

Neighborhood Differentiation and Travel Patterns in Singapore

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PART 1: INTRODUCTION

There have been many initiatives within the Singaporean government to improve quality of life for Singaporeans and visitors through transit infrastructure, transit demand management, land use planning initiatives and housing. The result of this investiture made by agencies such as URA, HDB, SLA, LTA, SMRT and others, transportation in Singapore seems to support widespread mobility for Singaporeans traveling to work, school, shopping districts and recreational activities, and plans have yielded one of the best transit systems in the world. Moreover, Singapore has provided its residents high levels of transportation mobility despite challenges of high population density and rapid changes in development.

Nevertheless, in this time of advancing urbanization, we are interested in which aspects of life, movement and socialization are important for modeling Singaporean travel demand needs in the present and future, with respect to rising income levels, demographic changes, and increased need for redevelopment. Future densification and urbanization will require new attention to the impacts on travel patterns as well as a better understanding of physical and social forces.

This predicament calls for richer modeling capabilities. Recently, a shift toward activity-based modeling has been successful in capturing more biographical, or true-to-life view of travel decisions of citizens. There is a rich literature on travel demand modeling and activity patterns. Further, understanding the implications of future improvements in mobility includes a need to address more than the traditional journey to work concerns. This modeling endeavor is motivated by such concerns as which activities are conducted where, which errands can be conducted during commutes, how families pick up children, or the nature of non-home based trips. Phenomena such as trip-chaining and how citizens choose third-places for socialization may provide a more robust image of the social and spatial choices that are being made in Singapore. With conveniences such as e-banking, and increased household disposable income, or a new 'empty nest' (when children move out of the home), extraprofessional and extra-domestic activities might become increasingly important, and could even dictate home and work location choices. Also, physical and social settings like neighborhood enclaves, natural features, or creative districts could change destination and home location proclivities, as Singaporeans find that aspects of the built environment resonate with their personalities, choices and lifestyles.

This report provides background information about the physical and social setting in Singapore, and which aspects of these settings are likely to affect travel demand as mobility and economic conditions improve. It is intended to help connect the worlds of urban planning and transportation planning with particular attention to social networks and capital, household constraints, and the opportunities for computational social science, urban sensing, and data mining to improve the structure and calibration of activity-based transportation models. This report enumerates possible additions to current transportation models and suggests priority characteristics, variables and features that can best reflect the patterns of movement in Singapore. Given the importance of

interpersonal relationships in daily life as well as their impact on social health and wellbeing, this document also assumes that one important aspect of transportation in Singapore is how to best support human relationships.

This report proceeds and answers the following questions as follows: Part 2 Overall Demographics: What kinds of demographic and cultural patterns are found in Singapore? Part 3 Social Capital: How and where do Singaporeans relate to one another? Part 4 Neighborhoods: What types of partitions and communities are in Singapore? Part 5 Commercial Areas: What is the geographic pattern of commercial areas within residential zones? Part 6 Travel: How do Singaporeans move around Singapore, in terms of modality and types of activities? Part 7 Conclusion: What is important to model for the future of urban mobility in Singapore?

PART 2: OVERALL DEMOGRAPHICS

Fundamentals

According to SingStat¹, the number of Singapore residents as of 2010 is 3,771,700. According to SingStat², the overall ethnic composition of Singapore is 74.1 percent Chinese, 13.4 percent Malay, 9.2 percent Indian and 3.3 percent other.

Including non-Singaporeans, the total estimated population of Singapore is near 5.08 million (in 2010), meaning that the population density averages at 7,126 persons per square kilometer in Singapore. Also, between 2009 and 2010, the population density increased by an average of 100 people per square kilometer (7,022 persons per square kilometer in 2009). About 18.3 percent (596,108) of the resident population base were born outside Singapore, mainly in Malaysia (306,998); China, Hong Kong, and Taiwan (163,503); South Asia (61,308); Indonesia (32,785); and other Asian countries (15,137).³

Males and females

The male to female ratio has decreased from 99.8 males for every 100 females, to 97.4 males to every 100 females in the past 10 years (since 2000). This difference is least marked in the Indian population, but visible in the Chinese, Malay and Other ethnicities of Singapore. However, since this ratio is for Singaporeans only, one may expect that the expat population, and population of visiting workers may have a different skew. If the domestic sector is prominent, we may see more females in the population. Most female domestic workers are from Philippines and Indonesia. Additionally, records of Work Permit (FDW) holders (mostly female) and Work Permit (Construction) holders (mostly male) can be a good indication of neighborhood composition.⁴ A counter-balance to the female majority is the typically-male dominated expatriate community of professionals in finance, science and technology. Additionally, day laborers and construction workers may be typically male,

¹ Statistics Singapore (2010) Census of Population 2010 Statistical Release 3: Geographic Distribution and Transport © Department of Statistics, Ministry of Trade and Industry, Republic of Singapore

² "Census of the Population 2010" Statistical Release 3: Geographic Distribution and Transport. ("SR3") Copyright, Singapore Department of Statistics, Ministry of Trade & Industry, Republic of Singapore. ISBN 978-981-08-8114-6. <http://www.singstat.gov.sg/pubn/popn/c2010sr3.html>

³ Movement of Workers in ASEAN: Health Care and IT Sectors" Report by the Association of South East Asian Nations (ASEAN) www.aseansec.org/aadcp/repsf/docs/04-007-FinalMainReport.pdf

⁴ <http://www.mom.gov.sg/statistics-publications/others/statistics/Pages/ForeignWorkforceNumbers.aspx>
Information from Tuan Yee Ching (MIT Dept. of Urban Studies and Planning)

which could skew the male population upwards. Of course, only prominent factor for these types of dynamics is that life expectancy for females is generally higher; In Singapore, female life expectancy at birth is 83 years and male expectancy is 79 years.⁵ Females are also more likely to leave Singapore for college than males, but later in life, male residents are more likely to be overseas.

Young, single and at home

One major change in the past 10 years has been the decrease in unmarried (single) young adults aged 30-34 years. In 2000, 30.7 percent of males were single, compared with 37.1 in 2010. Similarly, in 2000, 19.5 percent of females were single, compared with 25.1 today. The trend is not similar across ethnic groups. In fact, 'Other' ethnicity males dropped from 31.5% single to 22.1% single (in the same age bracket—30-34 years) from the 10 year period from 2000-2010. (The trend is not echoed by females of other ethnicity). The rate of single people for the Indian population also went against the larger trend, and showed a decrease (of about 3% points) for both male and female members. The highest percentage of single people are the Chinese males from 30-34 years old (42.2%) and lowest is Indian females 30-34 years old (8.5%)⁶ Since single Singaporeans almost always live with their parents, this change means that young adults do not form enclaves or the types of districts that can often be seen in Western countries, such as college (and grad school) neighborhoods, and the more romantic notions of gentrified districts and young artist districts. Mechanically, household size sees a prolonged saturating point, as children do not move out as quickly to form couples. Because of this trend, older, married parents are not as quick to 'downsize' their flats, but perhaps to look for more space. The trend also means that young, working adults will need transportation to jobs *from* all (or any) parts of the city, and may command travel to nightlife venues or third places for peer socialization from these wide-spread home origins.

Birth rates & ethnicity

The birth rate in Singapore is decreasing, and has dropped from 2.21 average number of children for a female 40-49, to 2.02 children. This decrease is seen the least in the Malaysian ethnicity group, where women of Malaysian ethnicity have more than average number of children (1/4th of all Malay women have 4 or more children. 33% have exactly three children). The average number of children for a woman of Malay descent is 2.73, compared with Chinese (1.89), Indian (2.05) and Other (1.78), the later three ethnicities have seen decreases with the Chinese ethnicity seeing the biggest drop (.22%). This finding is congruent with the reduced percentage of married men of Chinese ethnicity.

As we have learned through personal correspondence, the choice of a school for preschool-12th grade students is very dependent on home location, and great measures are taken to place one's children in high-ranking schools. As one could imagine, this creates a system of dynamics, school saturation and competition. Also, priority is given to students whose fathers have attended the school of choice (personal correspondence).

Religion

The reported religious beliefs of Singaporeans are eclectic. Roughly, they sum to 18% Christianity, 44% Buddhism/Taoism, 15% Islam, 5% Hindu and 17% with no reported religion. Buddhism has a reported drop of 9% in the past 10 years, where no religion and Christianity have risen a few

⁵ World Development Indicators, The World Bank 2002. <http://data.worldbank.org/data-catalog/worlddevelopmentindicators>

⁶ "Census of the Population 2010"

percentage points each. 98.7% of the Malay ethnicity population reports Islam as their religion. Alongside cultural geography literature, the travel patterns of women (ex. the work of Mei Po Kwan on the geographies of fear and activity spaces) may be of interest to travel planners, as social mores might differ from those of the general population. In Singapore, it is not uncommon for Muslim women to be travelling, in the workforce or in school without any restrictions⁷, unlike in countries with stricter theocratic or cultural regulations. Certain neighborhoods may need more lunchtime travel needs during the month-long holiday of Ramadan, or more typically, Muslim men travel during lunchtime to mosques near their workplaces on Fridays to observe Friday prayers. It is also common to see increased travel around churches on Sunday mornings. There are many other considerations that could be taken into account when the socio-cultural needs of religious participants transcend into travel needs.

Education

Also, regarding education, nearly twice as many Singaporeans have university degrees than in 2000. (11.7% vs. 22.8%). This trend is expected to continue, as Singaporeans continue to place an emphasis on education, and the government holds education and higher education as a pillar of focus for the future of Singapore. With this in mind, travel patterns to polytechnic schools, and universities such as NTU, NUS, STUD, SMU and others should be minded and should be expected to increase in the future. Also, transportation planners may be involved in site suitability issues for future universities, if the demand for higher education (and especially the likely future attraction of overseas students) increases.

Households and nuclear families

There are 1,145,900 households in Singapore, up from 915,100 households in 2000. The average household size has decreased slightly from 3.7 people in 2000 to 3.5 people in 2010. Even among Singaporeans, the percentage of no-family nucleus households has risen from 12.4% to 17.1% in 2010. Of households, 69.8% are headed by a couple, a 4.2% drop since 2000. For travel purposes this may indicate that there may be fewer homes with two drivers, less spousal coordination of rides and errands, and more solo decisions of where to live, instead of decisions that regard distance and convenience to work places, and in some cases, schools. Singaporeans are known to move often (personal correspondence). The homeownership rate has decreased from 92% to 87.2%. Singaporean neighborhoods are generally mixed in terms of age, ethnicity and other variables.

International migration

Singapore accepts professionals from many countries. Foreign workers are often from Malaysia, Indonesia, Bangladesh, India and the Philippines.¹¹ Non-Singaporean residents make up about roughly 25.3% of the Singaporean population (2009) As of June of the respective years, there were 184,500 (2010) and 192,300 (2011) Singaporeans living outside of Singapore for 6+ months in the past 12 months. Most Singaporeans living abroad are between 20 and 54 years old. As mentioned, there is a majority of girls from age 15-39 (with a spike at college age) as the majority of overseas Singaporeans. From ages 40-beyond, however, the majority is with the male population.

⁷ Information added by Tuan Yee Ching

PART 3: SOCIAL CAPITAL

Why Social Capital? We believe that an important and perhaps under-investigated aspect of transportation planning is the effectiveness of transit to bring people together. Singapore is a very interesting case from which to study social capital because of the geographic area of the country (everyone can be accessed under two hours' time, with a mean time under one hour) and because of the long-lasting social ties in Singapore—as only 150,000 or so Singaporean citizens are currently overseas, leaving those who were raised in Singapore as still accessible for colocation and meetings. This may seem like a trivial point, but compared to other countries, where family members and friends live hours away, the Singaporean social network would seem to have fewer geographic constraints imposed on the harnessing and upkeep of an individual's social capital. HDB has conducted a study on trust networks and social networks in Singapore (focusing on *Informal ties* which involve family members, relatives, friends, neighbors and colleagues⁸) and more information on this topic can be found in the academic research sphere. (See the work of Vincent Chua⁹ for an example).

Spatial Social Capital? How much of one's social network is located in their own estate, block, or planning district? How geographically diverse are social networks? Or, how easy is it to meet with members of one's social network? (Perhaps in a convenient third place) How do we measure the 'ease' or 'convenience' or 'accessibility' involved in meeting those we care about and/or those with whom we want to strengthen a relationship?

We can look at some aggregate statistics under the heading of **Visiting Parents and Parents Visiting** where 96.7% of married children who lived in the same estate or nearer visited within a month, as opposed to 85.6% of married children, who must visit from elsewhere in Singapore. When parents lived 'elsewhere' in Singapore 87.4% of married children visited within the month, vs. 96.4% when parents were in the same estate or closer, or 92.2% when parents were in a nearby estate. (The age of the children is also a factor in determining the likelihood of a visit to grandparents: as children get older, the likelihood decreases. Yet, for married couples without children, the rate of visiting is still high at nearly 94%—which drops to 87.3% with eldest children in their teenage years, and down to 83.8% with eldest children over 21 years old. This phenomenon may be due to the demanding nature of school and activities for students above 12 years old in Singapore, and that as grandchildren age, grandparents age as well and may not be alive. Or, perhaps grandparents are more likely to see their families in third places, or at the home of the children and grandchildren.) (See Appendix for tables)

Mobility and wealth While proximity seems to play a significant role, it could be that wealthier Singaporeans live in more 'central' (aka areas with high accessibility) places than others. One answer is evident from the visiting patterns of Singaporeans to their parents or children: Older residents making \$5000 or more per month are more likely to visit their married children (97.6%) at least once

⁸ Public Housing in Singapore: Well-Being of Communities, Families and the Elderly. 2010 Research and Planning Department Housing and Development Board

⁹ V Chua: *Social capital and inequality in Singapore*, Doctoral Dissertation, Department of Sociology, University of Toronto, 2010 and V Chua: *Social networks and labour market outcomes in a meritocracy*, Social Networks Volume 33, Issue 1, January 2011, Pages 1–11.

per month than those making less than \$3000 (87.5% visited). Similarly, 94% of younger married residents who made \$8000 or above, visited their parents within a month as opposed to 85.1% of younger married residents who visited their parents within a month's time. This may perhaps have to do with car usage, or that low earners are busier on the weekends with making extra income. (See Appendix for tables)

How extensive is the social network of the average Singaporean? Singaporeans have an average of 61 persons in their social circle. These informal networks (aka not including business relationships) are, on average, comprised of 7 family members, 17 relatives, 24 friends who are not neighbors, 6 neighbors who are friends and 10 neighbors in general. This indicates that at least 16 (6 + 10) out of the average of 61 people in a social circle are contacts due to geographic proximity. Prior friends (here, as averaged to be 24 people) may have also been an ego's (aka the person whose social capital is being enumerated) neighbor at one point.

Two additional factors that yield bigger social circles are increased wealth and marriage. (see appendix) In fact, marriage increases the average social circle by at least 6 people, and up to 12 people when compared to the social circles of those who are widowed or divorced. Having children who are married also widens one's average social circle greater than marriage.

