

1                   **Supplemental Information for:**

2       **Development of a Nationally Representative Set of Combined Building Energy and Indoor Air Quality**  
3                   **Models for U.S. Residences**

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## 26 Appendix A. Primary characteristics of the model homes

27 Table A.1. Assumed primary home characteristics for each of 209 baseline homes

House #	Year of construction <sup>1</sup>	Floor Area <sup>2</sup>	# of Floors <sup>3</sup>	Stove <sup>4</sup>	Foundation <sup>5</sup>	Garage <sup>6</sup>	Forced Air <sup>7</sup>	Heating <sup>8</sup>	Cooling <sup>9</sup>
AH1	HC1	1	2	1	3	1	2	FG	AC
AH10	HC1	1	2	1	3	1	1	SG	RC
AH11	HC2	1	2	1	3	1	2	FG	AC
AH12	HC4	1	1	2	1	2	2	FE	AC
AH13	HC2	1	2	1	1	1	2	FG	AC
AH14	HC3	1	1	2	1	1	2	FG	AC
AH15	HC3	2	2	2	1	2	2	FG	AC
AH16	HC1	1	2	1	2	1	1	EB	RC
AH17	HC2	1	1	1	2	1	1	SG	RC
AH18	HC2	1	2	1	1	1	1	SG	RC
AH19	HC2	1	2	1	1	2	2	FG	AC
AH2	HC3	1	2	2	1	1	2	FG	AC
AH20	HC1	1	2	1	4	2	2	FG	AC
AH21	HC1	2	2	1	4	2	2	FG	AC
AH22	HC3	1	2	2	1	2	1	EB	RC
AH23	HC3	1	2	2	4	2	2	FG	AC
AH24	HC1	2	2	1	3	1	1	SG	RC
AH25	HC2	1	1	2	1	2	1	EB	RC
AH26	HC4	1	2	2	1	1	2	HP	-
AH27	HC1	2	2	2	4	2	1	SG	RC
AH28	HC3	2	2	2	3	1	2	HP	-
AH29	HC4	2	2	1	1	2	2	FG	AC
AH3	HC2	1	1	2	1	1	2	HP	-
AH30	HC1	1	1	2	2	2	1	EB	RC
AH31	HC2	1	1	1	3	1	2	FG	AC
AH32	HC2	1	1	1	4	2	2	FG	AC
AH33	HC1	1	1	2	3	1	2	FG	AC
AH34	HC3	2	2	2	3	1	2	HP	-
AH35	HC3	1	2	2	1	1	1	EB	RC
AH36	HC2	1	1	2	1	2	2	FG	AC
AH37	HC2	1	1	2	2	2	1	EB	RC
AH38	HC1	1	1	2	4	2	1	SG	RC
AH39	HC4	1	1	2	1	1	2	FG	AC
AH4	HC3	1	1	2	1	2	2	FE	AC
AH40	HC1	1	2	1	1	1	1	SG	RC
AH41	HC2	2	2	2	3	1	2	FE	AC
AH42	HC2	1	2	2	4	2	2	FG	AC
AH43	HC3	2	1	2	1	2	2	FG	AC
AH44	HC3	1	1	2	2	1	1	EB	RC
AH45	HC2	1	1	2	2	1	2	FG	AC
AH46	HC2	1	2	1	2	1	2	FG	AC
AH47	HC3	1	1	2	4	2	2	FG	AC
AH48	HC3	1	2	2	2	1	2	FE	AC
AH49	HC3	1	1	1	2	2	1	SG	RC
AH5	HC2	1	2	1	3	1	1	SG	RC
AH50	HC3	1	2	2	2	2	2	FG	AC
AH51	HC3	1	2	2	3	1	1	EB	RC
AH52	HC3	2	2	2	2	1	2	HP	-
AH53	HC4	1	1	2	2	1	2	FG	AC
AH6	HC3	1	2	1	1	2	2	FG	AC
AH7	HC3	1	2	2	3	1	2	FG	AC
AH8	HC2	1	1	1	1	1	1	EB	RC
AH9	HC1	1	2	1	3	2	1	SG	RC
APT1	HC3	1	1	2	-	-	2	FE	AC
APT2	HC3	1	1	2	-	-	1	EB	RC
APT3	HC1	1	1	2	-	-	2	FE	AC
APT4	HC1	1	1	2	-	-	1	EB	RC

**Table A.1. Assumed primary home characteristics for each of 209 baseline homes (Continued)**

House #	Year of construction <sup>1</sup>	Floor Area <sup>2</sup>	# of Floors <sup>3</sup>	Stove <sup>4</sup>	Foundation <sup>5</sup>	Garage <sup>6</sup>	Forced Air <sup>7</sup>	Heating <sup>8</sup>	Cooling <sup>9</sup>
APT5	HC2	1	1	1	-	-	1	SO	RC
APT6	HC3	1	1	2	-	-	2	FE	AC
APT7	HC2	1	1	2	-	-	1	SG	RC
APT8	HC2	2	1	2	-	-	1	EB	RC
APT9	HC3	1	1	2	-	-	1	SG	RC
APT10	HC3	1	1	1	-	-	2	FE	AC
APT11	HC2	1	1	2	-	-	1	EB	RC
APT12	HC3	1	1	2	-	-	2	HP	-
APT13	HC2	1	1	2	-	-	2	FE	AC
APT14	HC3	2	1	2	-	-	2	FE	AC
APT15	HC2	1	1	2	-	-	1	EB	RC
APT16	HC2	1	1	2	-	-	2	HP	-
APT17	HC1	1	1	1	-	-	1	SO	RC
APT18	HC1	1	1	2	-	-	1	EB	RC
APT19	HC3	1	1	1	-	-	1	SG	RC
APT20	HC2	1	1	1	-	-	2	FG	AC
APT21	HC3	2	1	1	-	-	1	SG	RC
APT22	HC3	1	1	1	-	-	1	SG	RC
APT23	HC3	1	1	2	-	-	1	SG	RC
APT24	HC2	1	1	1	-	-	1	SG	RC
APT25	HC2	1	1	2	-	-	2	FE	AC
APT26	HC2	1	1	1	-	-	2	FG	AC
APT27	HC2	1	1	1	-	-	2	FE	AC
APT28	HC1	2	1	1	-	-	1	SG	RC
APT29	HC2	1	1	2	-	-	2	FG	AC
APT30	HC3	1	1	2	-	-	2	HP	-
APT31	HC2	2	1	1	-	-	1	SG	RC
APT32	HC1	1	1	2	-	-	2	FE	AC
APT33	HC3	1	1	2	-	-	1	EB	RC
APT34	HC2	1	1	1	-	-	1	SG	RC
APT35	HC4	2	1	1	-	-	1	SG	RC
APT36	HC3	1	1	2	-	-	2	FE	AC
APT37	HC2	1	1	2	-	-	1	SG	RC
APT38	HC3	1	1	1	-	-	1	EB	RC
APT39	HC3	1	1	2	-	-	1	SG	RC
APT40	HC3	1	1	2	-	-	1	SG	RC
APT41	HC3	2	1	2	-	-	1	SG	RC
APT42	HC1	1	1	2	-	-	2	FE	AC
APT43	HC3	2	1	1	-	-	1	SO	RC
APT44	HC1	1	1	2	-	-	2	FE	AC
APT45	HC2	2	1	2	-	-	1	SG	RC
APT46	HC2	1	1	2	-	-	2	FE	AC
APT47	HC3	1	1	1	-	-	1	SG	RC
APT48	HC1	1	1	1	-	-	2	FG	AC
APT49	HC2	1	1	2	-	-	2	FE	AC
APT50	HC3	2	1	2	-	-	1	SG	RC
APT51	HC1	2	1	2	-	-	2	FG	AC
APT52	HC2	1	1	1	-	-	1	SG	RC
APT53	HC2	1	1	2	-	-	2	FE	AC
APT54	HC3	1	1	1	-	-	1	SG	RC
APT55	HC3	2	1	2	-	-	2	HP	-
APT56	HC2	1	1	2	-	-	2	FE	AC
APT57	HC3	1	1	2	-	-	2	FG	AC
APT58	HC2	2	1	2	-	-	2	FG	AC
APT59	HC4	1	1	2	-	-	1	EB	RC
APT60	HC4	1	1	2	-	-	2	FG	AC
APT61	HC2	1	1	2	-	-	2	FE	AC
APT62	HC4	1	1	1	-	-	2	FG	AC
APT63	HC2	2	1	1	-	-	2	FG	AC

