Urban Noise, Sleep Disruption and Health

Online Appendix

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Table A.1: Full Balancing Table between Individuals Exposed with and without Neighbor Noise

	with Neighbor Noise mean (s.d.)	without Neighbor Noise mean (s.d.)	Difference mean (s.e.)
Health Level	3.033	3.160	0.126***
	(0.636)	(0.644)	(0.019)
BMI	25.612	25.735	0.124
	(4.610)	(4.170)	(0.128)
Age	46.872	50.827	3.955***
	(12.780)	(13.105)	(0.385)
HH number of kids	0.794	0.925	0.130***
	(0.927)	(1.054)	(0.030)
HH Income	2688.644	3109.789	421.144***
	(1554.376)	(3323.712)	(84.712)
Hours	31.826	32.513	0.688*
	(12.492)	(13.157)	(0.384)
Sleep Disruption	0.376	0.265	-0.111***
	(0.485)	(0.441)	(0.014)
Street Noise	0.305	0.140	-0.165***
	(0.460)	(0.347)	(0.012)
Bad Air	0.169	0.070	-0.099***
	(0.375)	(0.255)	(0.009)
Cardiovascular	0.161	0.144	-0.017
	(0.368)	(0.351)	(0.011)
Cholesterol	0.167	0.195	0.028**
	(0.373)	(0.396)	(0.012)
Blood Pressure	0.214	0.249	0.035***
	(0.410)	(0.433)	(0.013)
Asthma	0.068	0.051	-0.017**
	(0.252)	(0.220)	(0.007)
Lung Disease	0.167	0.121	-0.045***
	(0.373)	(0.327)	(0.010)
Bones & Joints	0.702	0.607	-0.095***
	(0.457)	(0.488)	(0.014)
Diabetes	0.067	0.078	0.012
	(0.250)	(0.269)	(0.008)
Fatigue	0.785	0.747	-0.038***
	(0.411)	(0.435)	(0.013)
Headache	0.340	0.238	-0.102***
	(0.474)	(0.426)	(0.013)
Alzheimer	0.005	0.003	-0.001
	(0.068)	(0.057)	(0.002)
Depression	0.109	0.071	-0.038***
	(0.312)	(0.256)	(0.008)
Cancer	0.035	0.046	0.011*
	(0.185)	(0.209)	(0.006)
Smoker	0.655	0.664	0.009

	(0.475)	(0.472)	(0.014)
Daily Drinker	0.236	0.259	0.023*
	(0.425)	(0.438)	(0.013)
Male	0.474	0.522	0.048***
	(0.449)	(0.448)	(0.013)
Married	0.705	0.812	0.107***
	(0.456)	(0.390)	(0.012)
Unemployed	0.118	0.078	-0.040***
	(0.323)	(0.268)	(0.009)
Housewife	0.410	0.390	-0.020
	(0.492)	(0.488)	(0.015)
Student	0.100	0.059	-0.041***
	(0.300)	(0.236)	(0.008)
Retired	0.269	0.356	0.088***
	(0.443)	(0.479)	(0.014)
Primary Education	0.015	0.015	0.000
	(0.120)	(0.120)	(0.004)
Secondary Education	0.179	0.155	-0.024**
	(0.384)	(0.362)	(0.011)
Post-Secondary Education	0.691	0.680	-0.012
	(0.462)	(0.467)	(0.014)
Tertiary Education	0.194	0.166	-0.028**
	(0.395)	(0.372)	(0.011)
Religious	0.415	0.472	0.057***
	(0.493)	(0.499)	(0.015)
Crime in Area	0.283	0.103	-0.180***
	(0.451)	(0.305)	(0.011)
Urban Area	0.664	0.558	-0.107***
	(0.472)	(0.497)	(0.014)
Rural Area	0.197	0.272	0.075***
	(0.398)	(0.445)	(0.013)
Dwelling noisy	0.286	0.035	-0.251***
	(0.377)	(0.158)	(0.008)
Dwelling dark	0.070	0.026	-0.044***
	(0.255)	(0.158)	(0.006)
Dwelling cold	0.105	0.037	-0.069***
	(0.307)	(0.188)	(0.007)
Dwelling leaky	0.054	0.032	-0.022***
	(0.226)	(0.176)	(0.006)
Dwelling damp	0.131	0.057	-0.074***
	(0.338)	(0.232)	(0.008)
Dwelling rotten	0.097	0.050	-0.046***
	(0.295)	(0.219)	(0.007)
Dwelling small	0.227	0.090	-0.137***
	(0.419)	(0.286)	(0.010)
Ever moved	0.295	0.195	-0.100***
	(0.456)	(0.396)	(0.012)

