

Supplementary Information

Health risk associated with BTEX exposure at roadside and on-road traveling route in bangkok metropolitan region

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Supplementary Table 1. Inhalation exposure pathways of the study population

Population groups	Microenvironments	Measurement seasons	Exposure pathway
Van drivers in urban area	- working on-route	dry and wet seasons	LADD _{working on-route, dry} + LADD _{working on-route, wet} +
	- resting at roadside	dry and wet seasons	LADD _{resting at roadside, dry} + LADD _{resting at roadside, wet}
Pickup drivers in urban area	- working on-route	dry season	LADD _{working on-route, dry} + LADD _{resting at roadside, dry}
	- resting at roadside	dry seasons	
Pickup drivers in suburban area	- working on-route	dry season	LADD _{working on-route, dry} + LADD _{resting at roadside, dry}
	- resting at roadside	dry season	
Motorcycle drivers in suburban area	- working on-route	dry season	LADD _{working on-route, dry} + LADD _{resting at roadside, dry}
	- resting at roadside	dry season	
Van passengers in urban area	- travelling on-route	dry and wet seasons	LADD _{travelling on-route, dry} + LADD _{travelling on-route, wet} +
	- waiting at roadside	dry and wet seasons	
Pickup passengers in urban	- travelling on-route	dry season	LADD _{travelling on-route, dry} + LADD _{waiting at roadside, dry}
	- waiting at roadside	dry season	
Pickup passengers in suburban	- travelling on-route	dry season	LADD _{travelling on-route, dry} + LADD _{waiting at roadside, dry}
	- waiting at roadside	dry season	
Motorcycle passengers	- travelling on-route	dry season	LADD _{travelling on-route, dry} + LADD _{waiting at roadside, dry}
	- waiting at roadside	dry season	
Street side trader in urban	- working at roadside	dry and wet seasons	LADD _{working at roadside, dry} + LADD _{working at roadside, wet}
Street side trader in suburban	- working at roadside	dry season	LADD _{working at roadside, dry}

LADD: Lifetime average daily dose.

Supplementary Table 2. Comparison of cancer and noncancer risks of BTEX inhalation exposure among different studies

Study areas/period	Sampling sites	Population characteristics, exposure routes and time	LCR _B	HQ _B	HQ _T	HQ _E	HQ _X	HI _{BTEX}
Khon Kaen, Thailand/2018 ^[1]	Gasoline stations	Fueling workers	-	1.0E-01 to 5.5E + 00	< 1.0E-01 to 1.0E-01	< 1.0E-01 to 1.0E-01	< 1.0E-01 to 1.7E + 00	< 1.0E-01 to 7.3E + 00
Northern Iran/2016 ^[2]	A major oil distribution company	Tanker loading workers	1.6E-02	-	-	-	-	1.7E + 00
		Tank-gauging workers	2.5E-03	-	-	-	-	2.5E-01
		Drivers	2.0E-04	-	-	-	-	5.0E-02
		Firefighters	2.1E-04	-	-	-	-	2.0E-02
		Office workers	6.0E-05	-	-	-	-	1.0E-02
Montreal, Canada/2008 ^[3]	Automobile repair garages	Occupational exposures	8.6E-06*	3.7E-02*	8.1E-03*	2.9E-03*	1.3E-01*	1.8E-01*
		Non-occupational exposures	4.6E-06*	2.0E-02*	4.6E-03*	2.3E-03*	2.1E-03*	2.9E-02*
		Total environment exposure	1.3E-05*	5.7E-02*	1.3E-02*	5.2E-03*	2.3E-01*	3.0E-01*
Chonburi, Thailand/2007 ^[4]	Gas service station	Workers	2.0E-04	1.1E-01	3.4E-02	< 0.0E-03	2.0E-03	1.6E-1
Johannesburg, South Africa/n.a. ^[5]	Diesel service station for public buses	Diesel station workers	3.8E-04	1.7E-01 to 7.3E+00	4.5E-01 to 15.8E+00	-	1.2E-02 to 5.1E-01	6.9E + 00*
Bangkok, Thailand/n.a. ^[6]	Gasoline stations	Gasoline station workers	1.8E-04	6.0E-01	8.0E-03	7.0E-03	2.0E-03	6.2E-01
		Roadside exposure	8.7E-05	3.8E-01	5.0E-03	9.0E-03	2.0E-03	4.0E-01
Ardabil, Iran/2019 ^[7]	Indoor printing and copying	Workers (LaserJet printers)	3.8E-05	5.0E-01	5.0E-03	9.0E-03	7.0E-02	5.8E-01*

