

*Supplementary Material*

## **Regional Inhaled Deposited Dose of Urban Aerosols in an Eastern Mediterranean City**

**Hussein et al.**

This supplementary material contains tables listing the dose rates based on different concentration metrics, activity, gender, and location.

**Table S1.** Particle number concentration [ $\text{cm}^{-3}$ ] within measured particle diameter ranges  $D_{p1} - D_{p2}$  [ $\mu\text{m}$ ]. This data was adopted from the mobile measurement reported by Hussein et al. (2019). for Amman city.

	$D_{p1} - D_{p2}$	Mean	Stdev	Min	5%	25%	50%	75%	95%	Max
City Center	0.01 – 0.025	31923	16154	6854	13089	19270	27101	40563	64849	78430
	0.025 – 0.3	80561	74505	14610	18779	30463	51130	105082	242684	391695
	0.3 – 0.5	67.46	58.45	17.14	19.81	31.66	48.33	78.54	191.26	379.24
	0.5 – 1	11.46	10.07	3.13	3.77	5.97	9.27	12.02	26.73	80.13
	1 – 2.5	2.89	0.84	1.40	1.52	2.39	2.89	3.35	4.33	6.80
	2.5 – 5	0.87	0.29	0.35	0.39	0.59	0.95	1.08	1.26	1.62
	5 – 10	0.34	0.13	0.11	0.13	0.25	0.35	0.43	0.52	0.73
	10 – 25	0.05	0.03	0.01	0.02	0.04	0.05	0.07	0.09	0.15
Roads	0.01 – 0.025	50219	21106	6721	10915	34447	53850	66446	79342	93907
	0.025 – 0.3	123167	93903	5458	11251	56914	100884	172458	317462	465668
	0.3 – 0.5	45.82	29.53	12.95	23.07	30.47	37.92	51.98	102.02	192.82
	0.5 – 1	6.68	3.64	2.75	3.33	4.50	5.80	7.67	14.22	22.65
	1 – 2.5	2.59	1.05	1.25	1.48	1.85	2.29	3.03	4.56	6.61
	2.5 – 5	0.79	0.33	0.32	0.42	0.55	0.70	0.99	1.35	2.00
	5 – 10	0.30	0.16	0.08	0.13	0.18	0.27	0.38	0.67	0.87
	10 – 25	0.04	0.03	0.01	0.01	0.02	0.03	0.06	0.13	0.17
University of Jordan	0.01 – 0.025	30748	19239	737	11225	15942	23952	39370	70366	104292
	0.025 – 0.3	48129	42282	9665	14190	21681	31764	54821	155076	278869
	0.3 – 0.5	40.14	30.48	12.57	17.28	24.57	31.40	42.89	100.56	247.45
	0.5 – 1	5.69	7.39	2.05	2.35	3.12	3.89	5.18	15.11	60.56
	1 – 2.5	1.73	1.60	0.94	1.07	1.22	1.40	1.83	2.62	24.72
	2.5 – 5	0.55	0.45	0.20	0.25	0.35	0.48	0.62	0.97	7.36
	5 – 10	0.24	0.30	0.05	0.07	0.12	0.21	0.27	0.50	4.91
	10 – 25	0.05	0.05	0.00	0.01	0.02	0.04	0.05	0.12	0.79
Background	0.01 – 0.025	12358	14965	1539	1813	2181	5230	23086	40664	70795
	0.025 – 0.3	18392	29224	2533	2883	3610	5458	18809	96759	119559
	0.3 – 0.5	15.90	5.34	12.51	12.71	13.54	14.41	15.65	22.55	47.72
	0.5 – 1	4.68	0.52	4.03	4.10	4.32	4.50	4.86	5.84	6.15
	1 – 2.5	3.85	0.37	3.35	3.41	3.54	3.79	4.17	4.32	5.34
	2.5 – 5	1.15	0.21	0.91	0.92	1.00	1.12	1.21	1.51	2.19
	5 – 10	0.39	0.13	0.27	0.29	0.32	0.36	0.41	0.68	0.96
	10 – 25	0.04	0.03	0.02	0.02	0.03	0.03	0.05	0.13	0.16

**Table S2.** Regional inhaled deposited dose rates for an adult male as determined using the measured particle number size distributions and effective particle densities according to **Wu and Boor** (In Prep.).