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Easily Disturbed	2.810	2.627	-0.182***
	(0.864)	(0.839)	(0.025)
Stroke	0.007	0.009	0.002
	(0.061)	(0.081)	(0.002)

$^{*}\ p < 0.1,\ ^{**}\ p < 0.05,\ ^{***}\ p < 0.01$

Table A2: Instrumental Variables Estimation: First Stage Regressions
(All Control Variables Reported)

	Sleep Disruption	Sleep Disruption	Sleep Disruption
Neighbor Noise	0.111***	0.074***	0.058***
	(0.014)	(0.014)	(0.014)
Smoker		0.033**	0.033**
		(0.014)	(0.013)
BMI		0.007***	0.007***
		(0.002)	(0.001)
Age		0.007**	0.011***
		(0.004)	(0.004)
Age^2		-0.003	-0.006*
		(0.004)	(0.004)
Male		-0.117***	-0.078***
		(0.016)	(0.016)
Married		-0.009	-0.017
		(0.017)	(0.016)
University		-0.02	-0.011
		(0.018)	(0.017)
HH Income		-0.068***	-0.061***
		(0.017)	(0.017)
Bad Air		0.063***	0.053**
		(0.023)	(0.022)
Dwelling small		0.038*	0.025
		(0.02)	(0.02)
Dwelling dark		0.034	0.027
		(0.035)	(0.034)
Dwelling cold		0.001	-0.011
		(0.03)	(0.028)
Dwelling leaky		0.015	0.011
		(0.035)	(0.034)
Dwelling damp		0.019	0.018
		(0.025)	(0.025)
Dwelling rotten		0.018	0.025
		(0.028)	(0.028)
educ_2		-0.006	-0.002
		(0.018)	(0.018)
educ_3		-0.003	0.007
		(0.015)	(0.015)
educ_1		0.052	0.054
		(0.055)	(0.054)
Daily Drinker		0.025	0.021
		(0.016)	(0.016)
Unemployed		0.034	0.026
		(0.022)	(0.022)
Housewife		0.067***	0.056***

		(0.014)	(0.014)
Student		0.084***	0.080***
		(0.029)	(0.028)
Retired		-0.030*	-0.027
		(0.018)	(0.018)
hh_numkids		-0.001	0
		(0.001)	(0.001)
hours		-0.011	-0.009
		(0.007)	(0.007)
Religion		-0.001	-0.005
		(0.013)	(0.013)
Crime in Area		0.079***	0.075***
		(0.019)	(0.018)
Urban Area		-0.005	-0.003
		(0.013)	(0.013)
Rural Area		-0.014	-0.013
		(0.015)	(0.015)
Easily Disturbed			0.102***
			(0.008)
Ever moved			0.052***
			(0.016)
N	5102	5102	5102
R-sq	0.013	0.079	0.113
F-statistic	67.44***	14.48***	20.24***

robust standard errors in parentheses

$* p < 0.1, ** p < 0.05, *** p < 0.01$

Table A.3: Robustness – Include dwelling & neighborhood, physical & demographic, and socio-economic controls in sequence

	cardio-vascular			cholesterol			blood pressure		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
Sleep Disruption	0.164	0.417***	0.436***	-0.238	0.126	0.098	-0.287	0.123	0.094
	(0.137)	(0.136)	(0.146)	(0.158)	(0.129)	(0.137)	(0.178)	(0.138)	(0.148)
N	5,104	5,104	5,104	5,102	5,102	5,102	5,102	5,102	5,102
	asthma			lung disease			bone & joint		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
Sleep Disruption	0.157	0.153*	0.158	0.315**	0.407***	0.420***	0.993***	1.125***	1.173***
	(0.097)	(0.092)	(0.098)	(0.137)	(0.133)	(0.143)	(0.231)	(0.233)	(0.254)
N	5,099	5,099	5,099	5,104	5,104	5,104	5,104	5,104	5,104
	diabetes			fatigue			headache		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
Sleep Disruption	-0.150	-0.005	-0.024	0.276*	0.048	0.079	0.945***	0.685***	0.739***
	(0.102)	(0.088)	(0.095)	(0.165)	(0.152)	(0.162)	(0.218)	(0.179)	(0.196)
N	5,102	5,102	5,102	5,104	5,104	5,104	5,104	5,104	5,104
	Alzheimer			depression			cancer		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
Sleep Disruption	0.015	0.021	0.024	0.285**	0.270**	0.267**	-0.142*	-0.039	-0.041
	(0.022)	(0.021)	(0.022)	(0.112)	(0.105)	(0.112)	(0.083)	(0.072)	(0.077)
N	5,049	5,049	5,049	5,104	5,104	5,104	5,049	5,049	5,049

robust standard errors in parentheses

$* p < 0.1, ** p < 0.05, *** p < 0.01$

Column (a) include dwelling & neighborhood controls. Column (b) adds on physical & demographic controls. Column (c) includes socio-economic controls, in addition to dwelling & neighborhood and physical & demographic controls.