Heads of household less than 35 years old seem to have more social capital than older or elderly residents, who also know fewer neighbours. Elderly residents' informal network size consisted of 54 persons, which was lower than the overall average of 61 persons. Below is an example of the different 'social capital' split of individuals depending on their flat type. This table is reproduced from HDB. (Similar tables with topics: Monthly Household Income from Work, Type of Family, Type of Family Nucleus, Age, Marital Status, and Highest Education Level Attained)

Table: Size of social capital network by type of connection (rows) and housing type (columns)						
Flat Type	1-room	2-room	3-room	4-room	5-room	Executive
Family members	6	6	7	7	7	8
Relatives	12	10	16	17	19	21
Friends who are not neighbours	18	16	23	23	26	29
Neighbours who are friends	6	6	6	5	5	6
Neighbours in general	8	8	10	9	10	11
Size of informal networks(persons)	49	45	58	60	66	66

Geographic proximity of social capital may yield greater returns for some ethnic groups over others. It is unclear if there are statistically significant difference between which types of ethnic households engage in which types of "neighborly interaction", as enumerated by HDB.¹⁰ Yet, there seem to be some distinct trends: for example Chinese are least likely to exchange suggestions or advice, visit one another, keep watch over each others' flats, or exchange food/gifts on special

¹⁰ *Public Housing in Singapore: Well-Being of Communities, Families and the Elderly. HDB Sample Household Survey 2008.* Copyright 2010 Research and Planning Department Housing and Development Board ISBN 978-981-08-5112-5 <http://www.hdb.gov.sg/fi10/fi10320p.nsf/w/PublicationForSale?OpenDocument>

occasions. This may be for cultural reasons, or because those of the Chinese ethnicity prefer to engage in these interaction activities not with neighbors, but with friends or family. On the opposite end of the spectrum, those of the Malay ethnicity are most likely to exchange food/gifts with their neighbors on special occasions, exchange advice with their neighbors (59% do this as opposed to only 33.3% of Chinese), visit one another, or keep watch over a neighbor's flat.

Physical living arrangement refers to the geographical proximity between the parents' and their children's residence. About 36% of younger married residents live in the same flat or in close proximity to their parents. This figure has increased recently, perhaps due to Singapore's Married Child Priority Scheme—an initiative to offer financial incentives to older children who live near their aging parents.

We also see evidence of increased mobility even in the past decade. For example, HDB reports that there is less desire for elderly parents to live close by. In 2003, 44.7% of parents lived "elsewhere in Singapore" (aka not in the same estate or a nearby estate), whereas only 11.4% preferred that this was the case (the remainder preferred that the parents lived closer). In 2008, a similar percentage, 45.1% of parents lived "elsewhere in Singapore" but more than double of respondents (29.3%) said that this was preferred, over having the relatives closer. This desire has declined even though elderly parent-child meetings are more frequent, elderly parents watch their grandchildren 50% more often in 2008 than 2003 (29.6% in 2008 vs. 19.7% in 2003). (Source HDB¹¹)

Meeting Places

The most popular activities for Singaporeans, shopping for leisure (44.6%) and eating out¹² (39.1%), are many times conducted internally with the residents' neighborhood (39.2%), town or town center (31.0%) or CBD/downtown (19.2%).¹³ Nearly 70% of these activities include family members, or include friends (17%).

Places where neighbors meet: Only 4.8 report that they meet their neighbors for interaction at food places (2.6) and shopping/entertainment areas (1.0%), less than 1/4th of socialization that occurs among neighbors at bus stop/Interchange / MRT station (4.2%). The majority of places where neighbors meet seem to be in passing, such as lifts, walkways, and corridors and void decks. These latter types of "third places" are not conducive to seated, longer conversations and socializing, but geared more towards short discussions and exchanges of pleasantries. **(Number of responses* 2,217,636)**¹⁴

Usage of Social Facilities

¹¹ *Public Housing in Singapore: Well-Being of Communities, Families and the Elderly. HDB Sample Household Survey 2008.* Copyright 2010 Research and Planning Department Housing and Development Board ISBN 978-981-08-5112-5 <http://www.hdb.gov.sg/fi10/fi10320p.nsf/w/PublicationForSale?OpenDocument>

¹² These places include hawker centers/ coffee shops/ food courts eating houses, food centers, but not restaurants explicitly.

¹³ *Public Housing in Singapore: Well-Being of Communities, Families and the Elderly. HDB Sample Household Survey 2008.* Copyright 2010 Research and Planning Department Housing and Development Board ISBN 978-981-08-5112-5 <http://www.hdb.gov.sg/fi10/fi10320p.nsf/w/PublicationForSale?OpenDocument>

¹⁴ *Public Housing in Singapore: Well-Being of Communities, Families and the Elderly. HDB Sample Household Survey 2008.* Copyright 2010 Research and Planning Department Housing and Development Board ISBN 978-981-08-5112-5 <http://www.hdb.gov.sg/fi10/fi10320p.nsf/w/PublicationForSale?OpenDocument>

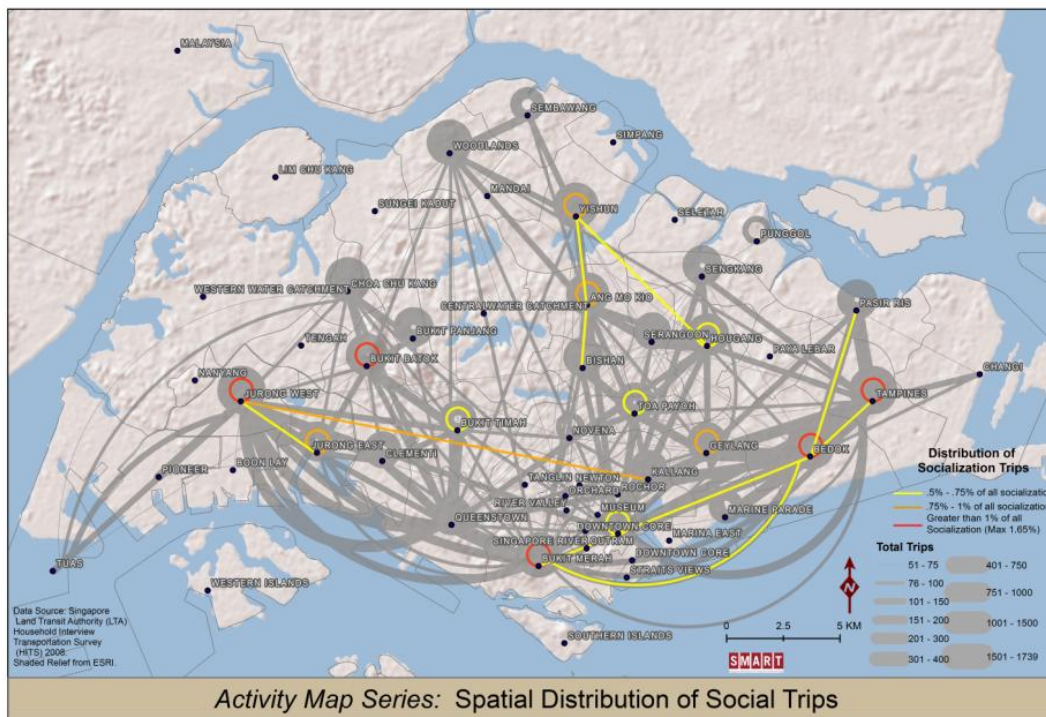
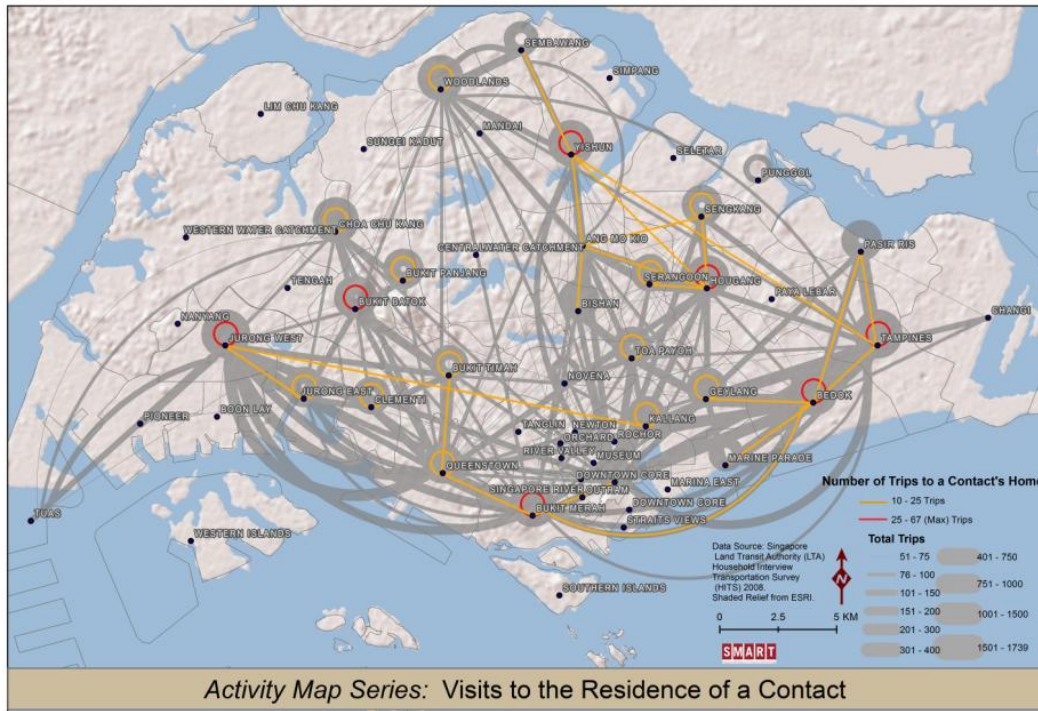
Percent of households using facilities at least once a week by household life-cycle stage

	Family Without Children	Family with Young Children	Family with Teenaged Children	Family with Unmarried Grown-up Children	Family with Married Children	Elderly Couples Living Alone	Non-Family Households
Shops	62.3	66	62	56.7	64.9	46.7	49.3
Hawker Centers	62.2	61.7	57.9	57.4	53.4	45.4	58.6
Eating House/Coffee Shop	68.7	62	59.1	58.3	57.3	50.2	57.7
Food Court	55.3	53.9	43.8	42.3	43.9	25.6	33.1

Source: Housing Development Board (HDB) Public Housing in Singapore: Residents' Profile, Housing Satisfaction and Preferences. HDB Sample Household Survey 2008. (<http://www.hdb.gov.sg>)

There are a number of patterns found in the usage statistics of estate facilities. Elderly couples living alone seem to patronize meal and shop facilities less often than families in other life cycle stages. Young couples also seem to patronize meal and shop facilities more than other groups, especially coffee shops or eating houses. Shopping seems to be a popular pastime for families with young children, as well as families with married children (perhaps some of these are grandparents). Non-family households patronize hawker centers and eating houses or coffee shops similarly as those with families, but food courts are not as popular as of destination for non-family households. In all, over time, there has been a declining trend for HDB shops and hawker centres and increasing trend for eating houses/coffee shops/food courts.

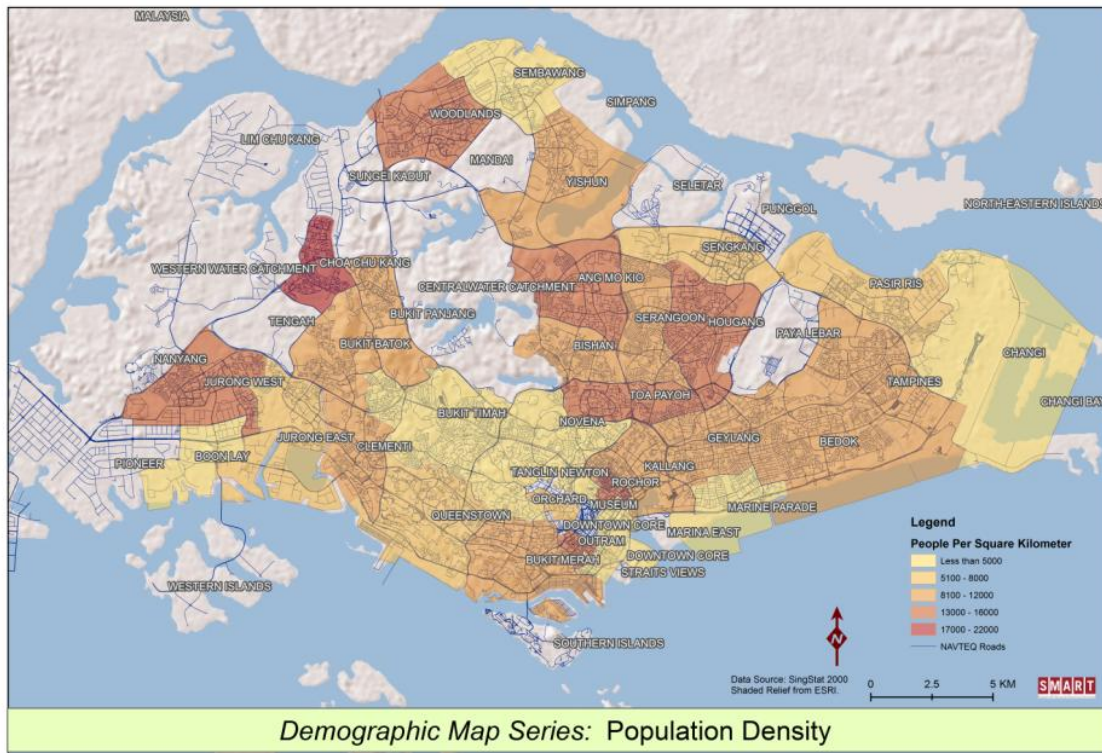
Visiting the residence of a contact is also a way to socialize. Below, we can see the kinds of spatial trends unearthed by the HITS 2008 survey, when trip purpose was listed as visiting the residence of a contact. Most times, these visits take place in internal districts, or to neighbor districts. However, we see trips joining Tampines to Yishun, Bukit Merah to Bedok and Jurong West to Kallang. Below, the distribution of all social trips in Singapore looks quite similar.



PART 4: NEIGHBORHOODS

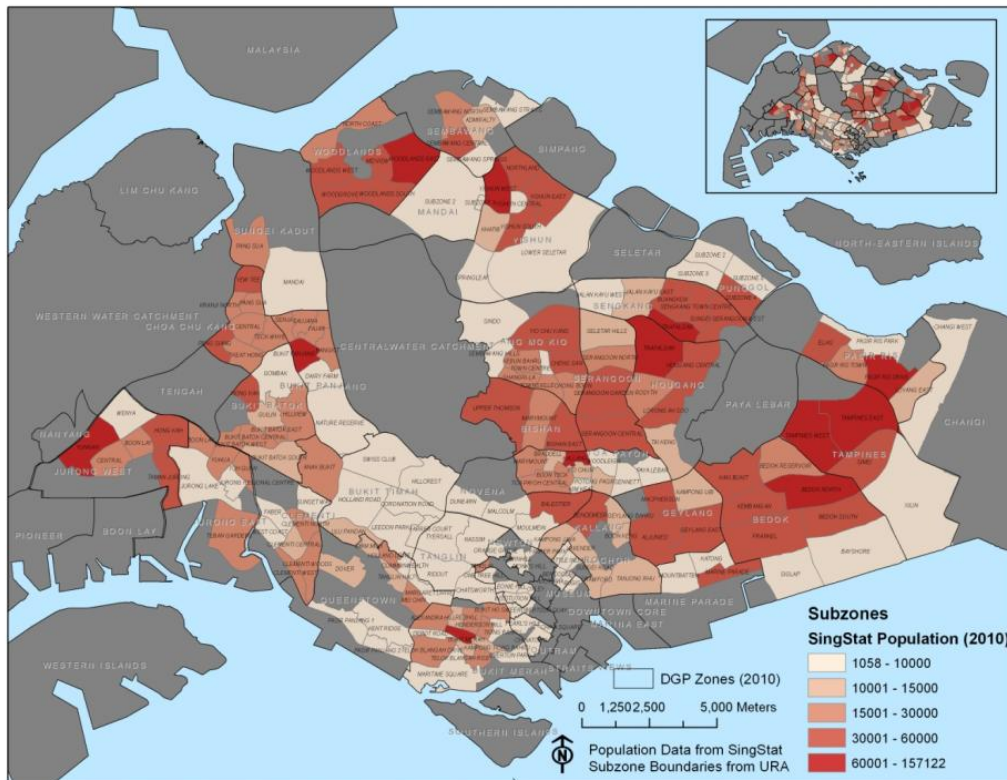
Residential neighbourhoods are divided at the highest level into 55 planning zones called DGP (Development Guide Plan) zones. The 55 Planning Districts are used by Singapore's Urban

Redevelopment Authority (URA) and Land Transit Authority (LTA) to delineate cohesive regions of interest for planning endeavours.



