 84.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	37 (13 - 62) 89.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	191 (68 - 319) 45.3%	44 (15 - 73) 80.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	191 (68 - 319) 45.3%	44 (15 - 73) 80.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	124 (44 - 206) 64.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	54 (19 - 90) 84.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	37 (13 - 62) 89.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.20. Estimated Annual Cardiopulmonary Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Phoenix, AZ, 2001**

(2001 As Is Levels = 10.4 ug/m3 Annual Average; 28.9 ug/m3 98th Percentile Daily Value)

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
15	40, 98th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
15	35, 98th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
15	30, 98th percentile value	137 (48 - 233) 42.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 98th percentile value	38 (13 - 65) 84.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	65, 99th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
15	40, 99th percentile value	220 (76 - 376) 7.2%	19 (6 - 32) 50.0%	0 (0 - 0) ---
15	35, 99th percentile value	136 (47 - 231) 42.6%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 99th percentile value	52 (18 - 89) 78.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 98th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
14	35, 98th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
14	30, 98th percentile value	137 (48 - 233) 42.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	25, 98th percentile value	38 (13 - 65) 84.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 99th percentile value	220 (76 - 376) 7.2%	19 (6 - 32) 50.0%	0 (0 - 0) ---
14	35, 99th percentile value	136 (47 - 231) 42.6%	0 (0 - 0) 100.0%	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	30, 99th percentile value	52 (18 - 89) 78.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 98th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
13	35, 98th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
13	30, 98th percentile value	137 (48 - 233) 42.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 98th percentile value	38 (13 - 65) 84.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 99th percentile value	220 (76 - 376) 7.2%	19 (6 - 32) 50.0%	0 (0 - 0) ---
13	35, 99th percentile value	136 (47 - 231) 42.6%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 99th percentile value	52 (18 - 89) 78.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 98th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
12	35, 98th percentile value	237 (82 - 405) 0.0%	38 (13 - 65) 0.0%	0 (0 - 0) ---
12	30, 98th percentile value	137 (48 - 233) 42.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 98th percentile value	38 (13 - 65) 84.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 99th percentile value	220 (76 - 376) 7.2%	19 (6 - 32) 50.0%	0 (0 - 0) ---
12	35, 99th percentile value	136 (47 - 231) 42.6%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 99th percentile value	52 (18 - 89) 78.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.21. Estimated Annual Cardiopulmonary Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\* Pittsburgh, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	282 (101 - 464) 0.0%	150 (53 - 248) 0.0%	17 (6 - 29) 0.0%
15	40, 98th percentile value	252 (90 - 415) 10.6%	117 (42 - 193) 22.0%	0 (0 - 0) 100.0%
15	35, 98th percentile value	184 (66 - 302) 34.8%	41 (15 - 68) 72.7%	0 (0 - 0) 100.0%
15	30, 98th percentile value	117 (42 - 191) 58.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	50 (18 - 82) 82.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	282 (101 - 464) 0.0%	150 (53 - 248) 0.0%	17 (6 - 29) 0.0%
15	40, 99th percentile value	200 (72 - 328) 29.1%	59 (21 - 96) 60.7%	0 (0 - 0) 100.0%
15	35, 99th percentile value	139 (50 - 228) 50.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	80 (29 - 130) 71.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	20 (7 - 33) 92.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	236 (84 - 388) 16.3%	99 (35 - 163) 34.0%	0 (0 - 0) 100.0%
14	35, 98th percentile value	184 (66 - 302) 34.8%	41 (15 - 68) 72.7%	0 (0 - 0) 100.0%
14	30, 98th percentile value	117 (42 - 191) 58.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 98th percentile value	50 (18 - 82) 82.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	200 (72 - 328) 29.1%	59 (21 - 96) 60.7%	0 (0 - 0) 100.0%
14	35, 99th percentile value	139 (50 - 228) 50.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	80 (29 - 130) 71.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	20 (7 - 33) 92.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	190 (68 - 312) 32.6%	48 (17 - 78) 68.0%	0 (0 - 0) 100.0%
13	35, 98th percentile value	184 (66 - 302) 34.8%	41 (15 - 68) 72.7%	0 (0 - 0) 100.0%
13	30, 98th percentile value	117 (42 - 191) 58.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 98th percentile value	50 (18 - 82) 82.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	190 (68 - 312) 32.6%	48 (17 - 78) 68.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	139 (50 - 228) 50.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	80 (29 - 130) 71.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	20 (7 - 33) 92.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	145 (52 - 237) 48.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	145 (52 - 237) 48.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	117 (42 - 191) 58.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	50 (18 - 82) 82.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	145 (52 - 237) 48.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	139 (50 - 228) 50.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	80 (29 - 130) 71.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	20 (7 - 33) 92.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.22. Estimated Annual Cardiopulmonary Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**San Jose, CA, 2003**

**(2003 As Is Levels = 11.1 ug/m3 Annual Average; 37.6 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	125 (43 - 213) 0.0%	42 (15 - 73) 0.0%	0 (0 - 0) ---
15	40, 98th percentile value	77 (27 - 131) 38.4%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	35, 98th percentile value	44 (15 - 74) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 98th percentile value	10 (4 - 17) 92.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	65, 99th percentile value	125 (43 - 213) 0.0%	42 (15 - 73) 0.0%	0 (0 - 0) ---
15	40, 99th percentile value	47 (16 - 80) 62.4%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	35, 99th percentile value	18 (6 - 30) 85.6%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 98th percentile value	77 (27 - 131) 38.4%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	35, 98th percentile value	44 (15 - 74) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	30, 98th percentile value	10 (4 - 17) 92.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 99th percentile value	47 (16 - 80) 62.4%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	35, 99th percentile value	18 (6 - 30) 85.6%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 98th percentile value	77 (27 - 131) 38.4%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	35, 98th percentile value	44 (15 - 74) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 98th percentile value	10 (4 - 17) 92.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 99th percentile value	47 (16 - 80) 62.4%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	35, 99th percentile value	18 (6 - 30) 85.6%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 98th percentile value	60 (21 - 102) 52.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	35, 98th percentile value	44 (15 - 74) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 98th percentile value	10 (4 - 17) 92.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 99th percentile value	47 (16 - 80) 62.4%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	35, 99th percentile value	18 (6 - 30) 85.6%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.23. Estimated Annual Cardiopulmonary Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Seattle, WA, 2003**

(2003 As Is Levels = 8.3 ug/m3 Annual Average; 21.7 ug/m3 98th Percentile Daily Value)

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	33 (11 - 57) 0.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	40, 98th percentile value	27 (9 - 46) 18.2%	0 (0 - 0) ---	0 (0 - 0) ---
15	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	65, 99th percentile value	33 (11 - 57) 0.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	40, 98th percentile value	27 (9 - 46) 18.2%	0 (0 - 0) ---	0 (0 - 0) ---
14	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	40, 98th percentile value	27 (9 - 46) 18.2%	0 (0 - 0) ---	0 (0 - 0) ---
13	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	40, 98th percentile value	27 (9 - 46) 18.2%	0 (0 - 0) ---	0 (0 - 0) ---
12	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.24. Estimated Annual Cardiopulmonary Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
St. Louis, MO, 2003**

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	426 (150 - 715) 0.0%	223 (78 - 376) 0.0%	16 (6 - 27) 0.0%
15	40, 98th percentile value	426 (150 - 715) 0.0%	223 (78 - 376) 0.0%	16 (6 - 27) 0.0%
15	35, 98th percentile value	423 (148 - 709) 0.7%	219 (77 - 369) 1.8%	12 (4 - 21) 25.0%
15	30, 98th percentile value	296 (104 - 494) 30.5%	76 (27 - 128) 65.9%	0 (0 - 0) 100.0%
15	25, 98th percentile value	170 (60 - 283) 60.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	426 (150 - 715) 0.0%	223 (78 - 376) 0.0%	16 (6 - 27) 0.0%
15	40, 99th percentile value	426 (150 - 715) 0.0%	223 (78 - 376) 0.0%	16 (6 - 27) 0.0%
15	35, 99th percentile value	347 (122 - 581) 18.5%	134 (47 - 226) 39.9%	0 (0 - 0) 100.0%
15	30, 99th percentile value	233 (82 - 388) 45.3%	6 (2 - 10) 97.3%	0 (0 - 0) 100.0%
15	25, 99th percentile value	120 (42 - 198) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	356 (125 - 596) 16.4%	144 (50 - 242) 35.4%	0 (0 - 0) 100.0%
14	35, 98th percentile value	356 (125 - 596) 16.4%	144 (50 - 242) 35.4%	0 (0 - 0) 100.0%
14	30, 98th percentile value	296 (104 - 494) 30.5%	76 (27 - 128) 65.9%	0 (0 - 0) 100.0%
14	25, 98th percentile value	170 (60 - 283) 60.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	356 (125 - 596) 16.4%	144 (50 - 242) 35.4%	0 (0 - 0) 100.0%
14	35, 99th percentile value	347 (122 - 581) 18.5%	134 (47 - 226) 39.9%	0 (0 - 0) 100.0%
14	30, 99th percentile value	233 (82 - 388) 45.3%	6 (2 - 10) 97.3%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	120 (42 - 198) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	286 (101 - 478) 32.9%	66 (23 - 110) 70.4%	0 (0 - 0) 100.0%
13	35, 98th percentile value	286 (101 - 478) 32.9%	66 (23 - 110) 70.4%	0 (0 - 0) 100.0%
13	30, 98th percentile value	286 (101 - 478) 32.9%	66 (23 - 110) 70.4%	0 (0 - 0) 100.0%
13	25, 98th percentile value	170 (60 - 283) 60.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	286 (101 - 478) 32.9%	66 (23 - 110) 70.4%	0 (0 - 0) 100.0%
13	35, 99th percentile value	286 (101 - 478) 32.9%	66 (23 - 110) 70.4%	0 (0 - 0) 100.0%
13	30, 99th percentile value	233 (82 - 388) 45.3%	6 (2 - 10) 97.3%	0 (0 - 0) 100.0%
13	25, 99th percentile value	120 (42 - 198) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	217 (77 - 361) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	217 (77 - 361) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	217 (77 - 361) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	170 (60 - 283) 60.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	217 (77 - 361) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	217 (77 - 361) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	217 (77 - 361) 49.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	120 (42 - 198) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.25. Estimated Annual Lung Cancer Mortality Associated with Long-Term Exposure to PM2.5 When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**Boston, MA, 2003**

**(2003 As Is Levels = 12.1 ug/m3 Annual Average; 34.1 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM2.5		
		(95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	91 (28 - 141) 0.0%	47 (14 - 74) 0.0%	3 (1 - 5) 0.0%
15	40, 98th percentile value	73 (23 - 114) 19.8%	28 (9 - 44) 40.4%	0 (0 - 0) 100.0%
15	35, 98th percentile value	52 (16 - 81) 42.9%	5 (1 - 7) 89.4%	0 (0 - 0) 100.0%
15	30, 98th percentile value	32 (10 - 48) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	11 (3 - 17) 87.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	91 (28 - 141) 0.0%	47 (14 - 74) 0.0%	3 (1 - 5) 0.0%
15	40, 99th percentile value	30 (9 - 46) 67.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	15 (5 - 24) 83.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	1 (0 - 1) 98.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	73 (23 - 114) 19.8%	28 (9 - 44) 40.4%	0 (0 - 0) 100.0%
14	35, 98th percentile value	52 (16 - 81) 42.9%	5 (1 - 7) 89.4%	0 (0 - 0) 100.0%
14	30, 98th percentile value	32 (10 - 48) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 98th percentile value	11 (3 - 17) 87.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	30 (9 - 46) 67.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	15 (5 - 24) 83.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	30, 99th percentile value	1 (0 - 1) 98.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	68 (21 - 106) 25.3%	23 (7 - 35) 51.1%	0 (0 - 0) 100.0%
13	35, 98th percentile value	52 (16 - 81) 42.9%	5 (1 - 7) 89.4%	0 (0 - 0) 100.0%
13	30, 98th percentile value	32 (10 - 48) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 98th percentile value	11 (3 - 17) 87.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	30 (9 - 46) 67.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	15 (5 - 24) 83.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	1 (0 - 1) 98.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	53 (16 - 81) 41.8%	5 (2 - 8) 89.4%	0 (0 - 0) 100.0%
12	35, 98th percentile value	52 (16 - 81) 42.9%	5 (1 - 7) 89.4%	0 (0 - 0) 100.0%
12	30, 98th percentile value	32 (10 - 48) 64.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	11 (3 - 17) 87.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	30 (9 - 46) 67.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	15 (5 - 24) 83.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	1 (0 - 1) 98.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.26. Estimated Annual Lung Cancer Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Los Angeles, CA, 2003**

