Supplementary Materials

Behavioral variations and their effects on traffic-related $PM_{2.5}$ inhalation exposure: findings from three cross-sectional surveys (2015-2020)

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Supplementary Table 1. Sociodemographic characteristics of the participants during the years 2015, 2016–2018, and 2020

Characteristics	Total, n(%)	2015	2016-2018	2020	*P*-Value
Total, n	4802	2157	1323	1322	
Region type, n(%)					<0.0001
Urban	2680(55.8)	1307(60.6)	665(50.3)	708(53.6)	
Rural	2122(44.2)	850(39.4)	658(49.7)	614(46.4)	
Gender, n(%)					0.900
Male	2399(49.96)	1071(49.7)	661(49.96)	667(50.5)	
Female	2403(50.04)	1086(50.4)	662(50.04)	655(49.6)	
Age group(years), n(%)					<0.0001
18-29	678(14.1)	359(16.6)	114(8.6)	205(15.5)	
30-44	1194(24.9)	586(27.2)	284(21.5)	324(24.5)	
45-59	1725(35.9)	834(38.7)	448(33.9)	443(33.5)	
≥60	1205(25.1)	378(17.5)	477(36.1)	350(26.5)	
Occupation, n(%)					<0.0001
Scientific and technical personnel	327(6.8)	126(5.8)	59(4.5)	142(10.7)	
Social and economic personnel	95(2.0)	28(1.3)	28(2.1)	39(3.0)	
Officers and related personnel	487(10.1)	229(10.6)	166(12.6)	92(7.0)	
Business and services personnel	474(9.9)	88(4.1)	160(12.1)	226(17.1)	
Agricultural personnel	1703(35.5)	784(36.4)	553(41.8)	366(27.7)	
Manufacturing personnel	463(9.6)	311(14.4)	69(5.2)	83(6.3)	
Inconvenient-to-classify personnel	1253(26.1)	591(27.4)	288(21.8)	374(28.3)	
Family annual income (CNY), n(%)					<0.0001
＜30,000	2135(44.5)	1337(62.0)	432(32.7)	366(27.7)	
＜100,000	1338(27.9)	309(14.3)	534(40.4)	495(37.4)	
≥100,000	1329(27.7)	511(23.7)	357(27.0)	461(34.9)	
Family annual expenditure (CNY), n(%)					<0.0001
＜30,000	3172(66.1)	1826(84.7)	701(53.0)	645(48.8)	
＜100,000	1033(21.5)	120(5.6)	434(32.8)	479(36.2)	
≥100,000	597(12.4)	211(9.8)	188(14.2)	198(15.0)	

Inhalation rate

$$IR_i = \frac{BMR \times H \times VQ \times N}{1440}$$

Supplementary Equation 1

where IR_i represents the inhalation rate in each transportation mode, L/min; N represents the activity intensity, and the values for sedentary, moderate, and light activities are 1.2, 4, and 1.5, respectively; BMR represents the basal metabolic rate, kJ /d; H represents the oxygen uptake, whose value is typically 0.05 L/kJ; and VQ represents the ventilation equivalent, whose value is typically 27, these value were from *Exposure factors handbook: 2011 edition* [1].

Supplementary Table 2. $PM_{2.5}$ concentration studies for each transportation mode

Transportation modes		Santiago [2]	Taiwan [3]	London [4]	Milan [5]	Milan [6]	Dublin [7]	Xi'an [8]	Nanchong [9]	Foshan [10]
Walking		/	/	/	10.2	15.5	63.45	71.59	41.5	74.1
Public	Bus	60.4	38.5	16.3[a]/24.7[b]	/	/	128.16	54.39	41.6	75.9
	Subway	62.4	35.0	/	9.8	42.1	/	43.21	/	/
Car		46.5	22.1	26.1[a]/34.4[b]	11.2	6.8	82.73	29.94	51.2[c]/40.2[d]	56.8[d]
Open		50.9	67.5	15.4[a]/19.2[b]	17.4	19.1	88.14	/	44.9[e]/48.3[f]	76.8[e]/77.1[f]

[a]In summer ; [b]in winter; [c]private car; [d]Taxi; [5]bicycle; [6]motorcycle.

Relative concentration ratios

The relative concentration ratios used in this study were calculated based on $PM_{2.5}$ concentrations for each transportation mode.

$$Relative\ concentration\ ratio\ for \frac{walking}{car} = \frac{concentration\ in\ walking\ mode}{concentration\ in\ car\ mode}$$

Supplementary Equation 2

$$Relative\ concentration\ ratio\ for \frac{public}{walking}\ or \frac{open}{walking} = \frac{concentration\ in\ public\ or\ open\ mode}{concentration\ in\ walking\ mode}$$

Supplementary Equation 3

The $PM_{2.5}$ concentration used for the walking mode was 47.2 μg/m^3, which was calculated as the mean of annual average ambient $PM_{2.5}$ concentrations obtained from the *Report on the State of the Environment in Lanzhou* for the years 2015, 2016, 2017, 2018, and 2020[11]. The $PM_{2.5}$ concentrations for car, public, and open transportation modes were obtained from a study in Foshan[10], as shown in Supplementary Table 2.

