The Irvine–Minnesota Inventory to Measure Built Environments

Reliability Tests

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Background: Inter-rater reliability is an important element of environmental audit tools. This paper presents results of reliability tests of the Irvine–Minnesota Inventory, an extensive audit tool aimed at measuring a broad range of built environment features that may be linked to active living.

Methods: Inter-rater reliability was measured by percentage agreement between observers. Reliability was tested on a broad range of sites in both California and Minnesota.

Results: For the variables that remained in the inventory, in tests conducted at the University of California–Irvine, 76.8% of the variables had >80% agreement among the three raters. In tests conducted at the University of Minnesota, 99.2% of the variables had >80% agreement among the two raters.

Conclusions: Reliability was high for most items. The inventory was modified to eliminate items with low reliability. Differences in the use of the inventory and the goals of the research led to generally higher reliability in Minnesota. Those differences, limitations, and directions for future research are discussed.

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Introduction

This paper describes the second stage of developing the Irvine–Minnesota inventory—inter-rater reliability tests. The Irvine–Minnesota inventory was developed to respond to the need for reliable methods to measure built environment characteristics that might be related to walking or bicycling. To successfully contribute to research and policy work related to active living, the inventory should yield results that, within reason, do not vary depending on who uses the instrument. Here we describe the reliability tests conducted in two regions—Southern California and the Minneapolis–St. Paul metropolitan area. The items that were eliminated from the inventory due to poor inter-rater reliability were also discussed. The result is a tool with demonstrated inter-rater reliability that can be used by experts and nonexperts to study 162 elements of the built environment hypothesized to influence active living. (The instrument, codebook, and training protocol are available at www.ajpm-online.net.)

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Background

The development of the Irvine–Minnesota inventory included plans for reliability testing from the outset. Moudon and Lee[1] reviewed several recent environmental audit tools. Of those, only two have been tested for reliability, including the Systematic Pedestrian and Cycling Environmental Scan (SPACES) instrument, and the inventory developed by Brownson et al.[2,3] For SPACES, reliability tests showed that most items attained over 75% agreement for three observers, although these reliability tests were from locales that typically lacked broad variation in built environment characteristics.[2] The St. Louis tool, developed by Brownson et al.,[3] was tested on a wider range of places, including higher- and lower-income neighborhoods, which yielded variation in street-scale environments. The St. Louis tool was most reliable in measuring transportation and land-use items. Its questions on physical disorder, signage, and the social environment tended to have lower reliability.[3] Given the high interest in studying links between the built environment and physical activity, there is need for more information on instrument reliability.

One goal in developing the Irvine–Minnesota inventory was to maintain high inter-rater reliability while expanding environmental audits to include numerous built environment features not covered in other avail-

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able audit instruments such as SPACES. Toward that end, the Irvine–Minnesota inventory includes features such as the characteristics of streets, alleys, urban form, and architecture (e.g., vertical mixed use, porches, garage doors); multiple land-use categories, nearby nature (e.g., woods, ponds, agricultural land); and characteristics of views.

As mentioned in the companion paper to this,[4] the Minnesota research team approached the University of California–Irvine (UC–Irvine) team midway through the development of the inventory. The researchers at the University of Minnesota requested a draft version of the inventory to use in their research. The ensuing cooperation between the two research teams allowed for reliability testing in two locations: Southern California and Minnesota. Those reliability tests are described here. The goal of the research was to produce an inventory that other researchers could use, and the reliability tests were implemented with that goal in mind.

Methods

Geography for Reliability Testing

Because reliability tests were implemented in two different locations as parts of two distinct research projects, the methods for selecting geographies for data collection varied in California and Minnesota. The UC Irvine team tested reliability on settings—residential or nonresidential areas of walkable size—in Southern California. The size of the UC Irvine settings most commonly conformed to quarter-mile radius areas, but settings were chosen to represent coherent neighborhoods or coherent nonresidential (i.e., commercial, public) areas, thus the geography of settings was not regular.

In Minnesota, the research team applied the Irvine–Minnesota Inventory to study focus areas rather than settings. Focus areas comprised 0.5 mi^2 geographic districts, drawn from within the Minneapolis–St. Paul metropolitan area. The gridded focus-area geography matched the geography of the larger Minnesota study. The Irvine–Minnesota Inventory was applied within 1.0 mi^2 areas that surrounded the 0.5 mi^2 focus areas. The Minnesota team called the larger 1.0 mi^2 areas "context areas." Within both settings (in California) and context areas (in Minnesota), segments were the key observational elements.

Segments are street block faces. Segments are the fundamental geographic element for data collection, as all but 16 features on the inventory were measured once per segment. Examples of items measured once per segment include the presence and completeness of sidewalks, street trees, and land-use types. Sixteen questions pertain to street intersections, and so were measured at all intersections and hence twice for segments in grid-oriented street patterns. An example of a question asked at each intersection is information about painted street crossings or crosswalks.

In California, settings typically had 45 to 80 segments; observers adaptively sampled segments to measure 15 to 20 segments per setting.[4] In Minnesota, a total of 891 segments were randomly sampled from the context areas.

Reliability Testing in California

For reliability testing in California, the research team employed three observers, including the graduate research assistant who had been involved in developing the instrument and two undergraduate researchers. The two undergraduate researchers (a psychology major and an environmental design major) were selected to be similar in their background training to assistants who might be employed by future researchers using the inventory. Observers were trained through two classroom sessions, where each item on the instrument was discussed and a PowerPoint training protocol was used to illustrate items when appropriate. The classroom sessions lasted 2 hours each.

The inventory was developed to include a codebook and a PowerPoint training protocol. The codebook explains the basic philosophy of the inventory and also includes short descriptions of the meaning of each question. For example, for the question about monuments and markers, the training manual shows "Monuments or Markers: For each segment, determine if there are monuments, markers, or neighborhood entry signs that tell individuals that one is entering a certain neighborhood or district. These might include neighborhood entrance signs or posts or walls or other features at the entrance that indicate a particular or a special area. Entry markers do not have to have a name on them, they can simply signal that this is a particular place with its own identity and boundaries. Also include city signs that indicate a special district or neighborhood." The PowerPoint training protocol provides visual examples of urban design features that may be unfamiliar to observers (e.g., monuments and markers, curb bulb-outs, bollards).

In addition to the two classroom training sessions, the UC Irvine observers participated in one on-site training session, involving instructional dialogue between the trainer and observers. During that on-site training session, all observers rated segments in discussions with the graduate student research assistant who helped develop the inventory. This included discussion and clarification for each item in the inventory. Last, the inventory was pilot tested in a setting that was not used for reliability analysis. Observers independently recorded data for 15 segments in the pilot test. Results from the pilot test were analyzed and further instruction was given to the observers as necessary.

The team of three observers conducted reliability testing at 8 of the 27 settings that were observed during original development and field testing of the inventory.[4] Observers conducted independent, in-person observations, walking through each setting and coding observations directly onto a paper version of the instrument. During reliability testing, all three observers collected data simultaneously. Observers were never on the same segment at the same time, to eliminate the possibility of "consultation" between observers. Observers measured a sample of segments in each setting. Beginning at the first segment in the setting, the observer included segments in the sample if the current segment differed from the previously observed segment in terms of any of these four features: land uses, presence of a sidewalk network, presence of barriers, and whether the segment looks like a "nice" place to walk. These key features were intended to differentiate various types of segments in a setting, such that the full range of types of segments in a setting would be included in the sample. In sampling segments, a maximum of three adjacent

segments were skipped. To evaluate reliability, data were entered into Microsoft Access and then transferred to SPSS for data analysis.

Reliability Testing in Minnesota

Reliability testing in Minnesota was conducted independently of reliability testing by the UC Irvine team. In Minnesota, 36 discrete 0.5 mi^2 focus areas were selected for data collection, based on gross population density and street pattern (measured as median block size). The study sites were selected to represent a subset of the most extreme areas—ranking high or low on each of these two dimensions—and included nine sites with high density (≥10 persons per gross acre) and small blocks (<5 acres) nine with high density and big blocks (>8 acres) nine with low density (fewer than five persons per gross acre) and small blocks; and nine with low density and big blocks. All areas had at least 20% of their land area in residential land use. (In the larger study, in each focus area 20 residents have been or will be recruited to wear a motion detector—an accelerometer—for 7 days, complete a 7-day travel diary, have their height and weight measured, and answer a number of surveys dealing with demographic, attitudinal, and socioeconomic issues. Recruitment for individual measurement was 718. The study team is measuring dozens of specific environmental measures related to the broad areas of density, street pattern, mixed use, and pedestrian infrastructure, as well as numerous social and demographic variables. These variables are being measured for the focus areas, a wider 1.0 mi^2 context area, and most importantly for various network (street distance) and crow-flies buffers around the homes of individuals.)

As part of this study, data on built environment features were collected using a draft paper version of the Irvine–Minnesota Inventory that was ready in April 2004. The inventory included 241 items at this stage. The University of Minnesota research team shortened and made some changes to the instrument. Most revisions involved changes to layout, standardization of rating scales (e.g., reducing five attractiveness scales to one, and 12 quantity scales to four), clarification of items, and clarification of instructions to make data entry easier for skipped items. These changes, along with changes to the format of the instrument, have been incorporated into the final version of the Irvine Minnesota Inventory. Questions were cut that duplicated existing geographic information systems (GIS) data that would be used in the Minnesota study, as were questions that pertained to the entire setting (since the Minnesota study used grid cell areas and not "natural" settings). Excellent GIS data were available for use in the Minnesota study. Such data may or may not be available to future research teams who would use the Irvine–Minnesota Inventory. The inventory thus errs on the side of caution to include items that might be reasonably substituted with GIS data if they are available. The Minnesota version had 163 items.

The main observers on the Minnesota team included a landscape architecture student and an architecture student. Training of observers involved reading the codebook, viewing the training protocol, and reading the draft inventory, as well as on-site field testing. As it was a draft instrument, some of the training was also integrated with a process of revision. Two members of the research team tested the inventory independently on five segments not in the study area, marking each question where there was disagreement. The researchers revised training to minimize disagreements due to errors, and also modified the inventory to reduce the number of different rating scales in the instrument. The instrument was converted to Excel and reformatted to allow for easier data collection and to use less paper. Two new observers tested the revised inventory on the same five segments. All four observers then discussed all areas of disagreement and errors in interpretation that were identified. The inventory was revised a second time. The four observers tested the inventory in the field, and final refinements were made.

Observations were conducted by two observers on a random sample of segments until 147 segments had been completed, by which time there was basically perfect agreement. To undertake this random sample, researchers used a street database developed for the Twin Cities that is highly accurate and that does not include alleys. All street segments were identified using GIS. Because some street segments are entered into the database in sections, sections shorter than 50 ft were cut to eliminate false segments. Also eliminated were freeway on ramps and off ramps, and freeways themselves. These areas were also not chosen as segments by the UC Irvine team. The one time that two sides of a divided road were sampled, one was removed and the next randomly sampled segment was added instead. Researchers then randomly sampled 20% of the street segments in each 1.0 mi^2 area that surrounded the 0.5 mi^2 focus areas. This generated a sample that was well distributed across each 1.0 mi^2 area.

After that, the two observers split up for the remaining segments. In these dispersed environments, researchers found it easiest to conduct observations by car. Observers examined a total of 891 segments, a 20% sample of the total universe of eligible segments. Eligible segments included street segments that were accessible to pedestrians, were real blocks, and that were in the context area of 1.0 mi^2. Data were collected on paper and then entered into Excel and then Stata, version 9 (Stata Corp, College Station TX, 2005) and GIS for analysis. While data entry was a necessary step with the paper version of the inventory used for reliability tests, the research team has since developed a computer version of the inventory, available in Microsoft ACCESS, that eliminates the need to enter data from a paper version into a software program.

Differences in Reliability Testing in Irvine and Minnesota

Training of observers at UC Irvine was intentionally less exhaustive than might be conducted for the actual use of the inventory in future research. The objective of the UC Irvine reliability testing was to identify any items on the instrument that might have low reliability so that these items could be eliminated from the inventory, rather than to gain the highest possible level of inter-rater reliability. The goal of the UC Irvine research was to develop an inventory that would be reliable when used by others, including persons who are not trained in urban planning or urban design. For that reason, the UC Irvine teamed focused on not "over-training" observers. Specifically, the UC Irvine team avoided training to obtain inter-rater reliability beyond the level that could be expected of other research teams who would use the inventory, to identify questions that would have low inter-rater reliability in situations where observers are not expert in design or planning.

The Minnesota team, on the other hand, planned to use the data collected with the inventory in ongoing research, and hence sought to achieve the highest level of inter-rater reliability possible. Discussions among the UC Irvine and Minnesota teams indicated that the Minnesota team provided additional training that, in some instances, likely contributed to higher inter-rater reliability among Minnesota observers. As an example, observers in Minnesota discussed items with the goal of obtaining agreement. Due to travel constraints, they rated general areas at the same time. In addition, during the initial rating period (the first 147 segments) they marked items that were unclear and discussed them back at the office. This involved approximately one item per segment for approximately 35 early segments. Given that the observers examined a total of 23,961 items across the 147 segments, this comprised 0.15% of ratings. However, it is likely that these were difficult items and that the consultations increased training and hence agreement. This was because the initial idea was not to test the protocol but to increase accuracy. In California, observers were never allowed to rate the same segment at the same time, in part because the UC Irvine team did not want discussion among observers to inflate agreement.

Time Required for Data Collection

Data were collected using a draft paper version of the audit tool, for both California and Minnesota settings (this version did not yet have items eliminated due to low reliability). Data collection required approximately 10 minutes per segment for the California settings. For Minnesota settings, data collection involved a total of 20 minutes per segment in travel to fieldwork, actual fieldwork, data entry, and proofing. Training, piloting, survey revision, and other administrative tasks added perhaps 5 minutes per segment, though some of this time was due to the newness of the survey. Sampling time was additional. These time estimates are for the paper version of the instrument. A computerized version, programmed in Microsoft Access, is now available to allow researchers to collect data on a laptop or tablet PC in the field, eliminating the need for a separate data-entry stage.

