

ETH zürich
IVT-Seminar

Personal networks and social interactions in the Greater Tokyo Area

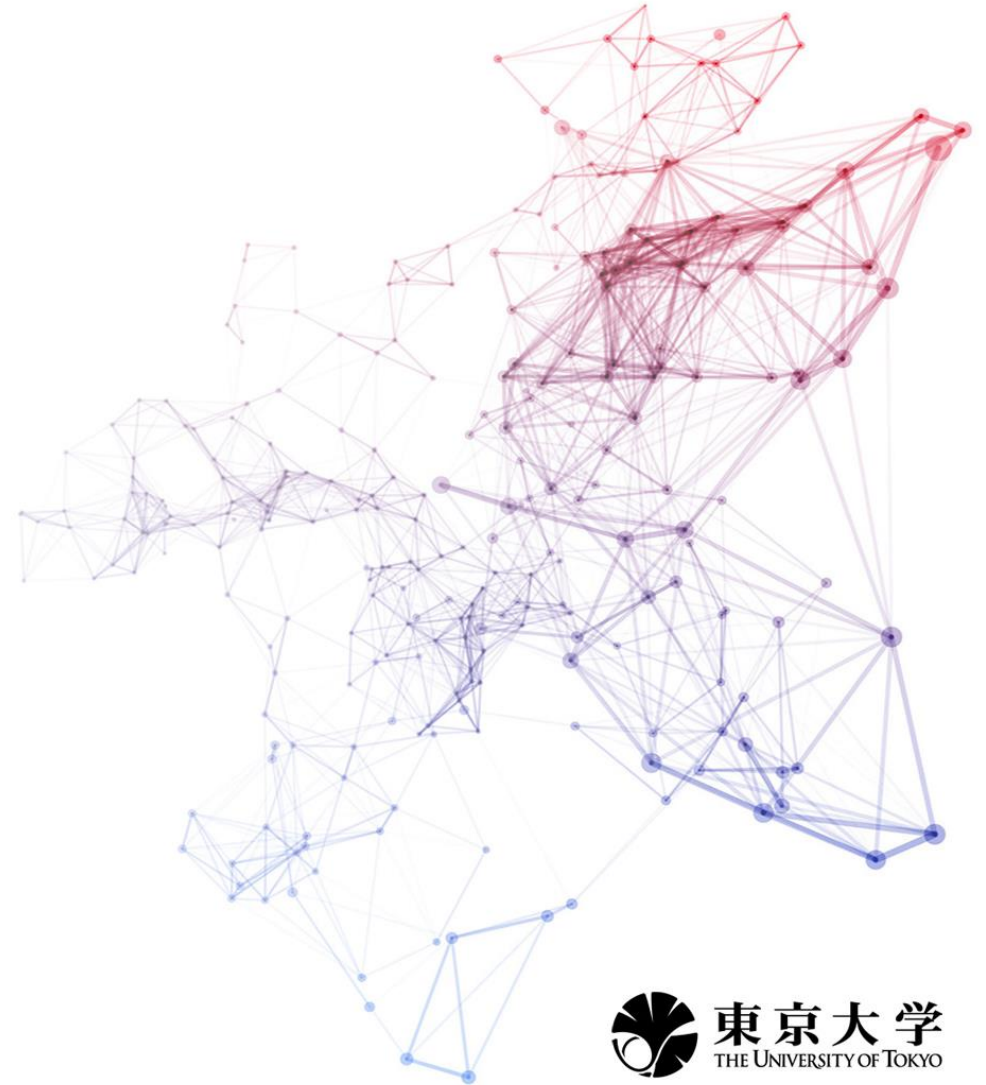
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Presentation Outline

1. Greater Tokyo 101
2. Social networks research in Japan
3. Survey design and execution
4. Are Japanese personal networks smaller than European and Pan-American networks?
5. Do ego-alter distances follow a power-law distribution?
6. What about social isolation?
7. What about friendship formation and contact frequency?
8. Conclusion
9. Next step

Greater Tokyo 101

MEGACITIES

The population and GRP (gross regional product) of the Greater Tokyo Area is compared with that of four of the world's metropolises.