**Table A.1. Assumed primary home characteristics for each of 209 baseline homes (Continued)**

House #	Year of construction <sup>1</sup>	Floor Area <sup>2</sup>	# of Floors <sup>3</sup>	Stove <sup>4</sup>	Foundation <sup>5</sup>	Garage <sup>6</sup>	Forced Air <sup>7</sup>	Heating <sup>8</sup>	Cooling <sup>9</sup>
APT64	HC4	1	1	2	-	-	1	SG	RC
APT65	HC3	1	1	2	-	-	1	EB	RC
APT66	HC1	2	1	2	-	-	2	FG	AC
APT67	HC2	1	1	2	-	-	2	FG	AC
APT68	HC3	1	1	2	-	-	2	FE	AC
APT69	HC4	1	1	2	-	-	2	FE	AC
DH1	HC2	2	1	2	1	2	2	FG	AC
DH10	HC3	2	2	2	3	2	2	FG	AC
DH11	HC2	1	1	1	2	2	1	SG	RC
DH12	HC3	2	2	2	3	2	2	FG	AC
DH13	HC2	2	1	2	2	2	2	FG	AC
DH14	HC1	2	2	2	3	2	2	FG	AC
DH15	HC4	2	2	2	3	2	2	FG	AC
DH16	HC2	1	1	2	2	1	2	FG	AC
DH17	HC2	2	2	2	3	2	2	FG	AC
DH18	HC1	1	2	1	3	1	2	FG	AC
DH19	HC3	1	1	2	3	2	2	FG	AC
DH2	HC2	1	1	2	3	2	2	FG	AC
DH20	HC1	2	2	2	3	2	1	SG	RC
DH21	HC2	1	1	2	1	1	2	FG	AC
DH22	HC3	2	2	2	1	2	2	FG	AC
DH23	HC1	1	2	2	3	2	1	SG	RC
DH24	HC3	2	2	2	1	2	2	FG	AC
DH25	HC2	1	1	2	3	2	1	SG	RC
DH26	HC2	1	1	1	1	1	1	SG	RC
DH27	HC2	1	1	2	3	1	2	FG	AC
DH28	HC4	2	2	1	1	2	2	FG	AC
DH29	HC1	1	1	2	2	1	1	SG	RC
DH3	HC2	1	1	2	2	1	1	SG	RC
DH30	HC3	2	1	2	2	2	2	FG	AC
DH31	HC3	1	1	2	2	2	2	FG	AC
DH32	HC4	1	1	2	1	2	2	FG	AC
DH33	HC3	2	1	2	1	2	2	FG	AC
DH34	HC3	1	1	2	1	1	2	FG	AC
DH35	HC3	2	1	2	1	2	2	FG	AC
DH36	HC4	2	2	2	1	2	2	FG	AC
DH37	HC3	2	1	2	3	2	2	FG	AC
DH38	HC3	1	1	2	2	1	2	FG	AC
DH39	HC2	2	1	2	2	1	2	FG	AC
DH4	HC1	1	1	2	2	2	2	FG	AC
DH40	HC3	2	2	2	2	2	2	FG	AC
DH41	HC1	2	2	2	3	1	2	FG	AC
DH42	HC3	1	1	2	2	1	1	EB	RC
DH43	HC2	2	2	2	3	2	1	SO	RC
DH44	HC1	1	1	2	1	2	2	FG	AC
DH45	HC3	2	2	2	4	2	1	SO	RC
DH46	HC2	1	1	1	1	2	1	SG	RC
DH47	HC3	1	1	2	2	2	1	EB	RC
DH48	HC4	1	1	2	2	1	2	FE	AC
DH49	HC2	1	1	2	3	1	1	SG	RC
DH5	HC2	1	1	2	1	2	2	FG	AC
DH50	HC1	1	2	1	3	1	1	SG	RC
DH51	HC3	2	2	2	2	2	2	FG	AC
DH52	HC1	2	2	2	4	2	2	FG	AC
DH53	HC3	2	1	2	1	1	2	FE	AC
DH54	HC1	1	1	2	2	1	2	FG	AC
DH55	HC4	1	1	2	2	2	2	FG	AC

**Table A.1. Assumed primary home characteristics for each of 209 baseline homes (Continued)**

House #	Year of construction <sup>1</sup>	Floor Area <sup>2</sup>	# of Floors <sup>3</sup>	Stove <sup>4</sup>	Foundation <sup>5</sup>	Garage <sup>6</sup>	Forced Air <sup>7</sup>	Heating <sup>8</sup>	Cooling <sup>9</sup>
DH56	HC2	1	2	2	3	1	2	FG	AC
DH57	HC2	2	1	2	2	2	1	SG	RC
DH58	HC4	2	2	2	3	2	2	FG	AC
DH59	HC1	2	2	2	3	2	1	SG	RC
DH6	HC1	1	2	2	3	2	2	FG	AC
DH60	HC3	1	1	2	4	2	1	SO	RC
DH61	HC1	1	1	1	4	1	2	FG	AC
DH62	HC2	2	2	2	3	2	1	SG	RC
DH63	HC2	1	2	2	4	2	1	SO	RC
DH64	HC4	2	1	2	1	2	2	HP	-
DH65	HC1	1	1	2	4	1	1	SG	RC
DH66	HC2	2	1	2	1	2	1	SG	RC
DH67	HC2	1	1	1	2	2	2	FG	AC
DH68	HC2	1	2	2	3	1	1	SO	RC
DH69	HC3	2	2	2	4	2	1	SG	RC
DH7	HC2	2	1	2	3	2	2	FG	AC
DH70	HC3	1	1	2	1	1	1	EB	RC
DH71	HC3	1	2	2	1	2	2	FG	AC
DH72	HC1	2	1	2	4	2	2	FG	AC
DH73	HC3	1	2	2	4	2	2	FG	AC
DH74	HC3	2	1	2	4	2	2	FG	AC
DH75	HC3	2	3	2	1	2	2	FG	AC
DH76	HC4	1	1	2	4	2	2	FG	AC
DH77	HC3	2	3	2	4	2	2	FG	AC
DH78	HC3	1	1	2	1	2	1	EB	RC
DH79	HC3	2	1	2	2	1	2	FG	AC
DH8	HC3	1	1	2	1	2	2	FG	AC
DH80	HC2	2	1	2	4	1	2	FG	AC
DH81	HC1	2	2	2	4	1	1	SG	RC
DH82	HC2	2	1	2	4	2	1	SG	RC
DH83	HC3	1	1	2	3	1	2	FG	AC
DH9	HC2	1	2	2	3	2	2	FG	AC
MH1	HC2	1	1	2	-	-	2	FE	AC
MH2	HC4	1	1	2	-	-	2	FG	AC
MH3	HC3	1	1	2	-	-	1	EB	RC
MH4	HC3	1	1	1	-	-	2	FG	AC

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34   <sup>1</sup>Year of Construction: HC1= <1940, HC2= 1940-1969, HC3= 1970-1989, and HC4= 1990-199735   <sup>2</sup>Floor Area: 1 = less than 148.6 m<sup>2</sup> and 2 = more than 148.6 m<sup>2</sup>36   <sup>3</sup># of Floors: 1, 2, or 3 story buildings (Apartments modeled as a single unit)37   <sup>4</sup>Stove type: 1 = Gas stove, 2 = Electric stove38   <sup>5</sup>Foundation type: 1 = Slab, 2 = Crawlspace, 3 = Finished basement, and 4 = Unfinished basement39   <sup>6</sup>Garage: 1 = without garage, and 2= with garage40   <sup>7</sup>Forced Air: 1 = without forced air system, and 2 = with forced air system41   <sup>8</sup>Heating system: FG = Furnace with gas fuel, FE = Furnace with electric, HP = Heat pump, SG = Steam  
42   boiler with gas fuel, SO = Steam boiler with fuel oil, and EB = Electric baseboard43   <sup>9</sup>Cooling system: AC = Central air conditioner, and RC = Room conditioner

44 **Appendix B. Home characteristics by climate zone and year of construction**45 **Table B.1. Assumed home characteristics for different locations and year of construction**