Residential population density by DGP planning district. DataSource: SingStat 2010

Where do Singaporeans live? The following figure shows the population distribution of Singapore from SingStat Subzone level population data (2010).



Population of Singaporean Residents by Census Subzone. (Source: SingStat 2010)

The planning districts of special interest for demographic composition include the following:

Bukit Timah, Tanglin, Orchard, Newton, River Valley and Novena: This area is dominated by car usage and greater average income, education and professional status. This area is also most likely to have landed houses or condos.

Rochor and Kallang: These areas, especially Rochor, have a significant Indian population. Along with Outram and Downtown Core, Rochor has the highest percentage of elderly population, at close to 20% of Singaporean residents. Kallang is located to the east of the Downtown Core.

Outram: This has a high Chinese population, as well as a high number of low-income populations and 1-2 room HDB flats. There is much cultural and historical heritage in this ‘Chinatown’ area, as well as many tourist attractions.

Woodlands and Sembawang and have a Malay population that is typically higher than expected. These areas are also high-MRT users, and have commuters with long commute times, but also produce many internal flows.

Jurong West: This mixed area is home to many industrial workers who commute to Tuas and Pioneer mostly by company bus.

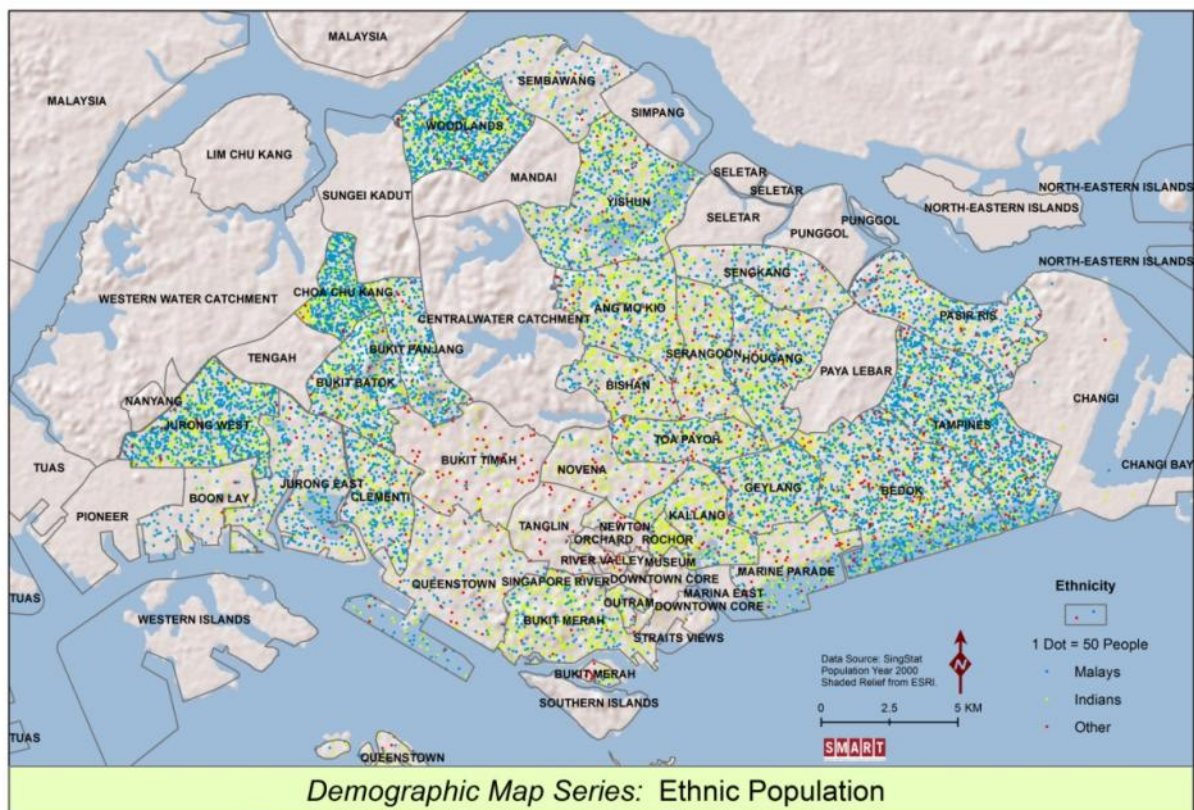
Punggol: This new development is home to many young families and couples—which follows a general pattern of increasing youthfulness in new developments away from the Central Area. The elderly population is the lowest of any district at 4.8%. The percent of the population that is

employed is very high, and 4/5 bedroom HDBs dominate the landscape. Additionally, Light Rail is a popular form of transportation here.

Ethnicity

The figure below shows the generalized spatial patterning of ethnic groups by DGP in Singapore according to data compiled by SingStat. In this map, dots denoting 50 people are placed randomly within the district of their home, therefore the absolute location is not precise, but the location within district boundaries is indicative of the member's home. Members of the Chinese ethnicity are not included here because their numbers are especially high, and spread generally equally throughout Singapore. One region, however, that houses a disproportionate number of Singaporeans of Chinese ethnicity is the Outram Region, next to the Central Business District (CBD). This region is home to Chinatown, the prosperous historic district, yet the residents of this area have some of the lowest income values in Singapore.

Overt policies for ethnic integration In *Public Housing in Singapore: Well-Being of Communities, Family and the Elderly* (2010) The Housing Development Board (HDB) makes explicit statements that ethnic enclaves are not a favored outcome in the planning process. The HDB has written that "...care has been exercised in policy formulation to prevent racial enclaves through the Ethnic Integration Policy, and the grouping of income segments through the offer of different flat types within a precinct. Despite that, some residents may choose to socialise with a fairly homogeneous group, which may have an impact on shared goals. Ultimately, residents would be more willing to act together as a cohesive group should communities organise themselves around shared goals." (Page 15)

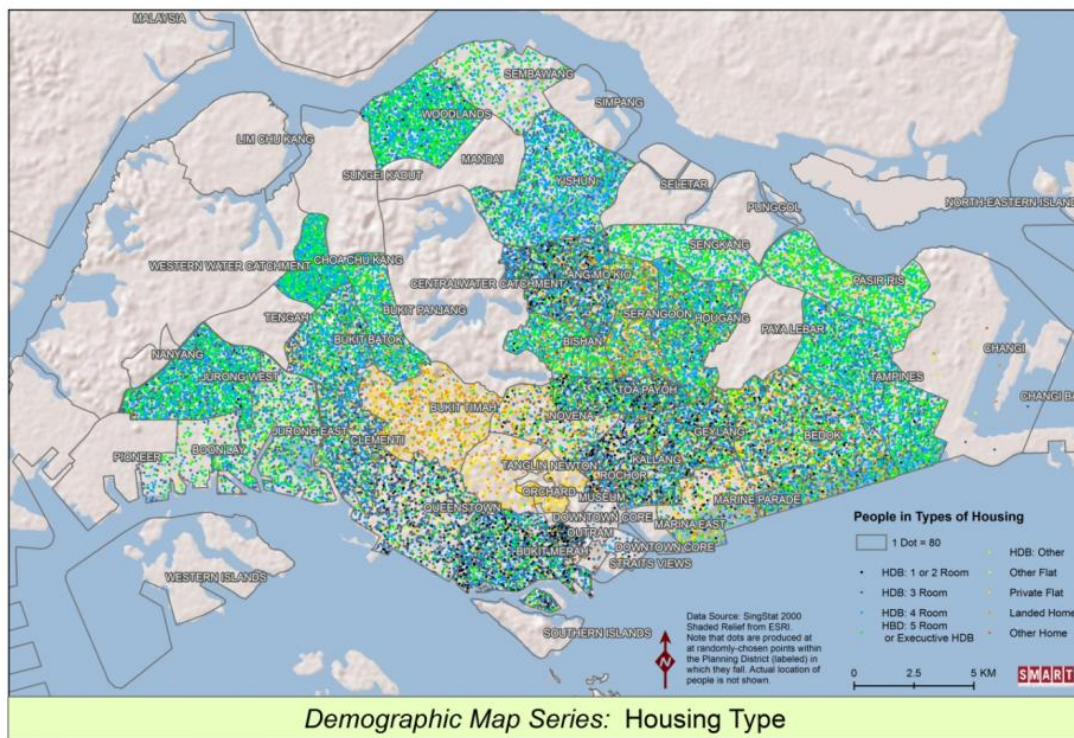


Housing

Singaporean residents typically live in Housing Development Board (HDB) sponsored locations. 82.4 percent of Singaporeans live in HDB dwellings (although this number was higher in 2000 at 87.8%). The percentage of people in each type of dwelling is as follows: 4.6% live in 1-2 room flats, 20% live in 3 room flats, 31.9% live in 4-room flats, 25.6% live in 5-room and executive flats, 11.2% live in condominiums and private flats, 5.7% live in landed properties.

With regard to the HDB living environment, residents' top three most-liked aspects were the *Location of their flat/neighbourhood*, *Transportation Network and Provision of Estate Facilities*. However, location of the flat/neighbourhood was overwhelmingly the most popular aspect of a home.¹⁵ Reasons for moving (below) can differ based on the **type of destination flat**:

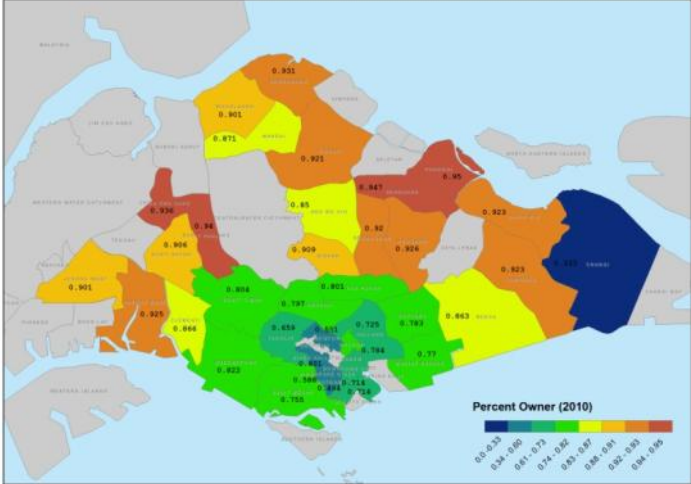
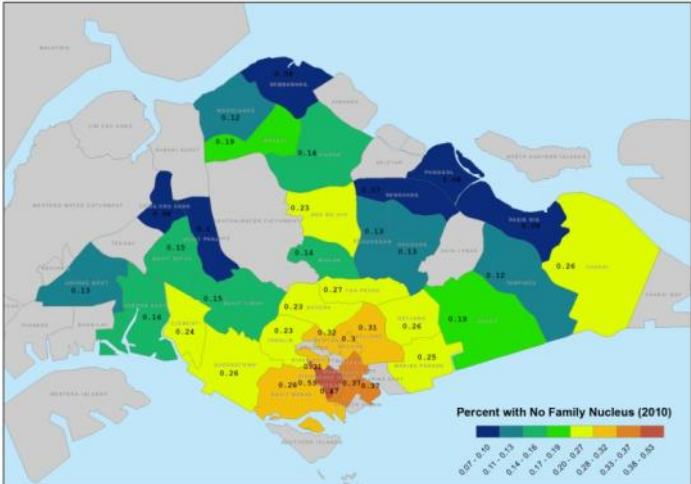
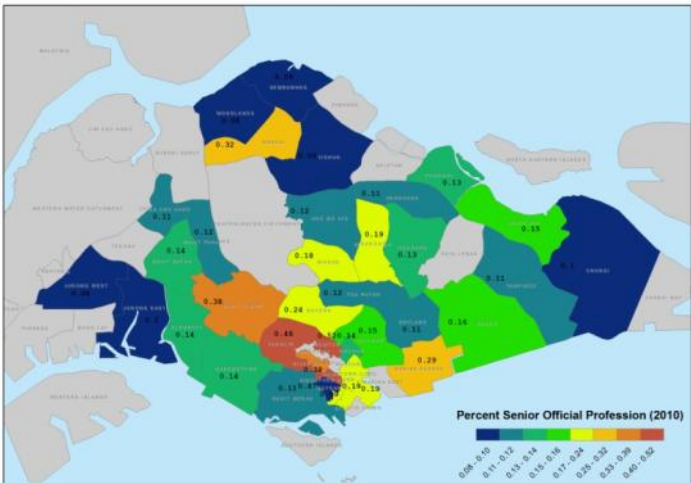
- **Bigger flat:** individual preference or increase in family size/income. better accessibility to their work place or a more conducive/cleaner environment.
- **Lateral flat:** better accessibility to their places of work, a more conducive/cleaner environment or more facilities.
- **Smaller flat:** affordability, preference for smaller flat types and better accessibility to their places of work.¹⁶



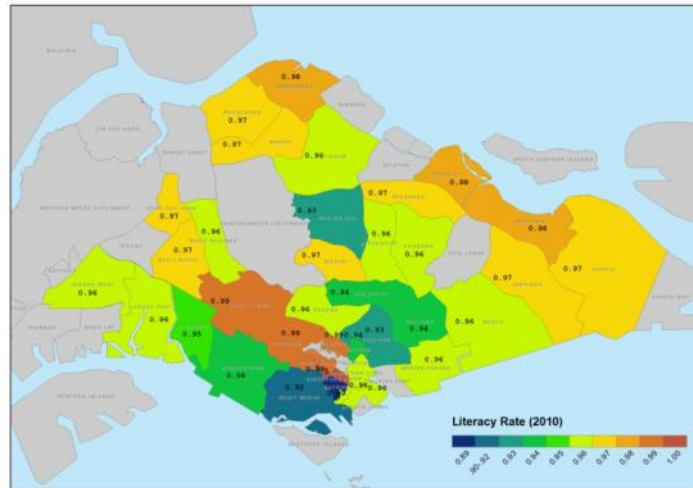
¹⁵ Housing Development Board (HDB) Public Housing in Singapore: Residents' Profile, Housing Satisfaction and Preferences. HDB Sample Household Survey 2008.

¹⁶ Ibid.