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	179 (58 - 264) 0.0%	98 (32 - 145) 0.0%	16 (5 - 24) 0.0%
15	40, 98th percentile value	179 (58 - 264) 0.0%	98 (32 - 145) 0.0%	16 (5 - 24) 0.0%
15	35, 98th percentile value	150 (49 - 221) 16.2%	66 (21 - 97) 32.7%	0 (0 - 0) 100.0%
15	30, 98th percentile value	98 (32 - 143) 45.3%	8 (3 - 11) 91.8%	0 (0 - 0) 100.0%
15	25, 98th percentile value	47 (15 - 68) 73.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	179 (58 - 264) 0.0%	98 (32 - 145) 0.0%	16 (5 - 24) 0.0%
15	40, 99th percentile value	60 (20 - 88) 66.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	28 (9 - 41) 84.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	150 (49 - 220) 16.2%	65 (21 - 96) 33.7%	0 (0 - 0) 100.0%
14	35, 98th percentile value	150 (49 - 220) 16.2%	65 (21 - 96) 33.7%	0 (0 - 0) 100.0%
14	30, 98th percentile value	98 (32 - 143) 45.3%	8 (3 - 11) 91.8%	0 (0 - 0) 100.0%
14	25, 98th percentile value	47 (15 - 68) 73.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	60 (20 - 88) 66.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	28 (9 - 41) 84.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	120 (39 - 176) 33.0%	32 (10 - 47) 67.3%	0 (0 - 0) 100.0%
13	35, 98th percentile value	120 (39 - 176) 33.0%	32 (10 - 47) 67.3%	0 (0 - 0) 100.0%
13	30, 98th percentile value	98 (32 - 143) 45.3%	8 (3 - 11) 91.8%	0 (0 - 0) 100.0%
13	25, 98th percentile value	47 (15 - 68) 73.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	60 (20 - 88) 66.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	28 (9 - 41) 84.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	91 (30 - 132) 49.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	91 (30 - 132) 49.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	91 (30 - 132) 49.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	47 (15 - 68) 73.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	60 (20 - 88) 66.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	28 (9 - 41) 84.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.27. Estimated Annual Lung Cancer Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\* Philadelphia, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	77 (24 - 118) 0.0%	49 (15 - 75) 0.0%	20 (6 - 31) 0.0%
15	40, 98th percentile value	58 (18 - 89) 24.7%	28 (9 - 43) 42.9%	0 (0 - 0) 100.0%
15	35, 98th percentile value	43 (13 - 65) 44.2%	10 (3 - 16) 79.6%	0 (0 - 0) 100.0%
15	30, 98th percentile value	27 (9 - 41) 64.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	12 (4 - 18) 84.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	51 (16 - 78) 33.8%	20 (6 - 30) 59.2%	0 (0 - 0) 100.0%
15	40, 99th percentile value	8 (3 - 12) 89.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	65 (20 - 100) 15.6%	36 (11 - 55) 26.5%	5 (2 - 8) 75.0%
14	35, 98th percentile value	58 (18 - 89) 24.7%	28 (9 - 43) 42.9%	0 (0 - 0) 100.0%
14	30, 98th percentile value	43 (13 - 65) 44.2%	10 (3 - 16) 79.6%	0 (0 - 0) 100.0%
14	25, 98th percentile value	27 (9 - 41) 64.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	12 (4 - 18) 84.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	8 (3 - 12) 89.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 98th percentile value	54 (17 - 82) 29.9%	23 (7 - 34) 53.1%	0 (0 - 0) 100.0%
13	30, 98th percentile value	43 (13 - 65) 44.2%	10 (3 - 16) 79.6%	0 (0 - 0) 100.0%
13	25, 98th percentile value	27 (9 - 41) 64.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	12 (4 - 18) 84.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	8 (3 - 12) 89.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	42 (13 - 64) 45.5%	10 (3 - 15) 79.6%	0 (0 - 0) 100.0%
12	30, 98th percentile value	42 (13 - 64) 45.5%	10 (3 - 15) 79.6%	0 (0 - 0) 100.0%
12	25, 98th percentile value	27 (9 - 41) 64.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	12 (4 - 18) 84.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	8 (3 - 12) 89.6%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.28. Estimated Annual Lung Cancer Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**Phoenix, AZ, 2001**

**(2001 As Is Levels = 10.4 ug/m<sup>3</sup> Annual Average; 28.9 ug/m<sup>3</sup> 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
15	40, 98th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
15	35, 98th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
15	30, 98th percentile value	27 (8 - 43) 43.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 98th percentile value	8 (2 - 12) 83.3%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	65, 99th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
15	40, 99th percentile value	44 (13 - 69) 8.3%	4 (1 - 6) 50.0%	0 (0 - 0) ---
15	35, 99th percentile value	27 (8 - 42) 43.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 99th percentile value	10 (3 - 16) 79.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 98th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
14	35, 98th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
14	30, 98th percentile value	27 (8 - 43) 43.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	25, 98th percentile value	8 (2 - 12) 83.3%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 99th percentile value	44 (13 - 69) 8.3%	4 (1 - 6) 50.0%	0 (0 - 0) ---
14	35, 99th percentile value	27 (8 - 42) 43.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	30, 99th percentile value	10 (3 - 16) 79.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 98th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
13	35, 98th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
13	30, 98th percentile value	27 (8 - 43) 43.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 98th percentile value	8 (2 - 12) 83.3%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 99th percentile value	44 (13 - 69) 8.3%	4 (1 - 6) 50.0%	0 (0 - 0) ---
13	35, 99th percentile value	27 (8 - 42) 43.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 99th percentile value	10 (3 - 16) 79.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 98th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
12	35, 98th percentile value	48 (14 - 74) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
12	30, 98th percentile value	27 (8 - 43) 43.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 98th percentile value	8 (2 - 12) 83.3%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 99th percentile value	44 (13 - 69) 8.3%	4 (1 - 6) 50.0%	0 (0 - 0) ---
12	35, 99th percentile value	27 (8 - 42) 43.8%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 99th percentile value	10 (3 - 16) 79.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.29. Estimated Annual Lung Cancer Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Pittsburgh, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	56 (18 - 84) 0.0%	30 (10 - 45) 0.0%	4 (1 - 5) 0.0%
15	40, 98th percentile value	50 (16 - 75) 10.7%	23 (7 - 35) 23.3%	0 (0 - 0) 100.0%
15	35, 98th percentile value	37 (12 - 55) 33.9%	8 (3 - 12) 73.3%	0 (0 - 0) 100.0%
15	30, 98th percentile value	23 (8 - 34) 58.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	10 (3 - 15) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	56 (18 - 84) 0.0%	30 (10 - 45) 0.0%	4 (1 - 5) 0.0%
15	40, 99th percentile value	40 (13 - 59) 28.6%	12 (4 - 17) 60.0%	0 (0 - 0) 100.0%
15	35, 99th percentile value	28 (9 - 41) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	16 (5 - 23) 71.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	4 (1 - 6) 92.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	47 (15 - 70) 16.1%	20 (6 - 30) 33.3%	0 (0 - 0) 100.0%
14	35, 98th percentile value	37 (12 - 55) 33.9%	8 (3 - 12) 73.3%	0 (0 - 0) 100.0%
14	30, 98th percentile value	23 (8 - 34) 58.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 98th percentile value	10 (3 - 15) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	40 (13 - 59) 28.6%	12 (4 - 17) 60.0%	0 (0 - 0) 100.0%
14	35, 99th percentile value	28 (9 - 41) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	16 (5 - 23) 71.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	4 (1 - 6) 92.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	38 (12 - 56) 32.1%	10 (3 - 14) 66.7%	0 (0 - 0) 100.0%
13	35, 98th percentile value	37 (12 - 55) 33.9%	8 (3 - 12) 73.3%	0 (0 - 0) 100.0%
13	30, 98th percentile value	23 (8 - 34) 58.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 98th percentile value	10 (3 - 15) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	38 (12 - 56) 32.1%	10 (3 - 14) 66.7%	0 (0 - 0) 100.0%
13	35, 99th percentile value	28 (9 - 41) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	16 (5 - 23) 71.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	4 (1 - 6) 92.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	29 (9 - 43) 48.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	29 (9 - 43) 48.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	23 (8 - 34) 58.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	10 (3 - 15) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	29 (9 - 43) 48.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	28 (9 - 41) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	16 (5 - 23) 71.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	4 (1 - 6) 92.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.30. Estimated Annual Lung Cancer Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
San Jose, CA, 2003  
(2003 As Is Levels = 11.1 ug/m3 Annual Average; 37.6 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	23 (7 - 35) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
15	40, 98th percentile value	14 (4 - 22) 39.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	35, 98th percentile value	8 (2 - 12) 65.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 98th percentile value	2 (1 - 3) 91.3%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	65, 99th percentile value	23 (7 - 35) 0.0%	8 (2 - 12) 0.0%	0 (0 - 0) ---
15	40, 99th percentile value	8 (3 - 13) 65.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	35, 99th percentile value	3 (1 - 5) 87.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 98th percentile value	14 (4 - 22) 39.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	35, 98th percentile value	8 (2 - 12) 65.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	30, 98th percentile value	2 (1 - 3) 91.3%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	40, 99th percentile value	8 (3 - 13) 65.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	35, 99th percentile value	3 (1 - 5) 87.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 98th percentile value	14 (4 - 22) 39.1%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	35, 98th percentile value	8 (2 - 12) 65.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 98th percentile value	2 (1 - 3) 91.3%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	40, 99th percentile value	8 (3 - 13) 65.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	35, 99th percentile value	3 (1 - 5) 87.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 98th percentile value	11 (3 - 17) 52.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	35, 98th percentile value	8 (2 - 12) 65.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 98th percentile value	2 (1 - 3) 91.3%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	40, 99th percentile value	8 (3 - 13) 65.2%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	35, 99th percentile value	3 (1 - 5) 87.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.31. Estimated Annual Lung Cancer Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Seattle, WA, 2003  
(2003 As Is Levels = 8.3 ug/m3 Annual Average; 21.7 ug/m3 98th Percentile Daily Value)**

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
15	65, 98th percentile value***	8 (2 - 12) 0.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	40, 98th percentile value	6 (2 - 10) 25.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	65, 99th percentile value	8 (2 - 12) 0.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
15	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	40, 98th percentile value	6 (2 - 10) 25.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
14	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from As Is Levels		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	40, 98th percentile value	6 (2 - 10) 25.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
13	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	40, 98th percentile value	6 (2 - 10) 25.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	35, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	30, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	25, 98th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	40, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	35, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	30, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---
12	25, 99th percentile value	0 (0 - 0) 100.0%	0 (0 - 0) ---	0 (0 - 0) ---

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.32. Estimated Annual Lung Cancer Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
St. Louis, MO, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	88 (27 - 134) 0.0%	46 (14 - 71) 0.0%	3 (1 - 5) 0.0%
15	40, 98th percentile value	88 (27 - 134) 0.0%	46 (14 - 71) 0.0%	3 (1 - 5) 0.0%
15	35, 98th percentile value	87 (27 - 133) 1.1%	45 (14 - 70) 2.2%	3 (1 - 4) 0.0%
15	30, 98th percentile value	61 (19 - 92) 30.7%	16 (5 - 24) 65.2%	0 (0 - 0) 100.0%
15	25, 98th percentile value	35 (11 - 53) 60.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	88 (27 - 134) 0.0%	46 (14 - 71) 0.0%	3 (1 - 5) 0.0%
15	40, 99th percentile value	88 (27 - 134) 0.0%	46 (14 - 71) 0.0%	3 (1 - 5) 0.0%
15	35, 99th percentile value	71 (22 - 109) 19.3%	28 (9 - 42) 39.1%	0 (0 - 0) 100.0%
15	30, 99th percentile value	48 (15 - 72) 45.5%	1 (0 - 2) 97.8%	0 (0 - 0) 100.0%
15	25, 99th percentile value	24 (8 - 37) 72.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 98th percentile value	73 (23 - 112) 17.0%	30 (9 - 46) 34.8%	0 (0 - 0) 100.0%
14	35, 98th percentile value	73 (23 - 112) 17.0%	30 (9 - 46) 34.8%	0 (0 - 0) 100.0%
14	30, 98th percentile value	61 (19 - 92) 30.7%	16 (5 - 24) 65.2%	0 (0 - 0) 100.0%
14	25, 98th percentile value	35 (11 - 53) 60.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	73 (23 - 112) 17.0%	30 (9 - 46) 34.8%	0 (0 - 0) 100.0%
14	35, 99th percentile value	71 (22 - 109) 19.3%	28 (9 - 42) 39.1%	0 (0 - 0) 100.0%
14	30, 99th percentile value	48 (15 - 72) 45.5%	1 (0 - 2) 97.8%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 (95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	25, 99th percentile value	24 (8 - 37) 72.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	59 (18 - 89) 33.0%	14 (4 - 21) 69.6%	0 (0 - 0) 100.0%
13	35, 98th percentile value	59 (18 - 89) 33.0%	14 (4 - 21) 69.6%	0 (0 - 0) 100.0%
13	30, 98th percentile value	59 (18 - 89) 33.0%	14 (4 - 21) 69.6%	0 (0 - 0) 100.0%
13	25, 98th percentile value	35 (11 - 53) 60.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 99th percentile value	59 (18 - 89) 33.0%	14 (4 - 21) 69.6%	0 (0 - 0) 100.0%
13	35, 99th percentile value	59 (18 - 89) 33.0%	14 (4 - 21) 69.6%	0 (0 - 0) 100.0%
13	30, 99th percentile value	48 (15 - 72) 45.5%	1 (0 - 2) 97.8%	0 (0 - 0) 100.0%
13	25, 99th percentile value	24 (8 - 37) 72.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	44 (14 - 67) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 98th percentile value	44 (14 - 67) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 98th percentile value	44 (14 - 67) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	35 (11 - 53) 60.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	44 (14 - 67) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	35, 99th percentile value	44 (14 - 67) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	44 (14 - 67) 50.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	24 (8 - 37) 72.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

E.2 Sensitivity analyses

**Exhibit E.33. Sensitivity Analysis: Estimated Annual Reductions of Short-Term and Long-Term Exposure Mortality Associated with Rolling Back PM<sub>2.5</sub> Concentrations to Just Meet the Current Annual Standard of 15 ug/m<sup>3</sup> and the Current Daily Standard of 65 ug/m<sup>3</sup> Using an Alternative Rollback Method  
Los Angeles, CA, 2003**

Health Effects	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Annual and Daily Standards	Percent Change in PM-Associated Incidence*		Portion of Proportional Rollback Incidence Reduction Achieved by Alternative Rollback Method
								All PM concentrations rolled back equally	Percent rollback of upper 10% of AQ distribution = 1.6 x percent rollback of lower 90% of AQ distribution	
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>									
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	40.9% 0.0%	41.0% 0.0%	100.2% --
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	40.9% 0.0%	41.0% 0.0%	100.2% --
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	40.9% 0.0%	41.0% 0.0%	100.2% --
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	40.9% 0.0%	41.0% 0.0%	100.2% --
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>									
	Krewski et al. (2000) - ACS	All cause	30+	log-linear			15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	58.9% 0.0%	59.1% 0.0%	100.3% --
	Pope et al. (2002) - ACS extended	All cause	30+	log-linear			15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	59.1% 0.0%	59.3% 0.0%	100.3% --
	<b>Multi-Pollutant Models</b>									
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		CO	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	59.2% 0.0%	59.4% 0.0%	100.3% --
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		NO <sub>2</sub>	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	59.4% 0.0%	59.6% 0.0%	100.3% --
	Krewski et al. (2000) - ACS	All cause	30+	log-linear		O <sub>3</sub>	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	59.2% 0.0%	59.4% 0.0%	100.3% --
Krewski et al. (2000) - ACS	All cause	30+	log-linear		SO <sub>2</sub>	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	58.5% 0.0%	58.6% 0.0%	100.2% --	

\* For the short-term exposure studies, health effects incidence was quantified down to estimated policy relevant background level of 2.5 ug/m<sup>3</sup>. For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Only those C-R functions for which rollbacks are predicted to result in a positive number of cases avoided are included.