Supplementary Table 3. Transportation modes during the years 2015, 2016–2018, and 2020

Characteristics	2015 Transportation mode (%,95%CI)				2016-2018 Transportation mode (%,95%CI)				2020 Transportation mode (%,95%CI)				*P*-Value
	Walking	Public*	Car**	Open***	Walking	Public*	Car**	Open***	Walking	Public*	Car**	Open***	
Total	78.0(76.2-79.8)	28.3(26.4-30.3)	7.7(6.7-9)	8.8(7.6-10)	88.4(86.5-90)	30.2(27.7-32.7)	11.3(9.7-13.2)	19.6(17.5-21.8)	86.5(84.6-88.3)	27.2(24.8-29.6)	16.0(14.1-18.1)	9.2(7.7-10.9)	<0.0001
Region type													
Urban	79.5(77.2-81.7)	43.8(41.1-46.5)	11.2(9.5-13)	5.9(4.7-7.3)	92.3(90-94.2)	51.0(47.1-54.8)	15.6(13-18.6)	9.3(7.2-11.8)	84.9(82-87.5)	40.5(36.9-44.3)	18.1(15.3-21.1)	7.6(5.8-9.8)	0.0039
Rural	75.8(72.7-78.6)	4.6(3.3-6.2)	2.5(1.5-3.8)	13.2(11-15.6)	84.4(81.3-87)	9.1(7-11.6)	7.0(5.2-9.2)	29.9(26.5-33.6)	88.4(85.6-90.9)	11.7(9.3-14.5)	13.7(11.1-16.7)	11.1(8.7-13.8)	<0.0001
Gender													
Male	75.2(72.5-77.7)	28.2(25.5-31.0)	10.2(8.4-12.2)	10.8(9-12.9)	88.8(86.2-91.1)	30.0(26.5-33.6)	10.7(8.5-13.4)	19.5(16.6-22.8)	86.2(83.4-88.7)	24.0(20.8-27.4)	19.6(16.7-22.9)	12.3(9.9-15)	<0.0001
Female	80.9(78.4-83.2)	28.5(25.8-31.2)	5.3(4.1-6.9)	6.7(5.3-8.4)	87.9(85.2-90.3)	30.4(26.9-34.0)	11.9(9.6-14.7)	19.6(16.7-22.9)	86.9(84.0-89.4)	30.4(26.9-34.1)	12.4(9.9-15.1)	6.1(4.4-8.2)	<0.0001
Age group													
18-29	78.0(73.4-82.2)	40.1(35-45.4)	13.7(10.3-17.6)	7.0(4.6-10.1)	85.1(77.2-91.1)	51.8(42.2-61.2)	16.7(10.3-24.8)	17.5(11.1-25.8)	81.0(74.9-86.1)	49.3(42.2-56.3)	24.4(18.7-30.9)	7.8(4.5-12.4)	0.0204
30-44	76.1(72.4-79.5)	33.3(29.5-37.3)	11.6(9.1-14.5)	10.1(7.8-12.8)	89.1(84.9-92.5)	35.6(30-41.4)	27.8(22.7-33.4)	19.7(15.3-24.8)	79.0(74.2-83.3)	31.5(26.5-36.9)	26.5(21.8-31.7)	13.0(9.5-17.1)	<0.0001
45-59	77.5(74.5-80.3)	21.9(19.2-24.9)	4.9(3.6-6.6)	10.6(8.6-12.8)	86.8(83.3-89.8)	28.6(24.4-33)	9.6(7-12.7)	25.9(21.9-30.2)	89.6(86.4-92.3)	23.5(19.6-27.7)	11.7(8.9-15.1)	10.8(8.1-14.1)	<0.0001
≥60	82.3(78.0-86.0)	23.5(19.4-28.2)	2.4(1.1-4.5)	4.5(2.6-7.1)	90.2(87.1-92.7)	23.3(19.6-27.3)	1.9(0.9-3.6)	14.1(11.1-17.5)	92.9(89.6-95.3)	14.9(11.3-19)	6.9(4.4-10)	4.6(2.6-7.3)	<0.0001
Occupation													
Scientific and technical personnel	83.3(75.7-89.4)	40.5(31.8-49.6)	8.7(4.4-15.1)	8.7(4.4-15.1)	91.5(81.3-97.2)	42.4(29.6-55.9)	25.4(15-38.4)	13.6(6-25)	80.3(72.8-86.5)	56.3(47.8-64.6)	19.0(12.9-26.5)	6.3(2.9-11.7)	0.0639
Social and economic personnel	78.6(59.1-91.7)	50.0(30.7-69.4)	17.9(6.1-36.9)	3.6(0.1-18.4)	71.4(51.3-86.8)	75.0(55.1-89.3)	21.4(8.3-41)	10.7(2.3-28.2)	87.2(72.6-95.7)	38.5(23.4-55.4)	23.1(11.1-39.3)	18.0(7.5-33.5)	0.3191
Officers and related personnel	78.6(72.7-83.7)	55.9(49.2-62.4)	17.5(12.8-23)	2.6(1-5.6)	88.0(82-92.5)	59.6(51.8-67.2)	30.1(23.3-37.7)	8.4(4.7-13.8)	80.4(70.9-88)	33.7(24.2-44.3)	23.9(15.6-33.9)	10.9(5.3-19.1)	0.0042
Business and services personnel	78.4(68.4-86.5)	21.6(13.5-31.7)	9.1(4-17.1)	8(3.3-15.7)	98.8(95.6-99.9)	46.3(38.4-54.3)	3.1(1.0-7.1)	8.1(4.4-13.5)	79.2(73.3-84.3)	30.1(24.2-36.5)	22.1(16.9-28.1)	11.5(7.7-16.4)	<0.0001
Agricultural personnel	78.7(75.7-81.5)	7.8(6-9.9)	5.0(3.6-6.7)	12.0(9.8-14.5)	83.2(79.8-86.2)	7.4(5.4-9.9)	5.4(3.7-7.7)	30.9(27.1-35)	94.5(91.7-96.6)	9.8(7-13.4)	7.4(4.9-10.6)	10.4(7.5-14)	<0.0001
Manufacturing personnel	72.7(67.4-77.6)	44.7(39.1-50.4)	9.7(6.6-13.5)	12.5(9.1-16.7)	88.4(78.4-94.9)	37.7(26.3-50.2)	20.3(11.6-31.7)	11.6(5.1-21.6)	81.9(72-89.5)	36.1(25.9-47.4)	31.3(21.6-42.4)	6.0(2-13.5)	0.0004
Inconvenient-to-classify personnel	78.5(75-81.8)	33.7(29.9-37.6)	5.8(4-8)	5.3(3.6-7.4)	93.8(90.3-96.3)	39.2(33.6-45.1)	10.4(7.1-14.5)	14.6(10.7-19.2)	88(84.2-91.1)	26.5(22.1-31.3)	13.6(10.3-17.5)	7.2(4.8-10.3)	<0.0001
Family annual income (CNY)													
＜30,000	80.3(78.1-82.4)	23.0(20.8-25.4)	5.5(4.4-6.9)	8.6(7.2-10.2)	78.2(74.1-82)	19.4(15.8-23.5)	5.8(3.8-8.4)	13.9(10.8-17.5)	94.0(91-96.2)	16.1(12.5-20.3)	7.4(4.9-10.6)	8.7(6.1-12.1)	0.0005
＜100,000	75.7(70.6-80.4)	33.7(28.4-39.2)	8.4(5.6-12.1)	9.7(6.7-13.6)	90.1(87.2-92.5)	36.3(32.2-40.6)	11.1(8.5-14)	21.9(18.5-25.7)	87.5(84.2-90.3)	25.9(22.1-30)	13.1(10.3-16.4)	9.9(7.4-12.9)	<0.0001
≥100,000	73.4(69.3-77.2)	38.9(34.7-43.3)	13.1(10.3-16.4)	8.6(6.3-11.4)	98.0(96-99.2)	33.9(29-39.1)	18.5(14.6-22.9)	23.0(18.7-27.7)	79.6(75.6-83.2)	37.3(32.9-41.9)	26.0(22.1-30.3)	8.9(6.5-11.9)	<0.0001
Family annual expenditure (CNY)													
＜30,000	78.2(76.2-80)	26.8(24.8-28.9)	7.0(5.8-8.2)	9.4(8.1-10.9)	82.3(79.3-85.1)	23(19.9-26.3)	6.4(4.7-8.5)	17.6(14.8-20.6)	90.4(87.9-92.6)	21.1(18-24.4)	9.5(7.3-12)	8.5(6.5-11)	<0.0001
＜100,000	70.8(61.8-78.8)	35.8(27.3-45.1)	12.5(7.2-19.8)	7.5(3.5-13.8)	93.6(90.8-95.7)	41.5(36.8-46.3)	14.1(10.9-17.7)	22.1(18.3-26.3)	84.6(81-87.7)	30.7(26.6-35)	18.6(15.2-22.4)	9.2(6.8-12.1)	<0.0001
≥100,000	81.0(75.1-86.1)	37.4(30.9-44.4)	11.9(7.8-17)	3.8(1.7-7.3)	98.9(96.2-99.9)	30.9(24.3-38)	23.4(17.6-30.1)	21.3(15.7-27.8)	78.8(72.4-84.3)	38.4(31.6-45.5)	31.3(24.9-38.3)	11.6(7.5-16.9)	<0.0001