Results

For each of the two research teams, the percent agreement among the observers was calculated to gauge the reliability of each item in the instrument. For the Irvine data, a total of 213 variables were tested for inter-rater reliability among three observers. (Table 1 lists 213 items tested. Of the items tested, 16 items were measured twice per segment and an additional 12 items relate to an earlier response scale for the questions about "public spaces" and "barriers." The categories in Table 1 are organized according to the final response scales and only list once items observed twice per segment, in the "neighborhood identification" and "street crossing" categories. Thus, Table 1 shows 213 items, while 241 items were initially tested in Irvine.) Sixty-eight percent of the variables had >70% agreement among the three observers. For tests conducted at Irvine, among the items that met the minimum threshold requirement (an inter-rater reliability of 70%), 76.8% of the variables had higher than 80% agreement among the three observers. Recall that the objective of reliability testing for the California team was not to maximize reliability, but rather to eliminate unreliable items.

For the Minnesota data, 163 items were tested for inter-rater reliability among two or more observers. All but one item attained ≥70% agreement among two raters. For tests conducted at the University of Minnesota, 99% of variables >80% agreement among the two raters.

In analyzing data, percent agreement was used as the measure of reliability rather than the often-used kappa, as there was not enough variance in the data for kappa statistics to be a good measure of agreement. Many features occurred only rarely (e.g., schools, libraries, railroad tracks) and in such cases statistics that rely in part on variance in the observer's ratings can be misleading.[a] The higher reliability of the Minnesota

[a]Data that lack variance violates a kappa requirement. Consider a hypothetical example with two scorers named Dr. Row and Dr. Column, each rating 148 segments on two aspects, 1 and 2. The resultant data might look like this:

		Col		
		1	2	Total
Row	1	70	4	74
	2	4	70	74
	Total	74	74	148

This says that Row and Column agreed 140 times, each scoring 70 segments a "1" and 70 segments a "2." Our raters disagree 8 times, which are on the off-diagonal. It follows that the good doctors. agree (140/148) 95% of the time. This data has good variance, by which we mean there is a nice spread across the main diagonal: 70 1's and 70 2's. Accordingly, the data yield a kappa of 89.2%.

Agreement	Expected Agreement	Kappa	Std. Err.	Z	Prob>Z
94.59%	50%	0.8919	0.0822	0.85	0.0000

Now consider the same amount of data distributed differently. Here Dr. Row and Dr. Column also agree (140/148) 95% of the time, but all such agreement is for the "1" value. . . They agree that almost all segments are "1", and disagree as before.

		Col		
		1	2	Total
Row	1	140	4	144
	2	4	0	4
	Total	144	4	148

Unlike the above data, this data has little variance and yields an impossible Kappa of -0.03: Kappa must be on the interval (0,1).

Agreement	Expected Agreement	Kappa	Std. Err.	Z	Prob>Z
94.59%	94.74%	−0.0278	0.0822	−0.34	0.6323

For data of the type in the Irvine–Minnesota Inventory, which are almost always poorly distributed, kappa is the wrong measure of agreement. While there is no perfect measure, the simple-to-understand percent agreement (i.e., 95%) is judged to be the best for the data in the inventory.[6–8]

Table 1. Summary of reliability tests for Irvine Minnesota inventory

Category	Number of items tested	Number of items on final inventory	Range of reliability scores of items in final inventory (Irvine)[a](%)	Range of reliability scores of items in final inventory (Minnesota) (%)
Neighborhood identification	1	1	84	100
Street crossing	16	15	69–100	90–100
Banners	1	1	88	99
Street characteristics	4	4	83–100	98–100
Views	2	2	71–74	98–100
Land uses	48	39	75–99	Not tested
Distinctive retail types	5	4	71–91	99–100
Public space	8	7	90–100	99–100
Other land uses	4	4	77–90	99–100
Gathering places	6	6	74–90	99–100
Nature features	8	8	79–100	99–100
Barriers	8	7	90–100	97–100
Sidewalks	18	9	74–96	96–100
Bicycle lanes	2	2	93	100
Mid-block crossing	6	6	96–98	99–100
Steepness	4	3	87–97	99
Sidewalk amenities	8	6	76–99	99–100
Street trees	3	2	77–78	Not tested
Buildings	6	3	73–89	95–100
Windows	2	1	75	100
Other features of buildings	7	2	83–87	93–99
Garages	2	2	74–79	93
Parking	7	2	75–91	100
Driveways	1	1	83	89
Maintenance	7	5	82–99	83–99
Lighting	3	1	77	Not tested
Freeways	1	1	100	100
Traffic features	12	9	72–100	94–100
Architecture/design[b]	5	3	36–76	66–100
Other features of the segment	5	5	90–97	100
People[c]	3	1	Not tested	Not tested
Notes				

[a]Reliability scores are percentage agreement among raters.
[b]Two items in this category were included in the final inventory despite not meeting the minimum threshold of 70% agreement in both California and Minnesota. Those two items, ratings for "attractiveness of segment" (41% agreement in California, 66% agreement in Minnesota) and "interesting architecture" (36% agreement in California and 85% agreement in Minnesota), were judged to influence the reliability of the historic buildings question (73% agreement in Irvine, 100% agreement in Minnesota). The two nonreliable items were left in the inventory based on the assessment that those items are important for the reliability of the "historic buildings" item.
[c]New question because both earlier questions had unsatisfactory aspects.

ratings may reflect several factors, including the elimination of some of the more complex questions, scale simplification that reduced some potential for confusion, and a training philosophy that focused on areas of disagreement and tried to train raters to code alike. Table 1 summarizes reliability data for items from both the California and Minnesota tests. Table 1 shows categories of items and for each category the number of variables tested, the number of variables included in the final inventory, and the range of reliability scores for variables in the final inventory. Reliability scores, for each item, are the percent of total segments for which all observers (in either Irvine or Minnesota) agreed. For the 16 items that are observed twice per segment, reliability scores are based on all observations at both ends of the segment. A larger table, with reliability scores for all items tested, is available upon request from the authors.

For virtually all items, the percent agreement was higher in Minnesota than in Irvine, reflecting the differences in approaches at the two research sites. More importantly, a large number of items on the inventory had percent agreement above 70%. The final inventory includes 162 items, organized into four domains: accessibility (62 items); pleasurability (56 items); perceived safety from traffic (31 items); and perceived safety from crime (15 items). Some items belong to more than one scale. Most items that were cut from the instrument due to low reliability were somewhat subjective in nature, such as items requiring observers to determine the attractiveness of certain urban design features.

After the reliability tests, items were eliminated from the inventory based on two criteria. Items which scored <70% agreement in either Irvine or Minnesota were eliminated from the inventory. Exceptions to the 70%

agreement cut-point were made in a two instances, and those exceptions are explained in Table 1. Some items for which there was no variation, because the item was never present, were also eliminated because no reliability information was available. Examples of items that were not present include airports, cemeteries, jails, and prisons, all of which had 100% agreement, but that was because the item was absent on all segments measured. Because this was equivalent to no reliability test, those items are not in the final inventory. (The final inventory is available in a paper format and a Microsoft Access format, at www.ajpm-online.net.)

Some items eliminated from the final inventory due to low reliability are built environment features that, with more intensive training of observers, might be measured with higher inter-rater agreement. As an example, observers did not agree on characterizing parks as one of the following: (1) neighborhood, (2) district, (3) regional, state, or national. Observers were also not able to agree on the width of sidewalks when responses had to be one of the following: (1) <4 feet; (2) 4 to 7 feet; or (3) >7 feet. One could imagine training criteria that would generate higher agreements for these built environment features. Seeking to design an inventory that could be used by a broad range of research teams, the researchers developing the Irvine–Minnesota inventory chose to err on the side of caution by eliminating items that did not attain 70% agreement with the training provided, even if more rigorous training might have increased the reliability of the item.

Conclusion

The results indicate that the Irvine–Minnesota inventory reliability is high for a broad range of questions across all four domains: accessibility, pleasurability, perceived safety from traffic, and perceived safety from crime. The reliability tests in Minnesota indicate the possibility of increasing observer agreement beyond the levels found in Irvine in cases where research teams can focus on specific questions.

The test of the inventory in two locations was both an opportunity and a source of limitations. The original study plan called for testing the inventory only in Irvine, and the opportunity to test the inventory while it was still in draft form in Minnesota was not anticipated at the beginning of the UC Irvine project. The advantages of the Minnesota collaboration included two reliability tests, refinements to the inventory that were suggested by the Minnesota team, and a better understanding of the usefulness of the inventory in studies of the impact of the built environment on physical activity. Yet the fact that the inventory was tested in draft form in Minnesota and in California is a source of some limitations.

The parallel adaptation of the instrument in both locales caused some questions to vary slightly across California and Minnesota during reliability tests. Those variations are documented in a table, available on request from the authors, which lists reliability for each item tested. We discussed those minor variations in detail and concluded that the reliability data in Table 1 was not influenced by differences in draft versions of the inventory itself except, as is explained above, that the Minnesota version contained significantly fewer different rating scales making it less confusing for observers. Differences in the reliability data across California and Minnesota are also due to some other factors. These include differences in the physical layout of the questions in the inventory, as in the Irvine format some rating scales were laid out across the page and some down the page so it was not always clear to observers where to answer questions. The final matrix format meant that there needed to be a code in every line. In addition there were differences in the built environment in the two locales, differences in the goals of the two research teams, and differences in training protocols. The final version of the inventory reflects all simplifications in scale, format, and question phrasing that were judged to increase reliability.

Another limitation is the time needed to use the inventory. In California, using the longer version before items were deleted based on reliability tests, the time to observe and record data was estimated at ten minutes per segment. Because segments are street block faces (in settings composed of streets, likely the most common case), using the inventory in a setting that is comparable to a quarter-mile-radius neighborhood could require 3 to 4 hours per setting. Research teams in both California and Minnesota found it necessary to sample segments rather than observe all segments in a neighborhood due to the time required to complete the inventory.

Future users of the Irvine–Minnesota inventory will likely face similar pressures to reduce the labor-intensive nature of the instrument. Sampling segments is one way to reduce the time involved, either choosing an adaptive sampling scheme designed to identify changes in the built environment within a setting and to capture the variation in built environment features in the setting (as was used in California) or a random sampling scheme that can allow statistical inference (as was used in Minnesota). Alternatively, research teams might find it useful to choose subsets of questions designed to measure specific questions of interest to the researcher. An example of this approach is a recent study that ranked the liveability of neighborhoods in Houston TX based on 50 of the 162 items on the inventory that were selected, a priori, for their hypothesized relevance and ease of measurement.[5]

While the research documented here provides information about inter-rater reliability, the validity of the

What This Study Adds . . .

Researchers have identified the need for reliable instruments to measure built environment features that may be linked to physical activity.

This article reports on the reliability of the Irvine–Minnesota Inventory.

Findings suggest that the inventory is highly reliable, making it appropriate for use to conduct in-person observations of built environment features that support active living.

items in the inventory has yet to be tested. The goal of this research was to develop a general tool for measuring the built environment. The research team believed that one possible limitation of other built environment inventories was the fact that those inventories were typically focused on specific research hypotheses. The Irvine–Minnesota inventory, in contrast, was designed to be general enough to apply to a broad range of research questions. Hence, the question of validity remains a topic for future research. Future studies should examine specific hypotheses, and assess how the items in the Irvine–Minnesota inventory measure built environment features that relate to theories of the link between the environment and behavior. As such research proceeds, particular inventory items that proxy for the effect of other inventory items might be identified, which could provide guidance in ways that the inventory items could be reduced for specific research questions.

Overall, the results of the reliability tests are encouraging. The results here show that it is possible to have observers rate a large number of built environment features in ways that are reliable when reliability is measured by percent agreement among observers. This is good news for persons seeking to measure features of built environments that would be difficult to obtain with methods other than direct observation. Future work should continue to apply the Irvine–Minnesota inventory to understand how the features in the inventory relate to potential health promoting behaviors.

