How does the planning goal 'urban density' correspond to people's residential choices and everyday life? - A Pilot Study

Inga Britt Werner, Docent
Urban and Regional Studies
School of Architecture and Built Environment
Royal Institute of Technology
Stockholm, Sweden

ingabritt@infra.kth.se

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Abstract

Despite consensus among planners and politicians that dense cities are better for the environment than sprawling urban landscapes, much of what is currently being built is characterised by low density. Researchers agree that, in industrialised countries, 'sprawl' is driven by rising average income and decreasing transport costs. Individual decisions by urban households are aggregated into a force that governs the development towards 'sprawl'.

The aim of the project is to analyse how urban environments can offer desired qualities, by studying households' actual use and valuation of opportunities for work, service, leisure activities, culture and education within areas of different densities. The contribution of the study will be a deeper understanding of what urban density means in the daily life of households.

The study employs theories and concepts from planning research and environmental psychology. Urban density is a key concept. Range and variety of urban functions are then important additions to measurement of physical densities. Another key concept is 'affordance'. 'Affordance' is here a quality or asset within a specific environment, which can be perceived and used by an individual for carrying out a certain activity.

The main study is a survey covering around 2000 households within the Stockholm area. Four study areas are selected to illustrate different urban densities and structure, from inner city to garden suburb. The survey covers the most important affordances inherent in the actual environment of the household, such as place of work, shops, schools and social networks.

The concept of 'affordance' is tested as a tool for structured comparisons between urban areas regarding different aspects of density. The availability of affordances in different urban structures is described and relationships between density, in all its aspects, and life styles can be tested. The paper presents preliminary results from a pilot study.

Background

The paper presents a pilot study for a project funded by FORMAS, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning. I welcome a discussion on methodological issues.

Introduction

In the recent debate on urban planning the idea that a dense and compact city is more sustainable and environmental friendly than a city that is spread out has been taken for granted (see for example RTK, 2001, in the EU see SCATTER, 2003, Kaufmann, Risser, 2004). The antonym for density in this context is termed 'sprawl' and development of this type carries very serious environmental consequences. In spite of the strong consensus among planners and politicians that development towards dense and compact cities is better for the environment, it is not clear how such urban patterns should be brought about through planning or other forms of management (RTK, 2005).

Generally researchers agree that 'sprawl' in industrialised countries is driven by rising average income and decreasing transport costs. A rising proportion of the urban population can afford to demand larger dwelling units as well as travel long distances every day, and many obviously prefer to make such choices. Individuals' and households' decisions are aggregated into a force that governs the development toward 'sprawl'.

That urban density is a remedy for increasing environmental impact is mainly inferred from the assumption that high urban density leads to a decreasing need for travel. This is plausible for inner city areas with an ample supply of services and public transport and where 'well to do' households live. However, isolated suburbs could have local high density but very little diversity of services and work opportunities and would not necessarily give rise to less travel. Social segregation, on both ends of the social scale, also leads households to accept long journeys.

If planning of the physical environment is to influence individuals' choices of dwelling, place of work and choice of travelling modes, planners must understand what households and individuals prefer and value in their everyday life. Thus, research at the micro level of households is needed.

Research aims and questions

Understanding what is needed for future development of the urban structure depends on better knowledge of the relationships between people's individual choices and physical urban development. The presented research aims at uncovering what factors motivate people to make certain choices, which will provide insights to facilitate a more informed discussion on possible future spatial patterns. One major goal is to clearly define the concept of 'urban density' and develop it for use in a meaningful discussion of different levels of urban scale; from building and neighbourhood to the macro scale of city. Such a concept would facilitate the planning of a city that offers preferred qualities within urban environments of different densities.

The hypothesis guiding the study is that in many situations it is desirable to promote 'density', but this term is often used with an overly simplified meaning: it is divorced from certain crucial aspects such as functional diversity and spatial social segregation. Today there are conflicts between the life goals of individuals and the planning goal of a more compact, presumably sustainable, city.

The main research questions are:

- What qualities are important for households' choice of residential location?
- How do individuals and households value and use these qualities and opportunities?
- What qualities and opportunities do urban settlements of varying density and structure offer individuals and households?