* Public: Public transportation mode included taking the bus or subway; ** Car: Car transportation mode included using private cars and taxis; *** Open: Open transportation mode included cycling, using electric bicycles, or motorcycles; the p-value is the test result of three different surveys for each characteristic index.

Supplementary Table 4. Transportation mode trends of participants with main roads near their homes and workplaces

Characteristics	Walking (%, 95%CI)	Public* (%, 95%CI)	Car** (%, 95%CI)	Open*** (%, 95%CI)	*P*-Value
With main roads near their homes	79.3(76.8-81.6)	26.9(24.3-29.6)	9.2(7.5-10.8)	13.1(11.2-15.2)	
With main roads near their workplaces	87.5(71.0-96.5)	56.3(37.7-73.6)	15.6(5.3-28.2)	6.3(0.8-20.8)	
With main roads near their homes and workplaces	84.4(82.4-86.2)	21.0(19.0-23.2)	10.5(9.0-12.1)	13.4(11.7-15.2)	<0.0001
Without main roads near their homes and workplaces	91.7(89.5-93.6)	42.2(38.6-45.8)	14.7(12.3-17.3)	14.2(11.8-16.9)	

* Public: public transportation modes included taking bus or subway; ** Car: car transportation modes included using private cars and taxis; *** Open: open transportation modes included cycling, using electric bicycles, or motorcycles

Supplementary Table 5. Multinomial logistic regression analysis of sociodemographic characteristics associated with the transportation mode trends during 2015, 2016–2018, and 2020

