

The Effects of Street Network Layout on Walking to School

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Abstract : Data for this cross-sectional study were drawn from questionnaires conducted in 10 elementary schools (1000 students, ages 12-14) located in Istanbul, Turkey. School environments (1600 meter buffers around the school) were evaluated through GIS-based land-use data (parcel level land use density) and street-level topography. Street networks within the same buffers were evaluated by using angular segment analysis (Integration and Choice) implemented in Depthmap as well as two segment-based connectivity measures, namely Metric and Directional Reach implemented in GIS. Segment Angular Integration measures how accessible each space from all the others within the radius using the least angle measure of distance. Segment Angular Choice which measures how many times a space is selected on journeys between all pairs of origins and destinations. Metric Reach captures the density of streets and street connections accessible from each individual road segment. Directional Reach measures the extent to which the entire street network is accessible with few direction changes. In addition, socio-economic characteristics (annual income, car ownership, education-level) of parents, obtained from parental questionnaires, were also included in the analysis. It is shown that surrounding street network configuration is strongly associated with both walk-mode shares and average walking distances to/from schools when controlling for parental socio-demographic attributes as well as land-use compositions and topographic features in school environments. More specifically, findings suggest that the scale at which urban form has an impact on pedestrian travel is considerably larger than a few blocks around the school.

Keywords : Istanbul, street network layout, urban form, walking to/from school

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