Research on households and urban density

Urban density is a key concept in the project, as different urban settings with different density will be studied and compared. The study will cover what the physical urban environment offers to specific households, which means that qualitative as well as quantitative aspects of density will be important.

In the recent literature 'sprawl', the lack of density, has received most of the attention. However 'sprawl' is not often very clearly defined but is open to several different interpretations. In a joint European project, SCATTER, (2003), researchers discuss the definition of sprawl as well as study empirically its consequences in a selection of European cities. They provide a number of indicators of density, such as concentration of built up areas and indexes for mixed use, which are of special interest for this project. The measurement and classification of density, regarding different spatial levels and different aspects, is discussed by a number of authors (see for example Cervero 1989, Turner 1989, McCann 2001). Cervero's criteria for classification will be used in this project.

The starting-point of the project is households' valuation and use of the urban environment. The concept 'affordance', derived from environmental psychology, sheds light on the individual's 'space of possible actions', which is a physical environment that allows for certain important activities (Gibson 1979/1986, Greeno, 1994). The concept is useful for studying the interplay between a physical environment and a specific individual or group, where the resources of the individuals are crucial for how the environment is utilised. Here the concept will be widened to include also social affordances (Heft 1988a) in the form of work, education and social networks. Heft (1988b) has developed a hierarchy of 'affordances' defining the levels of potential, perceived, shaped and used affordances in an environment. This hierarchy admits for ranking the supply of affordances in an environment. (Kyttä 2002).

Taken together the social and technical fields of research yield a range of empirical studies concerning how individuals and groups perceive, use and benefit from urban environments. In particular urban sociology and geography, as well as planning research, are of interest here.

Musterd and van Zelm (2001), supported by empirical data, state that journeys to work in general are so short that the idea of city regions is meaningless, looking at households' actual patterns of activity. These authors state that the character and design of housing areas are at least as important for households' decisions of where to live as convenient access to the labour market. Champion (2001) classifies urban environments along principles of polycentricity and discusses how different categories of households choose residential locations in such an urban structure. Champion stresses the need for further study of how households' choice of location affect the structure of the city and vice versa, how the urban structure affects people's lives and behaviour. Jarvis (2003), in a study of four American cities, finds that households do not choose to exploit opportunities in their nearest neighbourhood but rather make partial optimisations concerning how work and educational or other services could be reached within an everyday pattern of activities.

Arnstberg (Arnstberg, 2005) discusses 'sprawl' from a Swedish point of view and puts forward the difficulties inherent in governing the development of cities through planning measures, especially as sprawl is driven by economic growth. The Scandinavian research on rela-

tionships between the physical urban environment and people's patterns of activity is mainly focussed on patterns of travel and choice of travel mode (see for example Naess, Jenssen 2004, Westford 2004) and on how children or elderly perceive and use physical environments (Lilja 1994, Nordström 2003, Kyttä 2002).

These studies show a very heterogeneous view of how households interact with the urban environment. This heterogeneity could imply that this is a field where further study is needed, an idea which is supported by several authors. The project aims at contributing to this effort. Studying households' activity patterns related to the possibilities offered by their urban environment will provide a solid background for a discussion of how planning measures can influence households' behaviour.

Methodological issues

Proposed method for the main study

Study areas will be selected to illustrate different urban densities and structures. All study areas are situated in the Stockholm region, the largest urban area in Sweden, offering a variety of urban forms. Four different types of urban structure are considered for study:

- *Inner city,* spatially dense urban environment - highly accessible functions and many types of functions
- *Semi central suburb,* semi dense – accessible functions but with limited range of function mix
- *'Million homes' suburb*, low spatial density but large scale buildings – functions concentrated to a local centre, limited range of function mix
- *Garden suburb*, low spatial density, own homes on plots – spatially dispersed functions, few functions

The main study will use a survey of 2 000 households, randomly selected from the non-institutionalised population within the chosen study areas. For each study area, 500 households will be selected, a number that will allow for sub-dividing the samples into socio-economic strata. Statistics Sweden will be engaged for sampling and for distribution of the questionnaire.