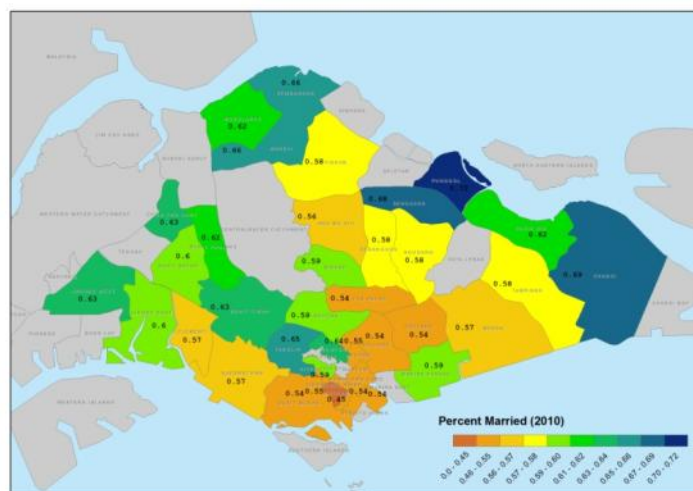
Neighborhood Variables

Social Variable	Spatial Representation
<p>The home ownership rates are less (40-60%) in smaller zones near the CBD, than in high ownership regions such as Punggol and Sengkang, Choa Chu Kang and Bukit Panjang. (reaching 95%) Areas with high ownership rates are typically those with mostly HDB flats. Condos near the Singapore River seem to be a source of low ownership in the River Valley and Singapore River Areas.</p>	 <p>Percent Owner (2010)</p>
<p>The percentage of households with a family nucleus is found to be high areas with high ownership rates, including Punggol, Pasir Ris, Sembawang, and Choa Chu Kang; and nucleus rates are lower when nearer to the downtown core, where up to 53% report having no family nucleus.</p>	 <p>Percent with No Family Nucleus (2010)</p>
<p>In Tanglin and Newton 46% and 56% of Singaporean workers are listed as senior office professionals, whereas in Jurong and the Northern districts (as well as Outram) this number falls below 10%. The Tanglin and Newton areas (as well as Bukit Timah to the Northwest) are also the most likely to be home to residents who use a car to get to work. Areas such as Marina Parade and Novena also have nearly 30% and 25% (respectively) of workers in senior positions.</p>	 <p>Percent Senior Official Profession (2010)</p>

The **literacy rate** in Singapore, among Singaporeans, ranges from 89% in Outram to .99 in Bukit Timah, Tanglin, River Valley and Newton. These high-professional areas do not, however, have significantly higher literacy rates than other areas, notably Sembawang and northern areas, and Punggol and Pasir Ris in the Northeast. Ang Mio Kio, Geylang, and Bukit Merah have relatively low rates (92%-93%). It's important to note that neighboring countries Malaysia and Indonesia have significantly lower literacy rates than all of Singapore.



The **average percent married** is highest, unsurprisingly, in the Punggol region, and neighboring Sengkang. The Tanglin area, as well as areas in the north also have high percentages of married residents. (As does Changi, although this region represents relatively few people.) Lower numbers are found near the Downtown Core to Kallang and up through Toa Payoh.



EDUCATION

Singaporeans in the Singapore River planning area are most likely to have attained a post-secondary education (86%), followed by Tanglin (85%) and Newton (84%). The smallest percentage of resident attaining the highest level of education can be found in Rochor (41%), Bukit Merah (41%) and Outram (30%).

LANGUAGE

Districts Tanglin, Singapore River, Bukit Timah, Newton and River Valley have the highest percentage of Singapore residents who primarily speak English at home (67 - 75 %). In the following districts, English was spoken most frequently at low rates: Woodlands (23%), Jurong West (20%) and Outram (16%).

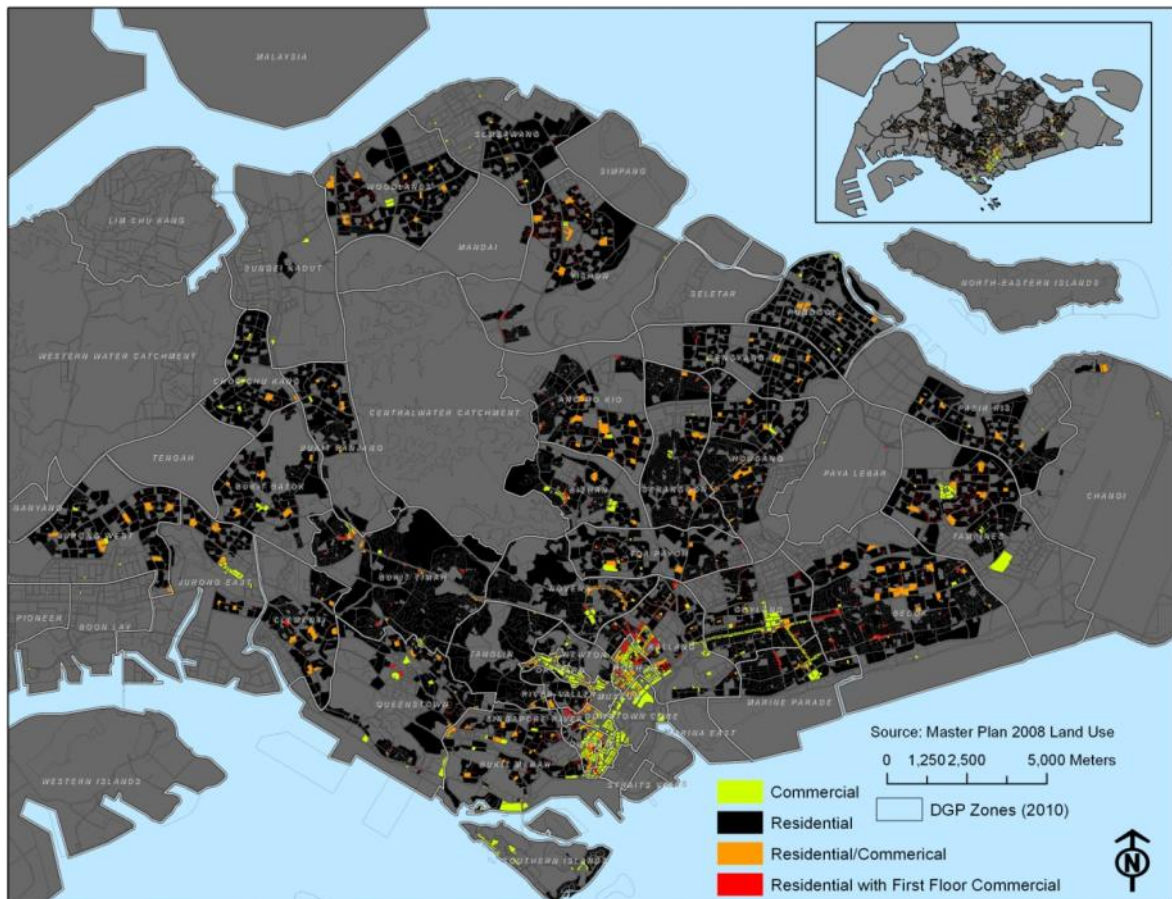
Relationships between variables

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<p>PERCENT HDB vs. AVERAGE INDIVIDUAL INCOME We find a general downward trend in the district's percentage of residents who live in HDB housing and the average individual income of residents in the districts. The more income the resident makes, the less likely he/she lives in a district with mostly HDB housing.</p>	
<p>PERCENT OWNER vs. HDB SIZE The size index for HDB residents (see neighborhood indicators methodology) is generally larger in districts where most residents own their flats. Smaller flats are generally found in districts where the ownership rate is lower. This points to a phenomenon where if residents can afford bigger HDBs, they also invest in buying the HDB instead of renting.</p>	
<p>PERCENT OWNER vs. PERCENT UNIVERSITY EDUCATED As the percent university educated increases in the district, the likelihood of the resident owning their home property decreases. In fact, there seems to be two groups of districts: high ownership and low percent university educated, and low ownership, high education. The two outlying points represent Little India and Chinatown areas.</p>	
<p>PERCENT OWNER vs. FAMILY NUCLEUS Although the downward trend between percent ownership and percent university educated is not clearly linear, there seems to be a clearer exchange between ownership and the presence of a family nucleus. The regions with high percent of families with a core nucleus are also likely to have high ownership rates. As 'no family nucleus' percentages increase, ownership decreases.</p>	

PART 5: COMMERCIAL AREAS

Commercial Outlets



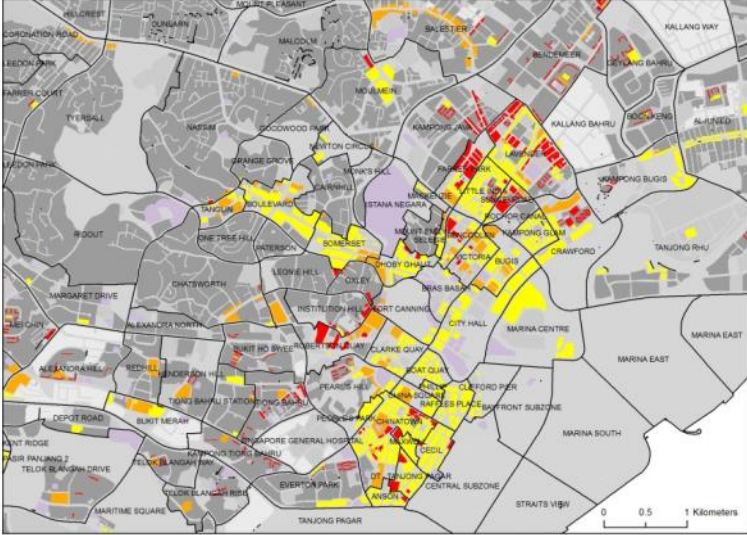

Commercial areas play a very important role in Singaporean culture, recreation, and social life. Therefore, commercial accessibility is an important measure of attractiveness of certain places, and a predictor of ease of travel to certain target destinations. Three types of commercial are used in this analysis, *Commercial*, *Commercial/Residential*, and Residential with *First Floor Commercial*. Each is taken from the 2008 URA Master Plan Land Use coding system. (Types of categories can be found in the appendix.)

Commercial Centers

In the following maps, yellow areas denote commercial zones, orange areas denote residential/commercial mixed zoning, and red denotes residential with first floor as commercial (a popular phenomenon, as most HDB blocks have at least one Hawker Center or set of small shops on the ground level of one of the block's HDB buildings). Dark grey represents residential zones, and light purple areas are zoned for community centers.

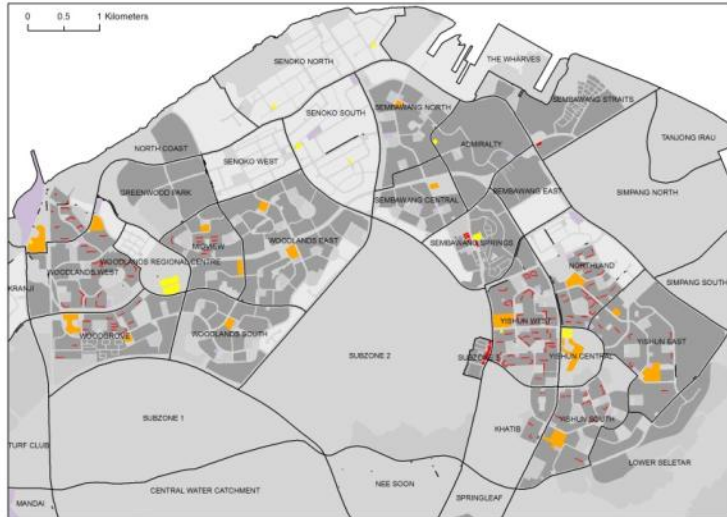
It is with these visualizations that we begin to note the differences in hierarchical patterns in commercial placement and nesting. HDB plans the location of commercial activities based on the

hierarchical town centre / precinct / neighbourhood model. New towns like Woodlands, Sembawang, Tampines and Jurong may display similar hierarchical patterns. Built in a later phase, new towns such as Sengkang and Punggol may display a slightly different hierarchical distribution pattern.¹⁷

AREA	MAP
<p>The downtown area has a high density of commercial. Five major areas are highlighted here, Chinatown, the CBD, Clarke Quay (Boat and Roberston Quays as well), Little India and Orchard Road. Little India (Rochor) and Chinatown are home to the most one and two bedroom flats, and the citizens with the lowest income in Singapore.</p> <p>Some high rise condominiums around Clarke Quay, Orchard Road and Marina Bay (CBD) house relatively few people, but have the highest rent prices in the city.</p>	
<p>The residential areas with the fewest intermixed commercial zones are north and west of Orchard Road and surrounding the Botanical Gardens. These neighborhoods (such as Newton, Tanglin and Bukit Timah) are known for the highest level of car ownership, as well as the highest income and percent “other” ethnicity. These areas contain a relatively high percentage of landed houses.</p>	

¹⁷ Information added by Tuan Yee Ching

The Woodlands, Sembawang area, at the Northern tip of Singapore, exhibits a nested hierarchical pattern of commercial types. The first-floor commercial residential zones are easily accessible. The residential/commercial areas are fewer and more spread out. Finally, the large commercial-only zones are found less frequently.



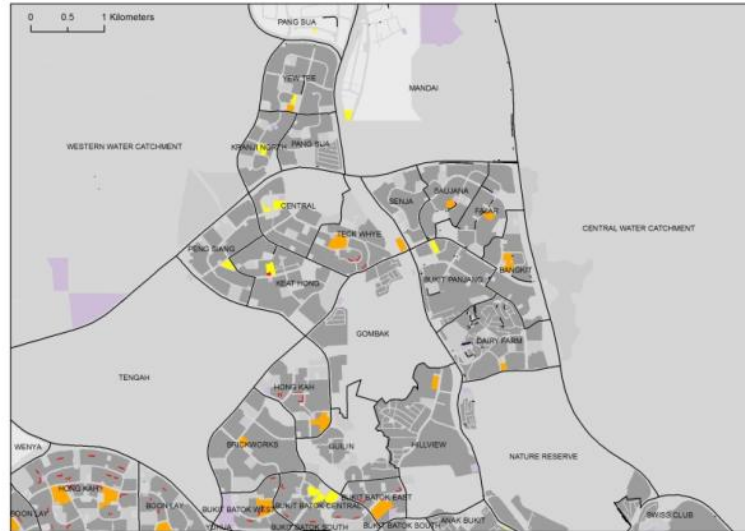
Tampines, a high-density residential area, also exhibits a nested hierarchical pattern of commercial types with first-floor commercial clustered near the large commercial center (yellow), and commercial/residential areas spread out around the district.



The East-West residential pattern in Jurong West also shows a hierarchical pattern of many small first-floor commercial zones (in red), intermittent orange zones, and a larger commercial zone cluster to the East. This yellow center is a large shopping mall.



Commerical is dispersed in the older neighbourhood of Yew Tee.



The patterns of commercial and commercial/residential zoning are a bit different in the Toa Payoh area, home of the oldest inhabited HDB neighborhoods in Singapore. Here, it is clear that residents are close to commercial in the dense Toa Payoh zone, but moving out to Serangoon (or West to Mount Pleasant or Malcolm) the distance to commercial decreased markedly.