**Exhibit E.34. Sensitivity Analysis: Estimated Annual Reductions of Short-Term and Long-Term Exposure Mortality Associated with Rolling Back PM<sub>2.5</sub> Concentrations to Just Meet the Current Annual Standard of 15 ug/m<sup>3</sup> and the Current Daily Standard of 65 ug/m<sup>3</sup> Using an Alternative Rollback Method Philadelphia, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Annual and Daily Standards	Percent Change in PM-Associated Incidence*		Portion of Proportional Rollback Incidence Reduction Achieved by Alternative Rollback Method
							All PM concentrations rolled back equally	Percent rollback of upper 10% of AQ distribution = 1.6 x percent rollback of lower 90% of AQ distribution	
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Lipfert et al. (2000)	Non-accidental	all	0 day		15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	10.9% 0.0%	10.6% 0.0%	97.2% --
	<b>Multi-Pollutant Models (Total Mortality)</b>								
	Lipfert et al. (2000)	Non-accidental	all	0 day	O3	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	10.9% 0.0%	10.6% 0.0%	97.2% --
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+			15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	17.4% 0.0%	17.6% 0.0%	101.1% --
	Pope et al. (2002) - ACS extended	All cause	30+			15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	17.5% 0.0%	17.6% 0.0%	100.6% --
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	17.6% 0.0%	17.7% 0.0%	100.6% --
	Krewski et al. (2000) - ACS	All cause	30+		NO2	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	17.6% 0.0%	17.7% 0.0%	100.6% --
	Krewski et al. (2000) - ACS	All cause	30+		O3	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	17.6% 0.0%	17.7% 0.0%	100.6% --
	Krewski et al. (2000) - ACS	All cause	30+		SO2	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	17.3% 0.0%	17.4% 0.0%	100.6% --

\*For the short-term exposure studies, health effects incidence was quantified down to estimated policy relevant background level of 3.5 ug/m<sup>3</sup>. For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Only those C-R functions for which rollbacks are predicted to result in a positive number of cases avoided are included.

**Exhibit E.35. Sensitivity Analysis: Estimated Annual Reductions of Short-Term and Long-Term Exposure Mortality Associated with Rolling Back PM<sub>2.5</sub> Concentrations to Just Meet the Current Annual Standard of 15 ug/m<sup>3</sup> and the Current Daily Standard of 65 ug/m<sup>3</sup> Using an Alternative Rollback Method  
Pittsburgh, PA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Annual and Daily Standards	Percent Change in PM-Associated Incidence*		Portion of Proportional Rollback Incidence Reduction Achieved by Alternative Rollback Method
							All PM concentrations rolled back equally	Percent rollback of upper 10% of AQ distribution = 1.6 x percent rollback of lower 90% of AQ distribution	
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Chock et al. (2000)	Non-accidental	<75	0 day		15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	35.3% 0.0%	35.4% 0.0%	100.3% --
	Chock et al. (2000)	Non-accidental	75+	0 day		15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	35.2% 0.0%	35.3% 0.0%	100.3% --
	<b>Multi-Pollutant Models (Total Mortality)</b>								
	Chock et al. (2000)	Non-accidental	<75	0 day	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10-2.5</sub>	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	35.3% 0.0%	35.5% 0.0%	100.6% --
	Chock et al. (2000)	Non-accidental	75+	0 day	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10-2.5</sub>	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	35.1% 0.0%	35.3% 0.0%	100.6% --
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+			15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	50.4% 0.0%	50.6% 0.0%	100.4% --
	Pope et al. (2002) - ACS extended	All cause	30+			15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	50.6% 0.0%	50.8% 0.0%	100.4% --
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	50.7% 0.0%	50.9% 0.0%	100.4% --
	Krewski et al. (2000) - ACS	All cause	30+		NO <sub>2</sub>	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	50.8% 0.0%	51.1% 0.0%	100.6% --
	Krewski et al. (2000) - ACS	All cause	30+		O <sub>3</sub>	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	50.7% 0.0%	50.9% 0.0%	100.4% --
	Krewski et al. (2000) - ACS	All cause	30+		SO <sub>2</sub>	15 ug/m <sup>3</sup> annual 65 ug/m <sup>3</sup> daily	50.0% 0.0%	50.2% 0.0%	100.4% --

\*For the short-term exposure studies, health effects incidence was quantified down to estimated policy relevant background level of 3.5 ug/m<sup>3</sup>. For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m<sup>3</sup>, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note: Only those C-R functions for which rollbacks are predicted to result in a positive number of cases avoided are included.

**Exhibit E.36. Sensitivity Analysis: Estimated Annual Reductions of Short-Term and Long-Term Exposure Mortality Associated with Rolling Back PM<sub>2.5</sub> Concentrations to Just Meet the Current Annual Standard of 15 ug/m<sup>3</sup> and the Current Daily Standard of 65 ug/m<sup>3</sup> Using an Alternative Rollback Method  
St. Louis, MO, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Annual and Daily Standards	Percent Change in PM-Associated Incidence*		Portion of Proportional Rollback Incidence Reduction Achieved by Alternative Rollback Method
							All PM concentrations rolled back equally	Percent rollback of upper 10% of AQ distribution = 1.6 x percent rollback of lower 90% of AQ distribution	
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)]	Non-accidental	all	mean of lag 0 & 1		15 ug/m3 annual 65 ug/m3 daily	18.0% 0.0%	17.5% 0.0%	97.2% --
	Schwartz (2003b) [reanalysis of Schwartz et al. (1996)] -- 6 cities	Non-accidental	all	mean of lag 0 & 1		15 ug/m3 annual 65 ug/m3 daily	18.0% 0.0%	17.6% 0.0%	97.8% --
Long-Term Exposure Mortality	<b>Single Pollutant Models</b>								
	Krewski et al. (2000) - Six Cities	All cause	25+			15 ug/m3 annual 65 ug/m3 daily	29.7% 0.0%	29.8% 0.0%	100.3% --
	Krewski et al. (2000) - ACS	All cause	30+			15 ug/m3 annual 65 ug/m3 daily	29.1% 0.0%	29.2% 0.0%	100.3% --
	Pope et al. (2002) - ACS extended	All cause	30+			15 ug/m3 annual 65 ug/m3 daily	29.2% 0.0%	29.3% 0.0%	100.3% --
	<b>Multi-Pollutant Models</b>								
	Krewski et al. (2000) - ACS	All cause	30+		CO	15 ug/m3 annual 65 ug/m3 daily	29.3% 0.0%	29.4% 0.0%	100.3% --
	Krewski et al. (2000) - ACS	All cause	30+		NO2	15 ug/m3 annual 65 ug/m3 daily	29.4% 0.0%	29.5% 0.0%	100.3% --
	Krewski et al. (2000) - ACS	All cause	30+		O3	15 ug/m3 annual 65 ug/m3 daily	29.3% 0.0%	29.4% 0.0%	100.3% --
	Krewski et al. (2000) - ACS	All cause	30+		SO2	15 ug/m3 annual 65 ug/m3 daily	28.9% 0.0%	29.0% 0.0%	100.3% --

\*For the short-term exposure studies, health effects incidence was quantified down to estimated policy relevant background level of 3.5 ug/m3. For the long-term exposure studies, health effects incidence was quantified down to 7.5 ug/m3, which was the lowest of the lowest measured levels in the long-term exposure studies. Percents are rounded to the nearest tenth.

Note 1: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

Note 2: Only those C-R functions for which rollbacks are predicted to result in a positive number of cases avoided are included.

**Exhibit E.37. Sensitivity Analysis: Estimated Annual Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels -- Rollbacks to Meet Annual Standards Using Design Values Based on Maximum vs. Average of Monitor-Specific Averages\* Pittsburgh, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages** (95% Confidence Interval)				Incidence Associated with PM <sub>2.5</sub> Using an Annual Design Value Based on the Average of Monitor-Specific Averages** (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards				Percent Reduction in Incidence from Current Standards			
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =15 µg/m <sup>3</sup>	Cutpoint** =20 µg/m <sup>3</sup>	Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =15 µg/m <sup>3</sup>	Cutpoint** =20 µg/m <sup>3</sup>
15	65, 98th percentile value***	50 (-108 - 200) 0.0%	22 (-48 - 87) 0.0%	10 (-23 - 41) 0.0%	5 (-11 - 18) 0.0%	59 (-128 - 238) 0.0%	31 (-66 - 122) 0.0%	17 (-37 - 67) 0.0%	9 (-19 - 35) 0.0%
15	40, 98th percentile value	47 (-102 - 189) 6.0%	19 (-43 - 77) 13.6%	9 (-19 - 34) 10.0%	4 (-9 - 15) 20.0%	47 (-102 - 189) 20.3%	19 (-43 - 77) 38.7%	9 (-19 - 34) 47.1%	4 (-9 - 15) 55.6%
15	35, 98th percentile value	41 (-88 - 162) 18.0%	14 (-31 - 56) 36.4%	5 (-12 - 21) 50.0%	2 (-5 - 8) 60.0%	41 (-88 - 162) 30.5%	14 (-31 - 56) 54.8%	5 (-12 - 21) 70.6%	2 (-5 - 8) 77.8%
15	30, 98th percentile value	34 (-74 - 136) 32.0%	9 (-21 - 37) 59.1%	3 (-6 - 11) 70.0%	1 (-2 - 4) 80.0%	34 (-74 - 136) 42.4%	9 (-21 - 37) 71.0%	3 (-6 - 11) 82.4%	1 (-2 - 4) 88.9%
15	25, 98th percentile value	28 (-60 - 110) 44.0%	5 (-12 - 20) 77.3%	1 (-3 - 5) 90.0%	0 (-1 - 2) 100.0%	28 (-60 - 110) 52.5%	5 (-12 - 20) 83.9%	1 (-3 - 5) 94.1%	0 (-1 - 2) 100.0%
15	65, 99th percentile value	50 (-108 - 200) 0.0%	22 (-48 - 87) 0.0%	10 (-23 - 41) 0.0%	5 (-11 - 18) 0.0%	59 (-128 - 238) 0.0%	31 (-66 - 122) 0.0%	17 (-37 - 67) 0.0%	9 (-19 - 35) 0.0%
15	40, 99th percentile value	42 (-92 - 168) 16.0%	15 (-34 - 61) 31.8%	6 (-13 - 24) 40.0%	3 (-6 - 10) 40.0%	42 (-92 - 168) 28.8%	15 (-34 - 61) 51.6%	6 (-13 - 24) 64.7%	3 (-6 - 10) 66.7%
15	35, 99th percentile value	36 (-79 - 145) 28.0%	11 (-24 - 43) 50.0%	4 (-8 - 14) 60.0%	1 (-3 - 5) 80.0%	36 (-79 - 145) 39.0%	11 (-24 - 43) 64.5%	4 (-8 - 14) 76.5%	1 (-3 - 5) 88.9%
15	30, 99th percentile value	31 (-67 - 122) 38.0%	7 (-15 - 27) 68.2%	2 (-4 - 7) 80.0%	1 (-2 - 3) 80.0%	31 (-67 - 122) 47.5%	7 (-15 - 27) 77.4%	2 (-4 - 7) 88.2%	1 (-2 - 3) 88.9%
15	25, 99th percentile value	25 (-54 - 99) 50.0%	4 (-8 - 14) 81.8%	1 (-2 - 3) 90.0%	0 (-1 - 1) 100.0%	25 (-54 - 99) 57.6%	4 (-8 - 14) 87.1%	1 (-2 - 3) 94.1%	0 (-1 - 1) 100.0%
14	40, 98th percentile value	46 (-99 - 182) 8.0%	18 (-40 - 72) 18.2%	8 (-17 - 31) 20.0%	3 (-8 - 13) 40.0%	47 (-102 - 189) 20.3%	19 (-43 - 77) 38.7%	9 (-19 - 34) 47.1%	4 (-9 - 15) 55.6%
14	35, 98th percentile value	41 (-88 - 162) 18.0%	14 (-31 - 56) 36.4%	5 (-12 - 21) 50.0%	2 (-5 - 8) 60.0%	41 (-88 - 162) 30.5%	14 (-31 - 56) 54.8%	5 (-12 - 21) 70.6%	2 (-5 - 8) 77.8%

Alternative Standards		Incidence Associated with PM2.5 Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages** (95% Confidence Interval)				Incidence Associated with PM2.5 Using an Annual Design Value Based on the Average of Monitor-Specific Averages** (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards				Percent Reduction in Incidence from Current Standards			
		Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3
14	30, 98th percentile value	34 (-74 - 136) 32.0%	9 (-21 - 37) 59.1%	3 (-6 - 11) 70.0%	1 (-2 - 4) 80.0%	34 (-74 - 136) 42.4%	9 (-21 - 37) 71.0%	3 (-6 - 11) 82.4%	1 (-2 - 4) 88.9%
14	25, 98th percentile value	28 (-60 - 110) 44.0%	5 (-12 - 20) 77.3%	1 (-3 - 5) 90.0%	0 (-1 - 2) 100.0%	28 (-60 - 110) 52.5%	5 (-12 - 20) 83.9%	1 (-3 - 5) 94.1%	0 (-1 - 2) 100.0%
14	40, 99th percentile value	42 (-92 - 168) 16.0%	15 (-34 - 61) 31.8%	6 (-13 - 24) 40.0%	3 (-6 - 10) 40.0%	42 (-92 - 168) 28.8%	15 (-34 - 61) 51.6%	6 (-13 - 24) 64.7%	3 (-6 - 10) 66.7%
14	35, 99th percentile value	36 (-79 - 145) 28.0%	11 (-24 - 43) 50.0%	4 (-8 - 14) 60.0%	1 (-3 - 5) 80.0%	36 (-79 - 145) 39.0%	11 (-24 - 43) 64.5%	4 (-8 - 14) 76.5%	1 (-3 - 5) 88.9%
14	30, 99th percentile value	31 (-67 - 122) 38.0%	7 (-15 - 27) 68.2%	2 (-4 - 7) 80.0%	1 (-2 - 3) 80.0%	31 (-67 - 122) 47.5%	7 (-15 - 27) 77.4%	2 (-4 - 7) 88.2%	1 (-2 - 3) 88.9%
14	25, 99th percentile value	25 (-54 - 99) 50.0%	4 (-8 - 14) 81.8%	1 (-2 - 3) 90.0%	0 (-1 - 1) 100.0%	25 (-54 - 99) 57.6%	4 (-8 - 14) 87.1%	1 (-2 - 3) 94.1%	0 (-1 - 1) 100.0%
13	40, 98th percentile value	41 (-90 - 165) 18.0%	15 (-32 - 58) 31.8%	6 (-13 - 22) 40.0%	2 (-5 - 9) 60.0%	47 (-102 - 189) 20.3%	19 (-43 - 77) 38.7%	9 (-19 - 34) 47.1%	4 (-9 - 15) 55.6%
13	35, 98th percentile value	41 (-88 - 162) 18.0%	14 (-31 - 56) 36.4%	5 (-12 - 21) 50.0%	2 (-5 - 8) 60.0%	41 (-88 - 162) 30.5%	14 (-31 - 56) 54.8%	5 (-12 - 21) 70.6%	2 (-5 - 8) 77.8%
13	30, 98th percentile value	34 (-74 - 136) 32.0%	9 (-21 - 37) 59.1%	3 (-6 - 11) 70.0%	1 (-2 - 4) 80.0%	34 (-74 - 136) 42.4%	9 (-21 - 37) 71.0%	3 (-6 - 11) 82.4%	1 (-2 - 4) 88.9%
13	25, 98th percentile value	28 (-60 - 110) 44.0%	5 (-12 - 20) 77.3%	1 (-3 - 5) 90.0%	0 (-1 - 2) 100.0%	28 (-60 - 110) 52.5%	5 (-12 - 20) 83.9%	1 (-3 - 5) 94.1%	0 (-1 - 2) 100.0%
13	40, 99th percentile value	41 (-90 - 165) 18.0%	15 (-32 - 58) 31.8%	6 (-13 - 22) 40.0%	2 (-5 - 9) 60.0%	42 (-92 - 168) 28.8%	15 (-34 - 61) 51.6%	6 (-13 - 24) 64.7%	3 (-6 - 10) 66.7%
13	35, 99th percentile value	36 (-79 - 145) 28.0%	11 (-24 - 43) 50.0%	4 (-8 - 14) 60.0%	1 (-3 - 5) 80.0%	36 (-79 - 145) 39.0%	11 (-24 - 43) 64.5%	4 (-8 - 14) 76.5%	1 (-3 - 5) 88.9%
13	30, 99th percentile value	31 (-67 - 122) 38.0%	7 (-15 - 27) 68.2%	2 (-4 - 7) 80.0%	1 (-2 - 3) 80.0%	31 (-67 - 122) 47.5%	7 (-15 - 27) 77.4%	2 (-4 - 7) 88.2%	1 (-2 - 3) 88.9%
13	25, 99th percentile value	25 (-54 - 99) 50.0%	4 (-8 - 14) 81.8%	1 (-2 - 3) 90.0%	0 (-1 - 1) 100.0%	25 (-54 - 99) 57.6%	4 (-8 - 14) 87.1%	1 (-2 - 3) 94.1%	0 (-1 - 1) 100.0%