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Date			1	2	3	4	5	6	7	8
Observer										
Segment #										
Answer questions 1-6 based on this end of the segment										
Intersection										
Neighborhood Identification										
1. Are there **monuments or markers** including neighborhood entry signs that indicate that one is entering a special district or area?	1	yes = 1; no = 0								
Street Crossing										
2a. Consider the places on the segment that are **intended** for pedestrians to cross the street. Are these places marked for pedestrian crossing?	2	all = 3; some = 2; none = 0; NA = 8								
2b. What type of **marking** do the crosswalks have? Mark all that apply.										
White painted lines	3	yes = 1; no = 0								
Colored painted lines	4	yes = 1; no = 0								
Zebra striping	5	yes = 1; no = 0								
Different road surface or paving (e.g. tiles, colored concrete, marble, etc)	6	yes = 1; no = 0								
Other	7	yes = 1; no = 0								
3. Are there **curb cuts** at all places where crossing is expected to occur?	8	all = 3; some = 2; none = 0; NA = 8								
4. What type of **traffic/pedestrian signal(s)/system(s)** is/are provided? Mark all that apply.										
Traffic signal	9	yes = 1; no = 0								
Stop sign	10	yes = 1; no = 0								
Yield sign	11	yes = 1; no = 0								
Pedestrian activated signal	12	yes = 1; no = 0								
Pedestrian crossing sign	13	yes = 1; no = 0								
Pedestrian overpass/underpass/bridge	14	yes = 1; no = 0								
5. For an individual who is on this segment, how **safe (traffic wise)** do you think it is to cross the street from this segment?	15	pretty/very safe = 1; not very safe/ unsafe = 0; cul de sac = 8								
6. For an individual who is on this segment, how **convenient (traffic wise)** do you think it is to cross the street from this segment?	16	pretty/very convenient =1; not very/inconvenient= 0; cul de sac = 8								
Answer questions 7-11 while standing at the beginning of the segment										
Neighborhood Identification										
7. Does the segment have **banners** that identify the neighborhood?	17	some/a lot = 3; few = 2; none = 0								
Street Characteristics										
8a. Is this a **pedestrianized** street?	18	yes = 1; no = 0								
8b. Is the street a …	19	one way = 1; two way = 2								
9. Is this segment an **alley**?	20	yes = 1; no = 0								
10. How many **vehicle lanes** are there for cars? (Include turning lanes).	21	six or more = 6; five = 5; four = 4; three = 3; two = 2; one = 1; NA (no lanes for car travel) = 8								
Views										
11a. Is this segment characterized by having **a significant open view** of an object or scene that is not on the segment? The view must be a prominent one.	22	yes = 1; no = 0								
11b. How attractive is the open view?	23	attractive = 3; neutral = 2; unattractive = 1; NA (no views) = 8								
Begin walking along segment to answer questions 12-68										
12a. What types of land uses are present on this area? Mark all that apply.										
Residential										
Single family home - detached	24	yes = 1; no = 0								
Single family home/duplex - attached (2 units or fewer)	25	yes = 1; no = 0								
Town home/condo/apartment housing (3 units or more)	26	yes = 1; no = 0								
Mobile homes (includes manufactured homes)	27	yes = 1; no = 0								
Residential, other	28	yes = 1; no = 0								
School										
Elementary, middle or junior high school	29	yes = 1; no = 0								
High school	30	yes = 1; no = 0								
University or college (includes all types of building forms)	31	yes = 1; no = 0								

			1	2	3	4	5	6	7	8
School, other	32	yes = 1; no = 0								
Public space										
Plaza, square, park, playground, landscaped open space, playing fields, garden	33	yes = 1; no = 0								
Public space, other	34	yes = 1; no = 0								
Recreational/leisure/fitness										
Gym/fitness center (also includes yoga/pilates studios, etc.)	35	yes = 1; no = 0								
Movie theater	36	yes = 1; no = 0								
Recreational, other	37	yes = 1; no = 0								
Public/civic building										
Community center or library	38	yes = 1; no = 0								
Museum, auditorium, concert hall, theater	39	yes = 1; no = 0								
Post office, police station, courthouse, Department of Motor Vehicles	40	yes = 1; no = 0								
Public building, other	41	yes = 1; no = 0								
Institutional										
Religious institution (church, temple, mosque, etc.)	42	yes = 1; no = 0								
Hospital, medical facility, health clinic	43	yes = 1; no = 0								
Institutional, other	44	yes = 1; no = 0								
Commercial										
Retail stores/restaurant	45	yes = 1; no = 0								
Bank/financial service	46	yes = 1; no = 0								
Hotel/hospitality	47	yes = 1; no = 0								
Car dealership	48	yes = 1; no = 0								
Gas/service station	49	yes = 1; no = 0								
Commercial, other	50	yes = 1; no = 0								
Office/service										
Offices	51	yes = 1; no = 0								
Service facilities (includes insurance offices, funeral homes, dry cleaning, Laundromats, etc.)	52	yes = 1; no = 0								
Office/service, other	53	yes = 1; no = 0								
Industrial/manufacturing										
Light industrial (e.g., auto paint and auto body repair shops; i.e. clean industries)	54	yes = 1; no = 0								
Medium or heavy industrial (e.g. chemical plants, oil wells, etc.)	55	yes = 1; no = 0								
Industrial, other	56	yes = 1; no = 0								
Transportation center										
Harbor/marina	57	yes = 1; no = 0								
Other										
Undeveloped land	58	yes = 1; no = 0								
Agricultural land, ranch, farming	59	yes = 1; no = 0								
Nature feature	60	yes = 1; no = 0								
Other	61	yes = 1; no = 0								
12b. How many of the buildings in this segment contain **vertical-mixed use**, that is, the building has different land uses on different floors of the building?	62	some/a lot = 3; few = 2; none = 0; NA (no buildings>1 story) = 8								
12c. Determine whether any of these **distinctive retail types** are present (focusing on the form of the building).										
Big box shops (includes super stores or warehouse stores)	63	yes = 1; no = 0								
Shopping mall	64	yes = 1; no = 0								
Strip mall/row of shops	65	yes = 1; no = 0								
Drive-thru	66	yes = 1; no = 0								
13a. Mark off all types of **public space**(s) on this area and how attractive it is										
Park/playground	67	attractive = 3; neutral = 2; unattractive = 1; 0 = no space;								
Playing or sport field	68	attractive = 3; neutral = 2; unattractive = 1; 0 = no space;								
Plaza /square /courtyard	69	attractive = 3; neutral = 2; unattractive = 1; 0 = no space;								

			1	2	3	4	5	6	7	8
Public garden	70	attractive = 3; neutral = 2; unattractive = 1; 0 = no space;								
Beach	71	attractive = 3; neutral = 2; unattractive = 1; 0 = no space;								
Other	72	attractive = 3; neutral = 2; unattractive = 1; 0 = no space;								
13b. Is it possible for the general public to **use the public space**(s)?	73	unclear = 2; yes = 1; no = 0								
Other Land Uses										
14. How many of these **land uses** are present on this segment?										
Bars/night clubs	74	some/a lot = 3; few = 2; none = 0								
Adult uses	75	some/a lot = 3; few = 2; none = 0								
Check cashing stores/pawn shops/bail bond stores	76	some/a lot = 3; few = 2; none = 0								
Liquor stores	77	some/a lot = 3; few = 2; none = 0								
15. How many of the following **gathering places** are on this segment?										
Restaurants	78	some/a lot = 3; few = 2; none = 0								
Coffee shops	79	some/a lot = 3; few = 2; none = 0								
Libraries/bookstores	80	some/a lot = 3; few = 2; none = 0								
"Corner" store	81	some/a lot = 3; few = 2; none = 0								
Art or craft galleries	82	some/a lot = 3; few = 2; none = 0								
Farmers market	83	yes = 1; no = 0								
16. Are these **nature features** present on this segment?										
Open field/golf course	84	yes = 1; no = 0								
Lake/pond	85	yes = 1; no = 0								
Fountain/reflecting pool	86	yes = 1; no = 0								
Stream/river/canal/creek	87	yes = 1; no = 0								
Forest or woods	88	yes = 1; no = 0								
Ocean	89	yes = 1; no = 0								
Mountain or hills	90	yes = 1; no = 0								
Desert	91	yes = 1; no = 0								
Barriers										
17. Are the following **barriers** present on this segment. Check all that apply, and whether barrier can be overcome e.g. there's a pedestrian bridge.										
Highway (elevated or below ground)	92	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Railroad track	93	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Impassable land use (e.g., gated community, major industrial complex, etc.)	94	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
River	95	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Drainage ditches	96	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Road with 6 or more lanes	97	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Other	98	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Sidewalks										
18a. How many sides of the street have sidewalks?	99	count 1 or 2								
18b. Is the sidewalk **complete** on one or both sides?	100	yes = 1; no = 0; 8 = NA								
18c. What is the **condition** or maintenance of the sidewalk?	101	under repair = 2; moderate or good = 1; poor = 0								
18d. Is there a decorative or unique paving that **covers most or all of the sidewalk** on the segment? (e.g., bricks, tile, etc.)	102	yes = 1; no = 0								

			1	2	3	4	5	6	7	8
18e. Determine how much of the sidewalk is covered by these **features that provide protection** from sun, rain, and/or snow.										
Arcades	103	some/ much of s'walk covered = 1; no/little covered = 0								
Awnings	104	some/ much of s'walk covered = 1; no/little covered = 0								
Other	105	some/ much of s'walk covered = 1; no/little covered = 0								
18f. Is there is a **buffer** (for example, parked cars, landscaped "buffer" strip, etc.) between sidewalk or street.	106	yes = 1; no = 0; NA = 8								
19. Are there **sidewalks/greenbelts/trails/paths** other than sidewalks along street?	107	yes = 1; no = 0								
Bicycle Lanes										
20a. Are there **bicycle lanes** on the segment?	108	yes = 1; no = 0								
20b. How are the bicycle lanes **demarcated**?	109	on road, painted line/reflectors=3; on road physical separation = 2; off road = 1								
Mid Block Crossing										
21a. Is there a **marked mid-block** crosswalk for pedestrians?	110	yes = 1; no = 0								
21b. What type of **marking** does the crosswalk have? Mark all that apply										
White painted lines	111	yes = 1; no = 0								
Colored painted lines	112	yes = 1; no = 0								
Zebra striping	113	yes = 1; no = 0								
Different road surface or paving (e.g. tiles, colored concrete, marble, etc)	114	yes = 1; no = 0								
Other	115	yes = 1; no = 0								
Steepness										
22. How **steep** or hilly is this segment? Mark all that apply.	116-118	steep slope = 2; moderate slope = 1; flat or gentle slope = 0								
Sidewalk Amenities										
23. Are there **outdoor dining areas** (e.g. cafes, outdoor tables at coffee shops or plazas, etc) located on the segment?	119	some/a lot = 3; few = 2; none = 0								
24a. Indicate how many of each of the following **street furniture/sidewalk amenities** is/are present on the segment.										
Benches (not a bus stop), chairs and/or ledges for sitting	120	some/a lot = 3; few = 2; none = 0								
Bus stops with seating	121	some/a lot = 3; few = 2; none = 0								
Heat lamps	122	some/a lot = 3; few = 2; none = 0								
Bike racks	123	some/a lot = 3; few = 2; none = 0								
25. Are there obvious **public restrooms** on this segment that are **clearly open to the public**?	124	yes = 1; no = 0								
Street Trees										
26a. How many street trees are on this segment? (Do not include trees that are not on the public right of way; street trees are typically between the sidewalk and the street or if there is no sidewalk, trees usually line the street)	125	some trees/trees along most or entire segment = 1; none/few trees = 0								
26b. Is the **sidewalk shaded** by trees?	126	yes/somewhat = 1; no = 0; NA = 8								
Buildings										
27. How many stories are most buildings on the segment?	127	5 or more = 3; 3-4 stories = 2; 1-2 stories = 1; heights vary, no predominant height = 0; NA (no buildings) = 8								
28. Are there **abandoned buildings or lots** on this segment?	128	some/a lot = 3; few = 2; none = 0; NA=8								
29. Does at least **50% of the segment have buildings**?	129	yes = 1; no = 0								
Windows										
30. How many buildings on this segment have **windows with bars**? (proportion)	130	some/a lot = 3; few = 2; none = 0; NA = 8								
Other features of buildings										
31. How many buildings on this segment have **front porches**? (porches you can sit on)	131	some/a lot = 3; few = 2; none = 0; NA = 8								
32. How much of the segment has **blank walls or buildings with blank walls**?	132	some/a lot = 3; few = 2; none = 0; NA = 8								

			1	2	3	4	5	6	7	8
Garages										
33a. How many buildings have **garage doors** facing the street?	133	some/a lot = 3; few = 2; none = 0; NA = 8								
33b. How **prominent** are most garage doors when looking at the front of the buildings?	134	very = 3; somewhat = 2; not very/not visible = 0								
Parking										
34a. Is there a **parking structure** visible on this segment (do not include parking structures that are completely underground)?	135	yes = 1; no = 0								
34b. Looking at the front of the parking structure on the street level floor, what is the **predominant use** that is visible to you?	136	parking = 2; varied = 1; not parking other uses = 0								
Driveways										
35. How many **driveways** are visible on the segment?	137	some/a lot = 3; few = 2; none = 0								
Maintenance										
36. Describe the general **maintenance of the buildings** on this segment.	138	attractive = 3; neutral = 2; unattractive = 1; NA = 8								
37. How much **graffiti** is apparent on this segment?	139	some/a lot = 3; little = 2; none = 0								
38. How much **litter** is apparent on this segment?	140	some/a lot = 3; little = 2; none = 0								
39. Are there **dumpsters** visible on this segment?	141	some/a lot = 3; few = 2; none = 0								
40. Is there visible **electrical wiring** overhead on the segment?	142	some/a lot = 3; little = 2; none = 0								
Lighting										
41. Is there **outdoor lighting** on the segment? (Include lighting that is intended to light public paths and public spaces)	143	yes = 1; no = 0								
Freeways										
42. Is there a **freeway overpass/underpass** connected to **this segment**?	144	under a freeway overpass =3; next to freeway = 2; IS a freeway overpass = 1; none of the above = 0								
Traffic Features										
43. What is the **posted speed limit** on this segment? Only include those on the segment itself.	145	use number; not posted =8								
44. Are there measures on this segment that could **slow down traffic**? Mark all that apply.										
Speed bump/speed hump/raised crosswalk; or dips (that are intended to slow down traffic)	146	yes = 1; no = 0								
Rumble strips or bumps (includes dots, reflectors, raised concrete strips, etc.)	147	yes = 1; no = 0								
Curb bulb out/curb extension	148	yes = 1; no = 0								
Traffic circle/roundabout	149	yes = 1; no = 0								
Median	150	yes = 1; no = 0								
Angled/ On-street parking (that runs along most or the entire segment - does not have to be on both sides of segment)	151	yes = 1; no = 0								
45a. Is there a **cul-de-sac or permanent street closing** on this segment?	152	yes = 1; no = 0								
45b. Is there a **pedestrian access point** or cut through point that allows pedestrians to go from one segment to another (even though vehicular traffic may not be able to)?	153	yes = 1; no = 0; don't know = 7								
Architecture/Design										
46. Rate the **attractiveness** of the segment (design + maintenance)	154	attractive = 3; neutral = 2; unattractive = 1								
47. Does this segment have buildings that appear to be **historic**? (old + detailed)	155	yes = 1; no = 0; NA = 8								
48. How **interesting** is the architecture/urban design of this segment?	156	interesting = 3; somewhat interesting = 2; uninteresting = 1								
Other features of the segment										
49. How many **street vendors or stalls** are on this segment? (do not count newspaper racks; there must be a person vending)	157	some/a lot = 3; few = 2; none = 0								
50. Is there **public art** that is visible on this segment?	158	yes = 1; no = 0								
51. Are there **billboards** present on this segment?	159	some/a lot = 3; few = 2; none = 0								
People										
52. How safe do you feel walking on this segment?	160	pretty/very safe = 1 not very safe/unsafe = 0								