Population (2014) ¹⁾
35.84 million



Population (2014) ²⁾
14.03 million



Population (2014) ³⁾
20.09 million




Population (2014) ⁴⁾
12.01 million



GRP (2012) ⁵⁾
JPY 161.6731 trillion
USD 2,028.219 billion / EUR 1,577.0 trillion




GRP (2012) ⁶⁾
JPY 63.8628 trillion
USD 800.381 billion / EUR 622.9 billion



GRP (2012) ⁷⁾
JPY 115.4296 trillion
USD 1,446.659 billion / EUR 1,125.9 billion



GRP (2012) ⁸⁾
JPY 63.8887 trillion
USD 800.706 billion / EUR 623.2 billion




Area (2015) ⁹⁾
13,562 km²



Tokyo metropolis and the three prefectures of Saitama, Chiba, and Kanagawa

Area (2014) ¹⁰⁾
12,109 km²



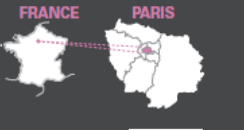
Greater London and a part of the surrounding eight counties

Area (2010) ¹¹⁾
21,482 km²



Part of the states of New York, New Jersey, and Pennsylvania

Area (2013) ¹²⁾
12,012 km²



Paris and the seven surrounding provinces

TOKYO



LONDON



NEW YORK



PARIS



Sources: ¹⁾ Ministry of Internal Affairs and Communications ²⁾ Cabinet Office
³⁾ Geospatial Information Authority of Japan ⁴⁾ Eurostat
⁵⁾ US census ⁶⁾ US BEA
⁷⁾ Exchange rate: National Accounts Main Aggregates Database

Social networks research in Japan

The study of social relations and personal networks has gained momentum, as a result of the so-called *muen-shakai* or isolated society problem (Ishida, 2011)

The isolated society problem in a nutshell:

The basic intermediate social groups supporting Japanese social relations

血縁

Family relations

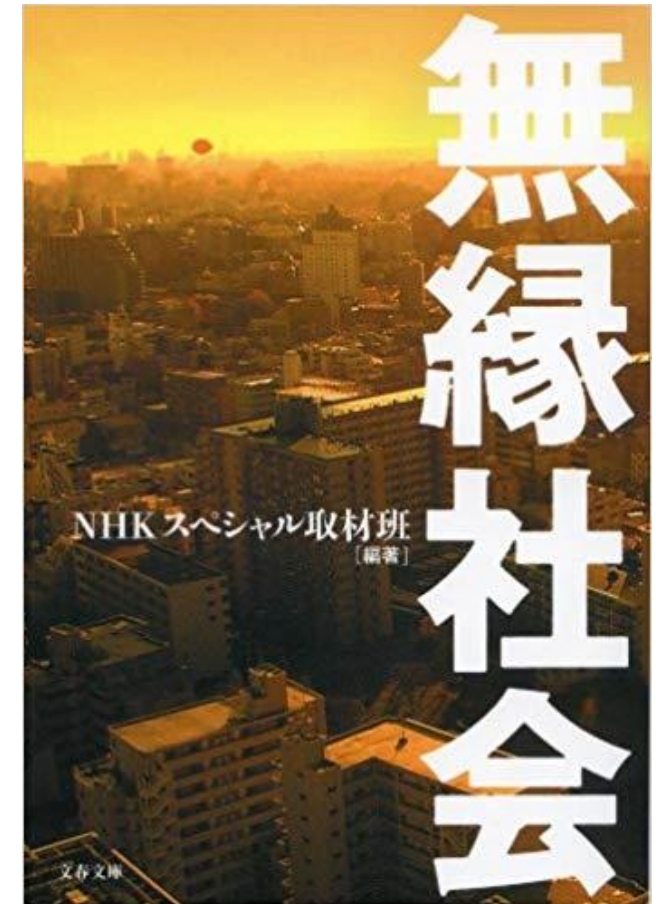
社縁

Work relations

地縁

Territorial relations

These traditional structures are collapsing, but the alternative pure relationships (Giddens 1991,1992) that should emerge out of this “liberation” have yet to materialize (Ishida,2011, Fujimoto 2012).