Alternative Standards		Incidence Associated with PM2.5 Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages** (95% Confidence Interval)				Incidence Associated with PM2.5 Using an Annual Design Value Based on the Average of Monitor-Specific Averages** (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards				Percent Reduction in Incidence from Current Standards			
Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
12	40, 98th percentile value	37 (-80 - 147) 26.0%	11 (-25 - 44) 50.0%	4 (-8 - 15) 60.0%	1 (-3 - 6) 80.0%	44 (-95 - 175) 25.4%	17 (-36 - 66) 45.2%	7 (-15 - 27) 58.8%	3 (-7 - 11) 66.7%
12	35, 98th percentile value	37 (-80 - 147) 26.0%	11 (-25 - 44) 50.0%	4 (-8 - 15) 60.0%	1 (-3 - 6) 80.0%	41 (-88 - 162) 30.5%	14 (-31 - 56) 54.8%	5 (-12 - 21) 70.6%	2 (-5 - 8) 77.8%
12	30, 98th percentile value	34 (-74 - 136) 32.0%	9 (-21 - 37) 59.1%	3 (-6 - 11) 70.0%	1 (-2 - 4) 80.0%	34 (-74 - 136) 42.4%	9 (-21 - 37) 71.0%	3 (-6 - 11) 82.4%	1 (-2 - 4) 88.9%
12	25, 98th percentile value	28 (-60 - 110) 44.0%	5 (-12 - 20) 77.3%	1 (-3 - 5) 90.0%	0 (-1 - 2) 100.0%	28 (-60 - 110) 52.5%	5 (-12 - 20) 83.9%	1 (-3 - 5) 94.1%	0 (-1 - 2) 100.0%
12	40, 99th percentile value	37 (-80 - 147) 26.0%	11 (-25 - 44) 50.0%	4 (-8 - 15) 60.0%	1 (-3 - 6) 80.0%	42 (-92 - 168) 28.8%	15 (-34 - 61) 51.6%	6 (-13 - 24) 64.7%	3 (-6 - 10) 66.7%
12	35, 99th percentile value	36 (-79 - 145) 28.0%	11 (-24 - 43) 50.0%	4 (-8 - 14) 60.0%	1 (-3 - 5) 80.0%	36 (-79 - 145) 39.0%	11 (-24 - 43) 64.5%	4 (-8 - 14) 76.5%	1 (-3 - 5) 88.9%
12	30, 99th percentile value	31 (-67 - 122) 38.0%	7 (-15 - 27) 68.2%	2 (-4 - 7) 80.0%	1 (-2 - 3) 80.0%	31 (-67 - 122) 47.5%	7 (-15 - 27) 77.4%	2 (-4 - 7) 88.2%	1 (-2 - 3) 88.9%
12	25, 99th percentile value	25 (-54 - 99) 50.0%	4 (-8 - 14) 81.8%	1 (-2 - 3) 90.0%	0 (-1 - 1) 100.0%	25 (-54 - 99) 57.6%	4 (-8 - 14) 87.1%	1 (-2 - 3) 94.1%	0 (-1 - 1) 100.0%

\*This analysis used a function from Chock et al. (2000), age 75+ model.

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.38. Sensitivity Analysis: Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels -- Rollbacks to Meet Annual Standards Using Design Values Based on Maximum vs. Average of Monitor-Specific Averages\* Pittsburgh, PA, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages**			Incidence Associated with PM <sub>2.5</sub> Using an Annual Design Value Based on the Average of Monitor-Specific Averages**		
		(95% Confidence Interval)			(95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards			Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	403 (141 - 699) 0.0%	215 (75 - 373) 0.0%	25 (9 - 43) 0.0%	546 (190 - 950) 0.0%	375 (130 - 654) 0.0%	202 (70 - 354) 0.0%
15	40, 98th percentile value	361 (126 - 626) 10.4%	168 (58 - 291) 21.9%	0 (0 - 0) 100.0%	361 (126 - 626) 33.9%	168 (58 - 291) 55.2%	0 (0 - 0) 100.0%
15	35, 98th percentile value	264 (93 - 456) 34.5%	59 (21 - 102) 72.6%	0 (0 - 0) 100.0%	264 (93 - 456) 51.6%	59 (21 - 102) 84.3%	0 (0 - 0) 100.0%
15	30, 98th percentile value	168 (59 - 289) 58.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	168 (59 - 289) 69.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 98th percentile value	72 (25 - 124) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	72 (25 - 124) 86.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	403 (141 - 699) 0.0%	215 (75 - 373) 0.0%	25 (9 - 43) 0.0%	546 (190 - 950) 0.0%	375 (130 - 654) 0.0%	202 (70 - 354) 0.0%
15	40, 99th percentile value	287 (100 - 495) 28.8%	84 (29 - 145) 60.9%	0 (0 - 0) 100.0%	287 (100 - 495) 47.4%	84 (29 - 145) 77.6%	0 (0 - 0) 100.0%
15	35, 99th percentile value	200 (70 - 345) 50.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	200 (70 - 345) 63.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	30, 99th percentile value	114 (40 - 197) 71.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	114 (40 - 197) 79.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	25, 99th percentile value	29 (10 - 50) 92.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	29 (10 - 50) 94.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages**			Incidence Associated with PM2.5 Using an Annual Design Value Based on the Average of Monitor-Specific Averages**		
		(95% Confidence Interval)			(95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards			Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	40, 98th percentile value	338 (118 - 585) 16.1%	141 (49 - 245) 34.4%	0 (0 - 0) 100.0%	361 (126 - 626) 33.9%	168 (58 - 291) 55.2%	0 (0 - 0) 100.0%
14	35, 98th percentile value	264 (93 - 456) 34.5%	59 (21 - 102) 72.6%	0 (0 - 0) 100.0%	264 (93 - 456) 51.6%	59 (21 - 102) 84.3%	0 (0 - 0) 100.0%
14	30, 98th percentile value	168 (59 - 289) 58.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	168 (59 - 289) 69.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 98th percentile value	72 (25 - 124) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	72 (25 - 124) 86.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	287 (100 - 495) 28.8%	84 (29 - 145) 60.9%	0 (0 - 0) 100.0%	287 (100 - 495) 47.4%	84 (29 - 145) 77.6%	0 (0 - 0) 100.0%
14	35, 99th percentile value	200 (70 - 345) 50.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	200 (70 - 345) 63.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	30, 99th percentile value	114 (40 - 197) 71.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	114 (40 - 197) 79.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	25, 99th percentile value	29 (10 - 50) 92.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	29 (10 - 50) 94.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	273 (96 - 471) 32.3%	68 (24 - 118) 68.4%	0 (0 - 0) 100.0%	361 (126 - 626) 33.9%	168 (58 - 291) 55.2%	0 (0 - 0) 100.0%
13	35, 98th percentile value	264 (93 - 456) 34.5%	59 (21 - 102) 72.6%	0 (0 - 0) 100.0%	264 (93 - 456) 51.6%	59 (21 - 102) 84.3%	0 (0 - 0) 100.0%
13	30, 98th percentile value	168 (59 - 289) 58.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	168 (59 - 289) 69.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 98th percentile value	72 (25 - 124) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	72 (25 - 124) 86.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages**			Incidence Associated with PM2.5 Using an Annual Design Value Based on the Average of Monitor-Specific Averages**		
		(95% Confidence Interval)			(95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards			Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
13	40, 99th percentile value	273 (96 - 471) 32.3%	68 (24 - 118) 68.4%	0 (0 - 0) 100.0%	287 (100 - 495) 47.4%	84 (29 - 145) 77.6%	0 (0 - 0) 100.0%
13	35, 99th percentile value	200 (70 - 345) 50.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	200 (70 - 345) 63.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	114 (40 - 197) 71.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	114 (40 - 197) 79.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	25, 99th percentile value	29 (10 - 50) 92.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	29 (10 - 50) 94.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	208 (73 - 358) 48.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	312 (109 - 539) 42.9%	112 (39 - 194) 70.1%	0 (0 - 0) 100.0%
12	35, 98th percentile value	208 (73 - 358) 48.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	264 (93 - 456) 51.6%	59 (21 - 102) 84.3%	0 (0 - 0) 100.0%
12	30, 98th percentile value	168 (59 - 289) 58.3%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	168 (59 - 289) 69.2%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 98th percentile value	72 (25 - 124) 82.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	72 (25 - 124) 86.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	208 (73 - 358) 48.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	287 (100 - 495) 47.4%	84 (29 - 145) 77.6%	0 (0 - 0) 100.0%
12	35, 99th percentile value	200 (70 - 345) 50.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	200 (70 - 345) 63.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	30, 99th percentile value	114 (40 - 197) 71.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	114 (40 - 197) 79.1%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	25, 99th percentile value	29 (10 - 50) 92.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	29 (10 - 50) 94.7%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.39. Sensitivity Analysis: Estimated Annual Mortality Associated with Short-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels -- Rollbacks to Meet Annual Standards Using Design Values Based on Maximum vs. Average of Monitor-Specific Averages\* St. Louis, MO, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages**				Incidence Associated with PM <sub>2.5</sub> Using an Annual Design Value Based on the Average of Monitor-Specific Averages**			
		(95% Confidence Interval)				(95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards				Percent Reduction in Incidence from Current Standards			
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =15 µg/m <sup>3</sup>	Cutpoint** =20 µg/m <sup>3</sup>	Policy Relevant Background =3.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =15 µg/m <sup>3</sup>	Cutpoint** =20 µg/m <sup>3</sup>
15	65, 98th percentile value***	191 (70 - 311) 0.0%	75 (28 - 122) 0.0%	29 (11 - 46) 0.0%	9 (3 - 14) 0.0%	201 (74 - 327) 0.0%	84 (31 - 137) 0.0%	34 (13 - 56) 0.0%	11 (4 - 19) 0.0%
15	40, 98th percentile value	191 (70 - 311) 0.0%	75 (28 - 122) 0.0%	29 (11 - 46) 0.0%	9 (3 - 14) 0.0%	201 (74 - 327) 0.0%	84 (31 - 137) 0.0%	34 (13 - 56) 0.0%	11 (4 - 19) 0.0%
15	35, 98th percentile value	190 (70 - 310) 0.5%	75 (27 - 121) 0.0%	28 (10 - 46) 3.4%	8 (3 - 14) 11.1%	190 (70 - 310) 5.5%	75 (27 - 121) 10.7%	28 (10 - 46) 17.6%	8 (3 - 14) 27.3%
15	30, 98th percentile value	160 (59 - 260) 16.2%	49 (18 - 80) 34.7%	14 (5 - 23) 51.7%	3 (1 - 4) 66.7%	160 (59 - 260) 20.4%	49 (18 - 80) 41.7%	14 (5 - 23) 58.8%	3 (1 - 4) 72.7%
15	25, 98th percentile value	130 (48 - 211) 31.9%	28 (10 - 45) 62.7%	5 (2 - 8) 82.8%	1 (0 - 1) 88.9%	130 (48 - 211) 35.3%	28 (10 - 45) 66.7%	5 (2 - 8) 85.3%	1 (0 - 1) 90.9%
15	65, 99th percentile value	191 (70 - 311) 0.0%	75 (28 - 122) 0.0%	29 (11 - 46) 0.0%	9 (3 - 14) 0.0%	201 (74 - 327) 0.0%	84 (31 - 137) 0.0%	34 (13 - 56) 0.0%	11 (4 - 19) 0.0%
15	40, 99th percentile value	191 (70 - 311) 0.0%	75 (28 - 122) 0.0%	29 (11 - 46) 0.0%	9 (3 - 14) 0.0%	200 (74 - 325) 0.5%	83 (31 - 135) 1.2%	34 (12 - 55) 0.0%	11 (4 - 18) 0.0%
15	35, 99th percentile value	172 (63 - 280) 9.9%	59 (22 - 96) 21.3%	19 (7 - 31) 34.5%	5 (2 - 7) 44.4%	172 (63 - 280) 14.4%	59 (22 - 96) 29.8%	19 (7 - 31) 44.1%	5 (2 - 7) 54.5%
15	30, 99th percentile value	145 (53 - 235) 24.1%	38 (14 - 62) 49.3%	9 (3 - 14) 69.0%	2 (1 - 3) 77.8%	145 (53 - 235) 27.9%	38 (14 - 62) 54.8%	9 (3 - 14) 73.5%	2 (1 - 3) 81.8%
15	25, 99th percentile value	118 (43 - 191) 38.2%	20 (7 - 33) 73.3%	3 (1 - 4) 89.7%	0 (0 - 1) 100.0%	118 (43 - 191) 41.3%	20 (7 - 33) 76.2%	3 (1 - 4) 91.2%	0 (0 - 1) 100.0%
14	40, 98th percentile value	175 (64 - 284) 8.4%	61 (22 - 99) 18.7%	20 (7 - 33) 31.0%	5 (2 - 8) 44.4%	184 (68 - 299) 8.5%	69 (25 - 112) 17.9%	25 (9 - 40) 26.5%	7 (3 - 11) 36.4%
14	35, 98th percentile value	175 (64 - 284) 8.4%	61 (22 - 99) 18.7%	20 (7 - 33) 31.0%	5 (2 - 8) 44.4%	184 (68 - 299) 8.5%	69 (25 - 112) 17.9%	25 (9 - 40) 26.5%	7 (3 - 11) 36.4%