Table A4: Robustness: Include Additional Controls on Psychometric and Lifestyle Attributes

	cardio-vascular		cholesterol		blood pressure		asthma	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.582**	0.657*	0.208	0.286	0.326	0.299	0.209	0.348
	(0.280)	(0.363)	(0.242)	(0.305)	(0.285)	(0.345)	(0.188)	(0.254)
Anxious	-0.033	-0.034	0.001	-0.008	-0.007	-0.009	-0.013	-0.022
	(0.034)	(0.037)	(0.030)	(0.031)	(0.035)	(0.036)	(0.023)	(0.026)
Happiness	0.005	0.007	0.001	0.008	0.009	0.012	0.003	0.005
	(0.015)	(0.018)	(0.013)	(0.015)	(0.015)	(0.017)	(0.010)	(0.012)
Exercise	-0.005	-0.004	-0.004	-0.006	-0.007	-0.007	0.003	0.004
	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.003)	(0.003)
Job Risk	0.000	0.000	0.000*	0.000*	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Drug	-0.049	-0.059	-0.000	-0.017	0.017	0.023	-0.025	-0.042
	(0.050)	(0.060)	(0.043)	(0.050)	(0.048)	(0.056)	(0.033)	(0.042)
Easily Disturbed		-0.016		0.007		0.020		-0.020
		(0.019)		(0.016)		(0.018)		(0.013)
Ever moved		-0.042*		-0.011		-0.021		-0.011
		(0.022)		(0.019)		(0.021)		(0.016)
N	3,075	2,957	3,075	2,957	3,075	2,957	3,074	2,956
	lung disease		bone & joint		diabetes		fatigue	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.661**	0.885**	1.456***	1.685**	0.016	0.031	1.248***	1.427**
	(0.299)	(0.427)	(0.546)	(0.738)	(0.150)	(0.187)	(0.469)	(0.622)
Anxious	-0.044	-0.056	-0.092	-0.107	0.001	-0.003	-0.001	-0.022
	(0.036)	(0.044)	(0.067)	(0.076)	(0.018)	(0.019)	(0.057)	(0.064)
Happiness	0.007	0.015	0.036	0.047	-0.004	-0.002	0.004	0.013
	(0.016)	(0.021)	(0.029)	(0.036)	(0.008)	(0.009)	(0.025)	(0.030)
Exercise	-0.003	-0.003	0.006	0.004	-0.005**	-0.005*	-0.015*	-0.016*
	(0.005)	(0.006)	(0.009)	(0.010)	(0.002)	(0.003)	(0.008)	(0.009)
Job Risk	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Drug	-0.017	-0.042	-0.171*	-0.196	-0.001	-0.003	-0.106	-0.129
	(0.051)	(0.069)	(0.093)	(0.120)	(0.027)	(0.031)	(0.080)	(0.100)
Easily Disturbed		-0.030		-0.026		0.008		-0.003
		(0.023)		(0.039)		(0.010)		(0.032)
Ever moved		-0.047*		-0.047		-0.007		-0.026
		(0.026)		(0.048)		(0.012)		(0.039)
N	3,075	2,957	3,075	2,957	3,075	2,957	3,075	2,957
	headache		Alzheimer		depression		cancer	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.994**	1.124**	0.013	0.017	0.094	0.106	0.100	0.116
	(0.421)	(0.550)	(0.028)	(0.035)	(0.189)	(0.231)	(0.130)	(0.163)
Anxious	-0.056	-0.068	0.001	0.001	0.048*	0.040	-0.009	-0.010
	(0.051)	(0.056)	(0.004)	(0.004)	(0.025)	(0.025)	(0.017)	(0.018)

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Happiness	-0.007	-0.001	0.001	0.001	-0.016	-0.013	0.002	0.002
	(0.023)	(0.027)	(0.001)	(0.002)	(0.010)	(0.011)	(0.007)	(0.008)
Exercise	-0.004	-0.003	0.001*	0.001	-0.007**	-0.007**	-0.001	-0.001
	(0.007)	(0.007)	(0.001)	(0.001)	(0.003)	(0.003)	(0.002)	(0.002)
Job Risk	0.000	-0.000	0.000	0.000	-0.000**	-0.000**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Drug	-0.112	-0.133	-0.001	-0.001	0.117***	0.113***	0.013	0.012
	(0.073)	(0.090)	(0.003)	(0.004)	(0.035)	(0.040)	(0.023)	(0.027)
Easily Disturbed		-0.011		-0.001		0.008		-0.004
		(0.029)		(0.002)		(0.012)		(0.008)
Ever moved		-0.006		-0.003		0.019		0.000
		(0.035)		(0.002)		(0.015)		(0.009)
N	3,075	2,957	3,051	2,935	3,075	2,957	3,051	2,935

robust standard errors in parentheses

$*$ p < 0.1, $**$ p < 0.05, $***$ p < 0.01

Included in regression but not shown: Dwelling characteristics, neighborhood characteristics, alcohol consumption, educational level, labor market status, number of children, religious status.