Cover of the *muen-shakai* book based on the NHK special of the same name (Source: Amazon.co.jp)

血縁

Family relations

- Increase in number of unmarried persons.
- Increase in number of single households.
- Desire to marry has not changed much.

社縁

Work relations

- Fast disappearance of the lifetime employment system.
- Loss of sense of belonging to one's company.
- Increase of "Freeters"
(Freelance+Arbeiter)

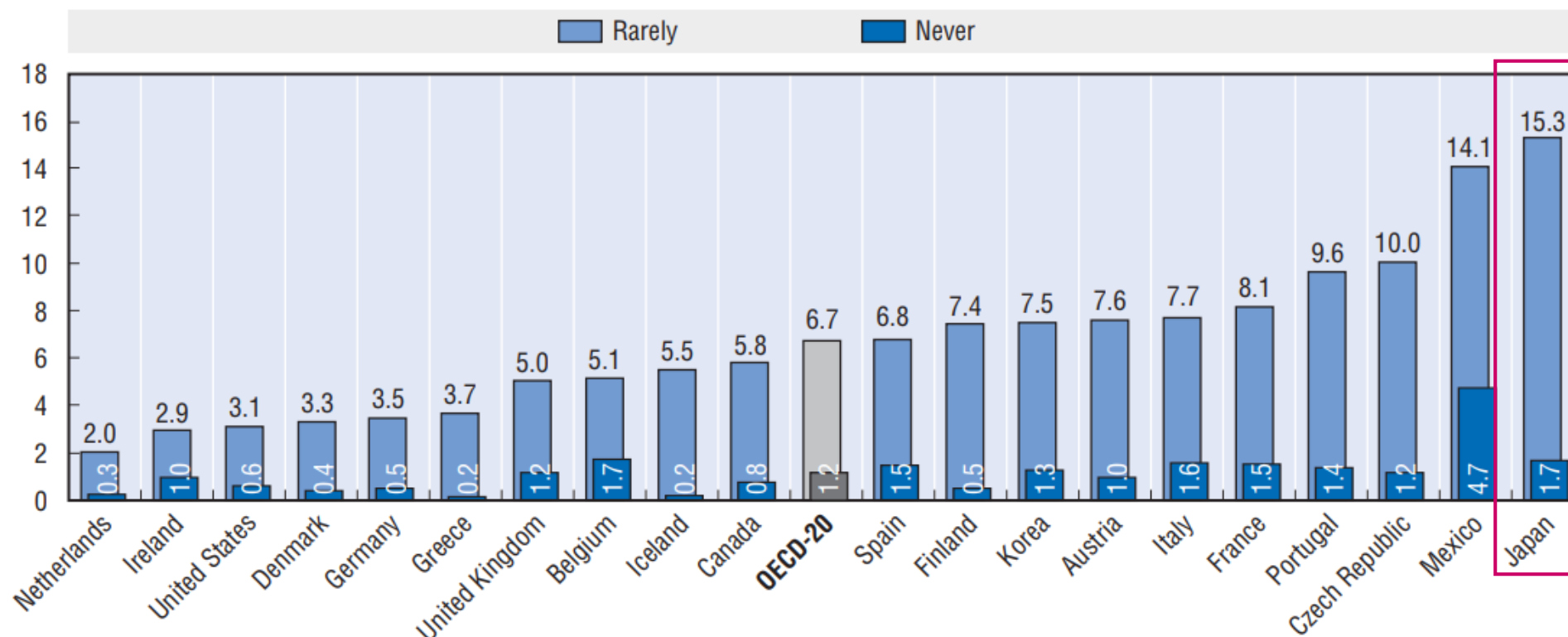
地縁

Territorial relations

- Reduced participation in local associations
- Reduced contact with neighbors.