			1	2	3	4	5	6	7	8
Dogs										
53. Are there **any loose/unsupervised/barking dogs** on this segment that seem menacing?	161	yes = 1; no = 0								
Olfactory Character										
54. Is the dominant smell unpleasant?	162	yes = 1; no = 0								
Neighborhood Identification (OTHER END OF SEGMENT)										
1. Are there **monuments or markers** including neighborhood entry signs that indicate that one is entering a special district or area?	163	yes = 1; no = 0								
Street Crossing										
2a. Consider the places on the segment that are **intended** for pedestrians to cross the street. Are these places marked for pedestrian crossing?	164	all = 3; some = 2; none = 0; NA = 8								
2b. What type of **marking** do the crosswalks have? Mark all that apply.										
White painted lines	165	yes = 1; no = 0								
Colored painted lines	166	yes = 1; no = 0								
Zebra striping	167	yes = 1; no = 0								
Different road surface or paving (e.g. tiles, colored concrete, marble, etc)	168	yes = 1; no = 0								
Other	169	yes = 1; no = 0								
3. Are there **curb cuts** at all places where crossing is expected to occur?	170	all = 3; some = 2; none = 0; NA = 8								
4. What type of **traffic/pedestrian signal(s)/system(s)** is/are provided? Mark all that apply.										
Traffic signal	171	yes = 1; no = 0								
Stop sign	172	yes = 1; no = 0								
Yield sign	173	yes = 1; no = 0								
Pedestrian activated signal	174	yes = 1; no = 0								
Pedestrian crossing sign	175	yes = 1; no = 0								
Pedestrian overpass/underpass/bridge	176	yes = 1; no = 0								
5. For an individual who is on this segment, how **safe (traffic wise)** do you think it is to cross the street from this segment?	177	pretty/very safe = 1; not very safe/ unsafe = 0; cul de sac = 8								
6. For an individual who is on this segment, how **convenient (traffic wise)** do you think it is to cross the street from this segment?	178	pretty/very convenient =1; not very/inconvenient= 0; cul de sac = 8								

IRVINE MINNESOTA INVENTORY
FOR OBSERVATION OF PHYSICAL ENVIRONMENT FEATURES
LINKED TO PHYSICAL ACTIVITY

CODE BOOK[1]

I. INTRODUCTION

This Irvine Minnesota Inventory is designed for collecting data on physical environment features that are potentially linked to physical activity, for use in research on the relationship between the physical environment and physical activity. The instrument was developed by a team of researchers at the University of California, Irvine, and tested and refined by researchers at the University of Minnesota. This section answers questions about whether this instrument is appropriate for use in your study.

What forms of physical activity are emphasized?
The instrument focuses on physical environment features that may be linked to walking and bicycling—both forms of physical activity that are part of daily life and that may be undertaken for travel and/or recreation.

What kinds of places may be observed with this instrument?
The instrument is designed to be used for observing settings that are roughly the equivalent of neighborhoods in size. Possible settings to observe include a wide range of land uses, not only residential areas. The instrument is appropriate for settings that contain primarily residential, commercial, or other land uses, and those that contain a mix of land uses. Settings may be rural, suburban, urban, or somewhere in between. Studies can compare two or more settings, or may focus on one setting only.

The instrument was developed based on observations of US settings. It can be easily adopted for use in settings in other contexts, especially in industrialized countries. A limited number of questions includes measurements in English measurements (e.g., miles per hour.) These questions can be changed to use metric equivalents.

What aspects of the physical environment may be observed?
The instrument allows for observation of macro- and micro-scale features of the physical environment. Macro-scale features pertain to the entire setting (e.g., overall street pattern—grid versus curvilinear). These are called *setting-level observations* in the instrument. Micro-scale features pertain to one particular block (what the instrument calls a segment) or section of the setting (e.g., number of street trees on a segment.) Micro-scale features are called *segment-level observations* in the instrument. Micro-scale features can vary for different places in the setting.

The instrument is organized into four scales, for observation of physical environment features that are potentially related to (1) accessibility, (2) pleasurability, (3) human needs and comfort, and (4) safety.

[1] Cite as: Day, K., Boarnet, M., & Alfonzo, M. (2005). Irvine Minnesota Inventory for observation of physical environment features linked to physical activity. Codebook. Accessed at: <https://webfiles.uci.edu/kday/public/index.html>.

The instrument is designed for use of all four scales; however, one or more scales may also be used independently.

What kind of background is needed to use this instrument?

This data collection instrument is designed to be used by trained observers. Training takes approximately 8 hours. Observers can be college students or others (e.g., community members). Observers do not need previous expertise in design or in physical activity to use the instrument. A team leader, preferably an individual with advanced research training (a Ph.D. or advanced graduate training), is needed to prepare for data collection, train the research team, test for reliability in observations, and oversee data collection and data analysis.

How is data actually collected?

Data is collected through in-person observation, conducted by walking through the setting and coding observations directly into a Tablet PC. The instrument can also be used in a paper version and entered separately into a computer for data analysis, A supplement to the instrument (**Appendix A**) identifies several questions for which information can be collected using Geographic Information Systems (GIS). The instrument can be used without GIS by simply skipping those questions.

How long does it take to observe one setting?

Settings are defined by researchers. Settings can vary dramatically in size. A sampling scheme (described later) is used within a setting to determine which segments to observe. Within an average size setting, say, a neighborhood with 60–80 blocks, the sampling scheme would result in a sample of approximately 15–20 segments to observe. Observations of 15–20 segments would take about 3–4 hours, using a team of two observers.

What is needed to use this instrument?

Two observers are needed to observe each setting, so that the reliability of observations can be calculated. In addition, observers should each have a Tablet PC with a copy of Microsoft Access software and the file for this instrument. Also needed is a detailed map of each setting (one map per setting), which has marked all streets (or their equivalents, e.g., alleys, footpaths, etc.) To use the GIS question supplement, the researcher will also need a GIS program, such as ARC-GIS, with street map and census geography layers (See **Appendix B**) For analyzing data from this instrument, researchers will need Stat Transfer and SPSS software or its equivalent.

II. GETTING STARTED

This section provides information to get you started in using this instrument for your study.

Identifying settings for observation

Your study may focus on one or more settings for observation. Conceptually, settings are the equivalent of neighborhoods, but settings are not only residential in terms of their land uses. Settings can be defined in various ways: as census block groups, as politically defined districts, as districts that display a coherent physical appearance (such as a neighborhood of historic homes), as places defined by dominant geographic borders or borders (such as districts that are bounded by major streets or by physical edges like rivers or large open spaces), or as places with homogeneous populations (such as a senior community).

Researchers should identify the settings they will observe, and mark the boundaries of the setting on a map that also shows all streets for that setting.

Defining settings as linear or non-linear

Researchers must first determine whether each setting to be observed is linear or non-linear in its organization. Linear settings are organized by a network of streets or the equivalent of streets (e.g., pedestrian streets). Linear settings are made up of segments. Segments refer to both faces of a street block, or its equivalent (e.g., facing sides of a pedestrian pathway.) *Most settings are linear.*

Settings that are non-linear are those that cannot be readily organized or understood in terms of streets or their equivalents. Examples of non-linear settings could include outdoor shopping malls or campus settings (college, office, etc.) that face inwards and that are not regularly intersected by street networks.

- *Each setting should be defined as linear or non-linear in its organization*. If the sample includes both linear and non-linear settings, researchers may elect to use the instrument and instructions for non-linear settings. See **Appendix B** for this short version of the instrument, which is available in paper form only.

The remaining instructions focus only on settings that are linear in their composition.

Identifying segments within settings

The unit of analysis for this instrument is the segment. Each setting must be subdivided into segments for observation. A segment is typically defined as a block face, including *both* facing sides of the street, which are coded by observers as one unit. Each setting will have a different total number of segments. Typically, segments range from as few as 40 to as many as 80 per setting.

- *The team leader should systematically drive or travel through the entire setting, numbering each individual segment in the setting on the detailed map and clearly marking the boundaries of each segment where these boundaries are not evident.* Any missing segments (such as alleys, etc.) should be added to the map. When possible, segment boundaries should be defined by intersections; blocks should not be divided into multiple segments in most cases. It is essential that segment boundaries be determined when actually observing the segment itself. Segment boundaries are not always obvious simply by looking at the map (though boundaries may appear clear on the map, in actuality, judgment is often required to determine where each segment begins and ends). The team leader should make any necessary determinations about the boundaries of a segment, where this is not evident. A consistent rule of thumb should apply

(e.g., when segment boundaries are not clear, the segment will always extend to the near edge of the next building after the open space).

The team leader should also confirm which segments should be included in the setting. If a segment is located at least partially within the setting, that segment should be included in the setting.

Sampling segments for observation

Only a sample of the segments in each setting will be observed. The sampling procedure is intended to ensure that a sufficient number of segments are observed to characterize the overall physical features of the setting. Also, the sampling procedure is intended to ensure that any unique or distinctive segments in the setting are included in the sample of segments that are observed. The presence of even one such segment in a setting can dramatically shape the potential of that setting to support physical activity (e.g., the presence of one segment with retail uses, in a setting where all other segments have only residential uses).

- After numbering all of the segments within the setting, the team leader should choose a segment on which to begin to implement the sampling scheme. The first segment chosen (you do not necessarily have to begin with the first numbered segment) will be included in the sample. The team leader should then move on to the next adjacent segment. The next adjacent segment should be included in the sample if any one of the following four characteristics differ from the preceding segment: 1) Land uses; 2) Sidewalk network; 3) Barriers; 4) If it is a nice place to walk. (This last criterion is intentionally meant to be subjective. It is meant to allow the researcher to include a segment that the he or she knows is different from the preceding segments in a way that is important to his or her hypotheses, but the reason as to why it is different does not fall into any of the three objective criteria.) The team leader may only skip up to three adjacent segments in identifying segments to be sampled; the next segment must then be included in the sample, even it its characteristics appear to be similar to the segment just sampled. This process is repeated until all segments have been observed.

Tablet PC

A Tablet PC is recommended for data collection. A Microsoft Access file has been designed to allow users to simultaneously collect and enter data on-site. The Microsoft Access file is best used on a Tablet PC as the Tablet PC is relatively small and allows users to choose responses with a stylus-type apparatus as opposed to utilizing a keyboard. The Tablet PC utilized in this project was a Toshiba Protégé M200.

III. CONDUCTING OBSERVATIONS

At the start of each observation session, the observer should note the date of the observations. Observers should each be assigned an individual observer number, and that number should also be noted.

Only one response may be marked for each question, unless noted otherwise. All questions must receive a response. Where more than one response could fit, observers should select the response that best characterizes the segment or setting. Two observers should conduct observations separately.

Segment-level observations

Observers should select one segment to begin observations. Observers may choose to observe segments separately, to ensure that their observations are independent. Segments need not be observed according to their numerical order on the map. *Except where otherwise noted, observations pertain to features present or absent on this segment only.*

- *While standing at one end of the segment, observers should type the intersection names where indicated, beginning with numbered streets first in ascending order and followed by named streets in alphabetical order.*
  For example:
  Observer is standing at the corner of Walnut and 1st street; type "1st and Walnut"
  Observer is standing at the corner of Walnut and Main; type "Main and Walnut"
  Observer is standing at the corner of 5th avenue and 3rd street; type "3rd and 5th"
  Observers should answer questions 1-6 again as they pertain to that end of the segment. Observers should then answer questions 7–11 as they stand at that end of the segment.

- *After answering questions 1–11, observers should walk to the other end of the segment. As they walk, observers should answer questions 12–56.*

- *At the end of the segment, observers should type the intersection names where indicated, beginning with numbered streets first in ascending order and followed by named streets in alphabetical order. Observers should then answer questions 1–6 as they pertain to that end of the segment. All questions pertaining to a segment should be answered before leaving that segment.*

Data to be observed are organized in terms of four scales or factors that are hypothesized to link to physical activity, including (1) accessibility, (2) pleasurability, (3) human needs and comfort, and (4) safety. In the observation instrument itself, for ease, data are collected in an order that mixes these four scales together. Researchers may like to refer to these separate scales for analysis purposes, however. The scales (and the questions associated with each) are included as **Appendix C.**

Setting-level observations

Data collection ends with observations of characteristics of the entire setting. Before responding to the setting level questions, observers should drive/walk through the entire setting. Observers should base responses to questions on the characteristics of the entire setting.

The following sections of the codebook provide specific instructions for responding to each question.

IV. SEGMENT LEVEL QUESTIONS

The following questions measure features of a single segment.

1. Monuments or Markers

For each segment, determine if there are monuments, markers, or neighborhood entry signs that tell individuals that one is entering a certain neighborhood or district. These might include neighborhood entrance signs or posts or walls or other features at the entrance that indicate a particular or a special area. Entry markers do not have to have a name on them, they can simply signal that this is a particular place with its own identity and boundaries. Also include city signs that indicate a special district or neighborhood.

2a. Crosswalks

Consider the places on this end of the segment that are intended for pedestrians to cross the street. Are these places marked for pedestrian crossing (for example, painted lines, traffic signal, etc.)? Do not consider places where pedestrians are not allowed to cross when determining how many of the intended crossings are marked. Mark:

All: In all the places where pedestrians are intended to cross the street, there is some marking to show that pedestrian crossing is permitted there.

Some: In some (but not all) of the places where pedestrians are intended to cross the street, there is some marking to show that pedestrian crossing is permitted there.

None: None of the places where pedestrians are intended to cross the street have any markings to show that pedestrian crossing is permitted there.

N/A: There is no street, or there are no places where pedestrian crossing is intended.

2b. Crosswalk Markings

Determine whether the following crosswalk markings are present:

White painted lines: The crosswalk is designated by two parallel lines that are painted white.

Colored painted lines: The crosswalk is designated by two parallel lines that are painted in a color other than white.

Zebra striping: The crosswalk is designated by close diagonal lines that are painted white or another color.

Different road surface or paving: The crosswalk is designated by a special paving treatment, such as brick, tile, or colored concrete.