The survey will cover blocks of questions concerning the most important affordances inherent in the actual environment of the household;

- Place of work (affords for example making a living, enjoying personal development)
- Shops, commercial services (affords the opportunity to provide necessary goods to the household)
- Schools (afford education for children, development in a certain social context)
- Day care for children (affords children a good and stable everyday life, stimulation of development and for parents untroubled time for work)
- Recreational areas (afford relaxation, being in the open, physical training)
- Places of entertainment (afford relaxation, meeting new people)
- Culture (affords new experiences, being part of a public event)
- Social networks (afford social relations, helping and trusting each other)
- Transport systems (afford varying opportunities to travel)

The questions will be constructed to provide the respondents the chance to grade perceived, potential and utilised affordances in their environment. Respondents will be asked to state where they find their specific affordances. Households will also be instructed to rate what

affordances in the 'affordance space' that were the most important for their choice of residential location.

The analysis will employ a number of basic statistical methods for bivariate analyses (such as t-tests and cross tabulations with appropriate tests). Factor analysis will be used for reduction of data and for generating an overall measure of the availability of affordances offered by different urban densities and structures. Multivariate modelling will be done using a number of techniques: given the nature of the measures, limited dependent variable approaches such as logit and/or multinomial logit will probably be used to model the probabilities for different household categories' residential choices.

The theory of affordances in connection to urban life and density

'Affordance' is here a quality or asset within a specific environment, which can be perceived and used by an individual for carrying out a certain activity. Affordances can be diverse, for example the possibility to work or the chance to meet with friends at certain locations within an accessible geographic area.

Affordance space is a geographic space demarcated by households' everyday targets. The geographical boundary of households' environments is assumed to stay within a radius of 25 km, a distance that generally can be reached within one hour's travel. Limiting study areas by this distance grants that the affordances probably will be located within the affordance space of respective studied household, since one hour of travel is the limit of what is generally accepted (RTK, 2005).

'Affordance' as a concept has been used in several studies of specific groups, mainly children or young teenagers, in defined environments. Descriptions of the interplay between behavior and the environment were based upon observations and interviews on behaviour in certain settings (Kyttä 2002, Clark, Uzzel 2002). This study covers a wider scope, taking into account different groups of people, engaged in a variety of projects, living different life styles in a metropolitan urban setting. As a consequence it addresses very diverse 'affordance spaces', varying with each respondent's activity pattern. Then the concept of 'affordance' gets very complex.