<b>City</b>		<b>Atlanta, GA</b>		
Heating Set Point (°C)		20.5 (69°F)		
Cooling Set Point (°C)		24 (75.8°F)		
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	1.9 (R-11)
Exterior Wall Material	Wood, light	Brick	Aluminum	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	1.9 (R-11)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	3.3 (R-19)
Window U-Value (W/m <sup>2</sup> K)	5.8	7.3	4.1	4.3
Window SHGC	0.76	0.81	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
<b>City</b>		<b>Birmingham, AL</b>		
Heating Set Point (°C)		19.7 (67.4°F)		
Cooling Set Point (°C)		24.5 (76.2°F)		
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	1.9 (R-11)
Exterior Wall Material	Wood, light	Brick	Aluminum	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	1.9 (R-11)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	3.3 (R-19)
Window U-Value (W/m <sup>2</sup> K)	5.8	7.3	4.1	4.3
Window SHGC	0.76	0.81	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

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**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

<b>City</b>	<b>Boston, MA</b>			
Heating Set Point (°C)	19.2 (66.5°F)			
Cooling Set Point (°C)	23 (73.5°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	2.6 (R-15)
Exterior Wall Material	Wood, light	Wood, light	Wood, light	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	2.3 (R-13)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	3.9 (R-22)	4.7 (R-27)	5.3 (R-30)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.4
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
<b>City</b>	<b>Buffalo, NY</b>			
Heating Set Point (°C)	19.2 (66.5°F)			
Cooling Set Point (°C)	23 (73.5°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	3.3 (R-19)
Exterior Wall Material	Wood, light	Wood, light	Wood, light	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	2.3 (R-13)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	5.3 (R-30)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.4
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

<b>City</b>	<b>Chicago, IL</b>			
Heating Set Point (°C)	19.2 (66.5°F)			
Cooling Set Point (°C)	23 (73.5°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	3.3 (R-19)
Exterior Wall Material	Wood, light	Brick	Aluminum	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	2.3 (R-13)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.9 (R-11)	5.6 (R-32)	5.3 (R-30)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.4
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
City	Cincinnati, OH			
Heating Set Point (°C)	20.5 (69°F)			
Cooling Set Point (°C)	24 (75.8°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	2.3 (R-13)
Exterior Wall Material	Wood, light	Brick	Aluminum	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	2.3 (R-13)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.9 (R-11)	5.6 (R-32)	4.6 (R-26)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.4
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

<b>City</b>	<b>Corpus Christi, TX</b>			
Heating Set Point (°C)	20.5 (69°F)			
Cooling Set Point (°C)	24 (75.8°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	0.9 (R-5)	1.9 (R-11)
Exterior Wall Material	Wood, light	Brick	Wood, light	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	1.9 (R-11)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	3.3 (R-19)
Window U-Value (W/m <sup>2</sup> K)	5.8	7.3	7.3	4.3
Window SHGC	0.76	0.81	0.81	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
City	Dallas, TX			
Heating Set Point (°C)	20.5 (69°F)			
Cooling Set Point (°C)	24 (75.8°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	1.9 (R-11)
Exterior Wall Material	Wood, light	Brick	Wood	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	1.9 (R-11)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	3.3 (R-19)
Window U-Value (W/m <sup>2</sup> K)	5.8	7.3	7.3	4.3
Window SHGC	0.76	0.81	0.81	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

<b>City</b>	<b>Denver, CO</b>			
Heating Set Point (°C)	19.2 (66.5°F)			
Cooling Set Point (°C)	23 (73.5°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	0.9 (R-5)	2.6 (R-15)
Exterior Wall Material	Wood, light	Brick	Stucco	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	2.3 (R-13)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	5.1 (R-29)	5.3 (R-30)
Window U-Value (W/m <sup>2</sup> K)	3.1	7.3	4.1	3.4
Window SHGC	0.67	0.81	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
City	Los Angeles, CA			
Heating Set Point (°C)	19.6 (67.3°F)			
Cooling Set Point (°C)	24.5 (76.2°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	1.9 (R-11)
Exterior Wall Material	Wood, light	Stucco	Stucco	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	1.9 (R-11)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.4 (R-25)	3.3 (R-19)
Window U-Value (W/m <sup>2</sup> K)	5.8	7.3	4.1	4.3
Window SHGC	0.76	0.81	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

City		Miami, FL		
Heating Set Point (°C)		19.2 (69°F)		
Cooling Set Point (°C)		23 (75.8°F)		
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	0.9 (R-5)	1.9 (R-11)
Exterior Wall Material	Wood, light	Brick	Aluminum	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	1.9 (R-11)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	2.3 (R-13)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	7.3	3.4
Window SHGC	0.67	0.72	0.81	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
City		Minneapolis, MN		
Heating Set Point (°C)		19.2 (66.5°F)		
Cooling Set Point (°C)		23 (73.5°F)		
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	0.9 (R-5)	3.3 (R-19)
Exterior Wall Material	Wood, light	Wood, light	Wood, light	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	3.3 (R-19)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	5.6 (R-32)	6.7 (R-38)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.1
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

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**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

<b>City</b>	<b>Nashville, TN</b>			
Heating Set Point (°C)	19.7 (67.4°F)			
Cooling Set Point (°C)	23 (73.5°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	0.9 (R-5)	1.9 (R-11)
Exterior Wall Material	Wood, light	Brick	Aluminum	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	3.3 (R-19)
Window U-Value (W/m <sup>2</sup> K)	5.8	7.3	4.1	3.7
Window SHGC	0.76	0.81	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
City	<b>New York, NY</b>			
Heating Set Point (°C)	19.2 (66.5°F)			
Cooling Set Point (°C)	23 (73.5°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	2.3 (R-13)
Exterior Wall Material	Wood, light	Wood, light	Wood, light	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	2.3 (R-13)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	4.6 (R-26)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.4
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

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**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

<b>City</b>	<b>Phoenix, AZ</b>			
Heating Set Point (°C)	19.6 (67.3°F)			
Cooling Set Point (°C)	24.5 (76.2°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	0.9 (R-5)	1.9 (R-11)
Exterior Wall Material	Wood, light	Brick	Stucco	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	2.3 (R-13)	1.9 (R-11)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.9 (R-11)	5.1 (R-29)	3.3 (R-19)
Window U-Value (W/m <sup>2</sup> K)	5.8	7.3	4.1	4.3
Window SHGC	0.75	0.81	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
City	Seattle, WA			
Heating Set Point (°C)	18.3 (65°F)			
Cooling Set Point (°C)	23 (73.5°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	2.3 (R-13)
Exterior Wall Material	Wood, light	Wood, light	Wood, light	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.9 (R-11)	5.6 (R-32)	4.6 (R-26)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.4
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

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**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

City		St. Louis, MO		
Heating Set Point (°C)		19.2 (66.5°F)		
Cooling Set Point (°C)		23 (73.5°F)		
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	0.9 (R-5)	2.3 (R-13)
Exterior Wall Material	Wood, light	Wood, light	Wood, light	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	3.3 (R-19)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	5.6 (R-32)	4.6 (R-26)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.4
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)
City		Washington, DC		
Heating Set Point (°C)		19.2 (66.5°F)		
Cooling Set Point (°C)		23 (73.5°F)		
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	1.9 (R-11)
Exterior Wall Material	Wood, light	Brick	Aluminum	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	1.9 (R-11)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	1.3 (R-7)	4.7 (R-27)	3.3 (R-19)
Window U-Value (W/m <sup>2</sup> K)	5.8	7.3	4.1	3.7
Window SHGC	0.75	0.81	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

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**Table B.1. Assumed home characteristics for different locations and year of construction (Continued)**

<b>City</b>	<b>Worchester, MA</b>			
Heating Set Point (°C)	19.2 (66.5°F)			
Cooling Set Point (°C)	23 (73.5°F)			
Home vintage	<1940	1940-1969	1970-1989	1990-1997
Floor Insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	Uninsulated	3.3 (R-19)
Exterior Wall Material	Wood, light	Wood, light	Wood, light	Vinyl, light
Wall insulation (m <sup>2</sup> K/W)	Uninsulated	Uninsulated	2.3 (R-13)	2.3 (R-13)
Wall Characteristics	Fiberglass batt Gr-1, 2x4, 16 in o.c.			
Attic Insulation (m <sup>2</sup> K/W)	Uninsulated ceiling	3.9 (R-22)	4.7 (R-27)	4.6 (R-30)
Window U-Value (W/m <sup>2</sup> K)	3.1	4.1	4.1	3.4
Window SHGC	0.67	0.72	0.72	0.4
Window Area	20%	20%	20%	12%
Duct Insulation (m <sup>2</sup> K/W)	Uninsulated	0.7 (R-4)	1 (R-6)	1.4 (R-8)