Other: The crosswalk is designated by some other markings on the pavement that are not listed above. Do not include traffic signals or stop signs.

If there is no crosswalk, mark No.

3. **Curbs Cuts**

Determine if there are curb cuts at all places where pedestrian or bicycle street crossing is expected. Curb cuts involve making a gentle slope (like a ramp) at the corner to make it easier for people and some vehicles to go down the curb (for example, wheelchair users, baby strollers, etc.) Expected crossing places are typically at the end(s) of the segment, but could sometimes also be in the middle of the segment. Mark:

All: Curb cuts are present at **all** places where pedestrians or others are expected to cross the street.

Some: Curb cuts are present at **some** of th e places where pedestrians or others are expected to cross the street, but not at all of these places

None: There are **no** curb cuts at places where pedestrians or others are expected to cross the street.

N/A: If neither side of the street has a sidewalk with a curb

4. **Pedestrian Crossing Signs or Signals (answer for the entire segment)**

For the entire segment, determine whether the following types of pedestrian crossing system(s) are present.

Traffic signal: The segment has a pedestrian crossing that is controlled by a traffic signal (stop light).

Stop sign: Traditional red sign or other sign telling car traffic to stop.

Yield sign: Sign telling car traffic to yield or give way to on-coming traffic.

Pedestrian activated signal: A signal intended to indicate to pedestrians when it is safe for them to walk. Usually, a red hand indicates to the pedestrian to stop, while a white human figure indicates that it is safe for the pedestrian to cross. The pedestrian signal may be automatic or have a mechanism (such as a button) by which the pedestrian can activate the crossing signal.

Pedestrian crossing sign: Sign warning motorists of the presence of pedestrians. May not be only at intersection.

Pedestrian overpass/underpass/bridge: A structure built either over the existing street or below street level to allow pedestrians and/or bicyclists to cross the street without encountering vehicle traffic.

5. **Sufficient <u>Safe</u> Crossing Opportunities**

Determine whether there are sufficient opportunities for the average individual to cross the street safely at this location. Answer yes if a typical person would not have to cross unsafely from this segment and if safe crossing is possible on this segment or nearby (within a short distance, say a block or so). Consider also the possible responses of children or teens who might be crossing independently. <u>If the intersection is a cul de sac, mark N/A</u>.

6. **Sufficient <u>Convenient</u> Crossing Opportunities**

Determine whether there are sufficient opportunities for the average individual to cross the street conveniently at this location. Answer yes if a typical person would not feel that he or she had to go noticeably out of his or her way to cross the street at a designated location. Also answer yes if the typical person would not be discouraged from crossing the street because designated places for crossing are too far away. <u>If the intersection is a cul de sac, mark N/A</u>.

7. **Banners**

For each segment, determine how many banners and relate signs are present. Usually, banners are fabric or vinyl, and are intended to mark special places or events. Include holiday or special events banners. Does not include standard city signage or other monuments or markers.

8a. **Pedestrianized Street**

Pedestrianized streets are blocked off to vehicular traffic. These streets are intended for use by pedestrians only. A pedestrianized street does not necessarily have to have pedestrians present while you are observing the segment to be marked as a pedestrianized street; rather it must be clear that motorized traffic is prohibited or permitted.

8b. **One-way versus Two-way Street**

One-way: Mark if the allowed direction of vehicle traffic travels only one-way.
Two-way: Mark if the vehicle traffic travels in both directions.

9. **Alleys**

Determine whether this segment is an alley. Alleys are typically pathways that are located behind buildings and do not have street names.

10. **Lanes for Cars**

For each segment, determine the number of designated lanes for cars on the street. Include turning lanes. Do NOT include parking lanes. Wide lanes that could reasonably fit more than one car across but that are designated for one car only should be counted as one lane. If there are no lanes designated for car travel (for example, on pedestrianized streets), mark N/A.

11a. **Open Views**

For each segment, assess whether it has a significant open views. Most segments have some view to somewhere, at least to other segments. This question asks specifically whether this view is somewhat more distinctive, in that its allows views to other places are notable and clear.

11b. **Attractiveness of View**

For each segment in which there is an open view, assess the attractiveness of that view.
Answer:
Attractive: The open view is pleasant or inviting (e.g., pleasant views of mountains, ocean, etc.)
Neutral: The open view is neither attractive nor unattractive
Unattractive: The open view is unpleasant or distasteful (e.g., unpleasant views of industrial properties, waste sites, etc.)
N/A (no views): If you marked that there was not an open view in question 11a.

12a. **Types of Land Uses**

For each segment, mark every type of land use that is present.

Residential: Focus here on the form of the buildings, not the population (e.g., seniors, families, etc.)

Single family home – detached: Houses for one household only, house stands alone. May be rental or owned.

Single family home/duplex – attached: Houses for two households, houses share at least one wall. May be rental or owned.

Town home/condo/apartment housing (3 units or more): Housing for three or more households, houses share at least one wall or floor/ceiling. May be rental and/or owned.

Mobile homes (including manufactured homes): Freestanding units, temporary or permanent structures, that are constructed elsewhere and driven to site.

Residential, other: Housing types not described above .

School: Includes public and private schools

Elementary , middle, or junior high school: Serves children in grades K–8 (may include higher and/or lower grades as well.)

High school: Serves children in grades 9–12.

University or college (includes all types of building forms): Includes colleges and universities, including community colleges and trade and technical schools.

School, other: Educational types not described above. Do not include child care here.

Public space: *Plaza, square, park, playground, landscaped open space, playing fields, garden*: Includes outdoor-oriented, generally accessible spaces that were developed or clearly intended for use by the public.

Public space, other: Public space type not described above. Do not include vacant or undeveloped land or recreational/sports/leisure facility.

Recreational/leisure/fitness: *Gym/fitness center*: Includes public or private gymnasiums or fitness facilities.

Movie theater: A building where films are shown to an audience.

Recreational, other: Recreational use not described above (e.g., pool). Does not include public spaces, above.

Public/civic building: *Community center or library*: Public building that houses activities for community residents, including a public building that allows residents to borrow books and offers other community services.

Museum, auditorium, concert hall, theater: Includes public buildings for exhibits and performances

Post office, police station, courthouse, Department of Motor Vehicles

Public building, other: Public building not described above. Does not include recreational/leisure/fitness uses or public outdoor spaces.

Institutional: *Religious institution (church, temple, mosque, etc.)*: Any structure intended to hold religious/spiritual events.

Hospital, medical facility, health clinic: Includes hospitals, urgent care facilities, and medical centers that serve large numbers of people, and that resemble facilities more than offices. Does not include private doctors' offices.

Institutional, other: Institutional uses not described above. Does not include office (below).

Commercial: *Retail stores/restaurant*: Includes uses that sell food or other goods or (non-financial) services to the public (e.g., delis, restaurants, fast food, coffee shops, clothing stores, etc.)

Bank/financial service: Includes financial institutions and those that provide financial services to the public

Hotel/hospitality: Includes hotels, motels, bed and breakfasts, etc.

Car dealership: Includes places that sell new or used automobiles.

Gas/service station: Includes places that sell gas and that repair motor vehicles. Includes oil change, brakes, etc.

Commercial, other: Commercial uses not described above. Does not include offices.

Office/service: *Offices*: Includes work spaces that are not primarily oriented to the public, such as administrative facilities. Does not include industrial/manufacturing.

Service facilities (including insurance offices, funeral homes, dry cleaning, Laudromats, etc.): Includes non-retail, non-financial facilities that may have customers, such as insurance offices, funeral homes, dry cleaning, Laundromats, etc.

Office/service, other: Includes offices not described above.

Industrial/manufacturing: *Light industrial)*: Includes uses involved in production of light manufacturing and industry. Typically "clean" industries. Includes auto paint and auto body repair shops.

Medium or heavy industrial: Includes uses involved in production of heavy manufacturing and industry. Typically less clean industries. Includes chemical plants, oil wells, etc.

Industrial, other: Industrial uses not described above. Does not include gas or service stations.

Other: *Harbor /marina*: Includes places with boats dock, marinas, and related facilities.

Undeveloped land: Includes spaces that are left undeveloped or open, such as vacant lots or other spaces in which landscaping or other intentional indicators that space is intended for public are not evident. Less "nature-oriented" than what would count as natural area.

Agricultural land, ranch, farming: land that is utilized for farming, herding, ranching, etc.

Nature feature: Area that is highly natural in character. May be a dedicated or "unofficial" natural area. Usually includes features like trees, grasses, hills, rocks, and/or water, etc. Do not include public spaces, above.

Other: Other land use that is not indicated above.

12b. **Vertical Mixed Use**

Determine whether there are buildings on the segment that contain vertical mixed use. Vertical mixed use refers to the presence of more than one type of use on different floors in the same building or structure. Usually, residential or office/service is located on an upper story, with commercial/retail or office/service below. If there are no buildings on this segment or if buildings are all one story, mark N/A.

12c. **Distinctive Retail Types**

Determine whether any of the retail uses on this segment can be categorized as any of the following:

Big Box shops: A large retail facility, typically with only one entrance and blank walls, often (but not always) surrounded by a large parking lot. There is only one tenant per building (e.g., Target, Walmart, Toys-R-Us, etc.)

Shopping mall: Clusters of stores and related uses, including some public spaces for customers. May be enclosed or open, usually surrounded by extensive parking lots. Most stores are typically entered from interior courts or spaces, rather than directly from the street.

Strip mall/row of shops: Typically retail stores organized along a "strip" or row, usually with parking lots between the buildings and the street. Strip malls typically are composed of one structure, with one roof and with interior walls separating individual stores. Stores are typically entered directly from the outdoors, and not from some designated interior space (enclosed or open).

Drive-thru: Accommodates automobiles to drive directly up to a window and obtain service/products. Most common for fast food, may also be banks or other facilities.

13a. **Public Space**

For each segment, rate the attractiveness of each of the following types of public spaces. Mark "no space" if the space is not present.

Park/playground: Area designed for active and/or passive uses (for example, playing, sitting, picnics.) May include features for playing. May be only dedicated, landscaped open space intended for public use or for public viewing.

Playing or sport field: Area intended for games or sports (for example, soccer field, basketball court, etc.)

Plaza/square/courtyard: Area that typically includes some "hard surfaces" on the ground (pavement, stone, etc.) and is usually adjacent to one or more buildings. Typically not designed for active play.

Public garden: Landscaped area typically designed for viewing and appreciation of landscaping, plants. Includes community gardens, which allow residents themselves to participate in gardening.

Beach: Area adjacent to ocean, lake or similar water body. May be sandy. Often used for active and passive recreation.

Other: Other outdoor space that seems to be intended for public use and that is accessible to the public. Does not include streets, sidewalks, or above elements. Often publicly owned, but not necessarily so.

13b. **Use the Public Space?**

For segments with public space, determine whether it is possible for most people to get into or otherwise use the public space. Mark Unclear if not evident whether most people can use the public space. <u>It is still accessible even if users have to pay a fee to enter</u>. Mark N/A if there are no public spaces.

14. **Other Types of Land Uses**

For each segment, determine how many of the following land uses are present on the segment.

Bars/night clubs: Establishments that are intended primarily for serving and drinking alcohol and/or dancing. Does not include restaurants that also serve alcohol

Adult uses: Establishments of an explicitly sexual nature (for example, adult book stores, adult video parlors, etc.)

Check cashing/pawn shop/bail bond storess: Establishments that are primarily intended as places to cash checks on the spot for customers. Also includes places that provide cash for individuals in exchange for household and other goods. Also includes places that provide cash for bail bonds. Primary purposes of these places is to provide ready cash to individuals. Do not consider automatic teller machines (ATM's), banks, savings and loans, or other more traditional lending establishments.

Liquor stores: Establishments that sell liquor (including beer, wine, etc.) for customers to take away. Consider also stores that sell limited other goods (e.g., snacks, cigarettes, etc.) if it appears that liquor is the primary item sold at the store. Include if the store name or a store sign indicates prominently that they sell liquor.

15. **Gathering Places**

For each segment, indicate how many of the listed gathering places are present. These are places that encourage people to linger and to socialize with friends and/or strangers. Mark:
Restaurants: Sells food to eat there or take away
Coffee shops: Sells coffee to drink there or take away. May also sell food.
Libraries/bookstores: Can read and/or purchase books and related material.
"Corner" store: Sells convenience items, especially for local residents (e.g., snacks, newspapers, some groceries, etc.)
Art or craft galleries: Displays and sells arts, crafts, or related items.
Farmer' market: Sells fresh produce and related items, typically grown locally. May be temporary or permanent.

16. **Nature Features**

For each segment, determine whether any of the listed nature features is present on the segment.

17. **Existence of Barriers/Overcoming Barriers**

For each segment, first determine if each of the potential barriers listed are present on this segment.

A barrier must prevent a person from walking or bicycling to a destination on the other side of the object. For an object to serve as a barrier, <u>there must be a possible destination an individual might choose to walk or bicycle to on the other side of the object</u>. For example, if a river runs parallel to the segment and no possible destination exists on the other side of the river, the river would not prevent that person from walking to that designation, so the river should not be marked as a barrier.

For an object to function as a barrier, it is not enough for the object (highway, river, etc.) to be present. The object must prevent walking or bicycling to a destination on the other side of the object. For example, a segment may contain a railroad track, but if that railroad track does not present a physical barrier to a possible destination that one might choose to walk or bicycle to, the fence would not be marked as a barrier. Possible destinations must be generally accessible to the public.

Barriers may be tangible physical barriers or perceived psychological barriers. A psychological barrier discourages people from walking in that direction (such as a major 8 lane road), even if walking is physically possible. Only obvious psychological barriers should be marked.

Mark:

No barrier: if the barrier is not present on this segment

If a barrier is present, you must then determine whether or not the barrier can be overcome. A reasonable means of getting around a barrier is one such that walking and bicycling travel is not significantly impeded. An example of a reasonable means of overcoming a barrier includes the presence of a pedestrian overpass/underpass to overcome the barrier of a street with more than six lanes of trafficMark:

Can be overcome: If the barrier is present on the segment but the barrier can be reasonably overcome. A reasonable means of overcoming the barrier is present.