One way to catch the complexity is to use a time – geography framework. Individuals are bound or partly bound to certain places for certain activities (Simonsen, K, 1974; Ellegård, K; Lenntorp, B, 1993), see illustration in picture 1. These place bound activities are mostly connected to reproduction in a broader sense, that is to work, education, child care, biological needs such as food and sleep. There is regularity and necessity to such activities that render them relatively stable in time and space, which makes it possible to put structured questions to respondents about their regular time-space use.
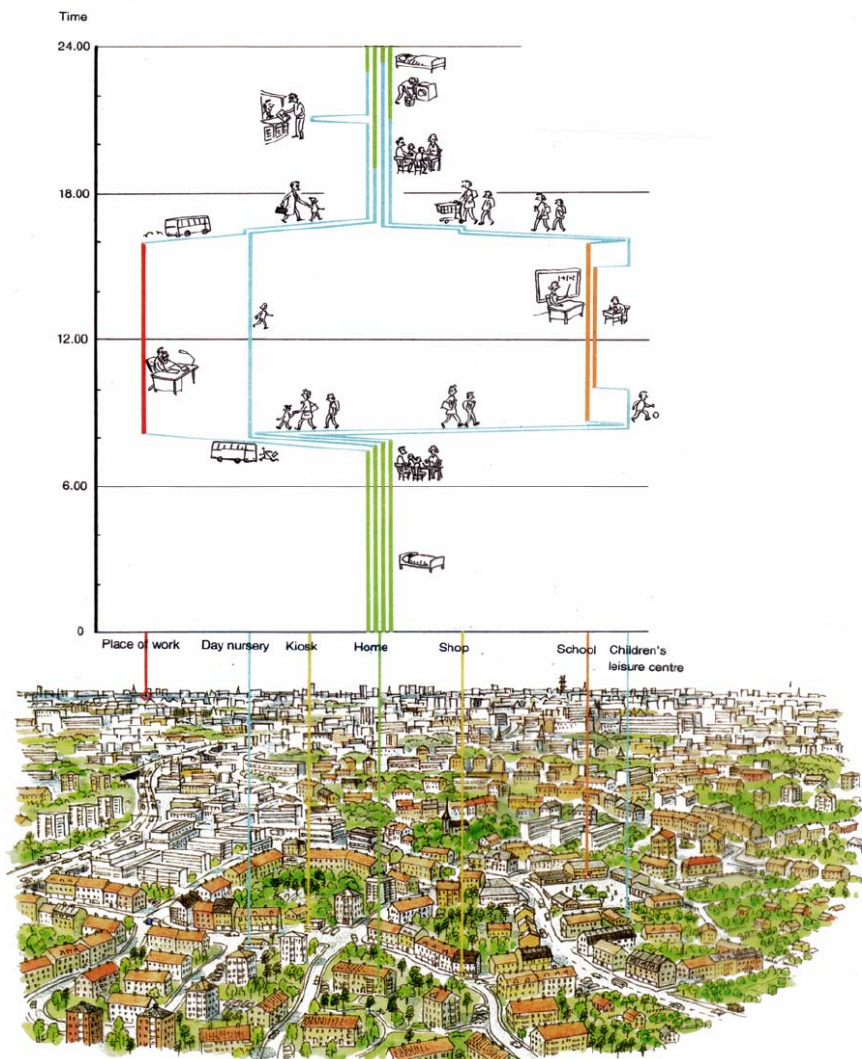
Picture 1 The time-space geography of a Swedish family during a weekday. From:
Ellegård, Kajsa & Bo Lenntorp (1993) Transformation of Everyday Life. In *THE NATIONAL ATLAS OF SWEDEN, VOL.10, WORK AND LEISURE*: pp 22-39

The concept of relative affordances (Heft, 1988b) adds yet another dimension. What environments are actually used for different purposes? What affordances do environments offer, not yet used but recognized by residents?

The complexity of urban life

This complexity calls for classification of activities into certain categories of more or less regularity. A first group depicts necessary and habitual activities / services:

- Work, study (own and partner's)
- Children's care
- Children's schools
- Everyday shopping
- Weekly shopping

- Transport nodes
- Social network

Leisure activities are connected to life style and personal tastes and thus more difficult to categorise or predict. They are not always part of a habitual pattern of activities. They need thoughtful treatment and more open questions, which again makes it more difficult to categorise and measure the spatial dispersion of such activities.

The time dimension

Affordance as a concept is not connected to time and time use. It was first developed in relation to nature and animal behavior (Gibson 1979) and in this context the time dimension was not considered very important. In modern human behavior, the use of time and time budgets are very important. For people in the age span 20 to 64 years of age, weekdays usually are fully scheduled for different activities, especially for families with young children and two parents in gainful employment. Lack of time is a pressure on many, which may influence the way people choose to use their nearest environment instead of travelling far.

Another aspect of the time dimension touches upon seasonal changes. The study is carried out in Sweden with its temperate to subarctic climate, which means that voluntary leisure activities out of doors are very much related to season. Totally different activity patterns appear summer and winter.

This calls for questions that cover the differences between activities of weekdays and free days as well as those of different seasons.

The concept of 'density' and its implications for choice of study objects

'Density' is used here to characterise both physical density and density of accessible functions in urban areas. The diversity of functions is also important. Several aspects such as density – built up area / plot area, maximum building height; mixed use – proportion of commercial area, number of shops, number of dwelling units (Cervero 1989, p. 81) as well as the accessibility of work places, are used as criteria for selection of study areas.

Pilot work

A preliminary questionnaire

The conceptual framework of the theory of affordances was the backbone for the construction of the questionnaire, as well as the work of other researchers regarding space – time use in urban environments. A preliminary questionnaire was drafted, covering modules of regular everyday activities, leisure activities, residential preferences and satisfaction with the dwelling / area and background information on the household. The questions were tested within the research team.