CO2.1. Proportion of respondents who rarely or never spend time with friends, colleagues, or others in social groups

Percentages, 1999-2002



Note: The proportion “Rarely” includes those who respond either “rarely” or “never” to all of the categories of contacts (friends, colleagues or others in social groups). The proportion “Never” includes those who respond “never” to all of the categories.

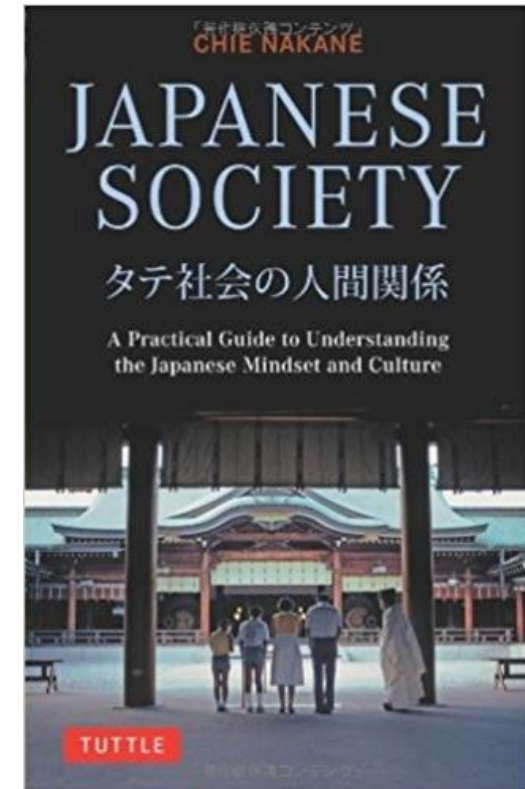
Criticism of the isolated society argument (Ishiguro 2018)

- The data to back up these assertions is scarce.
- In most cases based on attitudes towards social relations, and changes in some of the factors that are assumed to support the generation and maintenance of relations, rather than direct measurements of such relationships.

As an aside: If you read just one book on Japanese social relations

Nakane's Japanese society is the perfect introduction to social relations in Japan. Note that the English title does not do justice to the original title in Japanese "*Human relations in a vertical society*"

- An individual in a group has a distinctive relation to any other individual in that group (Senior(*senpai*), Junior(*kohai*), Same rank(*dōryō*))
- The relative rankings of ego to alter are firmly established (and fixed upon entry to a group)
- This ranking is a key controlling factor of social relations.



(Source: Amazon.co.jp)

Measuring personal networks

Traditionally, the study of personal communities in Japan has focused on kinship (Otani 1999). Otani was among the first researchers to focus comprehensively on personal networks in Japan, based on the work of Wellman on egocentric networks.

Otani (1999)	<p>“How many intimate kin, co-workers, neighbors and friends do you have (People who you get together with frequently)”.</p> <p>*number of persons given separately for each type.</p>	Cross section	<ul style="list-style-type: none"> ➤ Hiroshima City (1999): 13.30 ➤ Matsuyama City (1999) 14.40
Iwata (2014)	<p>“Number of intimate friends you meet often with”</p>	Pooled cross section	<ul style="list-style-type: none"> ➤ Nationwide 11.59 (2001) → 9.42 (2011)
Ishiguro (2018)	<p>“How many relatives who are not living with you do you feel intimate with and rely on in your daily lives (include your parents if they are not living with you)?”</p> <p>* Same asked for colleagues, neighbors and friends, separately.</p>	Pooled cross section	<ul style="list-style-type: none"> ➤ Yamanashi City, Asaka city ➤ Males: 16.6 (1993) → 14.5 (2014) ➤ Females: 14.7 (1993) → 13.3 (2014)
Parady et al. (2018)	<p>Same as Otani (1999) with additional type “Club/circle friend”</p>	Cross section	<ul style="list-style-type: none"> ➤ Fukuoka City (2014): 10.89

Measuring personal networks

To measure social network characteristics these studies have largely relied on **asking respondents directly to count the number of social network members**.