Can be somewhat overcome: If the barrier is present on the segment but the barrier can be somewhat reasonably overcome. A somewhat reasonable means of overcoming the barrier is present. The barrier can be overcome but not without some effort.

Cannot be overcome: If the barrier is present on the segment but the barrier cannot be overcome. A reasonable means of overcoming the barrier is not present.

18a. **Presence of Sidewalks**

Determine on how many sides of the segment there is a sidewalk present. Mark:
0: if no sidewalk is present on either side of the segment.
1: if a sidewalk is present on one side of the segment.
2: if a sidewalk is present on both sides of the segment.
**Note that the sidewalk does not have to be complete.

18b. **Completeness of Sidewalks**

Determine whether the sidewalk is complete or incomplete on one or both sides of the segment. Mark:

Yes: <u>At least one side of the segment</u> has a complete sidewalk.

No: There is not at least one side of the segment with a complete sidewalk.

N/A: There are no sidewalks.

18c. **Sidewalk Maintenance**

For segments with sidewalks, assess the maintenance or physical condition of the sidewalk. Answer:

Moderate or good: The sidewalk has few or no bumps, cracks, holes and weeds.

Poor: The sidewalk has many bumps, cracks, holes and weeds.

Under repair: The sidewalk is undergoing repairs.

N/A (no sidewalk): If there are no sidewalks on the segment.

18d. **Special Paving**

For each segment, determine whether there is a special paving on the street or sidewalk that makes the sidewalk look distinctive. Paving treatments include distinctive materials such as brick, tile, marble, colored concrete, wood, etc. Mark No if the special paving is in the crosswalk only. Mark N/A if there are no sidewalks present on the segment.

18e. **Protection from Weather**

For each segment, determine how much of the sidewalk is covered by the following architectural elements that help provide protection from sun, rain, or snow. Mark all that apply:

Arcades: A roof over the sidewalk or outdoor area. Arcades are made up of a series of arches covered by a roof and supported by columns. They are typically connected to the building.

Awnings: A roof-like cover or canopy that is fixed or collapsible, that comes out from the building over the sidewalk or outdoor area. Awnings are meant to provide protection from sun, rain or snow. They can be made of canvas, aluminum or other material.

Other: Sidewalks or outdoor areas are protected from the sun, rain, or snow by some other feature not listed above.

N/A: There are no sidewalks present on this segment.

18f. **Sidewalk Buffer**

For segments with sidewalks, determine whether there is a buffer that provides some space and or some "psychological distance" between individuals on the sidewalk and the street. Buffer can include features like parked cars, landscaped strip, row of street trees, etc. Mark N/A if there is no sidewalk present on this segment.

19. **Sidewalks/Greenbelts/Trails/Paths**

Do not include sidewalks that follow the street (questions 18a and 18b) in this answer. Mark:

Yes: There are other designated paths other than sidewalks to accommodate pedestrians (e.g., footpaths, greenbelts, trails.) Do not include paths that are not designated (for example, informal path worn into grass that does not appear to an "official" trail.)

No: There is no other pathway for pedestrians.

20a. **Presence of Bicycle Lanes**

Determine whether designated bicycle lanes are present. Bike lanes should be physically marked by painted lines and/or signage. Do not count regular sidewalks or wide lanes for cars as bike lanes.

20b. **Demarcation of Bicycle Lane**

Determine how the bicycle lanes are marked on the segment. Mark:

On road, painted lines/reflectors: The bicycle lane is marked only by a painted line or by reflectors on the pavement. Demarcation could be easily traversed by car.

On road, physical separation: The bicycle lane is on the street, but is physically separated from the motorized traffic on the segment by a more significant barrier, such as a curb. The bicycle lane continues to be part of the road network/street.

Off road: Bicycle path is not located on the street (e.g., bike trail). May be the same as other path for pedestrians (question 19).

N/A (no bicycle lane): If there is no bicycle lane present on this segment.

21a. **Mid-Block Crosswalk**

For each segment, determine whether there is a marked *mid-block* crosswalk for pedestrians (i.e. not at the corner). Do not count if this mid-block cross is at a "T" intersection with another lane for car travel.

21b. **Mid-Block Crosswalk Markings**

For each segment in which there is a marked mid-block crosswalk, determine whether the following types of marking are present.

White painted lines: The crosswalk is designated by two parallel lines that are painted white.

Colored painted lines: The crosswalk is designated by two parallel lines that are painted in a color other than white.

Zebra striping: The crosswalk is designated by close diagonal lines that are painted white or another color.

Different road surface or paving: The crosswalk is designated by a special paving treatment, such as brick, tile, or colored concrete.

Other: The crosswalk is designated by some other marking on the pavement that are not listed above. Do not include traffic signals or stop signs here.

22. **Steepness**

For each segment, determine how steep or hilly that segment is, or what its grade or slope is.

23. **Outdoor Dining**

Indicate how many outdoor dining areas are provided. Outdoor dining areas are typically adjacent to restaurants, delis, coffee shops, etc. Includes outdoor furniture that provides seating intended to be used for primarily for eating or drinking. Do not include seating intended primarily for sitting and not dining (e.g., bus stop). Seating areas can be located on the sidewalk or on any other public area, such as a plaza.

24. **Street Furniture**

For each segment, determine how much of each of the types of street furniture are present. Mark:
Benches (not a bus stop), chairs and/or ledges for sitting: Places intended for individuals to sit in public areas.
Bus stops with seating: Seating areas associated with bus stops. May or may not be covered. Do not include if only bus stop sign with no designated seating.
Heat lamps: Overhead lamps or lamps on posts that provide heat in outdoor areas.
Bike racks: Fixtures intended for individuals to use to lock bikes.

25. **Public Restrooms**

For each segment, determine if there are public restrooms that are accessible. Do not include restrooms in private or commercial establishments that do not appear to be generally open to the public (for example, restrooms in restaurants that are intended only for restaurant patrons.)

26a. **Street Trees**

For each segment, determine how many street trees there are (relative to the size of the segment). Street trees are located along the public right of way. They are typically between the sidewalk and the street or, if there is no sidewalk, trees usually line the street. Consider both sides of the segment in marking your answer.

26b. **Sidewalk Shade**

For each segment with sidewalks, determine to what extent the sidewalk is shaded when the sun is up (e.g., by trees, awnings, buildings, etc.). Consider conditions that are usually present for most of the day.

27. **Building Height**

For each segment, determine the number of stories of most of the buildings on the segment. If there are buildings of different heights without one height prevailing, mark No predominant height. If there are no buildings, mark N/A.

28. **Abandoned Buildings**

For each segment, determine whether there are buildings that appear to be abandoned. A building would likely be abandoned if the windows are boarded up or broken or if there are other visible signs that no one is inhabiting/or planning to inhabit the building. Mark:
Some/a lot: There are several or many buildings on the segment that appear to be abandoned.
Few: There are only one or a small number of buildings that appear to be abandoned.
None: There are no abandoned buildings.
N/A: No buildings.

29. **Building Coverage**

For each segment, determine whether at least 50% of the segment contains buildings.

30. **Bars on Windows**

For each segment, determine how many of the buildings have windows with bars. Consider bars that are attached to windows that appear to be permanent, and that appear to be intended to prevent entering through the window from the outdoors.

31. **Front Porches**

For each segment, determine how many buildings have front porches. Front porches are designated spaces on the front of the building that are large enough to accommodate two or more chairs for sitting. Chairs need not be present to count as a front porch. Porches can vary in size and type. Porches typically function as an "outdoor room."

32. **Blank Street Walls**

For each segment, determine how much of the segment is lined with buildings with blank walls. Blank walls refer to sides of buildings that do not have windows. Also consider how much of the segment is linked with other kinds of blank walls, such as walls for sound barriers from heavy traffic.

33a. **Garage Doors**

For each segment, determine how many buildings have garages doors that face the street. Do not consider public parking lots (covered or uncovered) as garages. If there are no buildings or no garages on the segment, mark N/A.

33b. **Prominent Garage Doors**

For each segment with garages, determine the prominence of most garage doors from the front of the buildings (i.e., from the street, in most cases.) How "dominant" are the garage doors in the appearance of the building? Mark N/A if no garage doors face the street on the segment.

34a. **Parking Structure**

For each segment, determine whether there is a parking structure visible. Do not consider parking structures that may be present that are not visible (e.g., completely underground and not detectable from the segment.)

34b. **Predominant Ground Floor Use**

For each segment with parking structures, determine if the ground floor contains a non-parking use (for example, retail, offices, bank). Mark N/A if no parking structure is present.

35. **Driveways**

For each segment, determine how many driveways there are that can be seen from the street. Driveways are typically part of private property and do not have street names.

36. **Maintenance of Buildings**

For each segment, assess the quality of the maintenance of the buildings. Do not consider litter in this response. Mark N/A if there are no buildings.

37. **Graffiti**

For each segment, determine whether there is any visible graffiti, or "unapproved" writing, signs, or symbols on buildings, streets, or other objects.

38. **Litter**

For each segment, determine whether there is any visible litter.

39. **Dumpsters**

For each segment, determine how many dumpsters are visible from the street. Consider only large trash receptacles for businesses, residential complexes, etc. Do not include smaller trashcans that could be emptied by an individual without a machine.

40. **Overhead Wiring**

For each segment, determine whether there is electrical wiring that is visible. Typically, overhead wiring is more common in older communities. Newer communities often locate electrical wiring underground.

41. **Presence of Outdoor Lighting**

For each segment, determine whether there is outdoor lighting present. Primarily consider lighting that is intended to light public paths and public spaces, such as sidewalks, streets, and walkways, where the public might travel. Lighting may be on public or private property. Do not consider lighting that is only intended to light small, mostly private areas (such as front doors of homes).

42. **Freeways**

For each segment, determine how or if a freeway overpass connects to the segment.
Under a freeway overpass: The segment (part or entire) is located beneath a freeway overpass.
Next to a freeway: The segment (part or entire) abuts a freeway.
IS a freeway overpass: The segment itself (part or entire) is actually a freeway overpass, on which pedestrians or bicyclists are permitted.
None of the above: This segment does not have any of these relationships with a freeway

43. **Speed Limit**

For each segment, determine the posted speed limit in miles per hour (mph) (for paper version of the inventory; use categories for Microsoft Access version of the inventory)Only note the speed limit if it is actually posted on that segment; do not generalize from other nearby segments. Often, the speed limit will not be posted. If the speed limit is not posted *on that segment*, mark "Not posted." Note that this question varies for Access and paper version of the instrument.

44. **Traffic Slowing (or Traffic Calming)**

For each segment, determine if features are present that could slow down traffic. Mark Yes or No for each.

Speed bump/speed hump/raised crosswalk or dips: These devices are intended to make cars slow down so that they don't hit this bump in the road. Included are speed bumps and larger speed humps. Also included are speed tables, which have a flattened rather than a rounded top, and are more like flattened "table tops" in the road. Also included are raised crosswalks, which are designated lanes for pedestrian crossing that are raised higher than the adjacent road.

Rumble strips or bumps: These are small markers (or "dots") or strips of markers on the road that are slightly raised, to warn drivers when the bumps or strips are driven over. Sometimes these bumps are also reflective to show lane boundaries. Also includes grates or cobblestones that are intended to serve this function.

Curb bulb out/curb extension: These are extensions from the sidewalk out into the street, which make the street somewhat narrower at the place where pedestrians cross.

Traffic circles/roundabout: These are circular medians in an intersection that take the place of traffic signals in most instances.

Median: These are permanent "islands" in the center of the road that reduce the size of the road, creating fewer or more narrow lanes for traffic. Medians may or may not have landscaping, and may or may not include a place for pedestrians to stop or wait.

Angled/ On-street parking: Parallel or angled parking that is located between the street and the sidewalk. Cars need not be present while conducting observations.

45a. **Cul-de-sacs/Street Closings**

For each segment, determine if there is a cul-de-sac or street closing. Mark:

Yes: At least one end of street is closed to car traffic by a cul-de-sac or permanent street closing. A cul-de-sac is a street that does not go all the way through; it is a dead-end. Typically, the "closed" end has buildings or houses around an open space that sometimes includes an island at the end of the street on the "closed" end. A street closing is a street that is not open to cars for through travel. The closed end may include a chain or fence, landscaping, or other physical barrier to show that car traffic cannot pass through.

No: No part of the segment is closed to through travel by cars.

45b. **Pedestrian Access Point**

For each segment with a cul-de-sac or permanent street closing, indicate whether there is a pedestrian access point, or a pass through where pedestrians are allowed to cross through the closed street end to adjacent streets/segments. Do not include pass throughs that do not appear to be intended (for example, a hole cut in a chain link fence to allow people to sneak through.) Mark N/A if the segment is not a cul de sac or if there is not a permanent street closing.

46. **Attractiveness of the Segment**

Rate the attractiveness of the segment. Attractiveness refers to the overall pleasantness of the appearance of the buildings, landscaping, and street. Attractive is not the same as interesting. A segment could be attractive or pleasant without necessarily being distinctive, interesting, or unique.

47. **Historic Appearance**

Determine whether the buildings appear to be historic. There are no fixed criteria for historic appearance, but generally, historic buildings would be those that appear to be noticeably older and have some positive quality (not just old). If there are no buildings on the segment, mark NA.

48. **Interesting Architecture**

Rate the interestingness of the architecture or general design of the segment. Interesting refers to how remarkable, fascinating or attention-grabbing the segment is (in color, architectural style, etc.). Interesting is not the same as attractive; architecture could be interesting without necessarily being pleasant or attractive. You don't have to like it for it to be interesting.

49. **Street Vendors/Stalls**

For each segment, determine how many street vendors or stalls are present (e.g., selling food, newspapers and magazines, jewelry, shoe shines.) Vendors may sell from carts, semi-permanent or permanent stalls, or directly on the sidewalk.

50. **Public Art**

For each segment, determine whether public art is visible. This includes artwork that is oriented towards and visible to the public. Most often, public art is located outdoors. It can be a public sculpture, statue, a mural, etc. Do not include fountains or public places themselves (plazas, etc.) as public art.