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137    **Appendix C. Outdoor air pollutant station summary**

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139    **Table C.1 Summary of selected stations in each location for outdoor PM<sub>2.5</sub>, O<sub>3</sub>, NO<sub>2</sub>, and NO<sub>x</sub> (UFP\*)**

Locations	Stations (State Code-County Code- Site ID)			
	PM <sub>2.5</sub>	O <sub>3</sub>	NO <sub>2</sub>	NO <sub>x</sub> (UFP*)
<b>Atlanta</b>	<b>13-089-0002</b>	<b>13-089-0002</b>	<b>13-089-0002</b>	<b>13-089-0002</b>
	13-121-0055	13-121-0055	13-223-0003	13-223-0003
		13-223-0003		
<b>Birmingham</b>	<b>01-073-2003</b>	<b>01-073-2006</b>		
	01-073-2006	01-073-0023	N/A	N/A
		01-073-1003		
<b>Boston</b>	<b>25-025-0042</b>	<b>25-025-0042</b>	<b>25-025-0002</b>	<b>25-025-0042</b>
	25-025-0043	25-025-0041	25-025-0040	25-025-0002
	25-027-0023	25-017-0009		
		25-021-3003		
<b>Buffalo</b>	<b>36-029-0005</b>	<b>36-029-0002</b>	<b>36-029-0002</b>	<b>36-029-0002</b>
	36-029-1013	36-031-0002	36-029-0005	36-029-0005
	36-031-0003		36-033-7003	36-033-7003
<b>Chicago</b>	<b>17-031-0076</b>	<b>17-031-0076</b>	<b>17-031-0076</b>	<b>17-031-0076</b>
	17-031-4201	17-031-4201	17-031-4201	17-031-4201
		17-031-1601		
<b>Cincinnati</b>	<b>39-061-0040</b>	<b>39-061-0040</b>	<b>39-061-0040</b>	<b>39-061-0040****</b>
	39-061-0006	39-061-0010	39-035-0060	39-035-0060
		39-061-0006		
<b>Corpus Christi</b>	<b>48-355-0025</b>	<b>48-355-0025</b>	<b>48-453-0014</b>	<b>48-453-0014</b>
	48-201-1039	48-201-1039	48-245-1035	48-245-1035
		48-201-1039	48-201-1039	48-201-1039
<b>Dallas</b>	<b>48-439-1006</b>	<b>48-439-1002</b>	<b>48-439-1002</b>	<b>48-439-1002</b>
	48-439-3011	48-439-3009	48-439-3009	48-439-3009
		48-439-3011	48-439-3011	48-439-3011
		48-439-3009		
<b>Denver</b>	<b>08-031-0002</b>	<b>08-031-0002</b>	<b>08-031-0002</b>	<b>08-031-0002</b>
	08-035-0004	08-031-0014	08-067-7001	08-057-0003
				08-067-1004
<b>Los Angeles</b>	<b>06-037-1103</b>	<b>06-037-1103</b>	<b>06-037-1103</b>	<b>06-037-1302</b>
	06-037-1201	06-037-1201	06-037-1201	06-037-1201
		06-037-9033	06-037-9033	06-037-1701
	06-037-4002			06-037-1103
	06-037-1302			06-037-9033
<b>Miami</b>	<b>12-086-6001</b>	<b>12-086-0027</b>	<b>12-086-4002</b>	<b>12-086-4002</b>
	12-086-1016	12-071-3002	12-086-0027	12-086-0027
		12-011-8002		
<b>Minneapolis**</b>	<b>27-003-1002</b>	<b>27-003-1002</b>	<b>27-003-1002</b>	<b>27-003-1002</b>
	27-075-0005	27-109-5008	27-037-0020	27-037-0020
<b>Nashville</b>	<b>47-037-0023</b>	<b>47-037-0011***</b>	<b>47-037-0011</b>	N/A
	47-145-3009		47-011-0102	
<b>New York</b>	<b>36-081-0120</b>	<b>36-081-0124</b>	<b>36-081-0124</b>	<b>36-081-0124</b>
	36-029-0005	36-085-0067	36-005-0133	36-033-7003
<b>Phoenix</b>	<b>04-013-9997</b>	<b>04-013-9997</b>	<b>04-013-0019</b>	<b>04-013-9997</b>

	04-013-2001	04-019-1028	04-013-3002	04-019-1028
<b>Seattle</b>	<b>53-033-0080</b>	<b>53-033-0080</b>	<b>53-057-0018</b>	
	53-033-0037	53-033-0010	53-057-0020	N/A
		53-057-0020		
<b>St. Louis</b>	<b>29-510-0085</b>	<b>29-510-0085</b>	<b>29-510-0086</b>	<b>29-510-0086</b>
	29-510-0093		29-095-0034	29-095-0034
<b>Washington</b>	<b>11-001-0043</b>	<b>11-001-0043</b>	<b>11-001-0041</b>	<b>11-001-0041</b>
	51-059-0030	11-001-0041	11-001-0043	11-001-0043
<b>Worcester</b>	<b>25-027-0023</b>	<b>25-027-0015</b>	<b>25-027-0023</b>	<b>25-027-0023</b>
	25-025-0043	25-025-0042	25-025-0042	25-025-0042
	25-025-0042	25-017-0009	25-025-0040	

- 140 \* NO<sub>x</sub> data was used to estimate UFP concentrations  
 141 \*\* Outdoor pollutant data from Blaine, MN are used for Minneapolis, MN  
 142 \*\*\* For Nashville, TN there is only data for March through October  
 143 \*\*\*\* For UFP concentrations in Cincinnati, OH the average of the rest of the year was used for  
 144 December  
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148 **Appendix D. Distributions of indoor and outdoor origin particles, penetration factor, deposition rate,**  
149 **and removal efficiency**

150 **Table D.1. Distributions of indoor and outdoor origin particles, penetration factor, deposition rate, and removal**  
151 **efficiency used to calculate the penetration factor and deposition rate PM2.5 and removal efficiency for PM2.5**  
152 **and UFP**

Size bins ( $\mu\text{m}$ )	<0.1	0.1-0.18	0.18-0.32	0.32-0.56	0.56-1	1-1.8	1.8-2.5
Indoor origin particle concentration ( $\mu\text{m}^3/\text{cm}^3$ ) <sup>1</sup>	0.36	0.8	1.22	1.85	0.61	0.95	0.92
Outdoor origin particle concentration ( $\mu\text{g}/\text{m}^3$ ) <sup>2</sup>	0.4	1.2	1.7	2	1.9	0.6	0.3
Penetration via infiltration (-) <sup>3</sup>	0.83	0.85	0.88	0.84	0.8	0.68	0.54
Deposition rate (-) <sup>4</sup>	0.25	0.19	0.19	0.19	0.29	0.45	0.6
Removal efficiency (-) <sup>5</sup>	0.09	0.05	0.05	0.07	0.13	0.20	0.29

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154 <sup>1</sup> Abt et al. (2000)

155 <sup>2</sup> Logue et al. (2015)

156 <sup>3, 4</sup> Thatcher et al. (2003) and Long et al. (2000)

157 <sup>5</sup> Hecker and Hofacre (2008)

158 **Appendix E. Predicting chronic health impacts**

159 The chronic health impacts of residential inhalation exposure to the modeled pollutants were estimated  
160 using a methodology previously developed by Logue et al. (2012) [1]. In the methodology, the total  
161 chronic health impacts on a disability-adjusted life-years (DALY) basis can be calculated by multiplying  
162 the disease incidence by the number of DALYs lost per incidence (i.e., a DALY factor), as shown in  
163 Equation S1.

164  $DALYs = \left( \frac{\partial DALYs}{\partial disease\ incidence} \right) \times \Delta y_i$  (S1)

165 Where,  $\Delta y_i$  is the change in annual health endpoint (disease incidence) (per person per year). The DALYs  
166 lost per incidence of specific diseases are taken from several studies as shown in Table E-1.