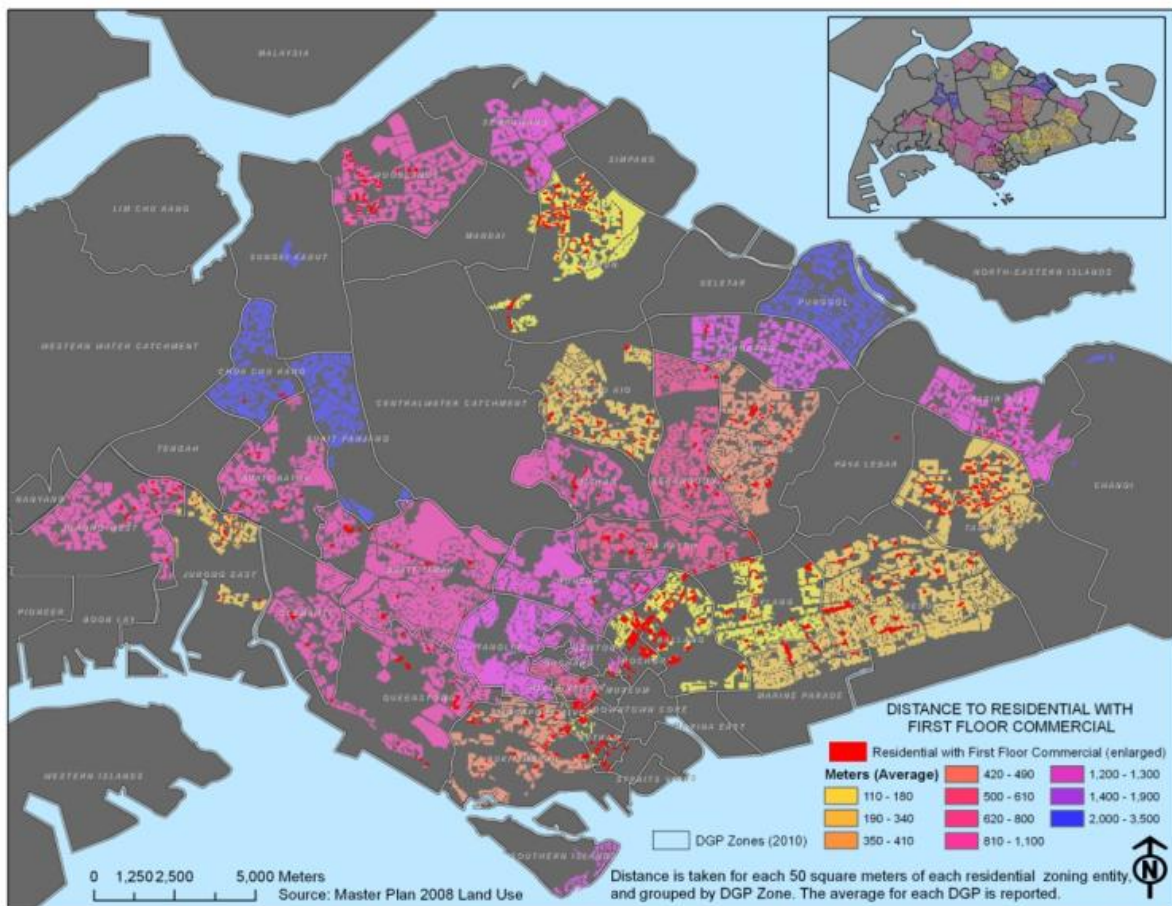


Distance to Commercial

Residential zones in planning districts have different access to commercial areas. Below, we describe three types of commercial areas, and each district’s access to these areas. Each distance value is created in the following way: Residential zoned areas are converted to rasters with 50 square meter resolution. For each raster cell, the Euclidean distance to the nearest commercial cell is recorded. The residential cells with the corresponding distance measures are grouped by district and an average district distance is reported.

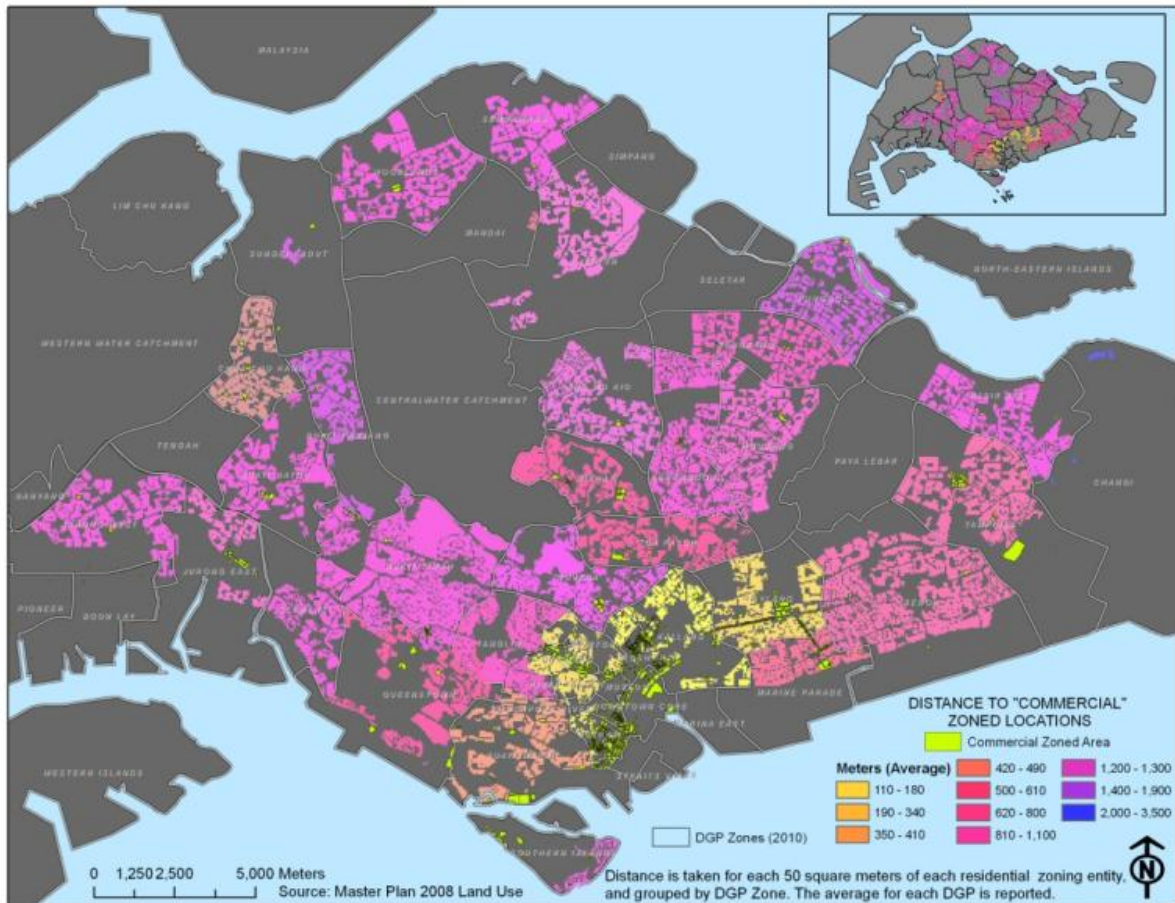
First, different communities have varying levels of accessibility to residential buildings with **first-floor commercial**. These types of first-floor commercial zones are important in Singaporean culture, as they are found prevalently in HDB blocks and estates, but typically represent the classic Singaporean shop house, where residents lived above their first-floor shop. Because of the small zoning footprints of the first-floor commercial, we can expect a relatively dense landscape in these neighborhood streets, perhaps offering food, home wears, clothing or other products. (In addition, in some cases, these types of micro commercial areas are many times marked with restored facades from historical

preservation efforts, or decorated traditional facades that architecturally-enrich the landscape.) The areas with residential that is closest to many of these areas is Outram (and Downtown Core), followed by Geylang, Rochor and Kallang, and Yishun in the north. Here, first floor commercial can be found within 180 meters. The furthest residential areas from first floor commercial are Punggol/Sengkang, Choa Chu Kang, and Bukit Panjang. (Ranging up to 3.5 km) It seems as though the older districts are more likely to be in close proximity to these properties than newer areas. There is also a relatively longer distance from the Tanglin area to first-floor residential, where there are very few zoned first floor areas in Tanglin and Novena to the north. In Tanglin, with mostly private housing, commercial activities are more historic and unplanned, and therefore this type of neighborhood lies in a different category than the HDB new towns with heavily planned zoning.



Distance to Commercial (commercial-only) zones shows a slightly more ‘smoothed’ picture, where all locations are within 2KM of commercial-only zoning. Commercial only can represent shopping malls, stand-alone stores (such as IKEA), grocery stores or any other free-standing buildings such as restaurants. These areas are found often in the CBD (although office buildings are often categorized as “business” in land use codes—see Appendix for a list), and on Orchard Rd., but also in the center (or in multi-centers) of planning districts. The downtown areas, Kallang and Geylang can take advantage of these areas quite easily. In fact, in Geylang Road gives the district a lateral artery filled with a sequence of small commercially zoned areas that promote pedestrian travel in the district just as in the more typically-pedestrian friendly areas of Kallang, Rochor, Outram, Downtown Core and Orchard Areas. The remainder of districts seem to have central mall areas that are not clustered, but anchored within residential zones in the districts. As we know, the shopping mall is an important

infrastructural area for social life and recreation in Singapore due to the consumer culture and the convenience of air conditioning. In this map, note the clear division between the yellow areas toward the downtown, and the much higher average distance districts to the north and west.

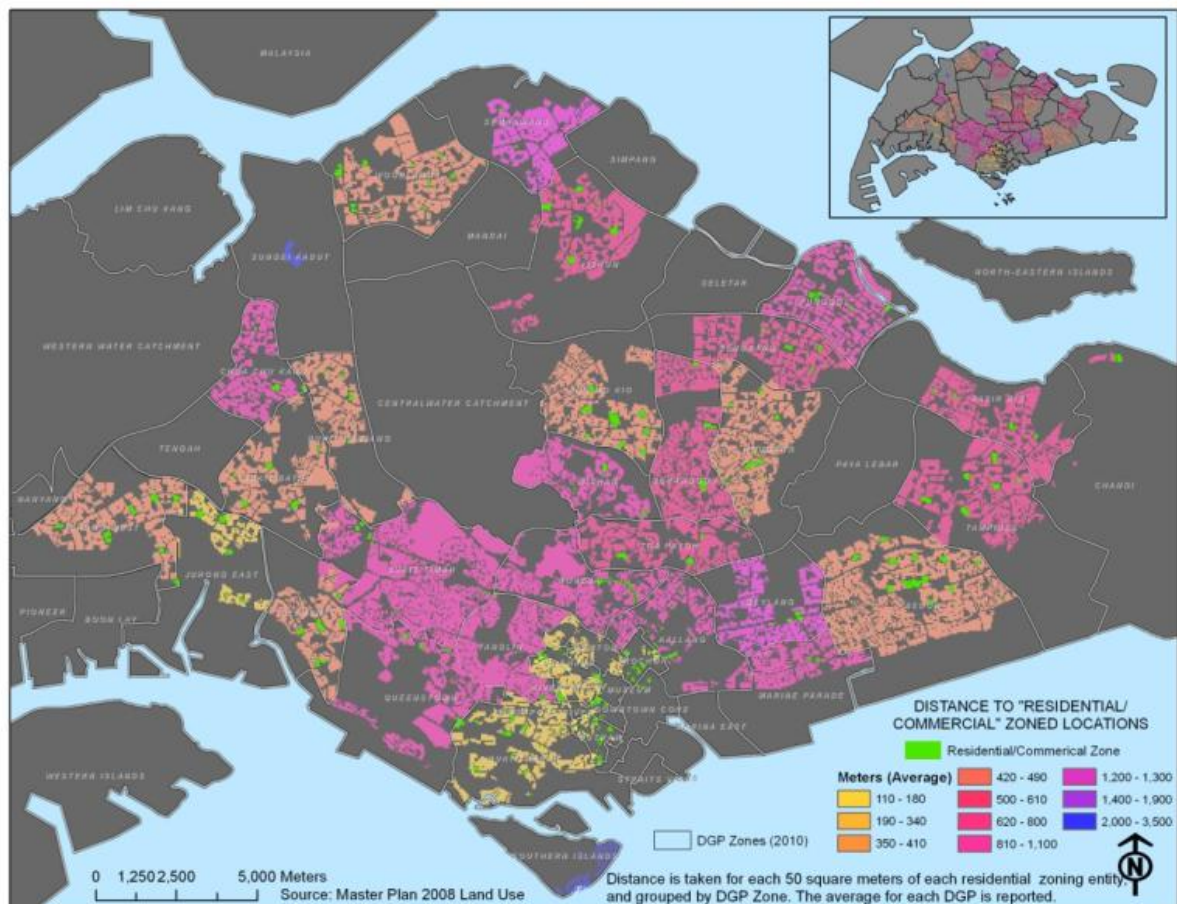


As perhaps a hybridized version of the first-floor commercial residential and the larger commercial area (such as the shopping mall or the all-commercial buildings lining Geylang St.) the **Residential/Commercial** zones are located densely in the downtown area, but also have a stronghold in almost every other district. Like the commercial zones, these zones are not likely to be clustered, but embedded within residential zones to limit the average distance from residential to commercial—thus supporting pedestrian or bus travel.

Areas such as Jurong West and especially Jurong East, as well as Woodlands, Ang Mo Kio, Hougang, Bedok, Clementi, Bukit Batok and Bukit Panjang represent typical Singaporean districts, with many HDBs and various types of workers. These areas also have the lowest average distance to the nearest commercial area at less than 500 meters. Jurong East joins the downtown core areas stretching from Bukit Merah to Bukit Timah and Rochor as having less than 400 meters to the nearest commercial. (See Neighborhood Indicators for more information) It is important to point out that the average distance to residential/commercial zones (average of all districts) is 534 meters, compared to 733 meters for commercial-only and 832 average meters to first-floor commercial residential. This indicates that the amenities of the residential/commercial areas are important to neighborhoods

because they are typically close, and what can be provided to the households at this close proximity may affect the quality of life of Singaporeans.

Also, like the commercial-only map above, note the divide between the purple areas and the yellow areas below. Although these are district boundaries (aka not created by us), they mark a major shift in the type of commercial accessibility available to residents of these districts---the northern/eastern districts (Novena, Tanglin, Bukit Timah) are more likely to have cars, while the more core districts are likely to rely on foot and bus.

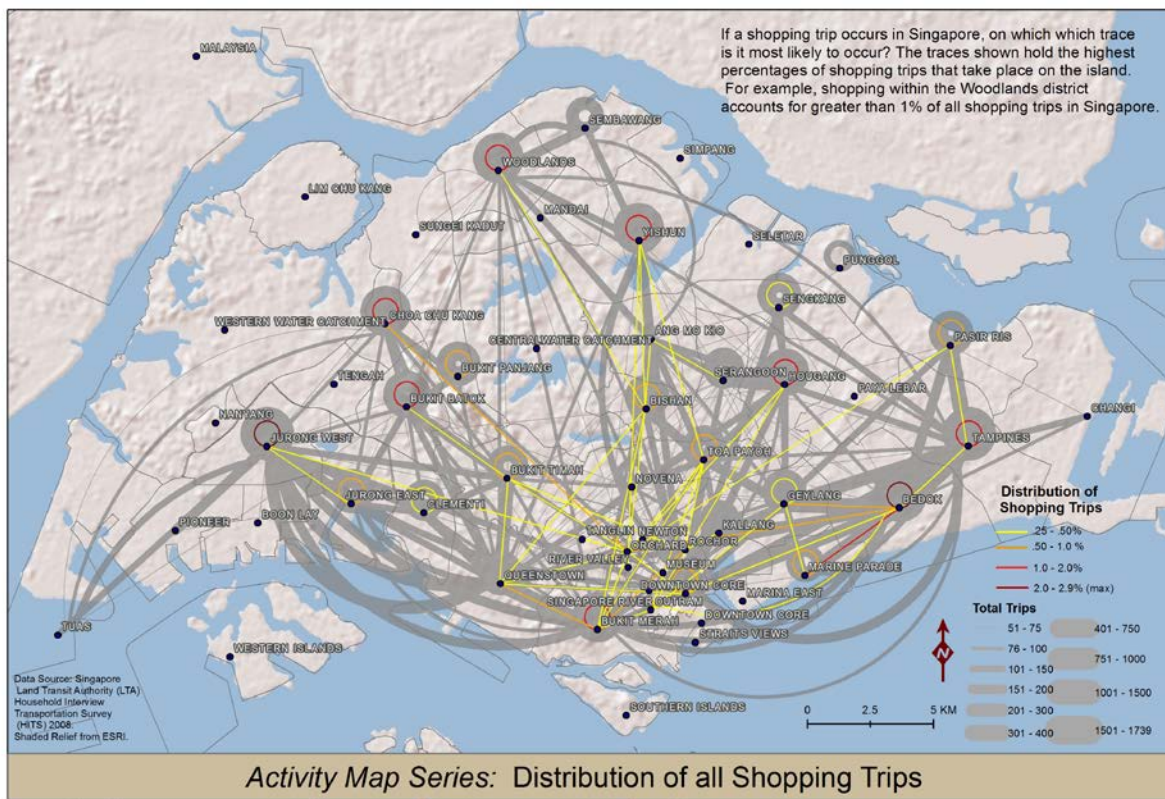
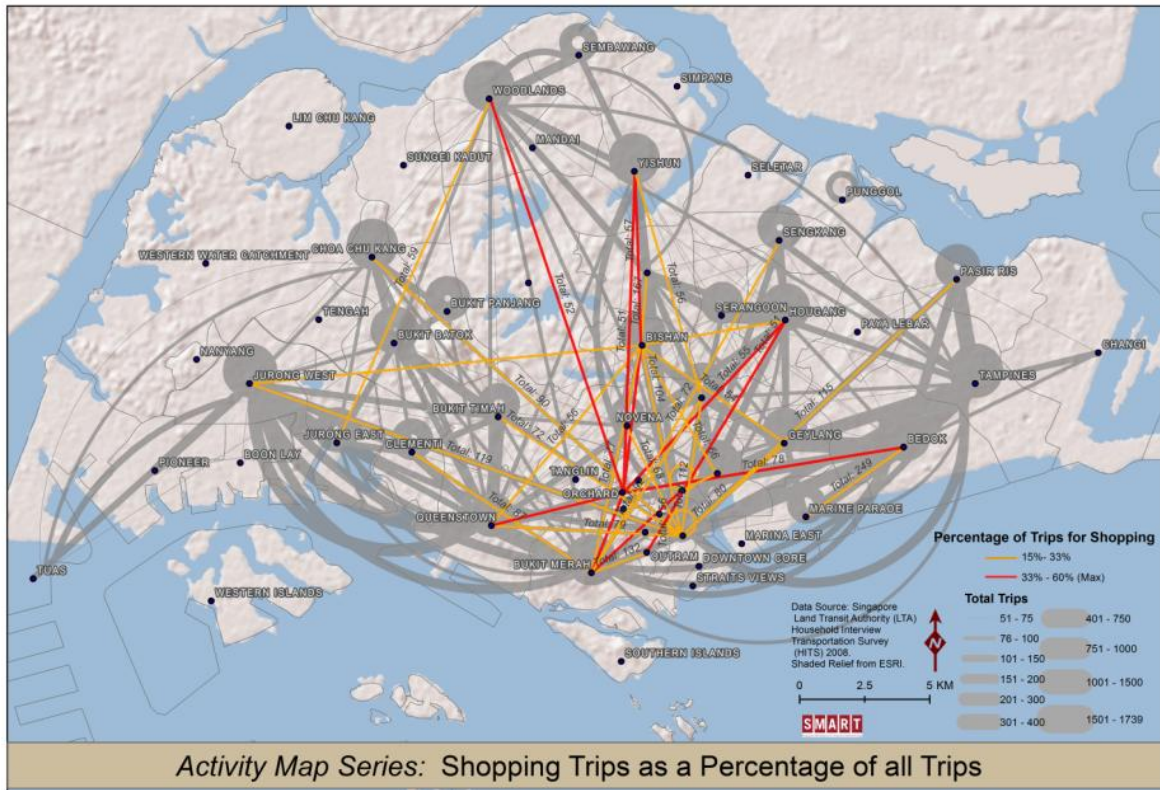