	Activity	DF	VE	Background				University of Jordan				Roads				City Center			
				Head	TB	Alv	Total	Head	TB	Alv	Total	Head	TB	Alv	Total	Head	TB	Alv	Total
PM <sub>1</sub> [×10 <sup>8</sup> particles/hour]	Yard work	Exer.	1.74	25	59	244	327	64	148	618	828	127	292	1,249	1,668	82	189	807	1,076
	Run 8.0 km/h	Exer.	3.48	50	117	487	653	127	295	1,236	1,656	254	584	2,498	3,335	164	377	1,613	2,152
	Walk 4.0 km/h	Exer.	1.38	20	47	193	259	51	117	490	657	101	232	991	1,323	65	150	640	854
	Driving Car	Rel.	0.66	18	29	73	118	44	72	184	300	87	142	377	605	56	92	244	391
	Riding in Car	Rel.	0.60	16	26	66	108	40	66	167	273	79	129	343	550	51	83	222	355
	Standing	Rel.	0.66	18	29	73	118	44	72	184	300	87	142	377	605	56	92	244	391
	Sitting	Rel.	0.54	15	24	60	97	36	59	151	245	71	116	309	495	46	75	200	320
PM <sub>2.5</sub> [μg/hour]	Yard work	Exer.	1.74	1.1	2.4	10.3	13.8	1.5	3.4	15.4	20.3	3.6	7.8	35.9	47.3	2.5	5.6	25.8	33.9
	Run 8.0 km/h	Exer.	3.48	2.1	4.8	20.7	27.6	3.0	6.7	30.7	40.5	7.1	15.6	71.9	94.6	5.1	11.2	51.5	67.8
	Walk 4.0 km/h	Exer.	1.38	0.8	1.9	8.2	10.9	1.2	2.7	12.2	16.1	2.8	6.2	28.5	37.5	2.0	4.4	20.4	26.9
	Driving Car	Rel.	0.66	2.8	0.8	3.6	7.2	2.0	1.4	5.1	8.5	3.7	3.4	11.7	18.9	3.3	2.4	8.5	14.3
	Riding in Car	Rel.	0.60	2.5	0.7	3.2	6.5	1.8	1.3	4.6	7.7	3.4	3.1	10.7	17.2	3.0	2.2	7.8	13.0
	Standing	Rel.	0.66	2.8	0.8	3.6	7.2	2.0	1.4	5.1	8.5	3.7	3.4	11.7	18.9	3.3	2.4	8.5	14.3
	Sitting	Rel.	0.54	2.3	0.7	2.9	5.9	1.6	1.2	4.2	7.0	3.0	2.8	9.6	15.5	2.7	2.0	7.0	11.7
PM <sub>10</sub> [μg/hour]	Yard work	Exer.	1.74	99.9	82.4	51.2	233.6	61.0	50.4	37.3	148.7	79.0	68.2	65.5	212.7	87.3	73.4	58.8	219.4
	Run 8.0 km/h	Exer.	3.48	199.8	164.8	102.4	467.1	122.0	100.8	74.6	297.4	157.9	136.4	131.0	425.3	174.6	146.7	117.5	438.8
	Walk 4.0 km/h	Exer.	1.38	79.2	65.4	40.6	185.2	48.4	40.0	29.6	117.9	62.6	54.1	52.0	168.7	69.2	58.2	46.6	174.0
	Driving Car	Rel.	0.66	72.4	7.8	14.4	94.6	42.8	5.5	11.0	59.3	56.2	8.7	19.6	84.5	62.2	8.3	17.4	87.8
	Riding in Car	Rel.	0.60	65.8	7.1	13.1	86.0	38.9	5.0	10.0	53.9	51.1	7.9	17.9	76.8	56.5	7.5	15.8	79.8
	Standing	Rel.	0.66	72.4	7.8	14.4	94.6	42.8	5.5	11.0	59.3	56.2	8.7	19.6	84.5	62.2	8.3	17.4	87.8
	Sitting	Rel.	0.54	59.2	6.4	11.8	77.4	35.0	4.5	9.0	48.5	46.0	7.1	16.1	69.1	50.9	6.8	14.2	71.9

**Table S3.** Regional inhaled deposited dose rates for an adult female as determined using the measured particle number size distributions and effective particle densities according to **Wu and Boor (In Prep.)**.