Characteristics		2015（OR,(95%CI))			2016-2018（OR,(95%CI))			2020（OR,(95%CI))		
		Public*	Car**	Open***	Public*	Car**	Open***	Public*	Car**	Open***
Region type	Urban	5.812(3.906-8.647)	4.253(2.422-7.468)	0.416(0.272-0.637)	3.236(1.879-5.570)	0.816(0.414-1.609)	0.320(0.182-0.561)	2.246(1.527-3.304)	0.586(0.390-0.882)	0.557(0.327-0.948)
	Rural		1[Reference]			1[Reference]			1[Reference]	
Gender	Male	1.037(0.848-1.267)	2.052(1.448-2.908)	1.718(1.246-2.367)	0.998(0.786-1.273)	0.966(0.675-1.382)	0.889(0.670-1.180)	0.851(0.661-1.097)	1.587(1.154-2.182)	2.123(1.413-3.191)
	Female		1[Reference]			1[Reference]			1[Reference]	
Age group	18-29	1.450(1.036-2.029)	5.121(2.423-10.827)	2.135(1.096-4.158)	2.434(1.534-3.863)	5.41(2.266-12.915)	1.454(0.809-2.616)	2.350(1.555-3.551)	3.330(1.904-5.822)	2.390(1.111-5.143)
	30-44	1.356(0.986-1.863)	4.148(2.000-8.603)	2.691(1.514-4.784)	1.785(1.198-2.659)	9.27(4.312-19.929)	1.362(0.895-2.074)	1.772(1.191-2.638)	3.131(1.877-5.225)	3.329(1.757-6.304)
	45-59	0.977(0.716-1.335)	1.906(0.902-4.029)	2.359(1.363-4.082)	1.475(1.044-2.084)	4.036(1.874-8.692)	1.697(1.191-2.417)	1.564(1.075-2.275)	1.713(1.022-2.872)	2.612(1.444-4.723)
	≥60		1[Reference]			1[Reference]			1[Reference]	
Occupation	Scientific and technical personnel	0.938(0.635-1.386)	1.111(0.535-2.309)	1.586(0.759-3.312)	0.849(0.487-1.480)	1.164(0.563-2.406)	0.890(0.383-2.064)	1.461(0.986-2.166)	1.001(0.574-1.748)	0.950(0.411-2.192)
	Social and economic personnel	1.452(0.717-2.942)	3.165(1.082-9.262)	0.711(0.092-5.492)	1.742(0.887-3.421)	1.480(0.528-4.153)	1.012(0.280-3.652)	1.021(0.522-1.998)	0.953(0.416-2.181)	1.899(0.731-4.934)
	Officers and related personnel	1.407(1.051-1.883)	2.284(1.376-3.79)	0.464(0.188-1.144)	1.087(0.741-1.593)	1.540(0.886-2.677)	0.653(0.329-1.298)	1.075(0.656-1.762)	1.174(0.650-2.118)	1.207(0.541-2.692)
	Business and services personnel	1.071(0.603-1.902)	2.047(0.866-4.838)	0.752(0.302-1.872)	1.221(0.836-1.784)	0.445(0.164-1.206)	0.641(0.327-1.256)	1.078(0.744-1.562)	1.380(0.880-2.164)	1.528(0.85-2.748)
	Agricultural personnel	0.660(0.456-0.955)	2.546(1.450-4.470)	1.227(0.723-2.084)	0.504(0.272-0.933)	0.478(0.224-1.018)	1.233(0.723-2.102)	0.705(0.429-1.160)	0.630(0.359-1.105)	1.117(0.611-2.039)
	Manufacturing personnel	1.505(1.129-2.006)	1.753(1.013-3.031)	1.838(1.082-3.121)	0.944(0.551-1.617)	1.277(0.612-2.664)	0.612(0.267-1.405)	1.488(0.891-2.487)	1.288(0.721-2.301)	0.502(0.181-1.391)
	Inconvenient-to-classify personnel		1[Reference]			1[Reference]			1[Reference]	
Family annual income (CNY)	＜30,000	0.863(0.678-1.098)	0.555(0.372-0.827)	0.660(0.434-1.002)	1.421(0.852-2.368)	1.301(0.590-2.870)	0.555(0.313-0.983)	0.846(0.534-1.341)	0.427(0.226-0.806)	0.973(0.440-2.152)
	＜100,000	0.944(0.691-1.290)	0.705(0.418-1.189)	0.962(0.573-1.616)	1.281(0.876-1.875)	1.241(0.701-2.197)	0.971(0.620-1.519)	0.958(0.688-1.335)	0.585(0.379-0.901)	1.122(0.607-2.075)
	≥100,000		1[Reference]			1[Reference]			1[Reference]	
Family annual expenditure (CNY)	＜30,000	1.046(0.765-1.430)	0.882(0.533-1.458)	2.262(1.062-4.818)	1.335(0.773-2.305)	0.410(0.185-0.905)	0.775(0.414-1.452)	0.890(0.578-1.370)	0.539(0.316-0.921)	0.550(0.258-1.176)
	＜100,000	1.034(0.645-1.658)	1.058(0.514-2.177)	2.322(0.848-6.364)	1.330(0.861-2.054)	0.632(0.356-1.124)	1.054(0.632-1.758)	0.946(0.649-1.379)	0.778(0.506-1.195)	0.640(0.332-1.234)
	≥100,000		1[Reference]			1[Reference]			1[Reference]	

* Public: Public transportation mode included taking the bus or subway; ** Car: Car transportation mode included using private cars and taxis; *** Open: Open transportation mode included cycling, using electric bicycles or motorcycles.

Supplementary Table 6. Multinomial logistic regression analysis of participants who have main roads near their homes and workplaces

Characteristics	Public* （OR,(95%CI))	Car** （OR,(95%CI))	Open*** （OR,(95%CI))
With main roads near their homes	0.738(0.612-0.89)	0.719(0.539-0.958)	1.067(0.815-1.397)
With main roads near their workplaces	1.398(0.762-2.565)	1.112(0.42-2.941)	0.462(0.108-1.966)
With main roads near their homes and workplaces	0.542(0.451-0.651)	0.773(0.595-1.005)	1.023(0.793-1.319)
Without main roads near their homes and workplaces		1[Reference]	

* Public: Public transportation mode included taking the bus or subway; ** Car: Car transportation mode included using private cars and taking taxis; *** Open: Open transportation mode included cycling, using electric bicycles, or motorcycles.