Trip Chaining

There is an overall trend of more home-based other, less non-home-based The *2004 Household Interview Survey and Stated Preference Survey HIS Final Report*¹⁸ reports a rise in home-based-other trips (22.2% of daily trips in 1991, 27% of daily trips in 1997 and 32.2% of daily trips in 2004). This trend may indicate third place prominence, as fewer home based trips are directed towards work destinations. Yet there are fewer non-home based trips, (16.7% of daily trips in 1991, 14.7% of daily trips in 1997 and 10.8% of daily trips in 2004) which may indicate fewer chained-errands. This may be due to new online or "e-tasks" such as banking, government fees, taxes, fines, etc., as well as the popular 'AXS' machine, which allow Singaporeans to access a host of services on a single machine.¹⁹

¹⁸ *Household Interview Survey and Stated Preference Survey HIS Final Report March 2005. Contact PT133*

¹⁹ From Tuan Yee Ching. For more information see: http://www.axs.com.sg/phpweb/consumer/network_axs_station.php



PART 6: MOVEMENT DETAILS

2010 Mode of Transport to Work by Housing Type Source: SingStat (2010)		
Type of Home	Predominant Mode	Percentage
Landed Properties	Cars (only mode)	60%
Condominiums	Cars (only mode)	51%
HDB 4+-room	Public bus only, or MRT only, MRT combined with something else	48-56%
HDB 1-3-room	Public bus only, MRT only, MRT combined with something else	69-62%

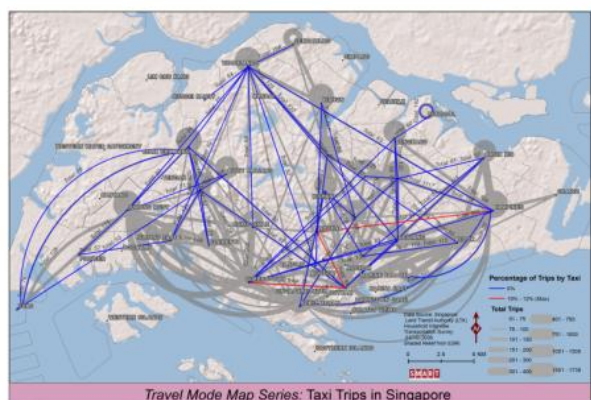
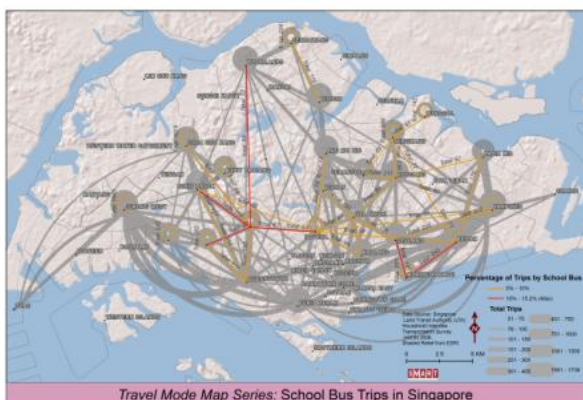
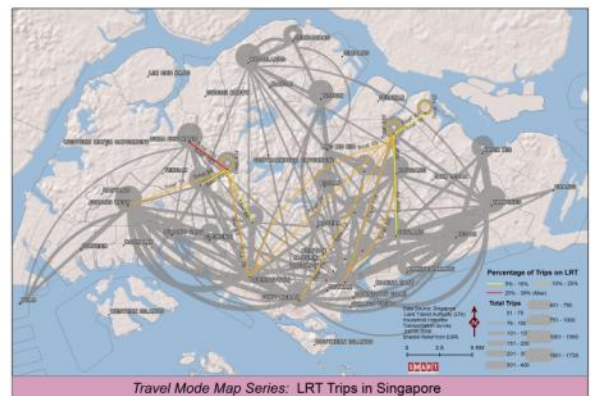
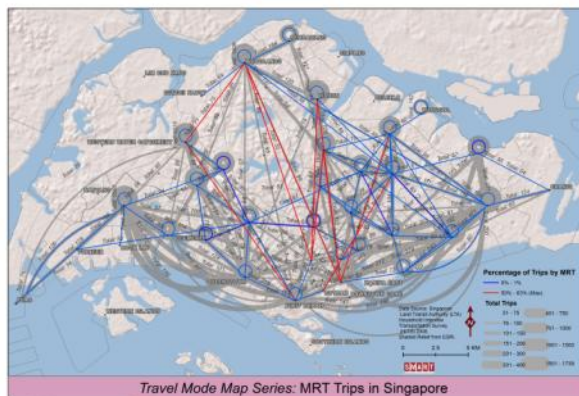
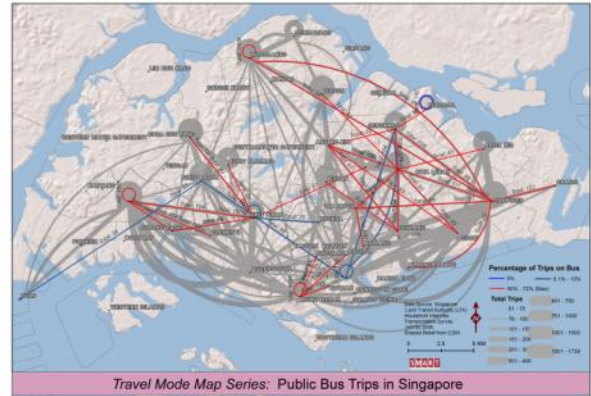
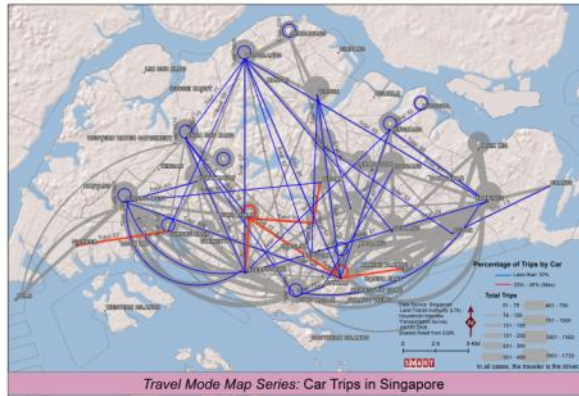
Mode Split and Travel Time

According to SingStat²⁰ the 2010 median travel to work time was under 25 minutes from the **Downtown Core, Outram, Newton, River Valley, Tanglin, and Changi** districts vs. 40 minutes from **Choa Chu Kang, Bukit Panjang, Woodlands, Sembawang, Yishun, Sengkang and Punggol**.

Among resident working persons with monthly household income from work of \$8,000 or more in 2005, 44 per cent relied on car compared with 4.8 per cent of those with less than \$2,000. In 2005, 60.5% of Senior Officials and managers travelled to work by car. Workers in lower-income households were more likely to use chartered bus/van and motorcycle/scooter than those in higher-income households

Working Residents of **Bukit Timah** and **Tanglin** use only a car to go to work 60-70% of the time. Low car districts are **Woodlands, Yishun, Bukit Merah, Geyang, Rochor** and the downtown areas. In **Bukit Merah**, 30-40% of commuters use the public bus only to go to work. High MRT (40-50%) ridership for commuting is found in the north districts of **Sembawang, Woodlands, Yishun and Choa Chu Kang**. Most other places have a mixture of the three modes, with Geylang especially having very few car commutes. (SingStat 2010) Below, we can see the prevalence of different types of transit depending on the origin and destination of the flows. (Source: HITS Survey- LTA Singapore 2008)

²⁰ "Census of the Population 2010" Statistical Release 3: Geographic Distribution and Transport. ("SR3") Copyright, Singapore Department of Statistics, Ministry of Trade & Industry, Republic of Singapore. ISBN 978-981-08-8114-6. <http://www.singstat.gov.sg/pubn/popn/c2010sr3.html>

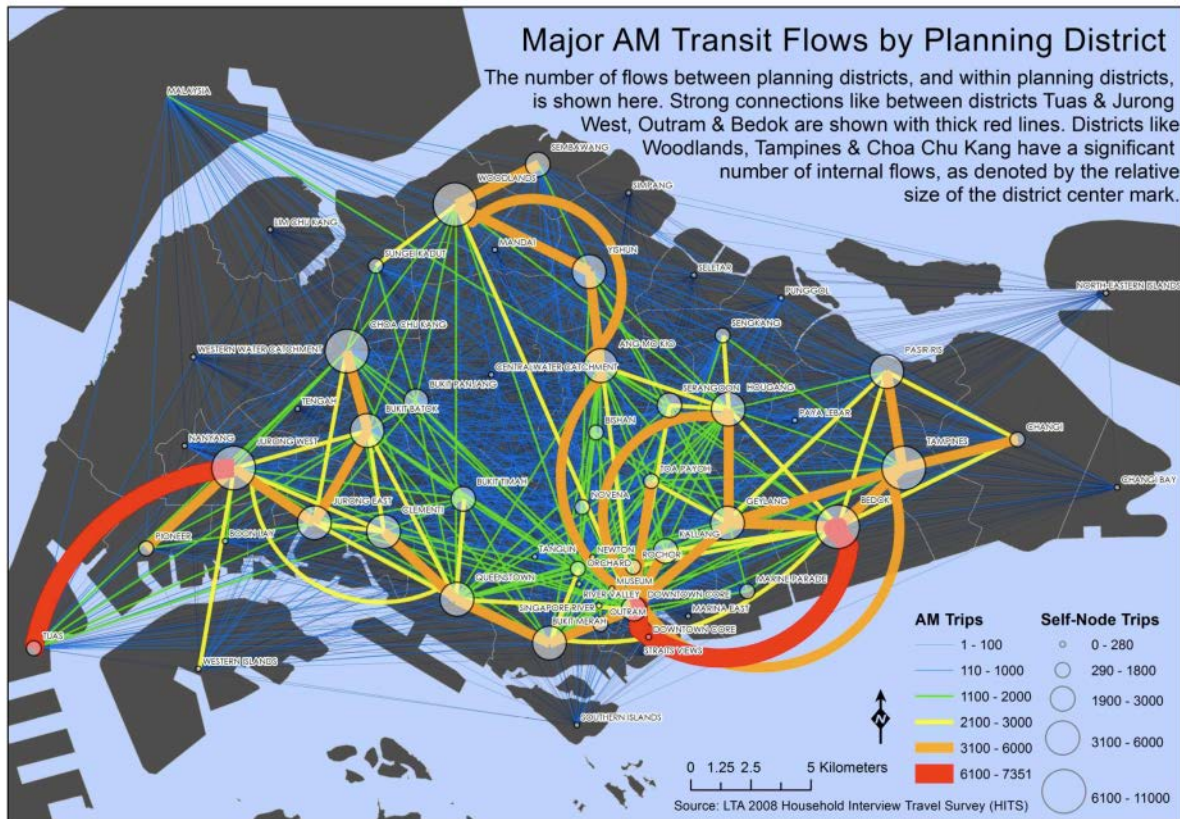


Feedback on public transportation infrastructure

The satisfaction with public transportation is highest for Singaporeans below 35 years old (%90.7) and gets gradually smaller until for those 65 years old & above, the satisfaction rate is at %82.2. This trend might have a number of collinear features associated, perhaps that those below 35 are more likely to own a car than those above 65. However, the difference in satisfaction could also indicate that elderly may have trouble with personal physical mobility—walking to bus stops, descending and ascending into MRT stations, finding sufficient seating on transportation vessels. (Although SMRT and SBSTransit, the operators of the MRT system, seem to be active in public campaigns and signage that support the comfort of the elderly, as well as access to elevators, etc.).

Pipelines

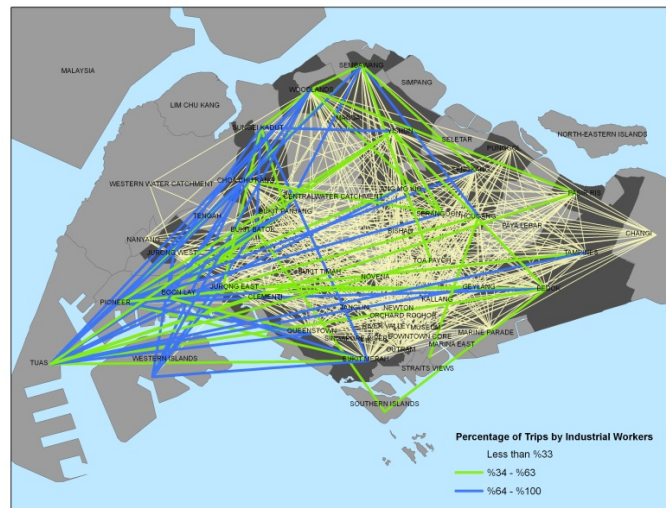
The idea of a ‘pipeline’ is to show places where given a specific origin, the destination of a traveler can be predicted with a relatively high probability. These type of inter-district connections are of interest for the following reasons (1) the amenities that are found in the destination (or the non-home location) can be perhaps harnessed and replicated closer to the origins (or home locations) of the travelers, in order to cut down on travel distance, cost and time. The work-home balance may be informed by these neighborhoods-to-neighborhood relationships. Additionally, pipelines may be indicators of express busses, new lines and other suitable, direct transit infrastructure.