Alternative Standards		Incidence Associated with PM2.5 Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages** (95% Confidence Interval)				Incidence Associated with PM2.5 Using an Annual Design Value Based on the Average of Monitor-Specific Averages** (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards				Percent Reduction in Incidence from Current Standards			
		Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3
14	30, 98th percentile value	160 (59 - 260) 16.2%	49 (18 - 80) 34.7%	14 (5 - 23) 51.7%	3 (1 - 4) 66.7%	160 (59 - 260) 20.4%	49 (18 - 80) 41.7%	14 (5 - 23) 58.8%	3 (1 - 4) 72.7%
14	25, 98th percentile value	130 (48 - 211) 31.9%	28 (10 - 45) 62.7%	5 (2 - 8) 82.8%	1 (0 - 1) 88.9%	130 (48 - 211) 35.3%	28 (10 - 45) 66.7%	5 (2 - 8) 85.3%	1 (0 - 1) 90.9%
14	40, 99th percentile value	175 (64 - 284) 8.4%	61 (22 - 99) 18.7%	20 (7 - 33) 31.0%	5 (2 - 8) 44.4%	184 (68 - 299) 8.5%	69 (25 - 112) 17.9%	25 (9 - 40) 26.5%	7 (3 - 11) 36.4%
14	35, 99th percentile value	172 (63 - 280) 9.9%	59 (22 - 96) 21.3%	19 (7 - 31) 34.5%	5 (2 - 7) 44.4%	172 (63 - 280) 14.4%	59 (22 - 96) 29.8%	19 (7 - 31) 44.1%	5 (2 - 7) 54.5%
14	30, 99th percentile value	145 (53 - 235) 24.1%	38 (14 - 62) 49.3%	9 (3 - 14) 69.0%	2 (1 - 3) 77.8%	145 (53 - 235) 27.9%	38 (14 - 62) 54.8%	9 (3 - 14) 73.5%	2 (1 - 3) 81.8%
14	25, 99th percentile value	118 (43 - 191) 38.2%	20 (7 - 33) 73.3%	3 (1 - 4) 89.7%	0 (0 - 1) 100.0%	118 (43 - 191) 41.3%	20 (7 - 33) 76.2%	3 (1 - 4) 91.2%	0 (0 - 1) 100.0%
13	40, 98th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%	166 (61 - 270) 17.4%	54 (20 - 88) 35.7%	17 (6 - 27) 50.0%	4 (1 - 6) 63.6%
13	35, 98th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%	166 (61 - 270) 17.4%	54 (20 - 88) 35.7%	17 (6 - 27) 50.0%	4 (1 - 6) 63.6%
13	30, 98th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%	160 (59 - 260) 20.4%	49 (18 - 80) 41.7%	14 (5 - 23) 58.8%	3 (1 - 4) 72.7%
13	25, 98th percentile value	130 (48 - 211) 31.9%	28 (10 - 45) 62.7%	5 (2 - 8) 82.8%	1 (0 - 1) 88.9%	130 (48 - 211) 35.3%	28 (10 - 45) 66.7%	5 (2 - 8) 85.3%	1 (0 - 1) 90.9%
13	40, 99th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%	166 (61 - 270) 17.4%	54 (20 - 88) 35.7%	17 (6 - 27) 50.0%	4 (1 - 6) 63.6%
13	35, 99th percentile value	158 (58 - 256) 17.3%	47 (17 - 77) 37.3%	13 (5 - 21) 55.2%	3 (1 - 4) 66.7%	166 (61 - 270) 17.4%	54 (20 - 88) 35.7%	17 (6 - 27) 50.0%	4 (1 - 6) 63.6%
13	30, 99th percentile value	145 (53 - 235) 24.1%	38 (14 - 62) 49.3%	9 (3 - 14) 69.0%	2 (1 - 3) 77.8%	145 (53 - 235) 27.9%	38 (14 - 62) 54.8%	9 (3 - 14) 73.5%	2 (1 - 3) 81.8%
13	25, 99th percentile value	118 (43 - 191) 38.2%	20 (7 - 33) 73.3%	3 (1 - 4) 89.7%	0 (0 - 1) 100.0%	118 (43 - 191) 41.3%	20 (7 - 33) 76.2%	3 (1 - 4) 91.2%	0 (0 - 1) 100.0%

Alternative Standards		Incidence Associated with PM2.5 Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages** (95% Confidence Interval)				Incidence Associated with PM2.5 Using an Annual Design Value Based on the Average of Monitor-Specific Averages** (95% Confidence Interval)			
		Percent Reduction in Incidence from Current Standards				Percent Reduction in Incidence from Current Standards			
		Annual (µg/m3)	Daily (µg/m3)	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3	Policy Relevant Background =3.5 µg/m3	Cutpoint** =10 µg/m3
12	40, 98th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%	149 (55 - 241) 25.9%	41 (15 - 66) 51.2%	10 (4 - 16) 70.6%	2 (1 - 3) 81.8%
12	35, 98th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%	149 (55 - 241) 25.9%	41 (15 - 66) 51.2%	10 (4 - 16) 70.6%	2 (1 - 3) 81.8%
12	30, 98th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%	149 (55 - 241) 25.9%	41 (15 - 66) 51.2%	10 (4 - 16) 70.6%	2 (1 - 3) 81.8%
12	25, 98th percentile value	130 (48 - 211) 31.9%	28 (10 - 45) 62.7%	5 (2 - 8) 82.8%	1 (0 - 1) 88.9%	130 (48 - 211) 35.3%	28 (10 - 45) 66.7%	5 (2 - 8) 85.3%	1 (0 - 1) 90.9%
12	40, 99th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%	149 (55 - 241) 25.9%	41 (15 - 66) 51.2%	10 (4 - 16) 70.6%	2 (1 - 3) 81.8%
12	35, 99th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%	149 (55 - 241) 25.9%	41 (15 - 66) 51.2%	10 (4 - 16) 70.6%	2 (1 - 3) 81.8%
12	30, 99th percentile value	141 (52 - 229) 26.2%	35 (13 - 57) 53.3%	8 (3 - 12) 72.4%	1 (1 - 2) 88.9%	145 (53 - 235) 27.9%	38 (14 - 62) 54.8%	9 (3 - 14) 73.5%	2 (1 - 3) 81.8%
12	25, 99th percentile value	118 (43 - 191) 38.2%	20 (7 - 33) 73.3%	3 (1 - 4) 89.7%	0 (0 - 1) 100.0%	118 (43 - 191) 41.3%	20 (7 - 33) 76.2%	3 (1 - 4) 91.2%	0 (0 - 1) 100.0%

\*This analysis used a C-R function from Schwartz (2003b).

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit E.40. Sensitivity Analysis: Estimated Annual Mortality Associated with Long-Term Exposure to PM<sub>2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels -- Rollbacks to Meet Annual Standards Using Design Values Based on Maximum vs. Average of Monitor-Specific Averages\* St. Louis, MO, 2003**

Alternative Standards		Incidence Associated with PM <sub>2.5</sub> Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages**			Incidence Associated with PM <sub>2.5</sub> Using an Annual Design Value Based on the Average of Monitor-Specific Averages**		
		(95% Confidence Interval)			(95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards			Percent Reduction in Incidence from Current Standards		
Annual (µg/m <sup>3</sup> )	Daily (µg/m <sup>3</sup> )	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>	Cutpoint** =7.5 µg/m <sup>3</sup>	Cutpoint** =10 µg/m <sup>3</sup>	Cutpoint** =12 µg/m <sup>3</sup>
15	65, 98th percentile value***	596 (206 - 1047) 0.0%	311 (107 - 548) 0.0%	23 (8 - 40) 0.0%	655 (226 - 1153) 0.0%	377 (130 - 667) 0.0%	97 (33 - 171) 0.0%
15	40, 98th percentile value	596 (206 - 1047) 0.0%	311 (107 - 548) 0.0%	23 (8 - 40) 0.0%	655 (226 - 1153) 0.0%	377 (130 - 667) 0.0%	97 (33 - 171) 0.0%
15	35, 98th percentile value	592 (204 - 1039) 0.7%	306 (105 - 539) 1.6%	17 (6 - 30) 26.1%	592 (204 - 1039) 9.6%	306 (105 - 539) 18.8%	17 (6 - 30) 82.5%
15	30, 98th percentile value	414 (144 - 726) 30.5%	107 (37 - 188) 65.6%	0 (0 - 0) 100.0%	414 (144 - 726) 36.8%	107 (37 - 188) 71.6%	0 (0 - 0) 100.0%
15	25, 98th percentile value	239 (83 - 417) 59.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	239 (83 - 417) 63.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
15	65, 99th percentile value	596 (206 - 1047) 0.0%	311 (107 - 548) 0.0%	23 (8 - 40) 0.0%	655 (226 - 1153) 0.0%	377 (130 - 667) 0.0%	97 (33 - 171) 0.0%
15	40, 99th percentile value	596 (206 - 1047) 0.0%	311 (107 - 548) 0.0%	23 (8 - 40) 0.0%	647 (223 - 1138) 1.2%	368 (127 - 651) 2.4%	87 (30 - 153) 10.3%
15	35, 99th percentile value	486 (168 - 853) 18.5%	188 (65 - 330) 39.5%	0 (0 - 0) 100.0%	486 (168 - 853) 25.8%	188 (65 - 330) 50.1%	0 (0 - 0) 100.0%
15	30, 99th percentile value	327 (113 - 571) 45.1%	8 (3 - 15) 97.4%	0 (0 - 0) 100.0%	327 (113 - 571) 50.1%	8 (3 - 15) 97.9%	0 (0 - 0) 100.0%
15	25, 99th percentile value	168 (58 - 293) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	168 (58 - 293) 74.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages**			Incidence Associated with PM2.5 Using an Annual Design Value Based on the Average of Monitor-Specific Averages**		
		(95% Confidence Interval)			(95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards			Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
14	40, 98th percentile value	498 (172 - 874) 16.4%	201 (69 - 354) 35.4%	0 (0 - 0) 100.0%	552 (191 - 970) 15.7%	262 (90 - 461) 30.5%	0 (0 - 0) 100.0%
14	35, 98th percentile value	498 (172 - 874) 16.4%	201 (69 - 354) 35.4%	0 (0 - 0) 100.0%	552 (191 - 970) 15.7%	262 (90 - 461) 30.5%	0 (0 - 0) 100.0%
14	30, 98th percentile value	414 (144 - 726) 30.5%	107 (37 - 188) 65.6%	0 (0 - 0) 100.0%	414 (144 - 726) 36.8%	107 (37 - 188) 71.6%	0 (0 - 0) 100.0%
14	25, 98th percentile value	239 (83 - 417) 59.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	239 (83 - 417) 63.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
14	40, 99th percentile value	498 (172 - 874) 16.4%	201 (69 - 354) 35.4%	0 (0 - 0) 100.0%	552 (191 - 970) 15.7%	262 (90 - 461) 30.5%	0 (0 - 0) 100.0%
14	35, 99th percentile value	486 (168 - 853) 18.5%	188 (65 - 330) 39.5%	0 (0 - 0) 100.0%	486 (168 - 853) 25.8%	188 (65 - 330) 50.1%	0 (0 - 0) 100.0%
14	30, 99th percentile value	327 (113 - 571) 45.1%	8 (3 - 15) 97.4%	0 (0 - 0) 100.0%	327 (113 - 571) 50.1%	8 (3 - 15) 97.9%	0 (0 - 0) 100.0%
14	25, 99th percentile value	168 (58 - 293) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	168 (58 - 293) 74.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
13	40, 98th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%	450 (156 - 788) 31.3%	147 (51 - 258) 61.0%	0 (0 - 0) 100.0%
13	35, 98th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%	450 (156 - 788) 31.3%	147 (51 - 258) 61.0%	0 (0 - 0) 100.0%
13	30, 98th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%	414 (144 - 726) 36.8%	107 (37 - 188) 71.6%	0 (0 - 0) 100.0%
13	25, 98th percentile value	239 (83 - 417) 59.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	239 (83 - 417) 63.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

Alternative Standards		Incidence Associated with PM2.5 Using an Annual Design Value Based on the Maximum of Monitor-Specific Averages**			Incidence Associated with PM2.5 Using an Annual Design Value Based on the Average of Monitor-Specific Averages**		
		(95% Confidence Interval)			(95% Confidence Interval)		
		Percent Reduction in Incidence from Current Standards			Percent Reduction in Incidence from Current Standards		
Annual (µg/m3)	Daily (µg/m3)	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3	Cutpoint** =7.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =12 µg/m3
13	40, 99th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%	450 (156 - 788) 31.3%	147 (51 - 258) 61.0%	0 (0 - 0) 100.0%
13	35, 99th percentile value	401 (139 - 702) 32.7%	92 (32 - 162) 70.4%	0 (0 - 0) 100.0%	450 (156 - 788) 31.3%	147 (51 - 258) 61.0%	0 (0 - 0) 100.0%
13	30, 99th percentile value	327 (113 - 571) 45.1%	8 (3 - 15) 97.4%	0 (0 - 0) 100.0%	327 (113 - 571) 50.1%	8 (3 - 15) 97.9%	0 (0 - 0) 100.0%
13	25, 99th percentile value	168 (58 - 293) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	168 (58 - 293) 74.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 98th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	348 (121 - 608) 46.9%	32 (11 - 56) 91.5%	0 (0 - 0) 100.0%
12	35, 98th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	348 (121 - 608) 46.9%	32 (11 - 56) 91.5%	0 (0 - 0) 100.0%
12	30, 98th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	348 (121 - 608) 46.9%	32 (11 - 56) 91.5%	0 (0 - 0) 100.0%
12	25, 98th percentile value	239 (83 - 417) 59.9%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	239 (83 - 417) 63.5%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%
12	40, 99th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	348 (121 - 608) 46.9%	32 (11 - 56) 91.5%	0 (0 - 0) 100.0%
12	35, 99th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	348 (121 - 608) 46.9%	32 (11 - 56) 91.5%	0 (0 - 0) 100.0%
12	30, 99th percentile value	304 (106 - 532) 49.0%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	327 (113 - 571) 50.1%	8 (3 - 15) 97.9%	0 (0 - 0) 100.0%
12	25, 99th percentile value	168 (58 - 293) 71.8%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%	168 (58 - 293) 74.4%	0 (0 - 0) 100.0%	0 (0 - 0) 100.0%

\*This analysis used a C-R function from Pope et al. (2002) -- ACS extended.