Supplementary Table 7. Time spent for different transportation modes by people living or working near main roads

Characteristics	Walking (min/d)	Public (min/d)	Car (min/d)	Open (min/d)	*P*-Value
With main roads near their homes	55.2(38.7)	78.9(61.8)	88.0(88.8)	51.4(54.4)	<0.0001
With main roads near their workplaces	61.4(24.7)	71.3(43.9)	81.4(95.2)	58.6(2.0)	0.8933
With main roads near their homes and workplaces	56.1(35.0)	65.9(47.0)	86.3(93.3)	41.3(28.8)	<0.0001
Without main roads near their homes and workplaces	63.1(51.6)	54.5(43.7)	59.2(55.5)	50.2(37.3)	0.0088

Supplementary Table 8. Time spent for different transportation modes in three different surveys

Characteristics		Walking (Mean (SD)) (min/d)				Public (Mean (SD)) (min/d)				Car (Mean (SD)) (min/d)				Open (Mean (SD)) (min/d)			
		2015	2016-2018	2020	p-Value	2015	2016-2018	2020	p-Value	2015	2016-2018	2020	p-Value	2015	2016-2018	2020	p-Value
	Total	53.8(33.3)	47.3(33.2)	68.1(46.9)	<0.0001	77.7(55.3)	45.9(29.4)	48.8(42.6)	<0.0001	99.4(89.1)	49.8(30.1)	64.0(80.8)	<0.0001	53.9(49.4)	42.1(29.5)	42.1(38.2)	0.1502
Region type	Urban	55.0(33.4)	51.7(33.4)	70.4(53.1)	<0.0001	74.7(51.9)	47.6(30.0)	51.7(45.7)	<0.0001	96.6(85.6)	47.8(30.1)	52.5(54.8)	<0.0001	69.8(60.1)	35.9(21.7)	40.6(33.3)	0.0035
	Rural	52.0(33.1)	42.4(32.3)	65.5(38.8)	<0.0001	122.1(80.4)	36.5(23.3)	37.3(24.2)	<0.0001	118.3(111.0)	54.5(29.8)	81.4(107.2)	0.0185	42.9(37.0)	44.1(31.3)	43.3(42.0)	0.3497
Gender	Male	54.3(33.0)	47.2(35.4)	68.2(49.0)	<0.0001	82.0(55.6)	48.5(31.5)	46.5(47.0)	<0.0001	103.5(98.8)	49.5(33.1)	77.1(97.4)	<0.0001	51.9(47.0)	44.5(33.5)	46.4(43.6)	0.6625
	Female	53.5(33.6)	47.3(30.8)	68.0(44.6)	<0.0001	73.6(54.7)	43.3(26.9)	50.7(38.7)	<0.0001	91.5(67.3)	50.2(27.4)	42.7(32.4)	<0.0001	57.0(53.1)	39.7(24.8)	33.2(21.6)	0.1102
Age group	18-29	45.1(27.7)	41.9(30.0)	64.0(50.6)	0.0001	70.8(50.5)	51.9(22.2)	52.6(55.2)	0.0037	115.0(122.3)	48.2(27.5)	43.3(42.6)	0.0006	47.2(42.1)	32.4(24.6)	36.9(31.0)	0.7237
	30-44	54.2(32.4)	42.2(27.7)	72.5(54.0)	<0.0001	84.5(60.4)	47.6(29.6)	56.8(39.9)	<0.0001	94.0(60.1)	50.0(30.3)	93.7(109.9)	<0.0001	48.2(42.8)	44.8(32.4)	48.4(29.6)	0.5955
	45-59	54.9(34.2)	44.6(32.7)	69.3(48.0)	<0.0001	81.1(56.4)	53.7(34.7)	45.5(36.9)	<0.0001	98.9(88.5)	50.7(30.0)	49.6(48.0)	0.0013	61.4(57)	40.4(22.6)	42.4(48.3)	0.0333
	≥60	59.1(35.8)	53.9(36.0)	65.2(36.1)	0.0010	67.5(45.7)	32.3(19.9)	32.3(20.1)	<0.0001	57.4(44.9)	48.2(38.5)	32.0(23.5)	0.1258	44.4(33.6)	45.7(37.4)	29.9(29.1)	0.0531
Occupation	Scientific and technical personnel	47.0(30.2)	42.8(28.8)	69.5(49.1)	0.0002	62.2(41.2)	39.3(22.8)	52.1(33.0)	0.0788	50.5(28.0)	59.7(33.4)	43.1(26.0)	0.2435	64.1(54)	64.0(74.2)	22.2(16.5)	0.0824
	Social and economic personnel	61.4(34.7)	35.9(30.7)	63.2(40.8)	0.0220	82.1(43.9)	63.4(32.6)	52.8(33.3)	0.1536	78.0(26.8)	47.0(27.7)	30.2(28.0)	0.0352	20.0(/)	30.4(27.6)	45.8(26.1)	0.4588
	Officers and related personnel	55.1(27.4)	47.7(27.4)	81.6(74.0)	0.0006	78.8(50.0)	55.7(26.4)	54.5(45.0)	0.0045	105.5(58.9)	38.8(25.9)	68.5(71.5)	<0.0001	75.0(38.9)	28.7(15.0)	58.9(39.8)	0.0036
	Business and services personnel	35.7(29.5)	44.7(27.8)	66.0(49.4)	<0.0001	79.4(83.8)	30.9(21.5)	56.9(65.2)	0.0010	133.9(117.3)	55.5(33.7)	102.8(133.0)	0.3139	47.1(35.0)	31.4(20.5)	42.2(24.1)	0.2031
	Agricultural personnel	54.9(33.4)	43.1(32.7)	69.6(39.7)	<0.0001	64.2(70.1)	32.4(22.8)	32.3(17.0)	0.1054	104.3(118.9)	44.9(28.7)	44.8(32.9)	0.0315	40.9(34.3)	43.0(27.6)	37.0(34.6)	0.0186
	Manufacturing personnel	61.5(35.2)	54.7(30.2)	69.9(38.8)	0.2866	97.4(49.9)	56.2(36.0)	45.8(35.8)	<0.0001	110.5(106.1)	75.7(17.4)	85.8(79.2)	0.3731	70.9(63.4)	35.9(18.9)	23.7(10.0)	0.1111
	Inconvenient-to-classify personnel	52.2(34.1)	55.6(39.2)	64.3(45.7)	<0.0001	71.0(54.3)	47.9(31.4)	45.1(37.5)	<0.0001	87.5(70.2)	55.9(32.9)	40.0(29.9)	0.0014	66.5(62.0)	44.4(29.3)	52(57.3)	0.6855
Family annual income (CNY)	< 30,000	53.4(33.3)	48.7(27.4)	64.7(44.7)	<0.0001	70.0(54.3)	35.0(23.0)	40.1(28.9)	<0.0001	98.7(87.3)	52.7(27.5)	55.0(58.1)	0.0091	46.3(42.1)	43.8(25.2)	44.5(55.3)	0.2245
	< 100,000	48.2(31.1)	49.6(36.3)	67.1(42.2)	<0.0001	63.1(46.4)	46.5(29.8)	48.0(51.7)	0.0016	100.8(130.4)	43.7(29.1)	71.9(97.8)	0.1052	49.3(41.8)	41.1(32.8)	40.5(26.2)	0.8673
	≥100,000	58.6(33.9)	42.7(33.3)	72.4(53.4)	<0.0001	97.4(55.9)	52.6(30.7)	52.4(38.6)	<0.0001	99.5(71.3)	54.3(31.4)	61.7(75.0)	<0.0001	76.6(64.1)	42.4(27.6)	42.1(34.9)	0.0043
Family annual expenditure (CNY)	< 30,000	53.3(33.0)	46.4(28.3)	66.0(42.7)	<0.0001	73.8(54.9)	40.2(25.4)	37.7(27.0)	<0.0001	92.7(84.4)	49.8(30.9)	64.8(95.0)	<0.0001	54.2(50.3)	43.4(25.1)	43.4(43.7)	0.3989
	< 100,000	55.8(33.9)	49.9(39.6)	69.5(47.9)	<0.0001	94.7(63.4)	50.2(32.6)	50.3(49.5)	<0.0001	149.3(145.4)	47.4(30.0)	66.3(86.7)	0.0016	43.3(35.7)	40.4(34.9)	36.4(30.2)	0.5293
	≥100,000	57.4(35.1)	44.0(31.5)	72.1(57.7)	<0.0001	92.8(48.7)	48.4(26.9)	65.8(45.4)	<0.0001	103.2(58.5)	53.2(29.8)	59.9(53.1)	0.0013	58.8(46.1)	42.3(28.0)	49.8(38.0)	0.7744