Limited use of name generators:

2013 Japan General Social Survey : Maximum 4 alters

Urban Life and Family Survey : Maximum 2 alters

Parady et al. (2018) : Maximum 5 alters

This approach allows researchers to observe **lower bounds of the network**, such as the presence of at least one important social contact, and it has been used to provide measures of social isolation.

No person to discuss important problems and have no emotional-support-providing relationships (Ishida 2011):

8.9%

Males, elders, divorcees/widowers, more likely to be associated with isolation.

Isolation rates doubled from 1993 to 2014 (Ishiguro 2018)

Males:
2.5% to 5.7%
(Elders 4.8% to 10.5%)

Females:
0.8% to 1.7%
(Elders 1.3% to 2.6%)

On the other hand, knowledge that can be elicited about ego-centric social network is limited. In particular related to the **geographical features of the network**, and **fine-grained relational characteristics**, of interest due to their relation with human mobility.

Social networks research in Japan: Summary

- Strong emphasis on social isolation
- Measured network size ranged from **9.42 to 16.6** alters
- Longitudinal data suggests a reduction in average network size in the past 2 decades.
- Measured social isolation at **8.9%**, with observed increases in the past 2 decades.
- Networks measured by asking respondents directly to count the number of social network members.
- Limited use of name generators, limiting the knowledge that can be extracted from networks, in particularly those associated with human mobility.

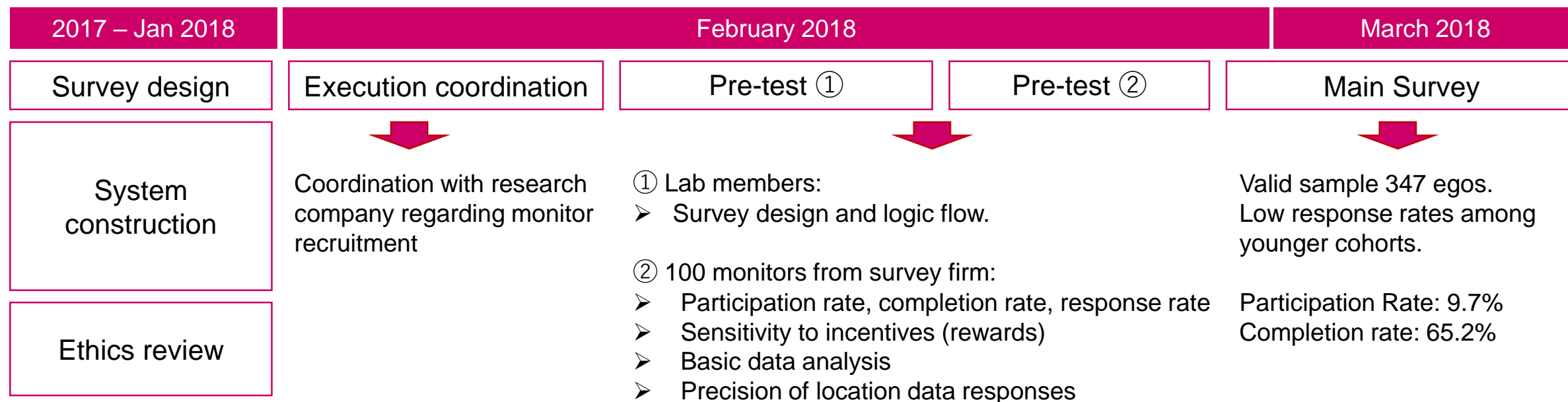
The gap that we aim to fill

- First virtually unrestricted name generator to measure social networks in Japan
- Gathering of fine-grained relational and spatial attributes of the network, that might be associated with human mobility.
- Contribute to the growing body of research in social networks, further allowing for cross-cultural comparison

Survey design and execution

General information

- Target population: Adults living in the **Greater Tokyo Area** (defined as the Tokyo Metropolitan Area, and the prefectures of Chiba, Saitama and Kanagawa).
- Execution period: **February to March of 2018**
- Sampling method: **quota sampling** to match the gender and age population distribution.
- Survey medium: **Online survey**
- Survey frame: monitors from an opt-in consumer panel maintained by a survey research firm in Japan accredited by the Japan Marketing Research Association (JMRA).