167 Two methods are used to estimate DALYs: (1) epidemiology-based concentration-response (C-R)  
168 functions (i.e., the intake-incidence-DALY, or IND method), and (2) dose-response (D-R) functions (i.e.,  
169 the intake-DALY, or ID method) that rely on data from Huijbregts et al. (2005) [2]. The IND approach is  
170 used for criteria pollutants (e.g., PM<sub>2.5</sub>, NO<sub>2</sub>, and O<sub>3</sub>) and the ID approach is used for all other non-  
171 criteria pollutants. DALYs were not estimated for total UFPs due to a lack of epidemiological literature  
172 for long-term exposures.

173 **Intake–incidence–DALY (IND) approach:**

174 In the IND method, a change in disease incidence is calculated based on a modified C-R function as  
175 shown in Equation S2:

176  $\Delta y_i = - (y_0 \times [\exp(-\beta \times C_{exposure}) - 1]) \times population$  (S2)

177 Where  $y_0$  is the baseline prevalence of illness (per person per year),  $\beta$  is the coefficient of the  
178 concentration change (per  $\mu\text{g}/\text{m}^3$ ),  $C_{exposure}$  is the exposure of pollutant concentration ( $\mu\text{g}/\text{m}^3$ ).

179 Several C-R function outcomes such as mortality, chronic bronchitis, nonfatal stroke, and hospital  
180 admissions for each criteria pollutant are utilized to evaluate the total chronic health impact of air  
181 pollution exposure, with values shown in Table E-1. All the input parameters for the C-R functions are  
182 assumed to be the same as a recent U.S. EPA cost–benefit analysis of the Clean Air Act [3].

183 Following Logue et al., Equation S2 was modified to account for the average fraction of time spent in  
184 residences and the resulting population-weighted annual average indoor pollutant concentrations found  
185 in residences (Equation S3).

186  $\Delta y_i = - (y_0 \times [\exp(-\beta \times C_{in} \times P_{time,indoor}) - 1]) \times population$  (S3)

187 where  $C_{in}$  is the population weighted indoor pollutant concentration ( $\mu\text{g}/\text{m}^3$ ),  $P_{time,indoor}$  is the  
188 average fraction of time people spend inside residences (i.e., 70%) [4], and population is the U.S.  
189 population (i.e., the number of persons exposed).

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**Table E.1. Summary of input parameters for health impact of criteria pollutant [1,3]**

Pollutant	Outcome	$\beta$ -Coefficient	$y_0$	$\partial \text{DALYs} / (\partial \text{disease incidence})$
$\text{PM}_{2.5}$	Total mortality	0.0058	0.0074	1.4
	Chronic bronchitis	0.091	0.0004	1.2
	Nonfatal stroke	0.025	0.0002	11.43
$\text{NO}_2$	Hospital admissions	Respiratory issues	0.004	0.0264 [5]
		Congestive heart failure	0.003	0.0264 [5]
	Ischemic heart disease	0.003	0.008	0.0264 [5]
$\text{O}_3$	Hospital admissions	Mortality	0.001	0.0077
		Asthma	0.003	0.0018
		Lung disease	0.003	0.0021
		Respiratory infection	0.002	0.0058
		Dysrhythmias	0.002	0.0024

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**195 Intake–DALY (ID) approach:**

196 For the ID method, we used the equation given in Logue et al. (2012) in which DALYs lost are calculated  
 197 using data in Huijbregts et al. (2005), which calculated human impact factors for carcinogenic and non-  
 198 carcinogenic substances (Equation S4).

$$199 \quad \text{DALYs}_i = C_i \times V \times \left[ \left( \frac{\partial \text{DALYcancer}}{\partial \text{intake}} \right)_i \times \text{ADAF} + \left( \frac{\partial \text{DALYnoncancer}}{\partial \text{intake}} \right)_i \right] \quad (\text{S4})$$

200 Where  $\frac{\partial \text{DALYcancer}}{\partial \text{intake}}$  and  $\frac{\partial \text{DALYnoncancer}}{\partial \text{intake}}$  are the carcinogenic and non-carcinogenic mass intake-based  
 201 DALYs lost per incidence respectively,  $C_i$  is the population weighted indoor concentration ( $\mu\text{g}/\text{m}^3$ ),  $V$  is a  
 202 population weighted average air intake in the residence ( $\text{m}^3/\text{year}$ ), and ADAF is the age-dependent  
 203 adjustment factor for cancer exposure (-). Both  $V$  and ADAF were computed using the combination of  
 204 age distribution and age-based inhalation rates and percent of day spent at home for U.S population.  
 205 Population average air intake and cancer ADAF are assumed to be  $5256 \text{ m}^3/\text{year}$  and 1.6, respectively.

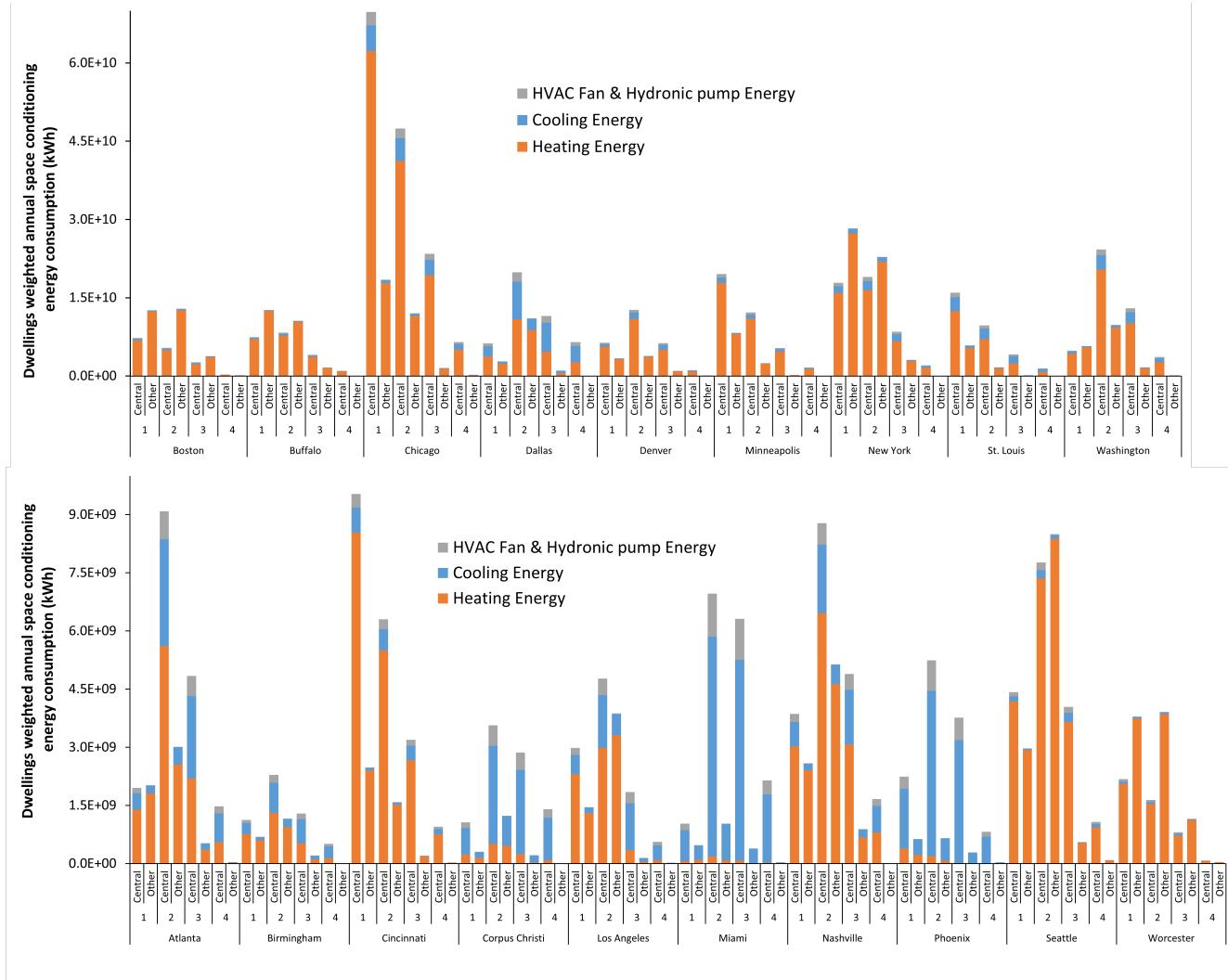
206 Detailed DALYs lost per incidence (total damage and effect factor) of selected VOCs and aldehydes for  
 207 carcinogenic and non-carcinogenic human health impacts are shown in Table E-2 [2].