p-value is the test result of different surveys for each subgroup characteristic of the transportation modes.

Supplementary Table 9. Regression analysis of characteristics and time spent on transportation

Characteristics	Walking			Public			Car			Open		
	Beta	t	p-Value	Beta	t	p-Value	Beta	t	Sig.	Beta	t	p-Value
Region type	-0.167	-10.150	<0.0001	-0.131	-5.618	<0.0001	-0.003	-0.080	0.936	-0.106	-2.801	0.005
Gender	-0.010	-0.671	0.502	-0.024	-1.058	0.290	-0.163	-4.402	<0.0001	-0.063	-1.832	0.067
Age group	0.079	4.971	<0.0001	-0.093	-3.983	<0.0001	-0.129	-3.428	0.001	0.028	0.772	0.440
Occupation	0.025	1.579	0.114	0.091	3.907	<0.0001	0.010	0.273	0.785	0.084	2.428	0.015
Family annual income	-0.009	-0.463	0.643	0.143	5.171	<0.0001	0.019	0.394	0.694	0.059	1.253	0.210
Family annual expenditure	0.015	0.768	0.443	0.059	2.142	0.032	-0.065	-1.396	0.163	-0.085	-1.811	0.070
Having main roads nearby home or workplace	0.027	1.671	0.095	-0.250	-10.076	<0.0001	-0.069	-1.757	0.079	0.056	1.559	0.119

Supplementary Table 10. Regression analysis of characteristics and time spent on transportation in each survey

