Supplemental Material

Methods:

Data collection

Subjects were asked to fast over night (e.g. no food after midnight) and home visits were performed early in the morning. Blood samples were returned to the Tufts Nutrition Evaluation Laboratory on the day of collection in coolers equipped with dry ice, immediately cooled to 4 degrees C and the plasma separated within 4 hours in a refrigerated centrifuge. The red blood cells (RBC) were washed twice with cold saline. The blood samples were prepared for the various analyses and distributed to the appropriate laboratories for analysis or storage. Plasma aliquots were saved in 1 mL cryogenic, screw-cap tubes, and stored at -70°C for later batch processing of high sensitivity CRP. CRP I serum was analyzed using the Immulite 1000 High Sensitive CRP Kit (LKCRP1) according to document : PILKCR-7, 2003-11-25, High sensitivity CRP, and according to Immulate 1000 Operating Manual, Document #600467, rev B1, revision 5.XX August 2003, Diagnostic Products Corporation (DCP) Los Angeles, CA 90045-5597. Analytical values above 10 mg/L were repeated.

To account for intra-individual variations in blood pressure measurements, trained interviewers used an electronic sphignomanometer (Dinamap^{TM} Model 8260, Critikon, Tampa, FL), at three time points, in duplicate, during the home visit; once near the beginning, during the middle, and near the end of the interview, after short rests, while the subject was seated quietly. The second and third sets of readings, four readings in total, were averaged.

Traffic exposure assessment

Geocoding is the process of assigning an XY coordinate pair to a location by comparing the address information (street number, name, city, and zip code) to a reference data base and delivering the best candidate or candidates as a point feature on the map. Address matching involves a process of probabilistic record linkage of two data files that produces an address match score; the higher the score, the greater the likelihood that the true address has been identified (Zandbergen 2008).

An address verification procedure was conducted and a geocoding hierarchy was established to minimize positional error in deriving address geo-coordinates. The geocoding hierarchy included three methods to obtain coordinates: parcel matching, street network matching, and verification of any discrepancies by hand using Google Earth/Google maps. The city of Boston has 18 neighborhoods with over 200 instances of the same road name being used for two or more different non-contiguous roads.

Geocoding against parcel boundary maps is generally considered a more spatially accurate method of geocoding, though match rates can be lower than street network matching because single parcels can be associated with duplex units, condominiums, and apartment complexes with separate units the individual addresses of which may not be reflected in the parcel database (Zandbergen, 2008). Parcel maps were only available for Boston, Chelsea, and Cambridge and in these cities, public housing sites, with several units and individual addresses, were not well represented. An estimated 25 percent of study cases reside in public housing. For

cases outside these areas, not matched to parcel maps, or receiving match score below 100, a second method of geocoding was conducted using ArcGIS StreetMap USA, a nationwide street network for map visualization, geocoding, and routing available as part of the ArcGIS software (ESRI 2006).

For both methods, match scores were reviewed to determine the reason for scores less than 100 (on a scale of 0-100). Typical reasons for scores between 80 and 99 included slight misspellings, or the use of the abbreviation for street or road (st., rd) in the address database. Complicating the geocoding process, the city of Boston has 18 neighborhoods with over 200 instances of the same road name being used for two or more different non-contiguous roads. Scores below 80 were checked against Google Earth which resulted in identification of zip code errors or clarification of neighborhood and street names, followed by resolution of all but 3 case addresses and assignment of exposure variables as discussed.

ArcGIS software (version 9.2) was used to construct 100 meter and 200 meter buffers along roadways of concern. Traffic volumes on the majority of roads were between 20,000 and 40,000 vehicles per day, with only four roads between 40,000 and 100,000 and volumes on two roads over 100,000 vehicles per day. Traffic density across the study ranged from 6,500 to 1,164,000 VMT/mi^2, with a median of 88,000 VMT/mi^2.

TAZ are small geographic areas defined by land use and demographic characteristics, consisting of links representing road segments and nodes representing intersections. TAZ are small, relatively homogeneous areas covering all classified roadways, including express highways, principal and minor arterials, collectors and local streets, for which estimates of vehicle miles travelled per dry land square mile (VMT/mi2) are developed (CTPS 2007). Details

on the use of TAZ-based data to characterize traffic density and exposure have been previously reported (Rioux et al. 2009a). Vehicles include automobiles and trucks, but not buses, which are evaluated as part of the public transportation network. The study area is comprised of 227 Traffic Analysis Zones (TAZs). Median TAZs size ranged from 0.014 to 1.25 square miles with a median of 0.11 square miles., ex. TAZs with <69,000 VMT/mi2 were considered level 1 traffic density; TAZs with between 69,000 and <123,000 were considered level 2 traffic density, etc (Table 1). Alternative methods of defining traffic levels were evaluated, including population and study-based quartiles, however these methods did not provide a sufficient contrast in VMT/mi2 across the study population.

Raster-based analysis.