Survey items

Ego/household level	Ego-alter level	Cliques level
<ul style="list-style-type: none"> ➤ Household size ➤ Relationship type, age, gender and employment status of all household members ➤ Education level of ego ➤ Driver's license ownership status ➤ Car and bicycle ownership status ➤ Residential and employment location ➤ Household income ➤ Community trust 	<ul style="list-style-type: none"> ➤ 2 name generators (25 alters per name generator) following Kowald and Axhausen (2012) <ul style="list-style-type: none"> ▪ <i>"Name the persons whom you spend your free time with (Examples of free time activities include: sports, cultural events, club activities, eating and drinking out, and outings during holidays, etc.)"</i> ▪ <i>"In addition to the persons named in the previous questions, please name the persons who you discuss important private problems unrelated to work."</i> ➤ Ego-alter relational information: <ul style="list-style-type: none"> ▪ Relationship type ▪ Relationship length ▪ Gender ▪ Age ▪ Employment status ▪ Marital status ▪ Contact frequency by mode (face to face, phone, e-mail and short message services (SMS), social networking services (SNS)) ▪ Residential and employment location 	<ul style="list-style-type: none"> ➤ Groups of alters that know each other and usually spend their free time together (cliques). ➤ For each group: <ul style="list-style-type: none"> ▪ Place when members meet often (maximum of 3 places per clique), if any ▪ Type of activities usually conducted at that place