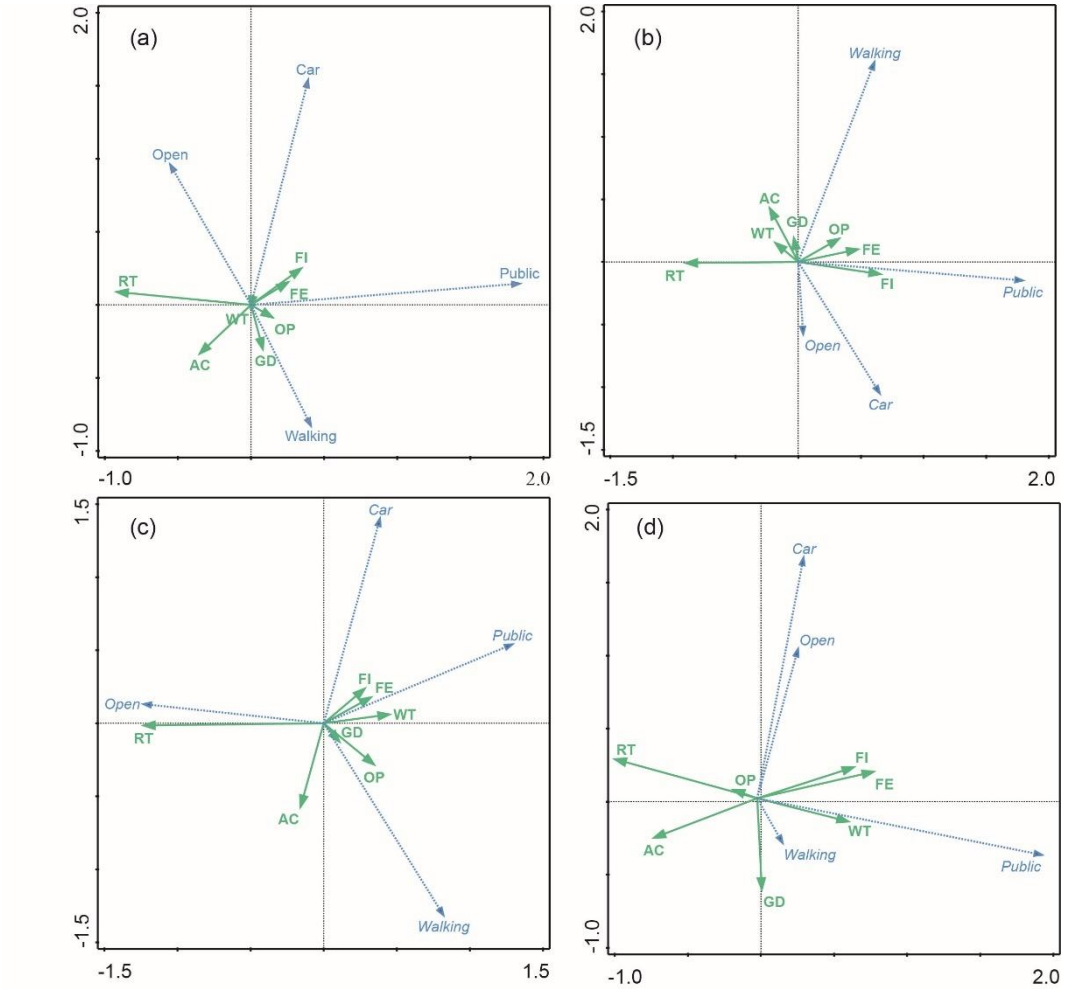
Characteristics		Walking			Public			Car			Open		
		Beta	t	p-Value	Beta	t	p-Value	Beta	t	Sig.	Beta	t	p-Value
2015 survey	Region type	-0.127	-4.869	<0.0001	0.187	5.811	<0.0001	0.082	1.185	0.237	-0.255	-3.255	0.001
	Gender	0.005	0.224	0.822	-0.066	-2.035	0.042	-0.096	-1.387	0.167	0.017	0.263	0.793
	Age group	0.123	5.019	<0.0001	-0.029	-0.845	0.399	-0.100	-1.435	0.153	0.073	1.081	0.281
	Occupation	0.099	4.078	<0.0001	0.133	4.033	<0.0001	0.057	0.815	0.416	0.083	1.217	0.225
	Family annual income	0.086	3.379	0.001	0.271	8.131	<0.0001	0.034	0.473	0.636	0.157	2.283	0.023
	Family annual expenditure	0.063	2.563	0.010	0.186	5.558	<0.0001	0.123	1.683	0.094	-0.012	-0.174	0.862
	Having main roads nearby home or workplace	0.074	2.976	0.003	-0.133	-4.115	<0.0001	0.096	1.325	0.187	-0.112	-1.556	0.121
2016-2018 survey	Region type	-0.324	-9.064	<0.0001	-0.088	-1.284	0.200	-0.168	-1.924	0.056	0.179	3.378	0.001
	Gender	-0.003	-0.098	0.922	-0.110	-2.106	0.036	-0.172	-2.130	0.035	-0.105	-2.215	0.027
	Age class	0.214	7.071	<0.0001	-0.094	-1.693	0.091	-0.246	-3.206	0.002	0.063	1.272	0.204
	Occupation	0.079	2.557	0.011	-0.028	-0.511	0.610	0.047	0.589	0.557	0.031	0.601	0.548
	Family annual income	-0.158	-3.558	<0.0001	0.144	1.954	0.051	0.189	1.348	0.180	-0.085	-1.159	0.247
	Family annual expenditure	0.141	3.099	0.002	-0.119	-1.556	0.121	-0.245	-1.581	0.116	0.071	0.978	0.329
	Having main roads nearby home or workplace	-0.024	-0.696	0.487	0.169	2.548	0.011	0.384	4.445	<0.0001	0.364	7.427	<0.0001
2020 survey	Region type	-0.024	-0.645	0.519	-0.080	-1.514	0.131	0.202	2.838	0.005	-0.007	-0.076	0.939
	Gender	-0.021	-0.786	0.432	-0.004	-0.097	0.923	-0.225	-4.287	<0.0001	-0.208	-3.143	0.002
	Age class	0.022	0.811	0.417	-0.101	-2.549	0.011	-0.127	-2.381	0.018	-0.073	-1.055	0.292
	Occupation	-0.037	-1.402	0.161	0.016	0.405	0.686	-0.047	-0.898	0.370	0.070	1.053	0.293
	Family annual income	0.035	0.851	0.395	-0.104	-1.891	0.059	0.145	1.734	0.084	-0.161	-1.449	0.149
	Family annual expenditure	0.002	0.043	0.965	0.316	6.163	<0.0001	-0.088	-1.184	0.237	0.149	1.409	0.160
	Having main roads nearby home or workplace	0.101	2.935	0.003	0.044	0.892	0.372	0.014	0.218	0.827	0.080	1.113	0.267