A raster-based spatial density analysis was conducted to examine the degree to which small TAZs may be influenced by the traffic levels of their contiguous TAZ. Spatial density analysis accounts for the size of a TAZ with respect to the influences of other TAZs and calculates the density of traffic levels in the vicinity smoothing the variation between them. Using the kernel density option, which is based on the quadratic kernel function (ESRI 2006; Silverman, 1986), a running weighted average of vehicle miles travelled within cells 10 by 10 meter in diameter (also testing 25 and 50 meters) was calculated over a 1000 meter radius (also testing 500 meters). The density is greatest at the point location and diminishes to zero at the specified radius. The volume under the surface equals the population field (vehicle miles travelled) value for the point. The sum of the intersecting spreads is calculated for each output raster cell by adding the values of all kernel surfaces where they overlay the raster cell center. Four levels of raster-based density were defined by ArcMap, part of the ArcGIS software,

(version 9.2), based on groups with similar values that also maximize the differences between classes.

CTPS. 2007. An overview of the CTPS Travel Model Set. Central Planning and Transportation Staff of the Boston Region Metropolitan Planning Organization.

ESRI. ArcGIS version 9.2 mapping software documentation. Redlands, CA.2006.

Rioux CL, Gute DM, Brugge D, Peterson S, Parmenter B. 2009a (submitted). Characterizing urban traffic exposures using transportation planning tools: An illustrated methodology for health researchers.

Silverman, BW. *Density Estimation for Statistics and Data Analysis*. New York: Chapman and Hall, 1986.

Zandbergen PA. 2007. Influence of geocoding quality on environmental exposure assessment of children living near high traffic roads. BMC Public Health 7.

Table 1. Range of values and number of cases for the four traffic density and raster-based density levels used to assess exposure across the 227 Traffic Analysis Zones in the study area - Greater Boston, Massachusetts

Traffic density level	VMT/mi^{2} [a]	n
1	<69,000	223
2	69,000 - <123,000	386
3	123,000 - <266,000	298
4	≥ 266,000	109
Raster-based density level	**Raster value**	
1	<37,000	377
2	37,000 - <79,000	457
3	79,000 - <142,000	138
4	≥ 142,000	27

Abbreviations: VMT/mi^{2}: vehicle miles travelled per square mile.

Table 2. Crude model percent differences and 95% CI in C-reactive protein associated with traffic indices for the complete study group and subgroups

	All Cases		Obesity				Diabetes			
Traffic index		*p* -value	Yes	*p* -value	No	*p* -value	Yes	*p* -value		*p* -value
≤ 100 m	-5.8(-21.4 - 12.7)	0.510	10.8(-11.2 - 38.4)	0.364	-6.0(-27.5 - 21.9)	0.640	-9.8(-31.7 - 19.2)	0.467	-2.3(-22.6 - 23.5)	0.846
≤200 m	9.3(-5.2 - 26.9)	0.241	28.7(7.9 - 53.4)	0.005	-1.0(-20.9 - 23.9)	0.933	-6.9(-25.8 - 16.8)	0.535	21.4(-0.1 - 47.4)	0.052
3-Tiered gradient										
≤ 100 m	0.99(-17.8 - 19.2)	0.914	20(-4.3 - 50.9)	0.113	-4.9(-27.6 - 24.7)	0.712	-10.7(-33.2 - 19.4)	0.444	6.3(-16.4 - 35.4)	0.614
>100 - ≤200 m	20.8(0.2 - 45.6)	0.048	36.6(9.9 - 69.9)	0.005	4.1(-22.1 - 39)	0.787	-3.4(-26.9 - 27.6)	0.807	40.2(9.3 - 79)	0.008
Number of roadways										
1 roadway	8.9(-6.7 - 27.2)	0.278	25.4(4.4 - 50.5)	0.016	0.3(-20.7 - 26.9)	0.981	-11.6(-30.2 - 12.1)	0.307	25.4(2.4 - 53.6)	0.029
2+ roadways	11.6(-19.5 - 54.9)	0.508	56.5(3.9 - 135)	0.032	-8.1(-42.4 - 46.5)	0.721	26.7(-21.1 - 104)	0.327	-4.2(-38.7 - 49.6)	0.851
VMT/mi ^{2}										
Level 2	7.1(-9.7 - 27.1)	0.429	7.6(-11.9 - 31.4)	0.473	14.7(-11.5 - 48.6)	0.298	-17.2(-36.1 - 7.2)	0.152	22.6(-2.2 - 53.6)	0.076
Level 3	-0.5(-19.0 - 22.4)	0.965	25.9(-0.9 - 59.8)	0.059	-28.5(-48.0 - -1.6)	0.039	-19.7(-41.9 - 10.9)	0.182	12.6(-13.5 - 46.8)	0.376
Level 4	23.1(-9.6 - 67.9)	0.187	43.9(-3.6 - 114)	0.075	35.4(-11.0 - 106)	0.157	-15.5(-49.6 - 41.7)	0.522	54.2(5.0 - 126)	0.027
Raster density										
Level 2	23.2(4.8 - 45.1)	0.011	36.7(13.2 - 65)	0.001	4.7(-18.6 - 34.6)	0.720	16.3(-9.6 - 49.5)	0.239	23.9(0.3 - 53.3)	0.047
Level 3	8.9(-13.6 - 37.0)	0.471	36.9(-7.2 - 65.4)	0.146	6.9(-23.1 - 48.6)	0.691	-3.4(-32.4 - 37.9)	0.848	15.7(-14.3 - 56.4)	0.340
Level 4	7.4(-31.9 - 69.4)	0.760	25.5(-24.9 - 109)	0.387	22.0(-62.5 - 62.1)	0.504	38.1(-31.9 - 180)	0.369	11.3(-50.9 - 60.5)	0.692