51. **Billboards**

For each segment, determine how many billboards are present. Billboards refer to large, fixed signs used for advertising. Billboards may be freestanding or mounted on the sides of buildings. Do not include banners that are being used to identify a neighborhood/district or banners used to promote a city event/holiday.

52. **Safety**

For each segment, determine how safe you feel. Do not consider traffic safety here.

53. **Loose/Barking/Unsupervised Dogs**

For each segment, determine if there are any loose/barking/unsupervised dogs that seem menacing (not in yards or on chains or directly supervised by an individual.)

54. **Olfactory Character**

For each segment, determine whether the smell/odor that dominates the segment unpleasant.

V. SETTING LEVEL QUESTIONS

The following questions measure aspects of the entire setting, not only a single segment.

1b. Dominant Land Use

Determine whether settings has a *predominant* residential land use. Mark:

Residential: The setting is mostly comprised of homes. Can be any type (e.g., single family homes, condos, apartments.).

Mixed-use: The setting is comprised of a balance of residential and non-residential uses (e.g., housing and commercial or office.)

Other: The setting is mostly comprised of a use that is not residential (e.g., commercial, office, industrial.)

2a. Existence of Barriers/Overcoming barriers

First, determine if each of the potential barriers listed are present in this setting.

A barrier must prevent a person from walking or bicycling to a destination on the other side of the object. For an object to serve as a barrier, <u>there must be a possible destination an individual might choose to walk or bicycle to on the other side of the object</u>. For example, if a river runs parallel to the segment and no possible destination exists on the other side of the river, the river would not prevent that person from walking to that designation, so the river should not be marked as a barrier.

For an object to function as a barrier, it is not enough for the object (highway, river, etc.) to be present. The object must prevent walking or bicycling to a destination on the other side of the object. For example, a setting may contain a railroad track, but if that railroad track does not present a physical barrier to a possible destination that one might choose to walk or bicycle to, the railroad track would not be marked as a barrier. Possible destinations must be generally accessible to the public.

Barriers may be tangible physical barriers or perceived psychological barriers. A psychological barrier discourages people from walking in that direction (such as a major 8 lane road), even if walking is physically possible. Only obvious psychological barriers should be marked. Mark:

No barrier: if the barrier is not present in this setting

If a barrier is present, you must then determine whether or not the barrier can be overcome. A reasonable means of getting around a barrier is one such that walking and bicycling travel is not significantly impeded. An example of a reasonable means of overcoming a barrier includes the presence of a pedestrian overpass/underpass to overcome the barrier of a street with more than six lanes of traffic.

Mark:

Can be overcome: If the barrier is present in the setting but the barrier can be reasonably overcome. A reasonable means of overcoming the barrier is present.

Can be somewhat overcome: If the barrier is present in the setting but the barrier can be somewhat reasonably overcome. A somewhat reasonable means of overcoming the barrier is present. The barrier can be overcome but not without some effort.

Cannot be overcome: If the barrier is present in this setting but the barrier cannot be overcome. A reasonable means of overcoming the barrier is not present.

3. **Public Space**

Throughout the setting, rate the attractiveness of each of the following types of public spaces. Mark "no space" if the space is not present.

Park/playground: Area designed for active and/or passive uses (for example, playing, sitting, picnics.) May include features for playing. May be only dedicated, landscaped open space intended for public use or for public viewing.

Playing or sport field: Area intended for games or sports (for example, soccer field, basketball court, etc.)

Plaza/square/courtyard: Area that typically includes some "hard surfaces" on the ground (pavement, stone, etc.) and is usually adjacent t to one or more buildings. Typically not designed for active play.

Public garden: Landscaped area typically designed for viewing and appreciation of landscaping, plants. Includes community gardens, which allow residents themselves to participate in gardening.

Beach: Area adjacent to ocean, lake or similar water body. May be sandy. Often used for active and passive recreation.

4. **Presence of railroad**

Throughout the setting, determine whether a railroad track is present.

Appendix A: GIS Measures

As noted in **I. Introduction**, a limited number of variables can be measured using Geographic Information System (GIS) rather than through in-person observations. For researchers who do not have access to GIS systems, these items can be skipped.

1. Density of Origins

Population density can be used to measure the density of origins. For each setting, GIS programs can be used to identify the census block(s), block group(s), or tract(s) that comprise the setting. Data on population and land area in the census blocks can then be obtained from census data. As an example, the U.S. Census Bureau web site has population density data for census tracts, which can be obtained through the following steps:

Go to the Census Bureau web site: http://www.census.gov
Choose "American FactFinder" from left side menu bar
Under "Getting Detailed Data," go directly to "data sets"
Choose "Geographic Comparison Tables" from right side menu bar
In the drop-down menu for "Select a geographic type," choose "county"
In the drop-down menu for "Select a state." choose the state that contains your setting
In the drop-down menu for "Select a geographic area," choose the county that contains your setting
In the drop-down menu for "Select a table format," choose "county – census tract"
Click "Next"
In the menu for "Select a table and click," choose "GCT-PH1. Population, Housing Units, Area, and Density: 2000"
Click "Show Result"
Table lists census tracts in the county you selected, land area (in square miles), and population density (in persons per square mile).

Note that census tracts will be too large for most settings. Users should obtain population density for smaller census block groups or blocks. Also, for most settings, census geography will not be contiguous with setting definitions. Users will have to either choose the census geographic units that best correspond to the setting or define settings based on census geography, e.g. by defining settings based on block or block group boundaries.

2. Density of Destinations

Researchers can measure this either by the density of jobs per land area or by the density of land uses (e.g., shopping, office, employment) by land area. Neither job data nor land use data are available from the census.

Many metropolitan planning organizations have data on jobs for census geographies – census blocks, block groups, or tracts. Researchers should take care to obtain employment-at-place data, which are data on the number of jobs in a geographic area, as opposed to data on the number of employed residents in a geographic area. Due to commuting, the number of jobs in small geographic areas can be very different from the number of employed residents in the same area. To proxy for the end of commute trips, researchers could gather data on the number of jobs. In some metropolitan areas, employment data will be available for unique geographies,

often organized into transportation analysis zones, as opposed to census geographies. Large planning departments (counties, cities) may also have these data. Land area data can typically be obtained from the same agency that compiles the employment data, or from the census if census geography is used.

In many studies of active transportation (walking, bicycling), destinations to shopping, education, and entertainment are of particular interest. In some cases land use data for parcels will be available. City governments are typically the best source for these data. Such data could be used to obtain counts of the number of land uses by type (commercial, entertainment, education, or other types) with the setting area.

3. **Intersection Pattern**

Intersection pattern can be measured by two variables: the percentage of street intersections within the setting that are four-way, and the number of intersections per square mile within the setting area. Most GIS programs can provide information for both variables. The percentage of street intersections that are four-way gives a measure of the extent to which the street network in the setting follows a grid pattern. The density of street intersections per square mile can proxy for average street block size.

4. **Street Width**

When GIS data are available, researchers can use GIS maps to calculate street widths for segments in the setting. If street width varies along the segment, the width at mid-block should be used. When GIS data are not available, street width can be measured in person with rolo-tape measuring devices.

5. **Street Length**

GIS data, when available, can also be used for this, measuring the distance between the two intersections that define the segment. Average street length for the setting can be effectively proxied by either the number of intersections per land area in the setting or the average census block size in the size. Street length can also be measured in person, measuring the length of the segment in feet, rounding to the nearest foot, from intersection to intersection.

Appendix B Inventory for Observation of Non-Linear Settings

The following, shortened version of the instrument can be used to observe settings that are not linear in their organization (see **II. Getting Started**.) This version of the instrument was not tested for reliability in non-linear settings.

Date			1	2	3	4	5	6	7	8
Observer										
Area #										
Answer questions 1-6 based on this end of the area										
Intersection										
Neighborhood Identification										
1. Are there **monuments or markers** including neighborhood entry signs that indicate that one is entering a special district or area?	1	yes = 1; no = 0								
Views										
11a. Is this area characterized by having a significant open view of an object or scene that is not on the area? The view must be a prominent one.	22	yes = 1; no = 0								
11b. How attractive is the open view?	23	attractive = 3; neutral = 2; unattractive = 1; NA (no views) = 8								
Begin walking along area to answer questions 12-68										
12a. What types of land uses are present on this area? Mark all that apply.										
Residential										
Single family home - detached	24	yes = 1; no = 0								
Single family home/duplex - attached (2 units or fewer)	25	yes = 1; no = 0								
Town home/condo/apartment housing (3 units or more)	26	yes = 1; no = 0								
Mobile homes (includes manufactured homes)	27	yes = 1; no = 0								
Residential, other	28	yes = 1; no = 0								
School										
Elementary, middle or junior high school	29	yes = 1; no = 0								
High school	30	yes = 1; no = 0								
University or college (includes all types of building forms)	31	yes = 1; no = 0								
School, other	32	yes = 1; no = 0								
Public Space										
Plaza, square, park, playground, landscaped open space, playing fields, garden	33	yes = 1; no = 0								
Public space, other	34	yes = 1; no = 0								

			1	2	3	4	5	6	7	8
Recreational/Leisure/Fitness										
Gym/fitness center (also includes yoga/pilates studios, etc.)	35	yes = 1; no = 0								
Movie theater	36	yes = 1; no = 0								
Recreational, other	37	yes = 1; no = 0								
Public/Civic Building										
Community center or library	38	yes = 1; no = 0								
Museum, auditorium, concert hall, theater	39	yes = 1; no = 0								
Post office, police station, courthouse, Department of Motor Vehicles	40	yes = 1; no = 0								
Public building, other	41	yes = 1; no = 0								
Institutional										
Religious institution (church, temple, mosque, etc.)	42	yes = 1; no = 0								
Hospital, medical facility, health clinic	43	yes = 1; no = 0								
Institutional, other	44	yes = 1; no = 0								
Commercial										
Retail stores/restaurant	45	yes = 1; no = 0								
Bank/financial service	46	yes = 1; no = 0								
Hotel/hospitality	47	yes = 1; no = 0								
Car dealership	48	yes = 1; no = 0								
Gas/service station	49	yes = 1; no = 0								
Commercial, other	50	yes = 1; no = 0								
Office/Service										
Offices	51	yes = 1; no = 0								
Service facilities (includes insurance offices, funeral homes, dry cleaning, Laundromats, etc.)	52	yes = 1; no = 0								
Office/service, other	53	yes = 1; no = 0								
Industrial/Manufacturing										
Light industrial (e.g., auto paint and auto body repair shops; i.e. clean industries)	54	yes = 1; no = 0								
Medium or heavy industrial (e.g. chemical plants, oil wells, etc.)	55	yes = 1; no = 0								
Industrial, other	56	yes = 1; no = 0								
Other										
Harbor/marina	57	yes = 1; no = 0								
Undeveloped land	58	yes = 1; no = 0								
Agricultural land, ranch, farming	59	yes = 1; no = 0								
Nature feature	60	yes = 1; no = 0								
Other	61	yes = 1; no = 0								

			1	2	3	4	5	6	7	8
12b. Do the buildings in this area contain vertical-mixed use, that is, the building has different land uses on different floors of the building?	62	yes = 1; no = 0; NA (no buildings>1 story) = 8								
12c. Determine whether any of these **distinctive retail types** are present (focusing on the form of the building).										
Big box shops (includes super stores or warehouse stores)	63	yes = 1; no = 0								
Shopping mall	64	yes = 1; no = 0								
Strip mall/row of shops	65	yes = 1; no = 0								
Drive-thru	66	yes = 1; no = 0								
13a. Mark off all types of public space(s) on this area and how attractive it is.										
Park/playground	67	attractive = 3; neutral = 2; unattractive = 1; 0 = no space								
Playing or sport field	68	attractive = 3; neutral = 2; unattractive = 1; 0 = no space								
Plaza /square /courtyard	69	attractive = 3; neutral = 2; unattractive = 1; 0 = no space								
Public garden	70	attractive = 3; neutral = 2; unattractive = 1; 0 = no space								
Beach	71	attractive = 3; neutral = 2; unattractive = 1; 0 = no space								
Other	72	attractive = 3; neutral = 2; unattractive = 1; 0 = no space								
13b. Is it possible for the general public to **use the public space**(s)?	73	unclear = 2; yes = 1; no = 0; NA = 8								
Other Land Uses										
14. How many of these land uses are present on this area?										
Bars/night clubs	74	some/a lot = 3; few = 2; none = 0								
Adult uses	75	some/a lot = 3; few = 2; none = 0								
Check cashing stores/pawn shops/bail bond stores	76	some/a lot = 3; few = 2; none = 0								
Liquor stores	77	some/a lot = 3; few = 2; none = 0								
15. How many of the following gathering places are on this area?										
Restaurants	78	some/a lot = 3; few = 2; none = 0								
Coffee shops	79	some/a lot = 3; few = 2; none = 0								
Libraries/bookstores	80	some/a lot = 3; few = 2; none = 0								
“Corner” store	81	some/a lot = 3; few = 2; none = 0								
Art or craft galleries	82	some/a lot = 3; few = 2; none = 0								
Farmers market	83	yes = 1; no = 0								

			1	2	3	4	5	6	7	8
16. Are these nature features present on this area?										
Open field/golf course	84	yes = 1; no = 0								
Lake/pond	85	yes = 1; no = 0								
Fountain/reflecting pool	86	yes = 1; no = 0								
Stream/river/canal/creek	87	yes = 1; no = 0								
Forest or woods	88	yes = 1; no = 0								
Ocean	89	yes = 1; no = 0								
Mountain or hills	90	yes = 1; no = 0								
Desert	91	yes = 1; no = 0								
Barriers										
17. Are the following barriers present on this area. Check all that apply, and whether barrier can be overcome e.g. there's a pedestrian bridge.										
Highway (elevated or below ground)	92	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Railroad track	93	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Impassable land use (e.g., gated community, major industrial complex, etc.)	94	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
River	95	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Drainage ditches	96	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Road with 6 or more lanes	97	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								
Other	98	no barrier = 0; can be overcome = 1; can be somewhat overcome = 2; can not be overcome = 3								