	Activity	DF	VE	Background				University of Jordan				Roads				City Center			
				Head	TB	Alv	Total	Head	TB	Alv	Total	Head	TB	Alv	Total	Head	TB	Alv	Total
PM <sub>1</sub> [×10 <sup>8</sup> particles/hour]	Yard work	Exer.	1.08	16	40	148	203	40	100	376	514	78	197	754	1,028	51	127	487	664
	Run 8.0 km/h	Exer.	3.03	44	111	415	569	110	281	1,053	1,442	218	551	2,115	2,884	141	355	1,365	1,861
	Walk 4.0 km/h	Exer.	1.20	18	44	165	226	44	111	417	572	87	219	838	1,143	56	141	541	737
	Driving Car	Rel.	0.51	15	27	50	92	38	69	127	233	75	135	261	470	48	87	169	303
	Riding in Car	Rel.	0.48	15	26	47	87	36	65	120	219	70	127	245	442	46	82	159	286
	Standing	Rel.	0.48	15	26	47	87	36	65	120	219	70	127	245	442	46	82	159	286
	Sitting	Rel.	0.42	13	23	42	76	32	57	105	192	62	111	215	387	40	72	139	250
PM <sub>2.5</sub> [μg/hour]	Yard work	Exer.	1.08	0.7	1.5	6.3	8.5	0.9	2.2	9.2	12.2	2.1	5.0	21.3	28.5	1.5	3.6	15.4	20.5
	Run 8.0 km/h	Exer.	3.03	1.9	4.2	17.7	23.8	2.6	6.1	25.7	34.4	6.0	14.1	59.8	79.9	4.3	10.1	43.1	57.5
	Walk 4.0 km/h	Exer.	1.20	0.7	1.7	7.0	9.4	1.0	2.4	10.2	13.6	2.4	5.6	23.7	31.6	1.7	4.0	17.1	22.8
	Driving Car	Rel.	0.51	2.1	0.7	2.4	5.2	1.5	1.4	3.5	6.4	3.0	3.3	8.1	14.3	2.6	2.3	5.8	10.7
	Riding in Car	Rel.	0.48	1.9	0.7	2.3	4.9	1.5	1.3	3.3	6.0	2.8	3.1	7.6	13.5	2.4	2.2	5.5	10.1
	Standing	Rel.	0.48	1.9	0.7	2.3	4.9	1.5	1.3	3.3	6.0	2.8	3.1	7.6	13.5	2.4	2.2	5.5	10.1
	Sitting	Rel.	0.42	1.7	0.6	2.0	4.3	1.3	1.1	2.9	5.3	2.4	2.7	6.6	11.8	2.1	1.9	4.8	8.8
PM <sub>10</sub> [μg/hour]	Yard work	Exer.	1.08	64.0	48.9	32.0	145.0	39.0	30.0	23.0	92.0	50.5	40.8	39.9	131.2	55.9	43.7	36.1	135.7
	Run 8.0 km/h	Exer.	3.03	179.7	137.3	89.7	406.7	109.5	84.2	64.4	258.1	141.6	114.4	112.0	368.0	156.7	122.7	101.3	380.7
	Walk 4.0 km/h	Exer.	1.20	71.2	54.4	35.5	161.1	43.4	33.3	25.5	102.2	56.1	45.3	44.3	145.7	62.1	48.6	40.1	150.8
	Driving Car	Rel.	0.51	54.8	6.3	10.3	71.4	32.5	4.6	7.8	44.9	42.7	7.5	13.8	64.0	47.2	6.9	12.3	66.4
	Riding in Car	Rel.	0.48	51.6	5.9	9.7	67.2	30.6	4.3	7.3	42.2	40.2	7.0	13.0	60.3	44.4	6.5	11.6	62.5
	Standing	Rel.	0.48	51.6	5.9	9.7	67.2	30.6	4.3	7.3	42.2	40.2	7.0	13.0	60.3	44.4	6.5	11.6	62.5
	Sitting	Rel.	0.42	45.1	5.2	8.5	58.8	26.8	3.8	6.4	36.9	35.2	6.1	11.4	52.7	38.9	5.7	10.1	54.7

**Table S4.** Regional inhaled deposited dose rates for adults calculated for particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) [ $\mu\text{g}/\text{hour}$ ] based on the calculated particle mass size distributions assuming spherical particles of unit density.