Leisure activities could be regular, scheduled in time and place bound, but from literature and own experience it was obvious that they also could be spontaneous, changing and covering a large urban region. They are connected to different life styles, in turn related to age group and socio economic strata. The draft questionnaire was reconstructed with this in mind, to give more room for open-ended questions on leisure activities. From those self reported activities, the respondent was asked to choose five of them and then describe each of the chosen activities in detail; for each special activity describe the place where it was performed, alternative places used and perceived afforded places. Respondents were also asked to mark on maps where the regular activities took place, see further discussion in next section.

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A new draft of the questionnaire was distributed among a convenience sample of colleagues at the department. 16 staff members at the author's department agreed to be the guinea pigs for this test. The test group is not representative of the contemplated real respondents, as all test respondents had a university degree and position, ranging from Msc to full professor. They also have a special interest in a colleague's work and insights in research methodology. Taking that into account, in comparison to the man on the street they presumably had more capacity to understand complex questions and tolerate comprehensive instructions for answering.

By this selection of respondents, selection of study areas according to different aspects of density was not tested. A pilot selection of study areas in the Stockholm region, using three dimensions of density; physical density, mixed use and accessibility by public transport, has been carried out. It is not further presented here as it is not connected to the pilot work of the survey.

The test sample was randomly divided into three groups and the groups were assigned different versions of the questionnaire. The differences did only pertain to the construction of the questions on leisure activities. For group A questions prompted respondents to list activities according to activity categories, based upon literature (Ellegård, K, 1999), for group B lists were related to weekdays and free days and for group C lists were related to spatial dimensions and the distance from home.

The use of maps

To cover regular, place bound activities the questionnaire offered two maps of different scales, for registering the location of regular activities and of important persons within the respondent's social network. The use of maps was intended to facilitate respondents' description of the spatial pattern of their daily lives, time schedules not taken into account. It was also designed to facilitate the analysis of data, as stated locations on maps were considered more reliable than written addresses.

The map of larger scale centred on each respondent's residential area. (As a preparatory measure the respondents were asked to tell the researcher in what part of the city they were living. In the main survey this information will be taken from registers.) There was also a general map of the Stockholm urban area, for registering activities / persons on larger distances from the respondent's home. For the more detailed map the scale was thought out to catch activities within walking and biking distances and for the over view map the scale was accommodated to catch the region, around 60 kilometres across.

The notation on the maps was a special symbol for each activity and the respondent was asked to draw these symbols on the maps by ballpoint pen. Symbols were shown as a legend with the maps. The maps were located on facing pages, presented on one spread for easy reading.

Preliminary results

On the questionnaire

All respondents except one, being on parental leave, handed back the questionnaires. All of them made comments on the questions and the structure of the questionnaire, as they had been asked to do.

The most commented questions where those about leisure activities. It was obvious that the difficulty lay with describing spontaneous leisure activities, with all the dimensions of what

they were, when they took place and above all, where they took place. The perceived affordances of leisure activities were, as a consequence, also hard to catch in a general way. Several respondents found it much easier to think of their leisure activities as just a category of activities – like "going to a pub to meet friends" – than to pinpoint the activity concerned to specific places. As the questionnaire forced them to do so, several respondents felt reluctant and left these questions out altogether.

The different versions of the listing of leisure activities, see above, did not produce any evident variance regarding the way respondents did answer the questions. Differences seemed to have more to do with the respondents' personality, age group and life style than with the wording of questions.

One emerging problem with the questionnaire was that the same set of structured questions was repeated for a number of activities. These activities were selected by respondents as 'important', from the list of all the leisure activities that were mentioned by the respondent. In order to remember which activities she / he had chosen earlier the respondents had to leaf back and forth between pages. Some of the respondents found this too taxing and did not answer all of the questions.

The maps were appreciated by some, and much criticised by others. To some respondents the task of drawing on a map was appealing and easy, while to others it seemed challenging and difficult. A main problem was that the scale of the most detailed map was too small and did not give room for noting all the requested information if activities were performed near to each other. Symbols had to be drawn at a certain size to be clear and visible, and then got stacked on top of each other. The regional map was not much used at all. Most of the regular activities could be noted on the more detailed map, and the regional maps were mostly used to show where friends and relatives lived.