			1	2	3	4	5	6	7	8
18c. What is the **condition** or maintenance of the sidewalk?	101	moderate or good = 2; poor = 1; under repair = 0; NA = 8								
18d. Is there a decorative or unique paving that covers most or all of the sidewalk on the area? (e.g., bricks, tile, etc.)	102	yes = 1; no = 0; NA = 8								
18e. Determine how much of the sidewalk is covered by these **features that provide protection** from sun, rain, and/or snow.										
Arcades	103	some/ much of s'walk covered = 1; no/little covered = 0; NA = 8								
Awnings	104	some/ much of s'walk covered = 1; no/little covered = 0; NA = 8								
Other	105	some/ much of s'walk covered = 1; no/little covered = 0; NA = 8								
Steepness										
22. How steep or hilly is this area? Mark all that apply.										
Steep	116	yes = 1; no = 2								
Moderate	117	yes = 1; no = 2								
Flat or gentle	118	yes = 1; no = 2								
Sidewalk Amenities										
23. Are there outdoor dining areas (e.g. cafes, outdoor tables at coffee shops or plazas, etc) located on the area?	119	some/a lot = 3; few = 2; none = 0								
24. Indicate how many of each of the following street furniture/sidewalk amenities is/are present on the area.										
Benches (not a bus stop), chairs and/or ledges for sitting	120	some/a lot = 3; few = 2; none = 0								
Bus stops with seating	121	some/a lot = 3; few = 2; none = 0								
Heat lamps	122	some/a lot = 3; few = 2; none = 0								
Bike racks	123	some/a lot = 3; few = 2; none = 0								
25. Are there obvious public restrooms on this area that are clearly open to the public?	124	yes = 1; no = 0								
Street Trees										
26a. How many street trees are on this area? (Do not include trees that are not on the public right of way; street trees are typically between the sidewalk and the street or if there is no sidewalk, trees usually line the street)	125	some trees/trees along most or entire area = 1; none/few trees = 0								
26b. Is the **sidewalk shaded** by trees?	126	yes/somewhat = 1; no = 0; NA = 8								

			1	2	3	4	5	6	7	8
Buildings										
27. How many stories are most buildings on the area?	127	5 or more = 3; 3-4 stores = 2; 1-2 stories = 1; hts. vary, no predominant ht. = 0; NA (no buildings) = 8								
28. Are there abandoned buildings or lots on this area?	128	some/a lot = 3; few = 2; none = 0; NA=8								
Windows										
30. How many buildings on this area have windows with bars? (proporition)	130	some/a lot = 3; few = 2; none = 0; NA = 8								
Other Features of Buildings										
31. How many buildings on this area have front porches? (porches you can sit on)	131	some/a lot = 3; few = 2; none = 0; NA = 8								
32. How much of the area has blank walls or buildings with blank walls?	132	some/a lot = 3; few = 2; none = 0; NA = 8								
Garages										
33a. How many buildings have **garage doors** facing the street?	133	some/a lot = 3; few = 2; none = 0; NA = 8								
33b. How **prominent** are most garage doors when looking at the front of the buildings?	134	very = 3; somewhat = 2; not very/not visible = 0; NA = 8								
Parking										
34a. Is there a parking structure visible on this area (do not include parking structures that are completely underground)?	135	yes = 1; no = 0								
34b. Looking at the front of the parking structure on the street level floor, what is the **predominant use** that is visible to you?	136	parking = 2; varied = 1; not pkg. other uses = 0; NA = 8								
Maintenance										
36. Describe the general maintenance of the buildings on this area.	138	attractive = 3; neutral = 2; unattractive = 1; NA = 8								
37. How much graffiti is apparent on this area?	139	some/a lot = 3; little = 2; none = 0								
38. How much litter is apparent on this area?	140	some/a lot = 3; little = 2; none = 0								
39. Are there dumpsters visible on this area?	141	some/a lot = 3; few = 2; none = 0								
40. Is there visible electrical wiring overhead on the area?	142	some/a lot = 3; little = 2; none = 0								
Lighting										
41. Is there outdoor lighting on the area? (Include lighting that is intended to light public paths and public spaces)	143	yes = 1; no = 0								

			1	2	3	4	5	6	7	8
Freeways										
42. Is there a freeway overpass/underpass connected to this area?	144	under a freeway overpass =3; next to freeway = 2; IS a freeway overpass = 1; none of the above = 0								
Architecture/Design										
46. Rate the attractiveness of the area (design + maintenance)	154	attractive = 3; neutral = 2; unattractive = 1								
47. Does this area have buildings that appear to be historic? (old + detailed)	155	yes = 1; no = 0; NA = 8								
48. How interesting is the architecture/urban design of this area?	156	interesting = 3; somewhat interesting = 2; uninteresting = 1								
Other Features of the area										
49. How many street vendors or stalls are on this area? (do not count newspaper racks; there must be a person vending)	157	some/a lot = 3; few = 2; none = 0								
50. Is there public art that is visible on this area?	158	yes = 1; no = 0								
51. Are there billboards present on this area?	159	some/a lot = 3; few = 2; none = 0								
52. How safe do you feel walking on this area?	160	pretty/very safe = 1 not very safe/unsafe = 0								
Dogs										
53. Are there any loose/unsupervised/barking dogs on this area that seem menacing?	161	yes = 1; no = 0								
Olfactory Character										
54. Is the dominant smell unpleasant?	162	yes = 1; no = 0								

Appendix C Scales for Analyzing Data

As discussed in **III. Conducting Observations**, data to be observed are organized in terms of four scales or factors that are hypothesized to link to physical activity, including (1) accessibility, (2) pleasurability, (3) human needs and comfort, and (4) safety. Items in the instrument can be analyzed in terms of the four scales, below.

**Accessibility=A; Pleasurability=P; Perceived safety from crime=S; Perceived safety from traffic=T

1	Monument	Monuments/markers 1	T
2a	Crosswalk	Crosswalk	T
2b	Whitline	White line	T
2b	Colrline	Colored line	T
2b	Zebrastp	Zebra striping	T
2b	Diffrdsf	Different road surface	T
2b	Cmother	Other type of traffic calming	T
3	Curbcuts	Curb cut	T
4	Traffsig	Traffic signal	T
4	Stopsign	Stop sign	T
4	Yieldsgn	Yield sign	T
4	Pedactsg	Pedestrian activated signal	T
4	Pedcrssg	Pedestrian crossing sign	T
4	pdunovps	Pedestrian overpass/underpass/bridge	T
5	Safecros	How safe is it to cross	T
6	Convcros	How convenient it is to cross segment	T
7	Banners	Banners	P
8a	Pedstree	Pedestrianized street	A
8b	Streetdir	Street direction	A
9	Alley	Presence of alley	P
10	Vehlanes	Number of vehicle lanes	T
11a	Openview	Open view	P
11b	Viewattr	Attractiveness of the view	P
12a	Sfhatach	Single family home detached	A
12a	Sfhdtach	Single family home attached	A
12a	Townhome	Town home	A
12a	Moblhome	Mobile home	A
12a	Resother	Other type of residential use	A
12a	School	School	A
12a	Highschl	High school	A
12a	College	College	A
12a	Schother	Other type of school	A
12a	Pubspace	Public space	A
12a	Pbspothr	Other type of public space	A
12a	Gymfitns	Gym/fitness center	A
12a	Movieth	Movie theater	A
12a	Recoher	Other type of recreational use	A
12a	Comctlib	Community center/library	A
12a	Mustheat	Museum/theater	A
12a	Pubcivic	Post office, police station, courthouse, DMV	A
12a	Civother	Other type of public/civic space	A
12a	Religion	Religious institution	A
12a	Medicine	Medical facility	A

12a	Insother	Other type of institutional	A
12a	Retrest	Retail stores/restaurants	A
12a	Financl	Financial institution	A
12a	Hotelhos	Hotel/hospitality use	A
12a	Cardeal	Car dealership	A
12a	Gasserv	Gasoline/service use	A
12a	Commothr	Other type of commercial use	A
12a	Offices	Offices	A
12a	Service	Service	A
12a	Ofseroth	Other type of office/service	A
12a	Lghtind	Light industrial use	A
12a	Mdhvind	Medium/heavy industrial uses	A
12a	Indsothr	Other type of industrial	A
12a	Harmain	Harbor/marina	A
12a	Undevlnd	Undeveloped land	A
12a	Agriclnd	Agricultural land	A
12a	Nature	Nature feature	A
12a	Other	Other land use	A
12b	Vermixus	Vertical mixed use	A
12c	Bigbox	Big Box store	A
12c	Shopmall	Shopping mall	A
12c	Strpmall	Strip mall/strip store	A
12c	Drivthru	Drive thru	A
13a	Parkplay	Park/playground	P
13a	Playsprt	Playing or sports field	P
13a	Plazasq	Plaza/square	P
13a	Pubgardn	Public garden	P
13a	Beach	Beach	P
13a	Pubother	Other type of public space	P
13b	Accesspb	Public space accessibility	P
14	Barsclub	Bars/clubs	S
14	Adultuse	Adult use	S
14	Chckcash	Check cashing store	S
14	Liquorst	Liquor store	S
15	Restarnt	Restaurant	P
15	Coffshop	Coffee shop	P
15	Libbkstr	Library/bookstore	P
15	Cornerst	Corner store	P
15	Artgllry	Art gallery	P
15	Farnermk	Farmers' market	P
16	Lakepond	Lake/pond	P
16	OpenFGC	Open field/golf course	P
16	Fountain	Fountain	P
16	strmrivr	Stream/river	P
16	Ocean	Ocean	P
16	Forest	Forest	P
16	Mountain	Mountain	P
16	desert	Desert	P
17	highway	Highway	A
17	Railroad	Railroad	A
17	Implndus	Impassable land use	A

17	river	River	A	
17	drnditch	Drainage ditch	A	
17	Sixlnrd	Six lane road	A	
17	Barrothr	Other type of barrier	A	
18a	Sidewalk	Sidewalk	A	Also T
18b	Sdwkcomp	Completeness of sidewalk network	A	
18c	Sdwkcndt	Condition of sidewalk	P	
18d	Sdwkpave	Decorative/unique sidewalk paving	P	
18e	Arcades	Arcades	P	
18e	Awnings	Awnings	P	
18e	Swptcoth	Other type of sidewalk protection	P	
18f	Sdwkbuff	Sidewalk buffer	P	Also T
19	Othrsdwk	Path other than sidewalk	A	
20a	Bikelane	Bike lane	A	Also T
20b	Bklntype	Type of bike lane	A	Also T
21a	Midblock	Midblock crossing	T	
21b	Mbwtln	Midblock crossing - white line	T	
21b	Mbclln	Midblock crossing - colored line	T	
21b	Mbzebra	Midblock crossing - zebra striping	T	
21b	Mbdfrdsf	Midblock crossing - different road surface	T	
21b	Mbother	Midblock crossing - other	T	
22	Flatslpe	Flat/gentle slope	P	
22	Modrslpe	Moderate slope	P	
22	Stpslpe	Steep slope	P	
23	Dining	Outdoor dining area	P	
24	Benches	Benches	P	
24	Busstops	Bus stops	P	
24	Heatlamp	Heat lamps	P	
24	Bikerack	Bike racks	P	
25	Pubrestr	Public restroom	P	
26a	Strttree	Street trees	P	
26b	Sdwkshde	Sidewalk shade	P	
27	Bldgstry	Building height	P	
28	Abndbldg	Abandoned buildings	S	
29	Prctbldg	Percent of segment with buildings	S	
30	Windbars	Bars on windows	S	
31	Frntprch	Front porch	P	
32	Blnkwall	Percentage of segment with blank walls	P	
33a	Garages	Number of buildings with garages	P	
33b	Prmntgar	Prominence of garages	P	
34a	Parkstrc	Parking structure	P	
34b	Prdusprk	Predominant use of first floor of parking structure	P	
35	Parklot	Parking lot	P	
36	Driveway	Prominence of driveways	P	
37	Mntbuild	Maintenance of buildings	S	
38	Mntlndsc	Landscape maintenance	S	
39	Grafitti	Graffiti	S	
40	Litter	Litter	S	
41	Dumpster	Visible dumpster	S	
42	Elecwire	Overhead electrical wiring	P	
43	Lighting	Outdoor lighting	S	

44	Freeway	Presence of freeway	A
45	Speedlim	Speed limit	T
46	Spdbump	Speed bump	T
46	Rumblesp	Rumble strip	T
46	Curbbulb	Curb bulb out	T
46	Trafcrcl	Traffic circle	T
46	Median	Median	T
46	Trcmpark	Traffic calming - parking	T
47a	Culdesac	Cul de sac	T
47b	Pedacspt	Pedestrian access point	A
48	Attrtve	Attractiveness of segment	P
49	Historic	Historic buildings	P
50	Intrstng	How interesting the segment is	P
51	Stvendor	Street vendors	P
52	Pubart	Public art	P
53	Billbrd	Billboard	P
54	Safepple	How safe you feel walking	S
55	Dogs	Dogs	S
56	Dmntsmll	Dominant smell	P
1	Monumnt2	Monuments/markers 2	T
2	Crosing2	Presence of crosswalk	T
2b	Whtline2	White line 2	T
2b	Colline2	Colored line 2	T
2b	Zebra2	Zebra striping 2	T
2b	Dfrdsf2	Different road surface 2	T
2b	Crsothr2	Other type of crosswalk marking	T
3	Curbcut2	Curb cut 2	T
4	Trafsgn2	Traffic signal 2	T
4	Stopsgn2	Stop sign 2	T
4	Yield2	Yield sign 2	T
4	Pedact2	Pedestrian activated signal 2	T
4	Pedcrs2	Pedestrian crossing sign 2	T
4	Pedbrgd2	Presence of pedestrian bridge	T
5	Trfsafe2	How safe is it to cross 2	T
6	Trfconv2	How convenient it is to cross segment 2	T