208

**Table E.2. Combined DALYs lost per incidence factor of selected VOCs and aldehydes for carcinogenic and non-carcinogenic damage**

Chemical Substances	$\delta\text{DALY}/\delta\text{intake} (\text{year kg}^{-1})$	
	Carcinogenic	Non-carcinogenic (inhalation)
<b>Formaldehyde</b>	0.76	-
<b>Acetaldehyde</b>	0.0064	0.032
<b>Acrolein</b>	-	50
<b>1,3-Butadiene</b>	0.003	0.071
<b>Benzene</b>	0.0058	0.0031
<b>1,4-Dichlorobenzene</b>	0.0012	0.0019

212 **Appendix F. Annual space conditioning energy simulation results**



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214 **Figure F.1. Estimates of annual space conditioning site energy aggregated across all home models in the 19**  
 215 **cities, weighted by the number of dwellings in each location and split by year of construction (1 = before 1940; 2**  
 216 **= 1940-69; 3 = 1970-89; and 4 = 1990 and newer) and by the presence/absence of central forced air distribution**  
 217 **systems (Central = homes with central forced air heating and/or cooling and other = home models without).**

218 Estimates of annual space conditioning site energy consumption, weighted by the number of dwellings  
 219 in each location, ranged from as low as  $3.5 \times 10^6$  kWh for homes without central forced-air located in  
 220 Corpus Christi, TX, and built after 1990 to as high as  $7.0 \times 10^{10}$  kWh for homes with central forced-air  
 221 located in Chicago, IL, and built before 1940. The maximum annual electricity consumption for air  
 222 conditioning occurred in homes in Dallas, TX built between 1940 and 1969 ( $7.2 \times 10^9$  kWh) and the  
 223 minimum electricity use for air-conditioning occurred in homes in Worcester, MA built after 1990  
 224 ( $5.2 \times 10^6$  kWh). For homes with central forced air heating, the maximum heating energy consumption  
 225 was predicted in Chicago, IL in homes built before 1940 ( $6.3 \times 10^{10}$  kWh). The minimum heating energy  
 226 consumption was predicted in homes in Phoenix, AZ built after 1990 ( $1.3 \times 10^7$  kWh). Finally, for homes  
 227 without central forced air heating systems, the maximum heating energy consumption was predicted in  
 228 homes in New York, NY built between 1940 and 1969 ( $2.7 \times 10^{10}$  kWh).

229 **Appendix G. Summary of experimental studies on indoor concentration of several pollutants**

230 We reviewed the existing literature for field studies of measured indoor pollutant concentrations,  
 231 infiltration factors, and indoor/outdoor (I/O) concentration ratios to provide comparisons to our model  
 232 results. Google scholar was used to search for several key words including “indoor concentration” of  
 233 “PM<sub>2.5</sub>,” “UFP,” “NO<sub>2</sub>,” “O<sub>3</sub>,” “aldehydes,” “VOCs,” “infiltration factor,” “indoor-outdoor ratio,”  
 234 “residential building,” “North America,” “indoor air,” and others. All data culled from non-smoking  
 235 occupied homes and only studies with measurements in at least 4 homes were included in this review.  
 236 Appendix G, H, and I summarize the resulting measured indoor concentrations, infiltration factors, and  
 237 I/O ratios of each pollutant found in the literature, respectively.

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239 **Table G.1. Summary of measured indoor pollutant concentrations of PM<sub>2.5</sub> and UFP from experimental studies**

Pollutant Type	$C_{in}^1$	# of Homes	Location	Season	Reference
PM <sub>2.5</sub>	17.6	212	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[6]
PM <sub>2.5</sub>	10.1	50	Nova Scotia (Canada)	Summer & winter <sup>2</sup>	[7]
PM <sub>2.5</sub>	11.6	208	Baltimore, Chicago, Los Angeles, New York, Rockland, St. Paul, Winston-Salem	Summer & winter <sup>3</sup>	[8]
PM <sub>2.5</sub>	8.7	50	Edmonton (Canada)	Summer & winter <sup>4</sup>	[9]
PM <sub>2.5</sub>	19.4	37	North Carolina	Four seasons	[10]
PM <sub>2.5</sub>	8.1	44	Seattle	Four seasons	[11]
PM <sub>2.5</sub>	5.8	91	Saskatchewan (Canada)	Summer and winter <sup>5</sup>	[12]
PM <sub>2.5</sub>	18.7	120	Detroit	Summer and winter	[13]
PM <sub>2.5</sub>	11.9	9	Boston	spring/summer 1998 and fall/winter 1998	[14]
PM <sub>2.5</sub>	13	108	Northern California	Summer & winter	[15]
PM <sub>2.5</sub>	20	N/A	New York city	Summer & winter <sup>6</sup>	[16]
PM <sub>2.5</sub>	19.1	58 & 223	Southwest and Central Virginia	Summer & winter <sup>7</sup>	[17]
PM <sub>2.5</sub>	13.7	10	Birmingham	Summer & winter <sup>8</sup>	[18]
PM <sub>2.5</sub>	13.9	3 communities (30 homes)	Minneapolis, St. Paul	Spring, summer & fall	[19]
PM <sub>2.5</sub>	10.8	9	Boston	Four seasons	[20]
PM <sub>2.5</sub>	19.1	37	Raleigh, NC & Chapel Hill, NC	Four seasons	[21]
PM <sub>2.5</sub>	15.5	13	Coachella Valley (southern California)	Winter & spring	[22]
PM <sub>2.5</sub>	13.9	32	Minneapolis, St. Paul	Spring, summer & fall	[23]
PM <sub>2.5</sub>	20.3	43	Boston	Four seasons	[57]
Literature PM <sub>2.5</sub> Median			13.9 µg/m <sup>3</sup>		
UFP	$8.8 \times 10^3$	44	Windsor, Ontario (Canada)	Summer & winter <sup>9</sup>	[24]
UFP	$13.7 \times 10^3$	36	Pembroke, Ontario Montreal, Quebec	Winter	[25]
UFP	$15 \times 10^3$	7	Northern California	Four seasons	[26]

UFP	$12.9 \times 10^3$	5	International Border Crossing in Buffalo, NY	Winter	[27]
Literature UFP Median	$13.3 \times 10^3 \text{#/cm}^3$				

240 <sup>1</sup> C<sub>in</sub>=Indoor concentration of pollutant, unit for PM<sub>2.5</sub>:  $\mu\text{g}/\text{m}^3$ , and UFP:  $\text{#/cm}^3$

241 <sup>2</sup> Mean value for winter ( $8.5 \mu\text{g}/\text{m}^3$ ) and summer ( $11.7 \mu\text{g}/\text{m}^3$ )

242 <sup>3</sup> Mean value for winter ( $10.4 \mu\text{g}/\text{m}^3$ ) and summer ( $12.8 \mu\text{g}/\text{m}^3$ )

243 <sup>4</sup> Mean value for winter ( $6.5 \mu\text{g}/\text{m}^3$ ) and summer ( $11 \mu\text{g}/\text{m}^3$ )

244 <sup>5</sup> Mean value for winter ( $5.5 \mu\text{g}/\text{m}^3$ ) and summer ( $6.2 \mu\text{g}/\text{m}^3$ )

245 <sup>6</sup> Mean value for winter ( $20.9 \mu\text{g}/\text{m}^3$ ) and summer ( $19 \mu\text{g}/\text{m}^3$ )

246 <sup>7</sup> Mean value for winter ( $17.4 \mu\text{g}/\text{m}^3$ ) and summer ( $19.9 \mu\text{g}/\text{m}^3$ )

247 <sup>8</sup> Mean value for winter ( $11.2 \mu\text{g}/\text{m}^3$ ) and summer ( $16.1 \mu\text{g}/\text{m}^3$ )