Respondents were allowed to alternatively enter the information in the form of text, writing down the names of places for different activities. This alternative turned out to be used by most respondents, complementing the information on maps. If data were given only in text form, the information was much harder to analyse, as the naming of places did vary. This problem was assumed, as mentioned above.

On activity patterns and affordances

The actual results of the first test – survey are mainly used to check the construction of the questionnaire and how the gathered information could be coded and analysed. Taking into account the selection of respondents and the preliminary questionnaire, the gathered data are at most interesting as to evaluate whether any surprising or contradictory trends would emerge.

The analyses of the data given on maps was carried out manually, measuring, as the crow flies, the distance from place of residence to place of work, shopping, school and leisure activities. The distances on the ground are longer, at least by a factor $\sqrt{2}$. Here the radius measures are given. The distances were categorised into classes, where distances were related to different means of transport. Less than 1 km was considered walking distance, 1-2,5 kilometres as biking distance and so on.

The urban areas where respondents lived were classified into three categories of physical density. The selection method did not allow for classifying the residential locations along all dimensions as described before.

The distance to work is a variable important to planning. In the pilot study, results showed that about half of the respondent group lived in areas that were classified into the highest category of density, and the other half were distributed evenly between the medium dense and the least dense categories. Those in the group living in urban areas of the highest density more frequently reported having short distance to work than those in the other categories, see diagram1 below. As the respondents have in common a workplace located at the fringe of the dense inner city, there is a geographical self selection influencing that result.
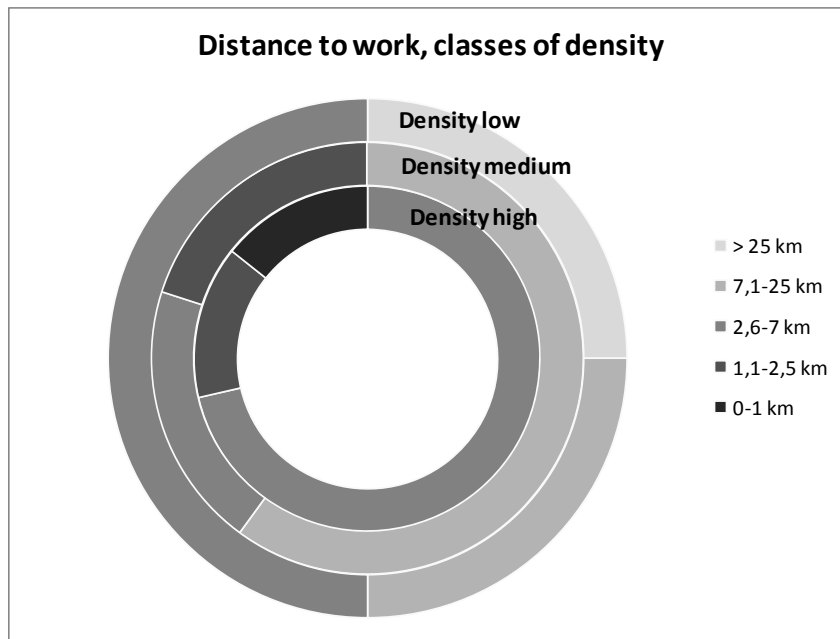

Diagram 1 The different sections of greys of the concentric circles represent percentages of the distance categories within each density group. The darker the grey, the shorter the distance

As a whole, responses regarding nearness to basic affordances, such as schools, shops for daily needs and public transport did not differ much for the different density groups. This could pertain to the fact that residential areas in the Stockholm region are well planned and equipped regarding such facilities, but also to the fact that the respondents were a group highly biased towards upper middle class. As such they may demand and choose residential locations of high quality.