\*\*For the cutpoints above 7.5 µg/m3, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*\*Current standards.

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Appendix F. Estimated Annual Health Risks Associated with PM<sub>10-2.5</sub> Concentrations**

## F.1 Primary Analysis

**Exhibit F.1. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10-2.5</sub> Concentrations  
Seattle, WA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>10-2.5</sub> Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Hospital Admissions	<b>Single Pollutant Models</b>							
	Sheppard (2003) [reanalysis of Sheppard et al. (1999)]**	Asthma	<65	1 day		27 (0 - 65)	2 (0 - 4)	1.7% (0.0% - 4.1%)

\*Health effects incidence was quantified down to the estimated policy relevant background level of 3.5 ug/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

\*\*Sheppard (2003) [reanalysis of Sheppard et al. (1999)] used daily PM<sub>10-2.5</sub> values obtained from nephelometer measurements rather than from air quality monitors.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>10-2.5</sub> coefficient.

**Exhibit F.2. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10-2.5</sub> Concentrations  
St. Louis, MO, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>10-2.5</sub> Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
<b>Respiratory Symptoms**</b>	<b>Single Pollutant Models</b>							
	Schwartz and Neas, 2000 -- 6 cities	Lower respiratory symptoms	7-14	0 day		6900 (-1200 - 20800)	300 (0 - 800)	12.3% (-2.2% - 36.9%)
	Schwartz and Neas, 2000 -- 6 cities	Cough	7-14	0 day		27000 (11000 - 40900)	1100 (400 - 1600)	16.4% (6.7% - 24.9%)
	<b>Multi-Pollutant Models</b>							
	Schwartz and Neas, 2000 -- 6 cities	Lower respiratory symptoms	7-14	0 day	PM2.5	2800 (-6900 - 10300)	100 (-300 - 400)	4.9% (-12.2% - 18.3%)
	Schwartz and Neas, 2000 -- 6 cities	Cough	7-14	0 day	PM2.5	24800 (6500 - 40100)	1000 (300 - 1600)	15.1% (4.0% - 24.4%)

\*Health effects incidence was quantified down to the estimated policy relevant background level of 4.5 ug/m3. Incidences are rounded to the nearest 100; percents are rounded to the nearest tenth.

\*\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>0-2.5</sub> coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit F.3. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10-2.5</sub> Concentrations, Assuming Various Cutpoint Levels\*  
Seattle, WA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>10-2.5</sub> Assuming Various Cutpoint Levels** (95% Confidence Interval)			
						Percent of Total Incidence (95% Confidence Interval)			
						Policy Relevant Background =3.5 µg/m3	Cutpoint =10 µg/m3	Cutpoint =15 µg/m3	Cutpoint =20 µg/m3
<b>Single Pollutant Models</b>									
Hospital Admissions	Sheppard (2003) [reanalysis of Sheppard et al. (1999)]***	Asthma	<65	1 day		27	12	5	2
						(0 - 65) 1.7% (0.0% - 4.1%)	(0 - 28) 0.7% (0.0% - 1.8%)	(0 - 11) 0.3% (0.0% - 0.7%)	(0 - 4) 0.1% (0.0% - 0.3%)

\*Incidence was quantified down to policy relevant background level of 3.5 µg/m3, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

\*\*\*Sheppard (2003) [reanalysis of Sheppard et al. (1999)] used daily PM10-2.5 values obtained from nephelometer measurements rather than from air quality monitors.

**Exhibit F.4. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10-2.5</sub> Concentrations, Assuming Various Cutpoint Levels\*  
St. Louis, MO, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Incidence Associated with PM <sub>10-2.5</sub> Assuming Various Cutpoint Levels** (95% Confidence Interval)			
						Percent of Total Incidence (95% Confidence Interval)			
						Policy Relevant Background =4.5 µg/m3	Cutpoint =10 µg/m3	Cutpoint =15 µg/m3	Cutpoint =20 µg/m3
<b>Single Pollutant Models</b>									
Hospital Admissions	Schwartz and Neas, 2000 -- 6 cities	Lower respiratory symptoms	7-14	0 day		6900 (-1200 - 20800) 12.3% (-2.2% - 36.9%)	3100 (-600 - 9100) 5.5% (-1.0% - 16.2%)	1500 (-300 - 4200) 2.7% (-0.5% - 7.4%)	800 (-100 - 1800) 1.3% (-0.3% - 3.2%)
	Schwartz and Neas, 2000 -- 6 cities	Cough	7-14	0 day		27000 (11000 - 40900) 16.4% (6.7% - 24.9%)	12100 (4900 - 18100) 7.3% (3.0% - 11.0%)	5800 (2500 - 8600) 3.6% (1.5% - 5.2%)	2900 (1300 - 4000) 1.7% (0.8% - 2.5%)

\*Incidence was quantified down to policy relevant background level of 4.5 µg/m<sup>3</sup>, as well as down to each of the alternative cutpoints. For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

\*\*Incidences are rounded to the nearest 100; percents are rounded to the nearest tenth.

**Exhibit F.5. Estimated Annual Hospital Admissions for Asthma (Age < 65) Associated with Short-Term Exposure to PM<sub>10-2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\*  
Seattle, WA, 2003  
(2003 As Is Levels = 11.4 ug/m3 Annual Average; 26.2 ug/m3 98th Percentile Daily Value)**

"As Is" PM <sub>10-2.5</sub> Concentrations and Alternative Daily Standards (ug/m3)	Incidence Associated with PM <sub>10-2.5</sub> (95% Confidence Interval)			
	Percent Reduction in Incidence from "As Is" PM <sub>10-2.5</sub> Concentrations			
	Policy Relevant Background =3.5 ug/m3	Cutpoint** =10 ug/m3	Cutpoint** =15 ug/m3	Cutpoint** =20 ug/m3
"As is" PM <sub>10-2.5</sub> concentrations	27 (0 - 65) 0.0%	12 (0 - 28) 0.0%	5 (0 - 11) 0.0%	2 (0 - 4) 0.0%
80 ug/m3 daily 98th percentile value	27 (0 - 65) 0.0%	12 (0 - 28) 0.0%	5 (0 - 11) 0.0%	2 (0 - 4) 0.0%
65 ug/m3 daily 98th percentile value	27 (0 - 65) 0.0%	12 (0 - 28) 0.0%	5 (0 - 11) 0.0%	2 (0 - 4) 0.0%
50 ug/m3 daily 98th percentile value	27 (0 - 65) 0.0%	12 (0 - 28) 0.0%	5 (0 - 11) 0.0%	2 (0 - 4) 0.0%
30 ug/m3 daily 98th percentile value	26 (0 - 63) 3.7%	11 (0 - 26) 8.3%	4 (0 - 10) 20.0%	1 (0 - 3) 50.0%
25 ug/m3 daily 98th percentile value	21 (0 - 51) 22.2%	7 (0 - 16) 41.7%	2 (0 - 5) 60.0%	0 (0 - 1) 100.0%
100 ug/m3 daily 99th percentile value	27 (0 - 65) 0.0%	12 (0 - 28) 0.0%	5 (0 - 11) 0.0%	2 (0 - 4) 0.0%
80 ug/m3 daily 99th percentile value	27 (0 - 65) 0.0%	12 (0 - 28) 0.0%	5 (0 - 11) 0.0%	2 (0 - 4) 0.0%
60 ug/m3 daily 99th percentile value	27 (0 - 65) 0.0%	12 (0 - 28) 0.0%	5 (0 - 11) 0.0%	2 (0 - 4) 0.0%
35 ug/m3 daily 99th percentile value	24 (0 - 58) 11.1%	9 (0 - 22) 25.0%	3 (0 - 8) 40.0%	1 (0 - 2) 50.0%
30 ug/m3 daily 99th percentile value	20 (0 - 48) 25.9%	6 (0 - 14) 50.0%	2 (0 - 4) 60.0%	0 (0 - 1) 100.0%

\*This analysis used a C-R function from Sheppard (2003).

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

Note: Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

**Exhibit F.6. Estimated Annual Days of Cough Among Children Associated with Short-Term Exposure to PM<sub>10-2.5</sub> When Alternative Standards Are Just Met, Assuming Various Cutpoint Levels\***

**St. Louis, MO, 2003**

**(2003 As Is Levels = 12.0 ug/m3 Annual Average; 24.1 ug/m3 98th Percentile Daily Value)**

"As Is" PM <sub>10-2.5</sub> Concentrations and Alternative Daily Standards (µg/m3)	Incidence Associated with PM <sub>10-2.5</sub> (95% Confidence Interval)			
	Percent Reduction in Incidence from "As Is" PM <sub>10-2.5</sub> Concentrations			
	Policy Relevant Background =4.5 µg/m3	Cutpoint** =10 µg/m3	Cutpoint** =15 µg/m3	Cutpoint** =20 µg/m3
"As is" PM <sub>10-2.5</sub> concentrations	27000 (11000 - 40900) 0.0%	12100 (4900 - 18100) 0.0%	5800 (2500 - 8600) 0.0%	2900 (1300 - 4000) 0.0%
80 ug/m3 daily 98th percentile value	27000 (11000 - 40900) 0.0%	12100 (4900 - 18100) 0.0%	5800 (2500 - 8600) 0.0%	2900 (1300 - 4000) 0.0%
65 ug/m3 daily 98th percentile value	27000 (11000 - 40900) 0.0%	12100 (4900 - 18100) 0.0%	5800 (2500 - 8600) 0.0%	2900 (1300 - 4000) 0.0%
50 ug/m3 daily 98th percentile value	27000 (11000 - 40900) 0.0%	12100 (4900 - 18100) 0.0%	5800 (2500 - 8600) 0.0%	2900 (1300 - 4000) 0.0%
30 ug/m3 daily 98th percentile value	23800 (9800 - 35600) 11.9%	9100 (3800 - 13300) 24.8%	4200 (1800 - 6000) 27.6%	2200 (1000 - 2900) 24.1%
25 ug/m3 daily 98th percentile value	18600 (7800 - 27400) 31.1%	5300 (2300 - 7300) 56.2%	2000 (900 - 2500) 65.5%	1300 (600 - 1600) 55.2%
100 ug/m3 daily 99th percentile value	27000 (11000 - 40900) 0.0%	12100 (4900 - 18100) 0.0%	5800 (2500 - 8600) 0.0%	2900 (1300 - 4000) 0.0%
80 ug/m3 daily 99th percentile value	27000 (11000 - 40900) 0.0%	12100 (4900 - 18100) 0.0%	5800 (2500 - 8600) 0.0%	2900 (1300 - 4000) 0.0%
60 ug/m3 daily 99th percentile value	27000 (11000 - 40900) 0.0%	12100 (4900 - 18100) 0.0%	5800 (2500 - 8600) 0.0%	2900 (1300 - 4000) 0.0%
35 ug/m3 daily 99th percentile value	18600 (7700 - 27300) 31.1%	5200 (2300 - 7300) 57.0%	1900 (900 - 2500) 67.2%	1200 (600 - 1600) 58.6%
30 ug/m3 daily 99th percentile value	15200 (6400 - 22200) 43.7%	3300 (1500 - 4400) 72.7%	1100 (600 - 1400) 81.0%	700 (400 - 900) 75.9%

\*This analysis used a C-R function from Schwartz and Neas (2000) -- 6 cities.

\*\*For the cutpoints above policy relevant background, the slope of the C-R function has been modified based on a simple hockeystick model (see discussion in section 2.5).

Note: Incidences are rounded to the nearest 100; percents are rounded to the nearest tenth.

## F.2 Sensitivity Analyses

**Exhibit F.7. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10-2.5</sub> Concentrations, Using Different Estimates of Background Level Seattle, WA, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>10-2.5</sub> Above Policy Relevant Background of:*					
						1 ug/m3		3.5 ug/m3		7 ug/m3	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Single Pollutant Models</b>											
<b>Hospital Admissions</b>	Sheppard (2003) [reanalysis of Sheppard et al. (1999)]**	Asthma	<65	1 day		35 (0 - 85)	2.2% (0.0% - 5.3%)	27 (0 - 65)	1.7% (0.0% - 4.1%)	17 (0 - 41)	1.1% (0.0% - 2.5%)

\*Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

\*\*Sheppard (2003) [reanalysis of Sheppard et al. (1999)] used daily PM<sub>10-2.5</sub> values obtained from nephelometer measurements rather than from air quality monitors.

Note: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>10-2.5</sub> coefficient.

**Exhibit F.8. Sensitivity Analysis: Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10-2.5</sub> Concentrations, Using Different Estimates of Background Level St. Louis, MO, 2003**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM <sub>10-2.5</sub> Above Policy Relevant Background of:*					
						1 ug/m3		4.5 ug/m3		9 ug/m3	
						Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence	Incidence	Percent of Total Incidence
<b>Respiratory Symptoms**</b>	<b>Single Pollutant Models</b>										
	Schwartz and Neas, 2000 -- 6 cities	Lower respiratory symptoms	7-14	0 day		9700 (-1700 - 27900)	17.2% (-3.1% - 49.4%)	6900 (-1200 - 20800)	12.3% (-2.2% - 36.9%)	3600 (-600 - 10700)	6.3% (-1.1% - 19.1%)
	Schwartz and Neas, 2000 -- 6 cities	Cough	7-14	0 day		37500 (15400 - 56100)	22.8% (9.4% - 34.1%)	27000 (11000 - 40900)	16.4% (6.7% - 24.9%)	13900 (5700 - 21000)	8.5% (3.4% - 12.8%)
	<b>Multi-Pollutant Models</b>										
	Schwartz and Neas, 2000 -- 6 cities	Lower respiratory symptoms	7-14	0 day	PM2.5	3900 (-9900 - 14300)	6.9% (-17.5% - 25.4%)	2800 (-6900 - 10300)	4.9% (-12.2% - 18.3%)	1400 (-3600 - 5300)	2.5% (-6.3% - 9.4%)
	Schwartz and Neas, 2000 -- 6 cities	Cough	7-14	0 day	PM2.5	34600 (9200 - 55000)	21.0% (5.6% - 33.4%)	24800 (6500 - 40100)	15.1% (4.0% - 24.4%)	12800 (3400 - 20600)	7.8% (2.0% - 12.5%)

\*Incidences are rounded to the nearest whole number, except respiratory symptoms incidences which are rounded to the nearest 100; percents are rounded to the nearest tenth.