248 <sup>9</sup> Mean value for winter ( $1.4 \times 10^3 \text{#/cm}^3$ ) and summer ( $1.3 \times 10^3 \text{ & } 0.8 \text{#/cm}^3$ )

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265 **Table G.2. Summary of measured indoor pollutant concentrations of NO<sub>2</sub> and O<sub>3</sub> from experimental studies**

Pollutant Type	$C_{in}^1$	# of Homes	Location	Season	Reference
NO <sub>2</sub> (gas)	23.1	276	Boston	Winter, summer and Fall	[28]
NO <sub>2</sub> (gas)	26.7	36	Portage (WI)	Four seasons	[29]
NO <sub>2</sub> (gas)	30.1	450	Boston	Four seasons	[30]
NO <sub>2</sub> (gas)	19.5	5	Topeka, Kansas	Spring	[31]
NO <sub>2</sub> (gas)	24.9	10	New York City	Spring	[32]
NO <sub>2</sub> (gas)	20.9	38	Portage (WI)	Summer & winter	[33]
<b>Literature NO<sub>2</sub> (gas) Median</b>				<b>24.0 ppb</b>	
NO <sub>2</sub> (electric)	8.2	50	Boston	Winter, summer and Fall	[28]
NO <sub>2</sub> (electric)	4	25	Portage (WI)	Four seasons	[29]
NO <sub>2</sub> (electric)	10	150	Boston	Four seasons	[30]
NO <sub>2</sub> (electric)	7.6	4	Topeka, Kansas	Spring	[31]
NO <sub>2</sub> (electric)	6.8	9	New York City	Spring	[32]
NO <sub>2</sub> (electric)	5.7	48	Portage (WI)	Summer & winter	[33]
<b>Literature NO<sub>2</sub> (electric) Median</b>				<b>7.2 ppb</b>	
O <sub>3</sub>	13	126	Southern California	Winter	[34]
O <sub>3</sub>	15	119	Southern California	Spring	[35]
O <sub>3</sub>	6	145	Mexico City	Fall, winter, and spring	[36]
O <sub>3</sub>	2.8	126	South Bronx and East Harlem (NY)	Four seasons	[37]
O <sub>3</sub>	2.3	35	Nashville	Summer	[38]
O <sub>3</sub>	0.7	91	Saskatchewan (Canada)	Summer	[12]
<b>Literature O<sub>3</sub> Median</b>				<b>4.4 ppb</b>	

266 <sup>1</sup> $C_{in}$ =Indoor concentration of pollutant, unit for all gases: ppb

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**Table G.3. Summary of measured indoor pollutant concentrations of aldehydes from experimental studies**

Pollutant Type	$C_{in}^1$	# of Homes	Location	Season	Reference
Formaldehyde	17.3	306	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[39]
Formaldehyde	25.2	96 & 83	Regina, Saskatchewan (Canada)	Summer & winter <sup>2</sup>	[12]
Formaldehyde	13.2	41 & 38	New York City	Summer & winter <sup>3</sup>	[16]
Formaldehyde	16.8	55	Boston	Summer & winter	[40]
Formaldehyde	54.6	6	New Jersey	Summer	[41]
Formaldehyde	26.5	59	Prince Edward Island (Canada)	Winter	[42]
Literature Formaldehyde Median	<b>21.2 ppb</b>				
Acetaldehyde	12.5	306	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[39]
Acetaldehyde	6.3	96 & 83	Regina, Saskatchewan (Canada)	Summer & winter <sup>4</sup>	[12]
Acetaldehyde	8.3	41 & 38	New York City	Summer & winter <sup>5</sup>	[16]
Acetaldehyde	7.1	55	Boston	Summer & winter	[40]
Acetaldehyde	3.0	6	New Jersey	Summer	[41]
Acetaldehyde	11	59	Prince Edward Island (Canada)	Winter	[42]
Literature Acetaldehyde Median	<b>7.7 ppb</b>				
Acrolein	0.7	306	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[39]
Acrolein	0.4	96 & 83	Regina, Saskatchewan (Canada)	Summer & winter <sup>6</sup>	[12]
Acrolein	0.4	59	Prince Edward Island (Canada)	Winter	[42]
Literature Acrolein Median	<b>0.4 ppb</b>				

279 <sup>1</sup> $C_{in}$ =Indoor concentration of pollutant, unit for Aldehydes: ppb280 <sup>2</sup> Mean value for winter (21.0 ppb) and summer (29.4 ppb)281 <sup>3</sup> Mean value for winter (9.7 ppb) and summer (16.7 ppb)282 <sup>4</sup> Mean value for winter (5.8 ppb) and summer (6.8 ppb)283 <sup>5</sup> Mean value for winter (8.2 ppb) and summer (8.5 ppb)284 <sup>6</sup> Mean value for winter (0.3 ppb) and summer (0.5 ppb)

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**Table G.04. Summary of measured indoor pollutant concentrations of VOCs from experimental studies**

Pollutant Type	$C_{in}^1$	# of Homes	Location	Season	Reference
1,3-Butadiene	0.5	40 & 36	New York City	Summer & winter <sup>2</sup>	[16]
1,3-Butadiene	0.2	55	Boston	Summer & winter	[40]
1,3-Butadiene	0.2	75	Ottawa (Canada)	Winter	[43]
<b>Literature 1,3-Butadiene Median</b>		<b>0.2 ppb</b>			
Benzene	1.1	306	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[39]
Benzene	0.7	108 & 94	Regina, Saskatchewan (Canada)	Summer & winter <sup>3</sup>	[12]
Benzene	1.2	41 & 36	New York City	Summer & winter <sup>4</sup>	[16]
Benzene	0.8	55	Boston	Summer & winter	[40]
Benzene	1.2	100	New Jersey	Four seasons	[44]
Benzene	0.9	75	Ottawa (Canada)	Winter	[43]
Benzene	0.9	159	Southeast Michigan	Four seasons	[45]
Benzene	1.8	71	Minneapolis, St. Paul	Spring, summer, and fall	[46]
<b>Literature Benzene Median</b>		<b>1.0 ppb</b>			
1,4-Dichlorobenzene	11.2	306	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[39]
1,4-Dichlorobenzene	13.3	36 & 36	New York City	Summer & winter <sup>5</sup>	[16]
1,4-Dichlorobenzene	0.51	55	Boston	Summer & winter	[40]
1,4-Dichlorobenzene	1.4	100	New Jersey	Four seasons	[44]
1,4-Dichlorobenzene	0.1	75	Ottawa (Canada)	Winter	[43]
1,4-Dichlorobenzene	0.2	71	Minneapolis, St. Paul	Spring, summer, and fall	[46]
<b>Literature 1,4-Dichlorobenzene Median</b>		<b>0.9 ppb</b>			

288 <sup>1</sup> $C_{in}$ =Indoor concentration of pollutant, unit for VOCs: ppb289 <sup>2</sup> Mean value for winter (0.4 ppb) and summer (0.5 ppb)290 <sup>3</sup> Mean value for winter (0.6 ppb) and summer (0.8 ppb)291 <sup>4</sup> Mean value for winter (0.5 ppb) and summer (1.8 ppb)292 <sup>5</sup> Mean value for winter (9.0 ppb) and summer (17.6 ppb)

293 **Appendix H. Summary of experimental studies on infiltration factors ( $F_{inf}$ ) for several pollutants**

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295 **Table H.1. Summary of experimental studies on  $F_{inf}$  for PM<sub>2.5</sub> and UFPs**