Supplementary Table 11. Daily exposure dose of transportation modes

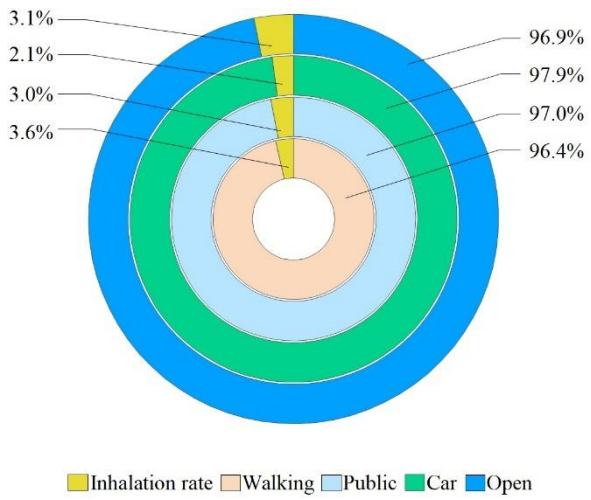
Characteristics		Car (Mean (SD)) (μg/d)	Open (Mean (SD)) (μg d)	Public (Mean (SD)) (μg /d)	Walking (Mean (SD)) (μg /d)
Total		16.200(20.890)	48.420(41.198)	20.782(17.566)	22.794(19.818)
Region type	Rural	18.679(27.226)	47.904(41.345)	14.219(8.489)	19.141(15.845)
	Urban	14.594(15.302)	49.584(40.947)	22.325(18.757)	26.284(22.438)
Gender	Female	9.104(6.888)	36.245(24.156)	18.411(13.594)	20.217(16.538)
	Male	20.137(24.688)	55.058(46.715)	23.301(20.699)	25.089(22.092)
Age group	18-29	11.550(12.103)	41.165(36.214)	22.029(21.916)	22.268(21.042)
	30-44	22.824(27.594)	53.989(41.106)	23.601(17.368)	24.917(22.539)
	45-59	13.323(12.967)	50.348(43.514)	21.39(17.427)	22.356(20.045)
	≥60	5.118(4.419)	42.918(38.559)	14.029(7.417)	21.715(15.538)
Occupation*	BSP	25.917(37.577)	40.793(28.902)	21.961(26.574)	24.982(23.308)
	FFP	9.760(8.639)	46.282(35.125)	12.391(6.823)	19.026(15.828)
	ICP	13.885(9.836)	55.682(51.069)	20.667(16.759)	22.888(18.803)
	MAP	24.618(22.978)	34.450(20.733)	21.256(17.622)	28.284(22.222)
	ORP	16.318(18.313)	60.661(53.456)	24.548(15.496)	27.565(26.136)
	SEP	6.779(7.518)	52.944(35.101)	24.964(15.919)	25.380(21.379)
	STP	12.880(8.93)	43.611(70.976)	20.675(13.646)	25.003(20.069)
Family annual income (CNY)	<30,000	14.194(15.717)	49.248(52.99)	14.368(9.746)	21.661(17.676)
	≥100,000	16.114(18.2)	51.196(38.937)	23.507(17.027)	23.885(22.235)
	30,000-100,000	17.295(27.307)	45.271(37.103)	19.573(19.867)	22.344(18.285)
Family annual expenditure (CNY)	<30,000	17.276(27.592)	45.548(41.501)	14.615(9.887)	21.404(17.407)
	≥100,000	15.475(13.828)	55.757(43.254)	26.305(18.565)	23.916(23.309)
	30,000-100,000	16.088(20.792)	46.795(39.217)	21.827(19.672)	23.662(20.166)

*The abbreviations of occupation are defined as follows; STP: scientific and technical personnel; SEP: social and economic personnel; ORP: officers and related personnel; BSP: business and services personnel; FFP: agricultural personnel; MAP: manufacturing personnel; ICP: inconvenient-to-classify personnel.

Supplementary Figure 1. Transportation trend and time spent associated with the sociodemographic characteristics among the three different surveys. (The transportation time in this figure was the mean value, and the error lines represented the standard errors of the mean. The abbreviations of occupation are defined as follows: STP: scientific and technical personnel; SEP: social and economic personnel; ORP: officers and related personnel; BSP: business and services personnel; FFP: agricultural personnel; MAP: manufacturing personnel; ICP: inconvenient-to-classify personnel. Family annual income and expenditure were expressed in CNY.)



Supplementary Figure 2. Influencing factors of the time spent on transportation modes. (Overall times spent on transportation modes from the (a) three surveys, (b) 2015 survey, (c) 2016–2018 survey, and (d) 2020 surveys. The abbreviations in this figure are defined as follows; RT: region type; AC: age group; GD: gender; OP: occupation; FI: family annual income; FE: family annual expenditure; WT: having main roads near homes or workplaces. The dotted lines with arrows in blue represent the time spent for each transportation mode, and the solid lines with arrows in green represent the influencing factors. The angle between the blue and green arrows indicates the sign of the correlation between the influencing factors and time spent on transportation for different modes. The approximated correlation is positive when the angle is sharp and negative when the angle is higher than 90°. The length of the perpendicular projection of green arrows onto the blue lines indicates the interdependency between the influencing factors and different times spent on transportation.)



Supplementary Figure 3. Sensitivity analysis of the inhalation rate and time spent for each transportation mode in the exposure analysis.

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