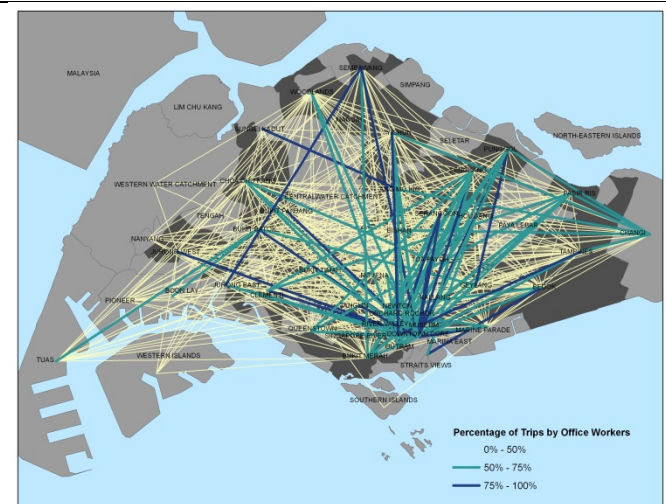
Some pipelines can be extracted based on homogeneous types of traveler on the same trajectory. The following maps were also created based on the LTA HITS 2008 survey data.

Type of Traveler Description	Trajectories of Travelers
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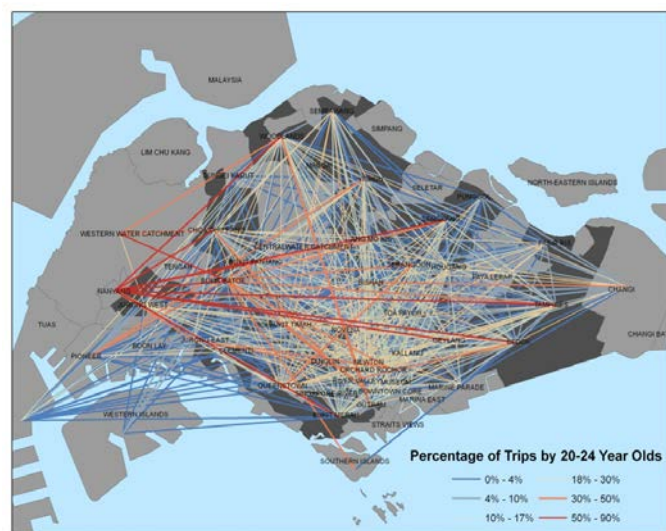
Here, industrial workers comprise most of the trips to the Western ports and industrial zones. Blue lines represent 60-100% of travelers working in industry, while green lines represent greater than 34% - 60% of travelers working in industry. We can see that a number of industrial workers commute from northern residential areas, as well as eastern residential areas such as Geylang and Tampines.



The travel configuration of office workers, is focused heavily towards the CBD, in comparison with the industrial workers' trajectories. We see strong channels from Punggol and Sengkang into the CBD area and surrounding districts, indicating that direct travel infrastructure could be used to accommodate office workers from these origins and destinations.



The 20-24 year old traveler comprises the highest percentage of one type of age group on a zonal flow (up to 90%). It can be expected that although this age group seems to be traveling towards Queenstown and the Downtown Core (from outlying districts), there is an especially strong pull to the West, where, presumably, university student commuters are attending Nanyang Technical University, in the district of the same name. We may have expected to see these types of heavy flows to Queenstown, where NUS is located—however, the lack of mostly-20-24-year old trips to Queenstown indicates that as a destination, Queenstown is more diversified, thus attracting different age groups. Additionally, Bukit Bator, east of the university, seems to also be a hub for travelers of this age group. Also, note the relatively few high-20-24-year old age



group flows from Punggol (and from Sembawang, in some directions), as well as the few flows between residential Singapore and the industrial areas in Tuas, Western Islands, Pioneer and Boon Lay.	
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“Sufficient” Communities

Delineating Neighborhoods by Short Trips

Neighborhood	Internal trips / Trips ending in the neighborhood
Yishun, Khatib	0.630
Yew Tee, Choa Chu Kang	0.611
Woodlands, Marsiling, Admiralty	0.607
Jurong West, Lakeside, Boon Lay	0.579
Tampines, Simei	0.574
Bukit Panjang	0.557
Bukit Batok, Bukit Gombak	0.548
Pasir Ris	0.544
Punggol	0.535
Sengkang, Buangkok	0.535

Some regions have high volumes of trips that both begin and end in the same neighborhood. This “introverted” or “contained” behavior might signify a number of underlying phenomena: (1) the neighborhood provides enough jobs, homes and amenities to fill the needs of the neighborhood citizens. (2) the citizens of the community may be retired, school age, or work at home (3) the current infrastructure has given the community fewer options for accessibility (4) there may be more citizens from these regions participating in the survey than from other regions (and vice versa for below).

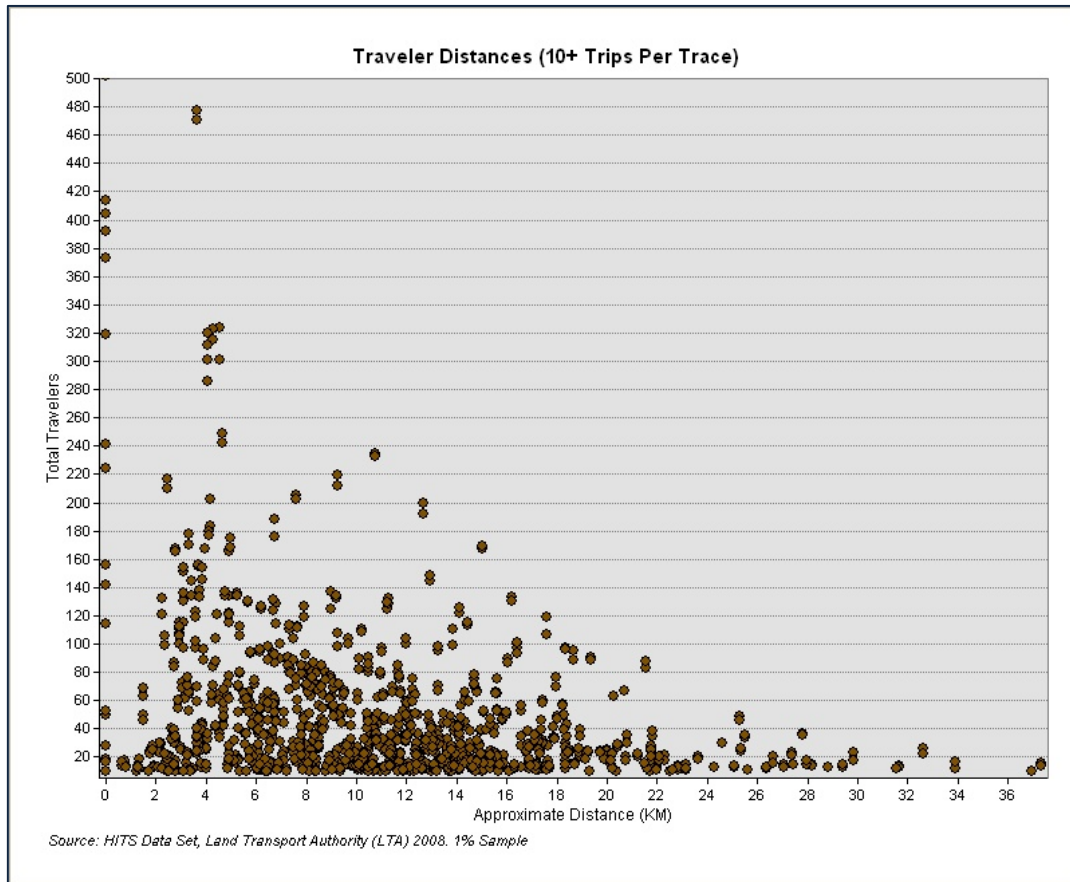
Neighborhood	Internal trips / Trips ending in the neighborhood
Lim Chu Kang	0.0000
Marina South	0.0000
Prince Edward, Anson Road	0.0058
Central Fire Station, Hill Street	0.0079
Marina, Esplanade, Suntec	0.0106
Raffles Place	0.0141
Robinson Road, Shenton Way	0.0145
Changi Airport	0.0155
Tengah	0.0160
Jurong, Joo Koon	0.0284

Other regions have low volumes of trips that both begin and end in their neighborhood. This “extroverted” behavior might signify the following: (1) the neighborhood may be specialized, focusing on specific types of activities such as tourism or industry (2) the area does not have enough jobs, amenities or residential to support both work and home life (3) the current infrastructure gives the community more options for accessibility (4) there may be physical or built features that do not support housing or commercial, such as the large cemetery at Lim Chu Kang.

Targeting the Work/Home Balance

The distance that Singaporeans travel (according to the 2008 HITS survey) when aggregating trips to their origin’s district centroid and destination’s district centroid, ranges from under 1 kilometer to slightly over 36 kilometers. Generally, as the distance between origin and destination districts increases, there are fewer travelers on the flow. However, there are some flows that register on an xy plot of total travelers vs. approximate distance as ‘above’ the trend line, meaning that these district-to-district trajectories are holding more than

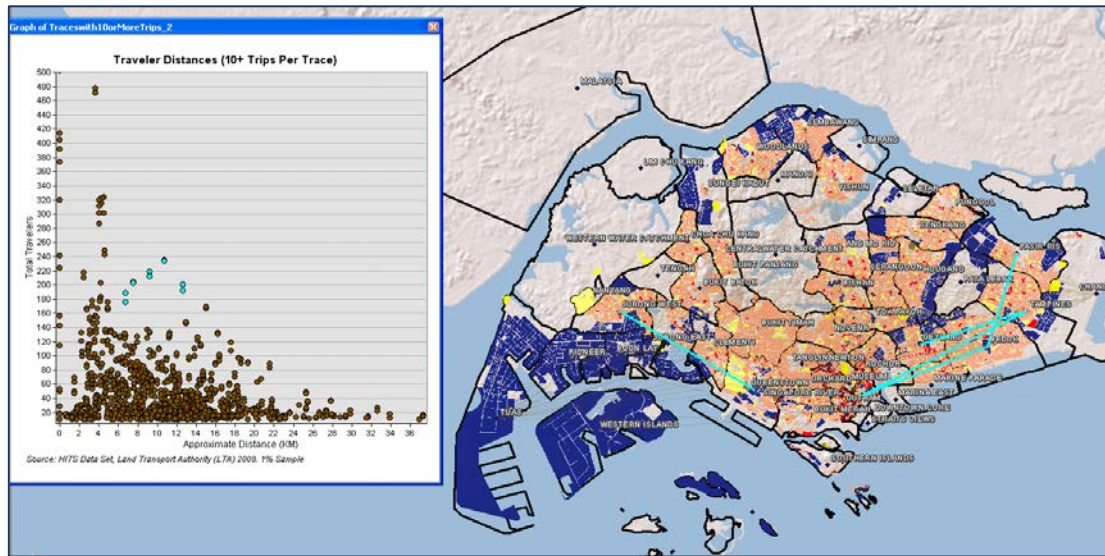
‘expected’ (based on the trend line) people based on their distance. We explore some of these trajectories below.



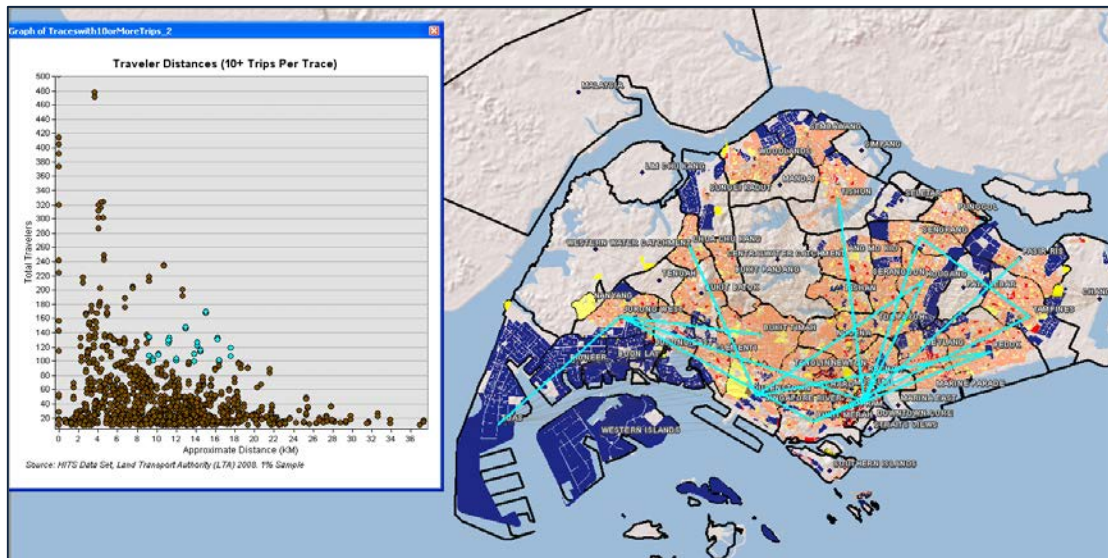
The above graph shows the relationship between travel distance and total travelers for district-to-district trips with more than 10 people on the same district-to-district connection. (Source: LTA 2008 HITS data)

Below are three cases where planners may be interested in how to bring homes and jobs closer together.