Pollutant Type	$F_{inf}$	# of Homes	Location	Season	Reference
PM <sub>2.5</sub>	0.48	212	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[6]
PM <sub>2.5</sub>	0.62	44	Seattle	Four seasons	[11]
PM <sub>2.5</sub>	0.60	208 & 264	Baltimore, Chicago, Los Angeles, New York, Rockland, St. Paul, Winston-Salem	Summer and winter	[8]
PM <sub>2.5</sub>	0.43	50	Edmonton (Canada)	Summer and winter	[9]
PM <sub>2.5</sub>	0.55	37	North Carolina	Four seasons	[10]
PM <sub>2.5</sub>	0.43	37	North Carolina	Four seasons	[47]
PM <sub>2.5</sub>	0.63	178	Riverside	Fall <sup>1</sup>	[48]
PM <sub>2.5</sub>	0.66	10	Birmingham	Summer & winter	[18]
PM <sub>2.5</sub>	0.70	9	Boston	Four seasons	[49]
PM <sub>2.5</sub>	0.51	172	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[50]
PM <sub>2.5</sub>	0.48	17	Los Angeles	Summer, fall, and spring	[51]
PM <sub>2.5</sub>	0.50	81	Houston	Four seasons <sup>2</sup>	[52]
PM <sub>2.5</sub>	0.74	104	Los Angeles	Four seasons <sup>3</sup>	[52]
PM <sub>2.5</sub>	0.64	78	Elizabeth	Four seasons <sup>4</sup>	[52]
PM <sub>2.5</sub>	0.68	32	Houston (TX), Los Angeles County (CA), and Elizabeth (NJ)	Four seasons <sup>5</sup>	[53]
Literature PM <sub>2.5</sub> Median				0.58	
UFP	0.21	94	Windsor, Ontario (Canada)	Summer & Winter	[24]
UFP	0.39	7	Northern California	Four seasons	[26]
UFP	0.08	5	International Border Crossing in Buffalo, NY	Winter	[27]
UFP	0.2	50	Nova Scotia (Canada)	Summer & winter	[54]
Literature UFP Median				0.21	

296 <sup>1</sup> Mean value for Daytime (0.7) and Overnight (0.56) infiltration factor297 <sup>2</sup> Mean value for primary combustion (0.51) and secondary combustion (0.48) infiltration factor298 <sup>3</sup> Mean value for primary combustion (0.66) and secondary combustion (0.82) infiltration factor299 <sup>4</sup> Mean value for primary combustion (0.65) and secondary combustion (0.63) infiltration factor300 <sup>5</sup> Mean value for homes with central AC (0.63) and homes without central AC (0.72) infiltration factor

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**Table 0H.2. Summary of experimental studies on  $F_{inf}$  for  $\text{NO}_2$  and  $\text{O}_3$** 

<i>Pollutant Type</i>	$F_{inf}$	<i># of Homes</i>	<i>Location</i>	<i>Season</i>	<i>Reference</i>
$\text{NO}_2$	0.25	Library	Prague (Czech Republic)	Summer, fall & winter <sup>1</sup>	[55]
$\text{NO}_2$	0.59	28	Brisbane, Australia	Spring	[56]
$\text{NO}_2$	0.59	37	Seoul, Korea	Summer	[56]
$\text{NO}_2$	0.48	43	Boston	Four seasons	[57]
$\text{NO}_2$	0.49	66	Basel, Geneva, Lugano (Switzerland)	Spring, summer and winter	[58]
<b>Literature <math>\text{NO}_2</math> Median</b>				<b>0.49</b>	
$\text{O}_3$	0.38	6	New Jersey	Summer	[59]
$\text{O}_3$	0.37	126	Los Angeles	Four seasons	[34]
$\text{O}_3$	0.24	119	Southern California	Spring	[35]
$\text{O}_3$	0.19	145	Mexico City	Fall, spring, and winter	[36]
$\text{O}_3$	0.14	126	South Bronx and East Harlem, NY	Four seasons	[37]
$\text{O}_3$	0.10	35	Nashville	Summer	[38]
$\text{O}_3$	0.12	91	Saskatchewan (Canada)	Summer	[12]
<b>Literature <math>\text{O}_3</math> Median</b>				<b>0.19</b>	

302 <sup>1</sup>Mean value for summer (0.22), fall (0.23) and winter (0.30) infiltration factor

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305 **Appendix I. Summary of experimental studies of the indoor/outdoor (I/O) ratio of several pollutants**

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307 **Table I.1. Summary of experimental studies of the I/O ratio for PM<sub>2.5</sub> and UFPs**

<i>Pollutant Type</i>	<i>I/O</i>	<i># of Homes</i>	<i>Location</i>	<i>Season</i>	<i>Reference</i>
PM <sub>2.5</sub>	0.94	70	Steubenville, USA	Summer & winter <sup>1</sup>	[60]
PM <sub>2.5</sub>	1.22	70	Portage, USA	Summer & winter <sup>2</sup>	[60]
PM <sub>2.5</sub>	0.77	10	Birmingham	Summer & winter <sup>3</sup>	[18]
PM <sub>2.5</sub>	1.03	13	Coachella	Spring & winter	[22]
PM <sub>2.5</sub>	1.7	3 Communities (30 homes)	Minneapolis	Spring, summer and fall	[19]
PM <sub>2.5</sub>	1.39	3 Communities	Minneapolis	Spring, summer and fall	[23]
PM <sub>2.5</sub>	0.78	9	Boston	Four seasons	[20]
PM <sub>2.5</sub>	0.73	4	Cincinnati	Spring	[61]
PM <sub>2.5</sub>	0.97	212	Houston (TX), Los Angeles (CA) and Elizabeth (NJ)	Four seasons	[6]
PM <sub>2.5</sub>	1.00	50	Nova Scotia (Canada)	Summer & winter	[7]
PM <sub>2.5</sub>	0.79	208	Baltimore, Chicago, Los Angeles, New York, Rockland, St. Paul, Winston-Salem	Summer & winter	[8]
PM <sub>2.5</sub>	0.98	50	Edmonton (Canada)	Summer & winter	[9]
PM <sub>2.5</sub>	0.99	37	North Carolina	Four seasons	[10]
PM <sub>2.5</sub>	0.79	44	Seattle	Four seasons	[11]
PM <sub>2.5</sub>	1.15	91	Saskatchewan (Canada)	Summer and winter	[12]
PM <sub>2.5</sub>	0.81	120	Detroit	Summer and winter	[13]
PM <sub>2.5</sub>	1.07	9	Boston	spring/summer 1998 and fall/winter 1998	[14]
PM <sub>2.5</sub>	1.65	108	Northern California	Summer & winter	[15]
PM <sub>2.5</sub>	1.67	N/A	New York city	Summer & winter	[16]
PM <sub>2.5</sub>	1.11	58 & 223	Southwest and Central Virginia	Summer & winter	[17]
PM <sub>2.5</sub>	0.99	37	Raleigh, NC & Chapel Hill, NC	Four seasons	[21]
<b>Literature PM<sub>2.5</sub> Median</b>			<b>1.0</b>		
UFP	0.80	94	Windsor, Ontario (Canada)	Summer & winter	[24]
UFP	0.75	29	Montreal, Quebec (Canada)	Winter	[25]
UFP	2.11	4	Boston Area	Summer & winter	[62]
UFP	1.00	7	Northern California	Four seasons	[26]
<b>Literature UFP Median</b>			<b>0.90</b>		

308 <sup>1</sup> Mean value for summer (0.83) and winter (1.04) indoor-outdoor ratio309 <sup>2</sup> Mean value for summer (1.0) and winter (1.44) indoor-outdoor ratio310 <sup>3</sup> Mean value for summer (0.61) and winter (0.92) indoor-outdoor ratio

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**Table I.2. Summary of experimental studies of the I/O ratio for NO<sub>2</sub>**

<i>Pollutant Type</i>	<i>I/O</i>	<i># of Homes</i>	<i>Location</i>	<i>Season</i>	<i>Reference</i>
NO <sub>2</sub> (gas)	3.23	36	Portage (WI)	Four seasons	[29]
NO <sub>2</sub> (gas)	1.19	314	18 cities (15 countries)	Winter	[63]
NO <sub>2</sub> (gas)	1.36	450	Boston	Four seasons	[30]
NO <sub>2</sub> (gas)	1.7	5	Topeka, Kansas	Spring	[31]
NO <sub>2</sub> (gas)	3.0	38	Portage (WI)	Summer & winter	[33]
<b>Literature NO<sub>2</sub> (gas) Median</b>				<b>1.7</b>	
NO <sub>2</sub> (electric)	0.60	25	Portage (WI)	Four seasons	[29]
NO <sub>2</sub> (electric)	0.69	227	18 cities (15 countries)	Winter	[63]
NO <sub>2</sub> (electric)	0.55	150	Boston	Four seasons	[30]
NO <sub>2</sub> (electric)	0.64	4	Topeka, Kansas	Spring	[31]
NO <sub>2</sub> (electric)	0.68	48	Portage (WI)	Summer & winter	[33]
<b>Literature NO<sub>2</sub> (electric) Median</b>				<b>0.6</b>	

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