Gender	Activity	DF	VE	Background				University of Jordan				Roads				City Center				
				Head	TB	Alv	Total	Head	TB	Alv	Total	Head	TB	Alv	Total	Head	TB	Alv	Total	
PM <sub>2.5</sub>	Male	Yard work	Exer.	1.74	0.7	1.6	6.8	9.0	1.1	2.3	10.7	14.0	2.5	5.5	25.2	33.2	1.8	3.9	17.8	23.5
		Run 8.0 km/h	Exer.	3.48	1.4	3.1	13.5	18.0	2.1	4.6	21.3	28.1	5.0	10.9	50.4	66.3	3.5	7.8	35.7	47.0
		Walk 4.0 km/h	Exer.	1.38	0.6	1.2	5.4	7.2	0.8	1.8	8.5	11.1	2.0	4.3	20.0	26.3	1.4	3.1	14.1	18.6
		Driving Car	Rel.	0.66	1.7	0.5	2.3	4.6	1.3	1.0	3.5	5.8	2.5	2.4	8.2	13.1	2.2	1.7	5.9	9.7
		Riding in Car	Rel.	0.60	1.6	0.5	2.1	4.2	1.2	0.9	3.2	5.3	2.2	2.2	7.5	11.9	2.0	1.5	5.4	8.8
		Standing	Rel.	0.66	1.7	0.5	2.3	4.6	1.3	1.0	3.5	5.8	2.5	2.4	8.2	13.1	2.2	1.7	5.9	9.7
		Sitting	Rel.	0.54	1.4	0.4	1.9	3.7	1.0	0.8	2.9	4.7	2.0	2.0	6.7	10.7	1.8	1.4	4.8	8.0
	Female	Yard work	Exer.	1.08	0.4	1.0	4.1	5.5	0.6	1.5	6.3	8.5	1.5	3.5	14.9	20.0	1.1	2.5	10.6	14.2
		Run 8.0 km/h	Exer.	3.03	1.2	2.8	11.6	15.6	1.8	4.2	17.8	23.8	4.2	9.9	41.9	56.0	3.0	7.0	29.8	39.8
		Walk 4.0 km/h	Exer.	1.20	0.5	1.1	4.6	6.2	0.7	1.7	7.0	9.4	1.7	3.9	16.6	22.2	1.2	2.8	11.8	15.8
		Driving Car	Rel.	0.51	1.3	0.5	1.6	3.3	1.0	1.0	2.4	4.4	2.0	2.3	5.6	10.0	1.7	1.6	4.0	7.3
		Riding in Car	Rel.	0.48	1.2	0.5	1.5	3.1	0.9	0.9	2.3	4.1	1.9	2.2	5.3	9.4	1.6	1.5	3.8	6.9
		Standing	Rel.	0.48	1.2	0.5	1.5	3.1	0.9	0.9	2.3	4.1	1.9	2.2	5.3	9.4	1.6	1.5	3.8	6.9
		Sitting	Rel.	0.42	1.1	0.4	1.3	2.8	0.8	0.8	2.0	3.6	1.6	1.9	4.6	8.2	1.4	1.3	3.3	6.0
PM <sub>10</sub>	Male	Yard work	Exer.	1.74	66.6	54.9	34.0	155.5	40.7	33.7	25.3	99.7	52.8	45.7	44.9	143.4	58.3	49.0	39.8	147.1
		Run 8.0 km/h	Exer.	3.48	133.2	109.8	68.1	311.1	81.4	67.3	50.6	199.3	105.5	91.4	89.9	286.8	116.5	98.1	79.7	294.3
		Run 6.4 km/h	Exer.	1.98	75.8	62.5	38.7	177.0	46.3	38.3	28.8	113.4	60.0	52.0	51.1	163.2	66.3	55.8	45.3	167.4
		Walk 4.0 km/h	Exer.	1.38	52.8	43.5	27.0	123.4	32.3	26.7	20.0	79.0	41.9	36.3	35.6	113.7	46.2	38.9	31.6	116.7
		Driving Car	Rel.	0.66	48.1	5.2	9.6	62.9	28.5	3.7	7.4	39.6	37.4	5.9	13.5	56.8	41.4	5.6	11.8	58.7
		Riding in Car	Rel.	0.60	43.7	4.7	8.7	57.2	25.9	3.4	6.8	36.0	34.0	5.4	12.3	51.7	37.6	5.1	10.7	53.4
		Standing	Rel.	0.66	48.1	5.2	9.6	62.9	28.5	3.7	7.4	39.6	37.4	5.9	13.5	56.8	41.4	5.6	11.8	58.7
	Sitting	Rel.	0.54	39.4	4.3	7.8	51.5	23.3	3.0	6.1	32.4	30.6	4.9	11.0	46.5	33.9	4.6	9.6	48.1	
	Female	Yard work	Exer.	1.08	42.7	32.6	21.2	96.5	26.0	20.1	15.5	61.6	33.7	27.4	27.3	88.4	37.3	29.2	24.4	91.0
		Run 8.0 km/h	Exer.	3.03	119.8	91.5	59.6	270.8	73.1	56.3	43.6	172.9	94.6	76.8	76.7	248.0	104.6	82.1	68.6	255.2
		Walk 4.0 km/h	Exer.	1.20	47.4	36.2	23.6	107.3	28.9	22.3	17.3	68.5	37.5	30.4	30.4	98.2	41.4	32.5	27.2	101.1
		Driving Car	Rel.	0.51	36.4	4.2	6.8	47.5	21.6	3.1	5.3	30.0	28.5	5.1	9.5	43.1	31.4	4.7	8.3	44.5
		Riding in Car	Rel.	0.48	34.3	3.9	6.4	44.7	20.4	2.9	5.0	28.2	26.8	4.8	8.9	40.5	29.6	4.4	7.8	41.8
		Standing	Rel.	0.48	34.3	3.9	6.4	44.7	20.4	2.9	5.0	28.2	26.8	4.8	8.9	40.5	29.6	4.4	7.8	41.8
Sitting		Rel.	0.42	30.0	3.4	5.6	39.1	17.8	2.5	4.3	24.7	23.5	4.2	7.8	35.5	25.9	3.9	6.9	36.6	