\*\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>10-2.5</sub> coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Appendix G. Estimated Annual Health Risks Associated with "As Is" PM<sub>10</sub>  
Concentrations**

## G.1. Relevant Population Sizes

**Exhibit G.1. Relevant Population Sizes for PM<sub>10</sub> Risk Assessment Locations**

City	Population <sup>a</sup>						
	Total	Ages 7-14	Ages ≥30	Ages <65	Ages ≥ 65	Ages <75	Ages ≥75
<b>Boston</b> <sup>1</sup>	2,806,000	283,000 (10%)	---	---	---	---	---
<b>Detroit</b> <sup>2</sup>	2,061,000	---	---	---	249,000 (12%)	---	---
<b>Los Angeles</b> <sup>3</sup>	9,519,000	---	5,092,000 (53%)	---	927,000 (10%)	---	---
<b>Philadelphia</b> <sup>4</sup>	1,518,000	---	---	---	---	---	---
<b>Phoenix</b> <sup>5</sup>	3,072,000	---	---	---	359,000 (12%)	---	---
<b>Pittsburg</b> <sup>6</sup>	1,282,000	---	---	---	---	1,166,000 (91%)	116,000 (9%)
<b>San Jose</b> <sup>7</sup>	1,683,000	---	---	---	---	---	---
<b>Seattle</b> <sup>8</sup>	1,737,000	---	---	1,555,000 (90%)	---	---	---
<b>St. Louis</b> <sup>9</sup>	2,518,000	307,000 (12%)	---	---	---	---	---

<sup>a</sup> Total population and age-specific population estimates taken from the CDC Wonder website are based on 2000 U.S. Census data. See <http://factfinder.census.gov/>. Populations are rounded to the nearest thousand. The urban areas given in this exhibit are those considered in the studies used in the PM<sub>2.5</sub> risk assessment. The percentages in parentheses indicate the percentage of the total population in the specific age category.

<sup>1</sup> Middlesex, Norfolk, and Suffolk Counties.

<sup>2</sup> Wayne County.

<sup>3</sup> Los Angeles County.

<sup>4</sup> Philadelphia County.

<sup>5</sup> Maricopa County.

<sup>6</sup> Allegheny County.

<sup>7</sup> Santa Clara County.

<sup>8</sup> King County.

<sup>9</sup> St. Louis, Franklin, Jefferson, St. Charles, Clinton (IL), Madison (IL), Monroe (IL), and St. Clair (IL) Counties and St. Louis City.

## G.2. Baseline Incidence Rates

**Exhibit G.2. Baseline Mortality Rates for 2001 for PM<sub>10</sub> Risk Assessment Locations\***

Health Effect	Boston <sup>1</sup>	Detroit <sup>2</sup>	Los Angeles <sup>3</sup>	Philadelphia <sup>4</sup>	Phoenix <sup>5</sup>	Pittsburgh <sup>6</sup>	San Jose <sup>7</sup>	St. Louis <sup>8</sup>	Seattle <sup>9</sup>	National Average
<b>Mortality<sup>a</sup>:</b>										
<b>A. Mortality Rates Used in Risk Analysis for Short-Term Exposure Studies<sup>b</sup> (deaths per 100,000 general population/year)</b>										
Non-accidental (all ages): ICD-9 codes < 800	776	916	581	---	---	---	494	869	---	791
Non-accidental (75+): ICD-9 codes < 800	---	---	---	---	---	761	---	---	---	469
Non-accidental (<75): ICD-9 codes < 800	---	---	---	---	---	399	---	---	---	322
Cardiovascular (all ages): ICD-9 codes: 390-459	---	416	---	---	---	---	206	---	---	328
Cardiovascular (all ages): ICD-9 codes: 390-448	---	---	---	418	---	---	---	---	---	324
Cardiovascular (65+): ICD-9 codes: 390-448	---	---	---	---	211	---	---	---	---	273
Cardiovascular (all ages): ICD-9 codes: 390-429	---	---	207	---	---	---	---	---	---	252

Health Effect	Boston <sup>1</sup>	Detroit <sup>2</sup>	Los Angeles <sup>3</sup>	Philadelphia <sup>4</sup>	Phoenix <sup>5</sup>	Pittsburgh <sup>6</sup>	San Jose <sup>7</sup>	St. Louis <sup>8</sup>	Seattle <sup>9</sup>	National Average
Respiratory (all ages): ICD-9 codes: 11, 35, 472-519, 710.0, 710.2, 710.4	---	---	---	---	---	---	51	---	---	80
Respiratory (all ages): ICD-9 codes: 460-519	---	72	---	---	---	---	---	---	---	79

\*The epidemiological studies used in the risk assessment reported causes of mortality using the ninth revision of the International Classification of Diseases (ICD-9) codes. However, the tenth revision has since come out, and baseline mortality incidence rates for 2001 shown in this exhibit use ICD-10 codes. The groupings of ICD-9 codes used in the epidemiological studies and the corresponding ICD-10 codes used to calculate year 2001 baseline incidence rates is given in Exhibit 5.4.

<sup>a</sup> Mortality figures were obtained from CDC Wonder for 2001. See <http://wonder.cdc.gov/>.

<sup>b</sup> Mortality rates are presented only for the locations in which the C-R functions were estimated. All incidence rates are rounded to the nearest unit. Mortality rates for St. Louis may be slightly underestimated because some of the mortality counts in the smaller counties were reported as missing in CDC Wonder.

<sup>1</sup> Middlesex, Norfolk, and Suffolk Counties.

<sup>2</sup> Wayne County.

<sup>3</sup> Los Angeles County.

<sup>4</sup> Philadelphia County.

<sup>5</sup> Maricopa County.

<sup>6</sup> Allegheny County.

<sup>7</sup> Santa Clara County.

<sup>8</sup> St. Louis, Franklin, Jefferson, St. Charles, Clinton (IL), Madison (IL), Monroe (IL), and St. Clair (IL) Counties and St. Louis City.

<sup>9</sup> King County.

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**Exhibit G.3. Baseline Hospitalization Rates for PM<sub>10</sub> Risk Assessment Locations <sup>a</sup>**

Health Effect	Detroit <sup>1</sup>	Los Angeles <sup>2</sup>	Seattle <sup>3</sup>
<b>Hospital Admissions (per 100,000 general population/year)</b>			
Pneumonia admissions (65 and over): ICD codes 480-487	252	---	---
Pneumonia admissions (65 and over): ICD codes 480-486	250	---	---
COPD and asthma admissions (all ages): ICD codes 490-496	---	152	---
COPD and asthma admissions (65 and over): ICD codes 490-496	192	---	---
COPD without asthma admissions (65 and over): ICD codes 490-492, 494-496	163	---	---
Asthma admissions (30 and over): ICD code 493	---	70	---
Asthma admissions (<65): ICD code 493	---	---	92
Cardiovascular admissions (65 and over): ICD codes: 390-429	---	728	---
Ischemic heart disease (65 and over): ICD codes 410-414	487	---	---
Dysrhythmias (65 and over): ICD code 427	161	---	---
Congestive heart failure (65 and over): ICD code 428	341	---	---

<sup>a</sup> Hospitalization rates are presented only for the locations in which the C-R functions were estimated. For each location, the number of discharges was divided by the location's population from the 2000 U.S. Census estimates to obtain rates. All incidence rates are rounded to the nearest unit.

<sup>1</sup> Wayne County. Year 2000 hospitalization data were obtained from the Michigan Health and Hospital Association.

<sup>2</sup> Los Angeles County. Year 1999 hospitalization data were obtained from California's Office of Statewide Health Planning and Development – Health Care Information Resource Center.

<sup>3</sup> King County. Year 2000 hospitalization data were obtained from the State of Washington Department of Health, Center for Health Statistics, Office of Hospital and Patient Data Systems.

### G.3. The PM<sub>10</sub> data

PM<sub>10</sub> data for Boston, Detroit, Los Angeles, Philadelphia, Phoenix, Pittsburgh, San Jose, Seattle, and St. Louis were obtained for the years 1999 through 2002 from EPA's Air Quality System (AQS). For all urban areas except Boston and San Jose, year 2002 data were used. For Boston and San Jose, there were no monitors in any year after 1999 that met the inclusion criterion, so year 1999 data were used.

PM<sub>10</sub> data for all cities were obtained from monitors measuring concentrations at standard temperature and pressure, because significantly more AQS PM<sub>10</sub> data are reported under standard conditions than local conditions. The numbers of days of observations by monitor and at the composite monitor, by quarter and for the year, along with annual averages and maximum concentrations, are given in Exhibits G.4 through G.12 for each of the locations in the PM<sub>10</sub> risk assessment.

**Exhibit G.4. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. Boston, 1999\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 250250024811021	11	14	15	12	52	24.3	50
<b>Composite<sup>1</sup></b>	11	14	15	12	52	24.3	50

\*All concentrations are in µg/m<sup>3</sup>; includes Middlesex, Norfolk and Suffolk Counties.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit G.5. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. Detroit, 2002\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 261630001811021	15	15	15	14	59	20.2	49
<b>Composite<sup>1</sup></b>	15	15	15	14	59	20.2	49

\*All concentrations are in µg/m<sup>3</sup>; includes Wayne County.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit G.6. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. Los Angeles, 2002\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 060370002811022	14	15	16	12	57	45.8	79
AQS 060371002811022	14	14	16	14	58	37.7	71
AQS 060374002811022	14	15	15	14	58	36.0	62
AQS 060375001811021	15	15	16	15	61	37.2	97
AQS 060376012811021	15	15	16	14	60	33.3	56
AQS 060379033811021	14	15	14	15	58	29.7	48
<b>Composite<sup>1</sup></b>	18	19	20	18	75	36.6	55

\*All concentrations are in  $\mu\text{g}/\text{m}^3$ ; includes Los Angeles County.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit G.7. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. Philadelphia, 2002\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 421010004811021	12	15	14	15	56	22.3	51
AQS 421010037811021	15	13	15	11	54	26.5	83
AQS 421010149811021	11	15	16	14	56	24.6	71
AQS 421010449811021	11	11	15	14	51	25.1	64
<b>Composite<sup>1</sup></b>	15	15	16	15	61	25.4	72

\*All concentrations are in  $\mu\text{g}/\text{m}^3$ ; includes Philadelphia County.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit G.8. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. Phoenix, 2002\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 040130019811021	15	15	16	15	61	52.5	98
AQS 040131003811021	15	15	16	15	61	37.9	86
AQS 040131004811021	15	15	16	14	60	36.9	72
AQS 040132001811021	15	15	16	14	60	40.3	85
AQS 040133002811022	15	15	16	15	61	43.1	76
AQS 040133003811021	15	15	16	15	61	36.7	62
AQS 040133006811021	15	15	13	13	56	44.6	90
AQS 040133007811022	14	15	16	15	60	80.5	174
AQS 040133010811021	15	15	16	15	61	54.6	102
AQS 040134003811021	15	15	16	15	61	59.5	123
AQS 040134004811021	15	15	16	15	61	38.5	77
AQS 040134006811021	13	15	16	14	58	62.5	134
AQS 040134007811021	14	14	16	15	59	31.9	67
AQS 040139812811021	15	15	16	15	61	69.9	158
AQS 040139993811021	15	15	15	14	59	28.8	78
<b>Composite<sup>1</sup></b>	15	15	16	15	61	47.9	83.9

\*All concentrations are in µg/m<sup>3</sup>; includes Maricopa County.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit G.9. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. Pittsburgh, 2002\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 420030067811021	13	15	16	13	57	19.3	54
AQS 420030092811021	13	14	16	15	58	23.2	61
AQS 420030095811021	13	13	16	13	55	18.5	59
<b>Composite<sup>1</sup></b>	13	15	16	15	59	20.5	58

\*All concentrations are in µg/m<sup>3</sup>; includes Allegheny County.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit G.10. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. San Jose, 1999\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 060850004811024	13	15	12	15	55	24.6	77
<b>Composite<sup>1</sup></b>	13	15	12	15	55	24.6	77

\*All concentrations are in µg/m<sup>3</sup>; includes Santa Clara County.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit G.11. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. Seattle, 2002\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 530332004811022	15	15	16	15	61	18.0	44
<b>Composite<sup>1</sup></b>	15	15	16	15	61	18.0	44

\*All concentrations are in µg/m<sup>3</sup>; includes King County.

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

**Exhibit G.12. Number of Days on which PM<sub>10</sub> Concentration Data are Available, by Monitor and by Quarter, and PM<sub>10</sub> Concentrations. St. Louis, 2002\***

Monitor	Q1	Q2	Q3	Q4	Year Total	Annual Avg.	98 <sup>th</sup> Percentile
AQS 171630010811021	15	13	15	15	58	29.8	93
AQS 291895001811022	15	15	16	15	61	16.7	36
<b>Composite<sup>1</sup></b>	15	15	18	15	63	22.8	69

\*All concentrations are in µg/m<sup>3</sup>; includes St. Louis (MO), Franklin (MO), Jefferson (MO), St. Charles (MO), Clinton (IL), Madison (IL), Monroe (IL), and St. Clair (IL) Counties and St. Louis City (MO).

1. The number of days at the composite monitor is the number of days on which at least one of the monitors reported.

G.4 Results

**Exhibit G.13. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
Boston, MA, 1999**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>							
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Non-accidental	all	0 day		420 (247 - 590)	15 (9 - 21)	1.9% (1.1% - 2.7%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Non-accidental	all	0 day		247 (142 - 351)	9 (5 - 13)	1.1% (0.7% - 1.6%)
	Dominici et al. (2003) [reanalysis of Samet et al. (2000)] -- regional	Non-accidental	all	1 day		145 (13 - 276)	5 (0 - 10)	0.7% (0.1% - 1.3%)
<b>Respiratory Symptoms**</b>	<b>Single Pollutant Models</b>							
	Schwartz et al. (1994) -- 6 cities	Lower respiratory symptoms	7 - 14	1 day		11600 (16400 - 49600)	400 (600 - 1800)	22.2% (31.6% - 95.4%)

\*Incidence was quantified down to the estimated policy relevant background level of 8 µg/m3. Incidences are rounded to the nearest whole number, except respiratory symptoms incidences which are rounded to the nearest 100; percents are rounded to the nearest tenth.