Study areas/period	Sampling sites	Population characteristics, exposure routes and time	LCR _B	HQ _B	HQ _T	HQ _E	HQ _X	HI _{BTEX}
	centers	Workers (inkjet printers)	<i>1.5E-04</i>	<i>2.3E + 00</i>	<i>1.9E-02</i>	<i>2.0E-02</i>	<i>1.8E-01</i>	<i>2.5E + 00*</i>
South China/2018-2019 ^[8]	E-waste recycling park	Workers	<i>1.2E-06</i>	<i>3.3E-02</i>	<i>6.1E-04</i>	<i>7.1E-04</i>	<i>1.2E-02*</i>	<i>5.3E-02</i>
Istanbul, Turkey/2015-2016 ^[9]	The ambient air around the largest wastewater treatment plants	Workers (8 h/day), adults	1.2E-06	-	1.0E-04	2.0E-04	6.4E-03	6.7E-03*
		Residents (12 h/day), adults	8.4E-06	-	9.0E-04	1.3E-03	4.9E-02	-
		Residents (24 h/day), adults	1.7E-05	-	1.8E-03	2.6E-03	9.7E-02	1.0E-01*
Kocaeli, Turkey/2007 ^[10]	Landfill	Workers	6.8E-05	-	1.5E-02	1.4E-02	2.0E-01	2.3E-01*
Klang valley region, Malaysia/2017-2018 ^[11]	Urban areas	Traffic policeman	5.3E-06	2.4E-01	1.0E-02	1.0E-02	2.1E-01	4.7E-01
Kolkata, India/2006 ^[12]	The City	Inhabitants, adults	2.8E-05	6.0E-01	4.0E-03	8.2E-03	1.3E-01	7.3E-01*
	Residential area		1.8E-05	3.9E-01	2.3E-03	2.9E-03	7.9E-02	
	Roadside area		3.6E-05	7.8E-01	5.4E-03	5.2E-03	1.8E-01	
Delhi, India/2016-2017 ^[13]	Traffic intersection points	Inhabitants, adults	3.6E-05	1.5E-01	7.3E-03	5.9E-03	1.6E-01*	3.3E-01
Azerbaijan, Iran/2018 ^[14]	Urmia metropolis	Inhabitants, adults, summer	<i>4.0E-06</i>	<i>2.4E-01</i>	<i>1.4E-03</i>	<i>4.6E-03</i>	<i>1.8E-01</i>	-
		Inhabitants, adults, winter	<i>5.4E-06</i>	<i>3.3E-01</i>	<i>3.8E-03</i>	<i>2.6E-03</i>	<i>2.0E-01</i>	-
		Inhabitants, adults, overall	<i>4.4E-06</i>	<i>2.7E-01</i>	<i>1.8E-03</i>	<i>3.7E-03</i>	<i>1.9E-01</i>	<i>4.7E-01*</i>