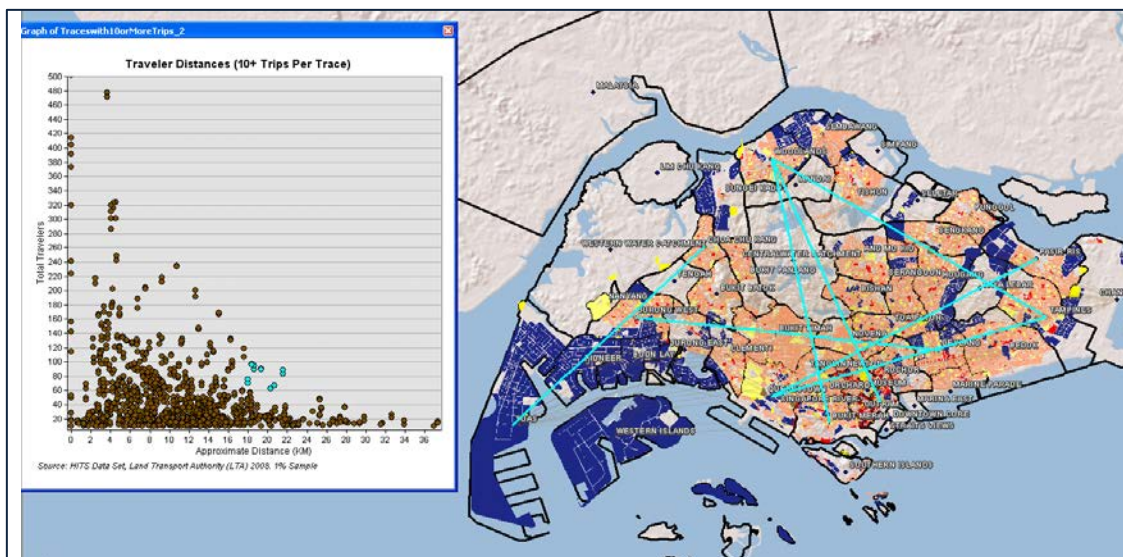
Many travelers on short trips



Many travelers on medium trips

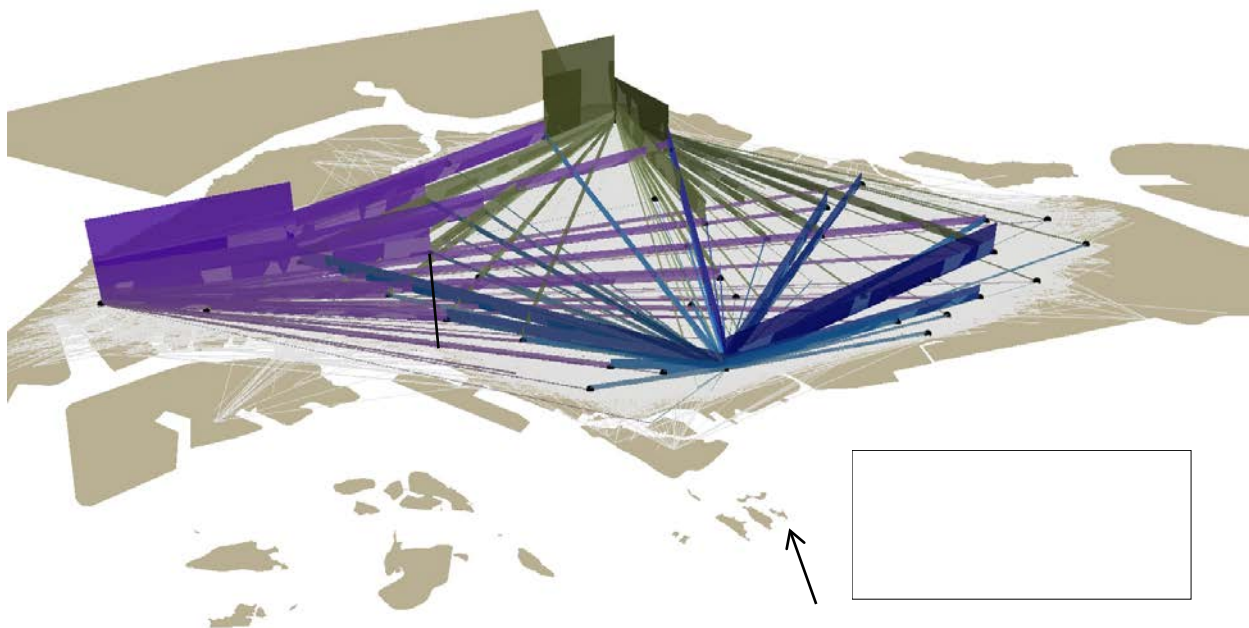


Many travelers on longer trips



Travel “Reach” of Neighborhoods

Below is map shows the ‘reach’ of flows from neighborhood to neighborhood for three example neighborhoods. In Tuas, we see a strong connection to Jurong West, and secondarily, to Bukit Batok and Woodlands. We also see that Tuas has connections with areas spanning to areas north of the CBD and near Bedok. Yet Tuas’ interchange with the CBD is not its most prominent feature. In Sembawang, although the neighborhood exchanges trips with diverse areas such as Bedok and Jurong West, its majority lies in connections with its nearest neighbor (Woodlands), to its second nearest neighbor (Yishun) and to its third nearest neighbor (Ang Mo Kio), respectively. This neighborhood is notably more isolated by natural features like the Central Water Catchment, and responds by creating close ties to its immediate vicinity. The CBD as signified by Raffles Place has a more even distribution of trip connections and magnitudes—as there is no clear ‘favorite’ neighborhood for flows to or from Raffles Place. High flows include those to Bedok and Yinshun. Unlike Tuas and Sembawang, Raffles Place does not seem favor nearby neighborhoods as its flow partners, meaning that those who commute to or visit Raffles Place may be doing so because of a unique element in the neighborhood that cannot be found conveniently. We might guess that this element is the dense financial and business cluster located around Raffles Place.



PART 7: Conclusion

In all, we ask, what is important to model for the future of urban mobility in Singapore? Bringing together three aspects of social/spatial Singapore (land use, transportation and socialization), we can learn more about the following focal points: How the configuration of the built environment is partitioned to host the needs of certain populations; How movement within the built environment connects people to places that are important to them—schools, work, personal and interpersonal activities; How the built environment and transit, combined, are effective at promoting socialization and fulfilling the colocation needs of interpersonal relationships.

Acknowledgment

While the interpretation of the data are solely the author's, I acknowledge the assistance of my research colleagues, and of staff of the Singapore Urban Redevelopment Authority and the Singapore Land Transport Authority who made data available and helped us understand the Singapore context. We also acknowledge the partial support of the Singapore National Research Foundation (NRF) through the Singapore-MIT Alliance for Research and Technology (SMART) Center for Future Mobility (FM).

APPENDIX

Part 1: FAMILY TYPE DEFINITIONS

Nuclear Family : (i) a married couple with or without children; or (ii) a family consisting of immediate related members, without the presence of a married couple e.g. a single parent with their unmarried child(ren).

Extended Nuclear Family: a nuclear family with one or more relatives who by themselves do not form a nuclear family.

Multi-Nuclear Family: a family comprising two or more nuclear families.

Non-Nuclear Family : (i) a single-person household (a person living alone who could be single, widowed or divorced); or (ii) unrelated or distantly related persons living together.

Source: Housing Development Board (HDB) Public Housing in Singapore: Residents' Profile, Housing Satisfaction and Preferences. HDB Sample Household Survey 2008. Copyright 2010 Research and Planning Department Housing and Development Board ISBN 978-981-08-5112-5.

Part 2: PHYSICAL LIVING ARRANGEMENT AND FREQUENCY OF VISITS

REPRODUCED FROM: *Public Housing in Singapore: Well-Being of Communities, Families and the Elderly*. HDB Sample Household Survey 2008 (Pages 104 and 112).

Table 5.2
Younger Married Residents' Present and Preferred Physical Living Arrangement vis-à-vis their Parents by Year

Physical Living Arrangement	SHS 1998		SHS 2003		SHS 2008		
	Present	Preferred	Present	Preferred	Present	Preferred	
In the Same Flat	10.7	16.9	11.2	23.1	14.0	18.4	
Next Door	1.2	11.2	1.2	7.4	0.6	3.1	
In the Same Block	1.8	11.9	2.1	9.5	2.1	4.6	
In a Nearby Block	7.2	22.4	6.1	17.2	9.0	13.0	
In the Same Estate	8.4	15.1	10.8	16.1	9.8	13.7	
In a Nearby Estate	23.2	13.7	21.2	14.1	16.9	16.2	
Elsewhere in Singapore	45.4	7.8	44.7	11.4	45.1	29.3	
Short-term Stay with Different Children	2.1	1.0	1.4	1.1	1.2	1.2	
Each Parent Staying at a Different Place	-	-	1.3	0.1	1.3	0.5	
Total	%	100.0	100.0	100.0	100.0	100.0	
	N*	318,556	318,556	335,129*	334,211*	303,846*	303,647*

*Excluding non-response cases

Table 5.12
Frequency of Visits of Younger Married Residents by Various Attributes

Attributes		Visited at Least Once a Month	Visited Less Than Once a Month or Never	Total	
				Per Cent	N*
Flat Type	3-Room & Smaller	86.0	14.0	100.0	38,176
	4-Room	88.6	11.4	100.0	97,109
	5-Room & Bigger	94.0	6.0	100.0	116,086
Monthly Household Income from Work	Below \$3000	85.1	14.9	100.0	57,170
	\$3001 - \$5000	89.1	10.9	100.0	61,062
	\$5001 - \$8000	93.6	6.4	100.0	62,416
	\$8001 and Above	94.0	6.0	100.0	69,566
Resident's Life-cycle Stage	Family Without Children	93.9	6.1	100.0	38,609
	Family With Eldest Child 12 Years and Below	95.2	4.8	100.0	95,840
	Family With Eldest Child Aged 13 – 20 Years Old	87.3	12.7	100.0	66,685
	Family With Eldest Child Above 21 Years Old	83.8	16.2	100.0	48,873
Where Their Parents Lived	Within Same Estate & Nearer	96.4	3.6	100.0	135,282
	Nearby Estate	92.2	7.8	100.0	51,311
	Elsewhere in Singapore	87.4	12.6	100.0	64,416

*Excluding residents who lived with their parents and non-response cases

Table 5.13
Frequency of Visits of Older Residents by Various Attributes

Attributes		Visited at Least Once a Month	Visited Less Than Once a Month or Never	Total	
				Per Cent	N*
Flat Type	3-Room & Smaller	86.1	13.9	100.0	67,225
	4-Room	94.7	5.3	100.0	43,723
	5-Room & Bigger	95.6	4.4	100.0	29,219
Monthly Household Income from Work	Below \$3000	87.5	12.5	100.0	87,128
	\$3001 - \$5000	94.3	5.7	100.0	23,659
	\$5001 and Above	97.6	2.4	100.0	27,125
Where Their Married Children Lived	Within Same Estate & Nearer	96.7	3.3	100.0	45,553
	Nearby Estate	91.8	8.2	100.0	33,207
	Elsewhere in Singapore	85.6	14.4	100.0	60,407

*Excluding residents who lived with their married children and non-response cases

Part 3: TYPES OF SOCIAL CAPITAL RESOURCES BY DIFFERENT SOCIAL VARIABLES

REPRODUCED FROM: *Public Housing in Singapore: Well-Being of Communities, Families and the Elderly. HDB Sample Household Survey 2008.*

Age	Less than 35	35-44	45-54	55-64	65 & above
Family members	6	7	7	7	8
Relatives	19	18	17	16	15
Friends who are not neighbours	25	25	24	26	19
Neighbours who are friends	4	5	6	6	6
Neighbours in general	8	9	10	10	10
Avg. Size of Social Network	63	65	62	58	54

Monthly Household Income from Work	Below \$2,000	\$2,000-\$3,999	\$4,000 -\$5,999	\$6,000 & above
Family members	7	7	7	7
Relatives	15	17	18	19
Friends who are not neighbours	20	22	25	29
Neighbours who are friends	6	5	6	5
Neighbours in general	9	9	10	10
Size of informal networks(persons)	54	59	64	68

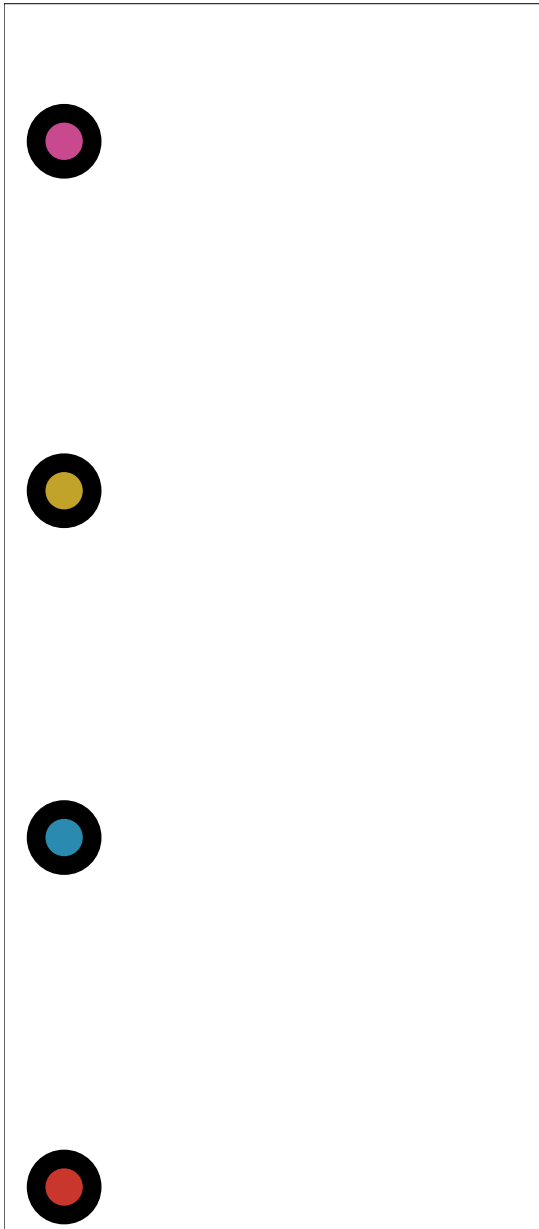
Marital Status	Single	Married	Widowed	Separated/Divorced
Family members	6	7	7	6
Relatives	15	18	14	13
Friends who are not neighbours	23	24	17	24
Neighbours who are friends	5	6	6	5
Neighbours in general	8	10	9	8
Size of informal networks (persons)	58	64	53	52

Highest Education Level Attained	Primary or lower	Secondary / Pre-University/Technical	Polytechnic/ University
Family members	7	7	7
Relatives	16	17	18
Friends who are not neighbours	18	25	30
Neighbours who are friends	6	5	5
Neighbours in general	9	10	9
Size of informal networks (persons)	55	63	66

Type of Family Nucleus	Nuclear	Extended Nuclear	Multi-Nuclear	Non-Nuclear
Family members	7	7	8	6
Relatives	17	19	22	13
Friends who are not neighbours	24	25	27	20
Neighbours who are friends	5	6	6	5
Neighbours in general	10	10	10	8
Size of informal networks (persons)	62	66	71	50

Type of Family	Family without children	Family with young children	Family with teenaged/unmarried children	Family with married children	Elderly couple living alone	Non-Nuclear household
Family members	6	7	7	8	8	6
Relatives	16	18	17	21	15	13
Friends who are not neighbours	25	25	24	26	19	19
Neighbours who are friends	4	5	6	6	6	5
Neighbours in general	8	9	10	11	10	8
Avg. Size of Social Network	59	63	62	70	56	50

Part 4: LAND USE CATEGORIES



Part 5: 2000-2010 MODE OF TRANSPORT TO WORK BY DWELLING

**Table 1 Resident Working Persons Aged 15 Years and Over
by Mode of Transport to Work and Type of Dwelling**

Transport Mode	Per Cent											
	HDB 1- and 2-Room Flats		HDB 3- Room Flats		HDB 4- Room Flats		HDB 5- Room and Executive Flats		Condominiums and Private Flats		Landed Properties	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Public Bus Only	46.2	39.9	33.8	28.7	26.8	21.5	18.6	15.3	12.4	10.3	12.0	8.6
MRT Only	6.7	10.8	9.0	12.2	9.2	12.5	9.8	12.4	5.3	8.9	3.7	5.5
MRT & Public Bus Only	13.9	18.2	15.2	19.8	15.3	19.8	14.4	18.0	6.8	10.9	6.5	9.4
MRT & Another Mode	0.4	0.6	0.7	1.3	1.0	1.9	1.6	2.7	1.5	2.9	1.3	2.2
Car Only	3.4	2.2	9.3	9.3	16.0	15.6	32.1	29.3	57.2	50.6	62.4	59.6
Private Chartered Bus/Van Only	4.1	2.3	7.7	4.1	8.8	4.7	5.7	3.6	1.6	1.5	1.5	1.2
Motorcycle/Scooter Only	4.9	4.4	6.2	5.1	6.2	5.2	3.6	3.3	0.7	0.8	0.8	0.6
Others	9.2	8.8	9.7	9.5	10.6	10.9	10.0	9.7	11.1	8.6	9.2	7.8
No Transport Required	11.2	12.9	8.4	9.9	6.2	7.9	4.1	5.9	3.4	5.6	2.6	5.1

Table from “Geographic Distributions” (Source: SingStat 2010) Census of the Population 2010” Statistical Release 3: Geographic Distribution and Transport. (“SR3”) Copyright, Singapore Department of Statistics, Ministry of Trade & Industry, Republic of Singapore. ISBN 978-981-08-8114-6.
<http://www.singstat.gov.sg/pubn/popn/c2010sr3.html>