\*\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM10 coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit G.14. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
Detroit, MI, 2002**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>							
	Dominici et al. (2003) [reanalysis of Samet et al. (2000)]	Non-accidental	all	1 day		54 (9 - 99)	3 (0 - 5)	0.3% (0.1% - 0.5%)
	Ito (2003) [reanalysis of Lippmann et al. (2000)]	Non-accidental	all	1 day		151 (-92 - 389)	7 (-4 - 19)	0.8% (-0.5% - 2.1%)
	Dominici et al. (2003) [reanalysis of Samet et al. (2000)] -- regional	Non-accidental	all	1 day		45 (9 - 80)	2 (0 - 4)	0.2% (0.1% - 0.4%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Ito (2003) [reanalysis of Lippmann et al. (2000)]	Circulatory	all	1 day		110 (-57 - 267)	5 (-3 - 13)	1.3% (-0.7% - 3.1%)
Ito (2003) [reanalysis of Lippmann et al. (2000)]	Respiratory	all	0 day		26 (-42 - 89)	1 (-2 - 4)	1.8% (-2.8% - 6.0%)	
<b>Hospital Admissions</b>	<b>Single Pollutant Models</b>							
	Schwartz and Morris (1995)	Congestive heart failure	65+	mean of lag 0 & 1		84 (32 - 134)	4 (2 - 7)	1.2% (0.5% - 1.9%)
	Ito (2003) [reanalysis of Lippmann et al. (2000)]	Congestive heart failure	65+	0 day		149 (-5 - 297)	7 (0 - 14)	2.1% (-0.1% - 4.2%)
	Zanobetti and Schwartz (2003) [reanalysis of Samet et al. (2000)] -- distr. lag model	COPD	65+	unconst.		127 (68 - 185)	6 (3 - 9)	3.8% (2.0% - 5.5%)
	Zanobetti and Schwartz (2003) [reanalysis of Samet et al. (2000)] -- 14 cities	COPD	65+	unconst.		101 (49 - 151)	5 (2 - 7)	3.0% (1.5% - 4.5%)
	Ito (2003) [reanalysis of Lippmann et al. (2000)]	COPD+	65+	3 day		60 (-81 - 193)	3 (-4 - 9)	1.5% (-2.1% - 4.9%)
	Schwartz and Morris (1995)	Dysrhythmias	65+	1 day		24 (-5 - 54)	1 (0 - 3)	0.7% (-0.2% - 1.6%)
	Ito (2003) [reanalysis of Lippmann et al. (2000)]	Dysrhythmias	65+	1 day		23 (-96 - 134)	1 (-5 - 7)	0.7% (-2.9% - 4.1%)
	Schwartz and Morris (1995)	Ischemic heart disease	65+	0 day		68 (19 - 120)	3 (1 - 6)	0.7% (0.2% - 1.2%)
	Ito (2003) [reanalysis of Lippmann et al. (2000)]	Ischemic heart disease	65+	2 day		187 (-7 - 376)	9 (0 - 18)	1.9% (-0.1% - 3.8%)

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
	Zanobetti and Schwartz (2003) [reanalysis of Samet et al. (2000)] -- distr. lag model	Pneumonia	65+	unconst.		59 (-2 - 120)	3 (0 - 6)	1.2% (0.0% - 2.3%)
	Ito (2003) [reanalysis of Lippmann et al. (2000)]	Pneumonia	65+	1 day		203 (64 - 335)	10 (3 - 16)	4.0% (1.3% - 6.5%)
	Zanobetti and Schwartz (2003) [reanalysis of Samet et al. (2000)] -- 14 cities	Pneumonia	65+	unconst.		100 (60 - 141)	5 (3 - 7)	1.9% (1.2% - 2.7%)

\*Incidence was quantified down to the estimated policy relevant background level of 8 µg/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM10 coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit G.15. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
Los Angeles, CA, 2002**

Health Effects	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
							Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>								
	Kinney et al. (1995)	Non-accidental	all	log-linear	0 day		819 (0 - 1735)	9 (0 - 18)	1.5% (0.0% - 3.1%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	0 day		85 (-610 - 770)	1 (-6 - 8)	0.2% (-1.1% - 1.4%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Non-accidental	all	log-linear, GAM (stringent), 30 df	1 day		169 (-447 - 778)	2 (-5 - 8)	0.3% (-0.8% - 1.4%)
	Dominici et al. (2003) [reanalysis of Samet et al.]	Non-accidental	all	log-linear, GLM, Bayes adjusted	1 day		459 (52 - 861)	5 (1 - 9)	0.8% (0.1% - 1.6%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 30 df	0 day		198 (-138 - 528)	2 (-1 - 6)	1.0% (-0.7% - 2.7%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000a)]	Cardiovascular	all	log-linear, GAM (stringent), 30 df	1 day		168 (-177 - 507)	2 (-2 - 5)	0.9% (-0.9% - 2.6%)
	<b>Multi-Pollutant Models (Total Mortality)</b>								
	Kinney et al. (1995)	Non-accidental	all	log-linear	0 day	O3	819 (0 - 1735)	9 (0 - 18)	1.5% (0.0% - 3.1%)
	Kinney et al. (1995)	Non-accidental	all	log-linear	0 day	CO	660 (-343 - 1437)	7 (-4 - 15)	1.2% (-0.6% - 2.6%)
	Dominici et al.(2003) [reanalysis of Samet et	Non-accidental	all	log-linear, GLM, Bayes adjusted	1 day	O3	454 (203 - 738)	5 (2 - 8)	0.8% (0.4% - 1.3%)
	Dominici et al.(2003) [reanalysis of Samet et	Non-accidental	all	log-linear, GLM, Bayes adjusted	1 day	O3, NO2	354 (-17 - 738)	4 (0 - 8)	0.6% (0.0% - 1.3%)
	Dominici et al.(2003) [reanalysis of Samet et	Non-accidental	all	log-linear, GLM, Bayes adjusted	1 day	O3, SO2	354 (34 - 704)	4 (0 - 7)	0.6% (0.1% - 1.3%)
	Dominici et al.(2003) [reanalysis of Samet et	Non-accidental	all	log-linear, GLM, Bayes adjusted	1 day	O3, CO	404 (85 - 721)	4 (1 - 8)	0.7% (0.2% - 1.3%)

Health Effects	Study	Type	Ages	Model	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
							Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Hospital Admission	<b>Single Pollutant Models</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 30 df	0 day		1404 (508 - 2286)	15 (5 - 24)	2.0% (0.7% - 3.3%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 30 df	1 day		1071 (160 - 1970)	11 (2 - 21)	1.6% (0.2% - 2.8%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	0 day		473 (198 - 743)	5 (2 - 8)	3.3% (1.4% - 5.1%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	1 day		482 (208 - 750)	5 (2 - 8)	3.3% (1.4% - 5.2%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 30 df	2 day		651 (370 - 926)	7 (4 - 10)	4.5% (2.6% - 6.4%)
	Linn et al. (2000) -- Calif. South Coast Air Basin**	Asthma	30+	log-linear	0 day		61 (-100 - 217)	1 (-1 - 2)	0.9% (-1.5% - 3.3%)
	<b>Multi-Pollutant Models</b>								
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000b)]	Cardiovascular	65+	log-linear, GAM (stringent), 100 df	0 day	CO	-554 (-1631 - 506)	-6 (-17 - 5)	-0.8% (-2.4% - 0.7%)
	Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 100 df	0 day	NO2	-13 (-391 - 354)	0 (-4 - 4)	-0.1% (-2.7% - 2.4%)
Moolgavkar (2003) [reanalysis of Moolgavkar (2000c)]	COPD+	all	log-linear, GAM (stringent), 100 df	1 day	NO2	167 (-166 - 491)	2 (-2 - 5)	1.2% (-1.2% - 3.4%)	

\*Incidence was quantified down to the estimated policy relevant background level of 6 µg/m3. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

\*\*The California South Coast Air Basin represents the area included in Los Angeles, Riverside, San Bernadino and Orange Counties, excluding the mountain and desert regions of the first three counties.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM10 coefficient.

Note 2: Multi-city or multi-county short-term exposure C-R functions were applied only to counties included among those used to estimate the function.

**Exhibit G.16. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
Philadelphia, PA, 2002**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Lipfert et al. (2000) -- 7 counties	Cardiovascular	all	1 day		538 (248 - 828)	35 (16 - 55)	8.5% (3.9% - 13.1%)

\*Incidence was quantified down to the estimated policy relevant background level of 8 µg/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM10 coefficient.

Note 2: Multi-city or multi-county short-term exposure C-R functions were applied only to counties included among those used to estimate the function.

**Exhibit G.17. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
Phoenix, AZ, 2002**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Mar et al. (2003) [reanalysis of Mar et al (2000)]	Cardiovascular	65-100	0 day		478 (107 - 862)	16 (3 - 28)	7.4% (1.7% - 13.4%)
	Mar et al. (2003) [reanalysis of Mar et al (2000)]	Cardiovascular	65-100	1 day		373 (0 - 776)	12 (0 - 25)	5.8% (0.0% - 12.0%)

\*Incidence was quantified down to the estimated policy relevant background level of 6 µg/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM10 coefficient.

**Exhibit G.18. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
Pittsburgh, PA, 2002**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>							
	Chock et al. (2000)	Non-accidental	<75	0 day		39 (3 - 75)	3 (0 - 6)	0.8% (0.1% - 1.5%)
	Chock et al. (2000)	Non-accidental	75+	0 day		48 (-23 - 118)	4 (-2 - 9)	0.5% (-0.2% - 1.2%)
	<b>Multi-Pollutant Models (Total Mortality)</b>							
	Chock et al. (2000)	Non-accidental	<75	0 day	NO2	54 (9 - 99)	4 (1 - 8)	1.1% (0.2% - 1.9%)
	Chock et al. (2000)	Non-accidental	75+	0 day	CO	88 (3 - 171)	7 (0 - 13)	0.9% (0.0% - 1.8%)

\*Incidence was quantified down to the estimated policy relevant background level of 8 µg/m3. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM10 coefficient.

**Exhibit G.19. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
San Jose, CA, 1999**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Short-Term Exposure Mortality	<b>Single Pollutant Models (Total Mortality)</b>							
	Dominici et al. (2003) [reanalysis of Samet et al. (2000)]	Non-accidental	all	1 day		30 (1 - 59)	2 (0 - 3)	0.4% (0.0% - 0.7%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	0 day		204 (76 - 329)	12 (5 - 20)	2.5% (0.9% - 4.0%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Non-accidental	all	1 day		-31 (-160 - 94)	-2 (-9 - 6)	-0.4% (-1.9% - 1.1%)
	Dominici et al. (2003) [reanalysis of Samet et al. (2000)] -- regional	Non-accidental	all	1 day		25 (-6 - 55)	1 (0 - 3)	0.3% (-0.1% - 0.7%)
	<b>Single Pollutant Models (Cause-Specific Mortality)</b>							
	Fairley (2003) [reanalysis of Fairley (1999)]	Respiratory	all	0 day		28 (-11 - 65)	2 (-1 - 4)	3.3% (-1.3% - 7.5%)
	Fairley (2003) [reanalysis of Fairley (1999)]	Cardiovascular	all	0 day		92 (7 - 173)	5 (0 - 10)	2.7% (0.2% - 5.0%)
	<b>Multi-Pollutant Models (Total Mortality)</b>							
	Dominici et al.(2003) [reanalysis of Samet et al.(2000)] -- national	Non-accidental	all	1 day	O3	37 (17 - 60)	2 (1 - 4)	0.5% (0.2% - 0.7%)
	Dominici et al.(2003) [reanalysis of Samet et al.(2000)] -- national	Non-accidental	all	1 day	O3, NO2	29 (-1 - 60)	2 (0 - 4)	0.4% (0.0% - 0.7%)
	Dominici et al.(2003) [reanalysis of Samet et al.(2000)] -- national	Non-accidental	all	1 day	O3, SO2	29 (3 - 58)	2 (0 - 3)	0.4% (0.0% - 0.7%)
	Dominici et al.(2003) [reanalysis of Samet et al.(2000)] -- national	Non-accidental	all	1 day	O3, CO	33 (7 - 59)	2 (0 - 4)	0.4% (0.1% - 0.7%)

\*Incidence was quantified down to the estimated policy relevant background level of 6 µg/m3. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM10 coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.

**Exhibit G.20. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
Seattle, WA, 2002**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
Hospital Admissions	<b>Single Pollutant Models</b>							
	Sheppard (2003) [reanalysis of Sheppard et al. (1999)]**	Asthma	<65	1 day		39 (10 - 66)	2 (1 - 4)	2.4% (0.6% - 4.1%)

\*Incidence was quantified down to the estimated policy relevant background level of 6 µg/m<sup>3</sup>. Incidences are rounded to the nearest whole number; percents are rounded to the nearest tenth.

\*\*Sheppard (2003) [reanalysis of Sheppard et al. (1999)] used daily PM<sub>2.5</sub> values obtained from nephelometer measurements rather than from air quality monitors.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM<sub>10</sub> coefficient.

**Exhibit G.21. Estimated Annual Health Risks Associated with Short-Term Exposure to "As Is" PM<sub>10</sub> Concentrations  
St. Louis, MO, 2002**

Health Effects	Study	Type	Ages	Lag	Other Pollutants in Model	Health Effects Associated with PM10 Above Policy Relevant Background*		
						Incidence	Incidence per 100,000 General Population	Percent of Total Incidence
<b>Short-Term Exposure Mortality</b>	<b>Single Pollutant Models (Total Mortality)</b>							
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)]	Non-accidental	all	0 day		130 (0 - 259)	5 (0 - 10)	0.6% (0.0% - 1.2%)
	Klemm and Mason (2003) [reanalysis of Klemm et al. (2000)] -- 6 cities	Non-accidental	all	0 day		227 (130 - 322)	9 (5 - 13)	1.0% (0.6% - 1.5%)
	Dominici et al. (2003) [reanalysis of Samet et al. (2000)] -- regional	Non-accidental	all	1 day		63 (13 - 112)	2 (1 - 4)	0.3% (0.1% - 0.5%)
<b>Respiratory Symptoms**</b>	<b>Single Pollutant Models</b>							
	Schwartz et al. (1994) -- 6 cities	Lower respiratory symptoms	7 - 14	1 day		4000 (1900 - 5700)	200 (100 - 200)	7.1% (3.3% - 10.2%)

\*Incidence was quantified down to the estimated policy relevant background level of 8 µg/m<sup>3</sup>. Incidences are rounded to the nearest whole number, except respiratory symptoms incidences which are rounded to the nearest 100; percents are rounded to the nearest tenth.

\*\*The C-R functions for lower respiratory symptoms and cough were calculated for the summer period April 1 through August 31.

Note 1: Numbers in parentheses are 95% confidence intervals based on statistical uncertainty surrounding the PM10 coefficient.

Note 2: Multi-city short-term exposure C-R functions were applied only to urban areas included among the cities used to estimate the function.