**Table S5.** Regional inhaled deposition dose rate fractions based on activity (exercise versus relax), gender (male versus female), and particulate matter metrics: mass concentrations (PM<sub>10</sub> and PM<sub>2.5</sub>) and number concentration (PN<sub>1</sub>).

			PN <sub>1</sub>			PM <sub>2.5</sub>			PM <sub>10</sub>		
			Head	TB	Alv	Head	TB	Alv	Head	TB	Alv
Background	Exercise	Male	7.6	17.8	74.6	7.8	17.3	74.9	42.8	35.3	21.9
		Female	7.6	19.5	72.9	7.9	17.8	74.3	44.2	33.8	22.1
	Relax	Male	14.7	24.1	61.2	38.9	11.2	49.9	76.5	8.3	15.3
		Female	16.3	29.4	54.4	39.7	14.3	46.1	76.8	8.8	14.5
University of Jordan	Exercise	Male	7.6	17.8	74.6	7.5	16.6	75.9	41.0	33.9	25.1
		Female	7.6	19.4	73.0	7.5	17.6	74.9	42.4	32.6	25.0
	Relax	Male	14.7	24.0	61.4	23.3	16.9	59.8	72.2	9.3	18.5
		Female	16.2	29.3	54.5	24.2	21.4	54.4	72.4	10.2	17.4
Roads	Exercise	Male	7.6	17.5	74.9	7.5	16.5	76.0	37.1	32.1	30.8
		Female	7.6	19.1	73.3	7.5	17.7	74.9	38.5	31.1	30.4
	Relax	Male	14.3	23.4	62.3	19.7	18.2	62.1	66.5	10.3	23.2
		Female	15.8	28.7	55.5	20.7	23.1	56.2	66.8	11.6	21.6
City Center	Exercise	Male	7.6	17.5	74.9	7.5	16.5	75.9	39.8	33.4	26.8
		Female	7.6	19.1	73.4	7.5	17.6	74.9	41.2	32.2	26.6
	Relax	Male	14.3	23.3	62.4	23.4	16.8	59.8	70.8	9.4	19.8
		Female	15.8	28.6	55.5	24.2	21.4	54.4	71.1	10.4	18.5