Respondents were asked to rank their preferences for nearness to several affordances and also to state their satisfaction with the same affordances around their present dwelling. Some tendencies regarding residential preferences were that those living in the inner city, the densest category, were not so interested in a safe neighbourhood nor in nearness to public transport as were the respondents of other categories. The same group of respondents were also more interested in nearness to pubs, entertainment and leisure activities than the other categories. This is not surprising, as you can expect those having preferences for an urban life style would choose their dwelling in denser urban areas. There is also the effect of habituation to a certain life style fitting in with the environment where you live.

A result that is a little more surprising was that all groups stated the same limited interest in choosing a residential location close to work, although the respondents within the category of high density stated that they were more satisfied with nearness to work than the other groups.

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The choice of a dwelling is a complex decision, where many factors are balanced. Nearness to work is a relative concept, and it can be measured by distance on ground, by time used travelling and also by the cost induced by transport. If you buy a travel pass per month or even year for the Stockholm region, the cost for public transport is fixed at a reasonable level. This gives the households the opportunity to pay by travel time instead of by money. Ultimately, the resources of the household will decide what range of options is accessible to them.

For the leisure activities the found patterns were very much influenced by the respondents' age group, family situation and also gender. The results were not surprising. The youngest respondents, still not having children, were much engaged in using the city as a meeting place, seeing friends at cafées, bars or other public places. A young male respondent used the lake Mälaren for kayaking among the city islands. In all the younger respondents described an active and mobile social life over the whole city area. Some also reported that they preferred change, steadily finding new interesting spots to visit.

Respondents having young children described a locally bound pattern of leisure activities. Playing near the house, going for a stroll to neighbouring green areas or playing football at nearby fields were commonly mentioned. Parents tended to describe their own leisure activities as regular and defined to certain places, as opposed to the younger respondents' more floating pattern of activities. This is understandable, taking into regard that families with two working parents have a tight schedule and have to plan their leisure time.

The older respondents, of whom the majority were male, had rather extensive mobility patterns for their leisure activities. They tended to be determined by each respondent's specific interests. One was interested in collecting books, thus going to antiquarian bookshops during weekends. Another was interested in going to horse races and meeting friends there. To summarise; the older respondents had more unique personal patterns than the younger.

It was interesting to note that despite the very small and socio economically homogenous sample, patterns of ethnic segregation prevailed. Three respondents were born in another country than Sweden. One was from a European country, now living in a green suburb near to the City centre. The two others had a background from non-European countries and they lived in suburbs south of Stockholm, where the proportion of immigrants is high. Also another respondent, herself of Swedish origin but married to a man of non-European background, lived in a suburb with many immigrants. The spatial distribution of ethnic groups seems to be a very strong force in shaping the social urban landscape. The pattern of activities as shown by these respondents did not deviate from others though, nor did their stated preferences for housing qualities.

Conclusions for further work

The results from this very small survey must not be taken for more than a test of the feasibility of the research questions, along with the testing of data gathering and analysis techniques. As it took its starting point in a common place of work instead of different residential locations it cannot give quite the information sought for in the coming main study.

Anyway, the pilot study gave evidence for that the research question on what qualities and opportunities urban settlements of varying density and structure offer individuals and households would be useful applied to a larger sample. Still many issues remain to address, especially the technical / practical solutions for gathering many faceted data on spatially bound activities and on the perceived but not used affordances that exist in people's environments.

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One solution considered is a more comprehensive use of maps, especially in connection to an interactive website for filling out questionnaires. Such a website could be made accessible to selected respondents, as an alternative to a written questionnaire. In study areas where the proportion of immigrants is high, it is well known that response rates for written questionnaires will be low. In such areas telephone interviews will be considered, guiding respondents through questions and sent out maps.

The underlying question of the whole study - whether dense and compact cities would be places of less travel and less impact on the environment - of course still remains. The results of the small pilot study rather raise more questions, such as; if you commute longer distances to work, will you get used to travelling and accept longer travel time for leisure activities? Do affordances nearby your place of work complement or crowd out affordances near home? Are peoples' lives revolving around their place of work as much as around their place of dwelling? Do parents of young children, living in dense urban structures, find compensatory affordances for children's outdoor play instead of moving to a one family home in a less dense suburb? Hopefully the main study will shed more light on these and other questions connected to the complex interaction between individuals and their physical and social environment.

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