Crude model includes individual traffic index and CRPln as outcome.

Reference levels were: > 100 m for ≤100 m; > 200 m for ≤200 m and the 3-tiered gradient; 0 (roadways) for number of roadways ≤200 m of a residence; and level 1 for VMT/m ^{2} and raster density.

Table 3. Crude model differences in pulse pressure and 95% CI associated with all traffic indices for the complete study group and subgroups

	All Cases		Obesity				Diabetes			
Traffic index		***p* -value**	**Yes**	***p* -value**	**No**	***p* -value**	**Yes**	***p* -value**	**No**	***p* -value**
≤ 100 m	2.1(-0.16 - 4.3)	0.069	4.6(1.5 - 7.7)	0.004	-0.88(-4.7 - 2.3)	0.857	2.5(-1.2 - 6.2)	0.178	1.8(-0.9 - 4.6)	0.188
≤200 m	1.9(0.09 - 3.7)	0.041	2.5(0.08 - 5.1)	0.043	0.6(-2.2 - 3.4)	0.669	2.7(-0.28 - 5.7)	0.075	1.2(-1.1 - 3.5)	0.311
3-Tiered gradient										
≤ 100 m	2.4(0.13 - 4.7)	0.038	4.7(1.5 - 7.9)	0.004	-0.38(-3.7 - 2.9)	0.822	3.2(-0.65 - 6.9)	0.104	1.9(-0.91 - 4.8)	0.182
>100 - ≤200 m	1.4(-0.92 - 3.7)	0.234	0.58(-2.5 - 3.7)	0.710	1.8(-1.7 - 5.4)	0.316	2.3(-1.4 - 6.1)	0.224	0.37(-2.6 - 3.3)	0.805
Number of roadways										
1 roadway	1.6(-0.33 - 3.5)	0.104	2.3(0.04 - 0.41)	0.082	0.16(-2.7 - 3.1)	0.913	1.9(-1.15 - 5.1)	0.212	1.1(-1.3 - 3.5)	0.352
2+ roadways	4.3(0.18 - 8.4)	0.041	4.7(-1.2 - 10.6)	0.118	3.2(-2.5 - 9.0)	0.264	7.2(0.85 - 13.6)	0.026	1.6(-3.7 - 6.9)	0.554
VMT/mi ^{2}										
Level 2	2.0(-0.12 - 4.1)	0.064	0.4(-2.4 - 3.3)	0.763	4.3(1.1 - 7.5)	0.009	0.59(-2.9 - 4.1)	0.737	2.1(-0.61 - 4.7)	0.131
Level 3	0.7(-1.8 - 3.3)	0.582	1.2(-2.2 - 4.6)	0.477	-0.35(-4.3 - 3.6)	0.863	4.0(-0.25 - 8.0)	0.065	-1.9(-5.0 - 1.2)	0.230
Level 4	-0.004(-3.8 - 3.8)	0.999	-2.6(-8.2 - 2.9)	0.354	2.9(-2.3 - 8.2)	0.276	-0.15(-7.0 - 6.7)	0.965	0.45(-4.0 - 4.9)	0.843
Raster density										
Level 2	0.4(-1.6 - 2.4)\	0.697	1.1(-1.6 - 3.8)	0.433	-0.36(-3.5 - 2.8)	0.823	0.81(-2.6 - 4.2)	0.636	-0.84(-3.3 - 1.7)	0.519
Level 3	2.4(-0.5 - 5.3)	0.106	2.5(-1.6 - 6.7)	0.225	-2.3(-1.8 - 6.4)	0.260	0.02(-4.7 - 4.7)	0.994	3.1(-0.43 - 6.7)	0.085
Level 4	-1.7(-7.6 - 4.1)	0.561	2.3(-9.8 - 5.2)	0.543	-0.47(-9.7 - 8.8)	0.921	-2.2(-11.9 - 7.6)	0.665	-1.8(-8.8 - 5.2)	0.612

Crude model includes individual traffic index and CRPln as outcome.

Reference levels were: > 100 m for ≤100 m; > 200 m for ≤200 m and the 3-tiered gradient; 0 (roadways) for number of roadways ≤200 m of a residence; and level 1 for VMT/m ^{2} and raster density.