Table A.5: Robustness - Exclude Individuals under 30 Years Old

	cardio-vascular		cholesterol		blood pressure		asthma	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.422***	0.439**	0.098	0.053	0.095	0.046	0.182*	0.211
	(0.155)	(0.189)	(0.150)	(0.182)	(0.162)	(0.196)	(0.104)	(0.129)
Easily Disturbed		-0.005		0.030		0.033		-0.017
		(0.021)		(0.020)		(0.021)		(0.014)
Ever moved		-0.038**		-0.015		-0.018		-0.001
		(0.017)		(0.016)		(0.018)		(0.012)
N	4606	4606	4604	4604	4604	4604	4603	4603
	lung disease		bone & joint		diabetes		fatigue	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.418***	0.432**	1.227***	1.330***	-0.053	-0.083	0.054	-0.059
	(0.151)	(0.184)	(0.271)	(0.346)	(0.105)	(0.128)	(0.177)	(0.217)
Easily Disturbed		-0.005		-0.057		0.019		0.074***
		(0.020)		(0.038)		(0.014)		(0.023)
Ever moved		-0.021		-0.050		-0.004		-0.029
		(0.017)		(0.032)		(0.012)		(0.020)
N	4606	4606	4606	4606	4604	4604	4606	4606
	headache		Alzheimer		depression		cancer	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.765***	0.763***	0.024	0.025	0.237**	0.182	-0.030	-0.056
	(0.208)	(0.252)	(0.022)	(0.025)	(0.116)	(0.138)	(0.082)	(0.100)
Easily Disturbed		0.002		0.000		0.034**		0.014
		(0.027)		(0.003)		(0.015)		(0.011)
Ever moved		-0.010		-0.002		0.005		0.016*
		(0.024)		(0.002)		(0.013)		(0.009)
N	4606	4606	4536	4536	4606	4606	4536	4536

robust standard errors in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01
Included in regression but not shown: Dwelling characteristics, neighborhood characteristics,
alcohol consumption, educational level, labor market status, number of children, religious status.

Table A.6. Robustness - Sample of daytime workers

	cardio-vascular		cholesterol		blood pressure		asthma	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.393**	0.437*	0.159	0.127	0.373	0.383	0.083	0.094
	(0.193)	(0.247)	(0.191)	(0.237)	(0.237)	(0.297)	(0.150)	(0.189)
Easily Disturbed		-0.013		0.018		0.003		-0.005
		(0.024)		(0.023)		(0.028)		(0.018)
Ever moved		-0.030*		-0.002		-0.023		-0.001
		(0.017)		(0.017)		(0.021)		(0.014)
N	2,820	2,820	2,819	2,819	2,819	2,819	2,817	2,817
	lung disease		bone & joint		diabetes		fatigue	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.391*	0.415	1.505***	1.672***	-0.112	-0.158	0.172	0.110
	(0.209)	(0.263)	(0.477)	(0.642)	(0.115)	(0.150)	(0.255)	(0.316)
Easily Disturbed		-0.009		-0.069		0.024		0.046
		(0.025)		(0.062)		(0.015)		(0.030)
Ever moved		-0.012		-0.057		0.002		-0.040*
		(0.019)		(0.048)		(0.011)		(0.023)
N	2,820	2,820	2,820	2,820	2,819	2,819	2,820	2,820
	headache		Alzheimer		depression		cancer	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Sleep Disruption	0.609**	0.569	0.001	0.001	0.164	0.098	0.074	0.081
	(0.301)	(0.369)	(0.019)	(0.024)	(0.159)	(0.195)	(0.096)	(0.120)
Easily Disturbed		0.020		0.000		0.027		-0.004
		(0.036)		(0.003)		(0.018)		(0.011)
Ever moved		0.003		-0.002		0.022		0.001
		(0.027)		(0.002)		(0.015)		(0.008)
N	2,820	2,820	2,787	2,787	2,820	2,820	2,787	2,787

robust standard errors in parentheses
$* \ p < 0.1, \ ** \ p < 0.05, \ *** \ p < 0.01$
Included in regression but not shown: Dwelling characteristics, Neighborhood characteristics,
alcohol consumption, educational level, labor market status, number of children, religious status.