Study areas/period	Sampling sites	Population characteristics, exposure routes and time	LCR _B	HQ _B	HQ _T	HQ _E	HQ _X	HI _{BTEX}
Razavi Khorasan, Iran/2018 ^[15]	Mashhad metropolis	Inhabitants, adult, summer	2.4E-06	1.5E-01	1.8E-04	1.3E-03	3.9E-02	-
		Inhabitants, adult, winter	1.6E-06	9.7E-02	1.2E-03	8.8E-04	2.5E-02	-
		Inhabitants, adults, overall	2.0E-06	1.2E-01	1.5E-03	1.1E-03	1.7E-02	1.4E-01*
Tehran, Iran/2018-2019 ^[16]	Urban area (the largest city)	Adults	3.2E-03	2.8E-03	3.0E + 00	1.1E-01	2.7E-03	3.1E + 00*
		Children	6.6E-03	5.2E-03	4.7E + 00	3.1E-01	7.1E-03	5.0E + 00*
Tehran, Iran/2012-2013 ^[17]	Urban area (the largest city)	Inhabitants, adults	3.9E-07	4.4E-02	1.1E-03	1.8E-03	6.1E-02	1.1E-01
Malaysia/2017 ^[18]	Urban environments	Inhabitants, adults	1.6E-05	2.0E-01	4.3E-03	4.3E-03	1.6E-01	3.6E-01
		Inhabitants, adults	4.2E-06	5.2E-02	1.6E-03	1.6E-03	4.0E-02	9.5E-02
		Inhabitants, adults	5.8E-06	7.2E-02	1.3E-03	1.4E-03	4.1E-02	1.2E-01
	Background station	Inhabitants, adults	1.8E-06	2.2E-02	5.0E-04	3.0E-04	2.2E-02	4.5E-02
Yunnan, China/2012 ^[19]	Residential areas near the coking factory	Residents, adults	2.1E-05*	1.1E-01	1.0E-03	6.2E-04	1.4E-02	1.3E-01*
Shiraz, Iran/2016 ^[20]	Urban hot spot (Bus terminal region)	Inhabitants, adults, morning	2.0E-04	8.8E-01	2.6E-03	7.5E-03	4.3E + 00	5.0E+00*
		Inhabitants, adults, evening	2.5E-04	1.1E+00	2.2E-03	6.6E-03	3.8E + 00	
Bolu, Turkey/2017 ^[21]	Villages	Inhabitants, adults	4.4E-06	3.8E-02*	3.0E-04*	2.5E-04*	6.6E-03*	6.5E-02*
	Roadside			3.1E-02*	2.4E-04*	2.4E-04*	6.5E-03*	
	City center			8.3E-02*	6.0E-04*	5.5E-04*	2.7E-02*	
Modugno,	City near an	Inhabitants, adults	8.3E-06	1.4E-01	6.1E-04	5.3E-04	1.4E-02	1.6E-01*

Study areas/period	Sampling sites	Population characteristics, exposure routes and time	LCR _B	HQ _B	HQ _T	HQ _E	HQ _X	HI _{BTEX}
Southern Italy/2008-2009 ^[22]	industrial area							
South Africa/n.a. ^[23]	Simulating coal combustion in a house	Residents, adults, male	1.1E-04	N/A	< 1.0E-03	5.0E-03	8.7E-02	9.9E-02*
		Residents, adults, female	1.2E-04	N/A	1.0E-03	6.0E-03	9.9E-02	
Southeast Louisiana/2010 ^[24]	Residential indoor air	Residents, adults, women	<i>1.3E-05</i>	<i>3.5E-02</i>	<i>1.0E-03</i>	<i>1.0E-03</i>	<i>4.0E-02</i>	-
Ardebil, Iran/2018 ^[25]	Indoor rural houses with different fuels for heating systems	Residents-natural gas	<i>2.5E-06</i>	<i>7.0E-01</i>	<i>6.0E-03</i>	<i>1.0E-02</i>	<i>2.4E-01</i>	<i>1.5E + 00*</i>
		Residents-Kerosene	<i>9.3E-05</i>	<i>1.4E + 00</i>	<i>1.8E-02</i>	<i>3.6E-02</i>	<i>5.2E-01</i>	
Shanghai, China/2015 ^[26]	Metro carriages (train)	Commuters, adults	1.7E-05*	-	-	-	-	-
Bangkok Metropolitan Region, Thailand (This study)	Urban and suburban areas	Passengers	<i>5.6E-06</i>	<i>2.4E-02</i>	<i>4.0E-04</i>	<i>2.5E-04</i>	<i>7.3E-03</i>	<i>3.2E-02</i>
		Drivers	<i>1.5E-05</i>	<i>6.2E-02</i>	<i>1.1E-03</i>	<i>6.1E-04</i>	<i>1.8E-02</i>	<i>8.2E-02</i>
		Street vendors	<i>6.8E-06</i>	<i>3.2E-02</i>	<i>4.6E-04</i>	<i>3.3E-04</i>	<i>7.6E-03</i>	<i>4.2E-02</i>

Italic font is the median values; *The values were calculated based on available results in the articles; LCR: Lifetime cancer risk; HQ: Hazard Quotient; HI: Hazard Index; LCR, HQ and HI values are unitless; HI_{BTEX}: Hazard index of benzene, toluene, ethylbenzene and xylene.

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