social-networks.jp

www.social-networks.jp

social-networks.jp

東京大学
THE UNIVERSITY OF TOKYO

概要

調査に回答する

研究成果

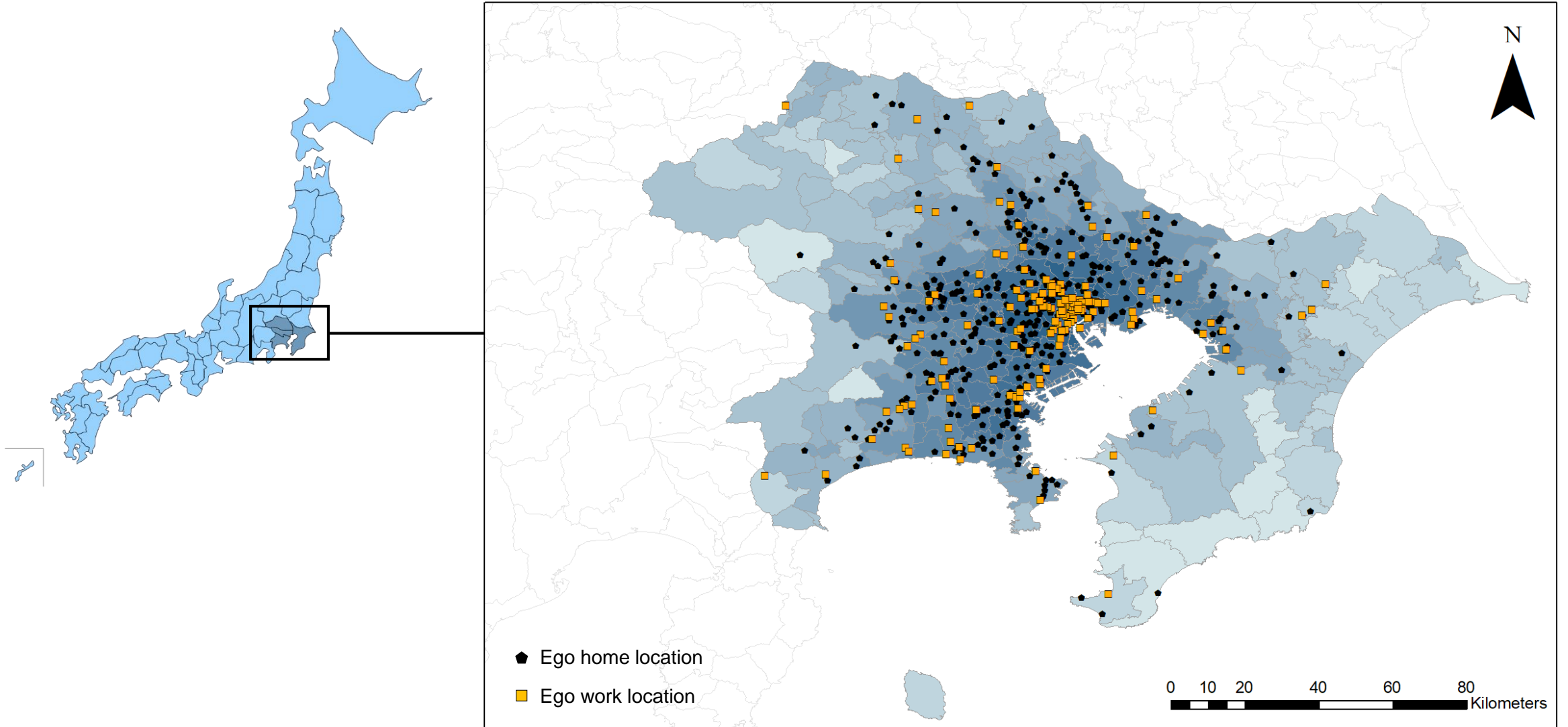
English

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<http://www.social-networks.jp>

An exploratory analysis

Spatial distribution of respondents

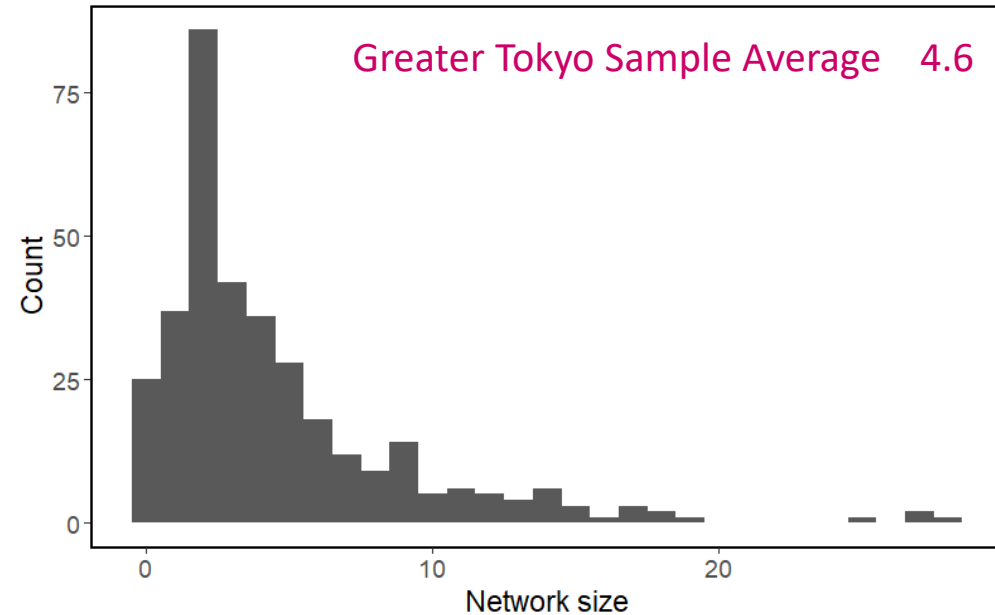


1. Are Japanese personal networks smaller than European and Pan-American networks?

Average network size in different cities

Toronto	23.8
Zurich (1)	11.9
Zurich (2)*	14.7
Eindhoven	23.9
Concepcion	20.9
Switzerland	21.6

Source: Kowald et al. (2013);
*Guidon et al. (2018)



Histogram of network size in the Tokyo sample

- Measured network size in the literature with direct counts ranged from **9.42 to 16.6** alters

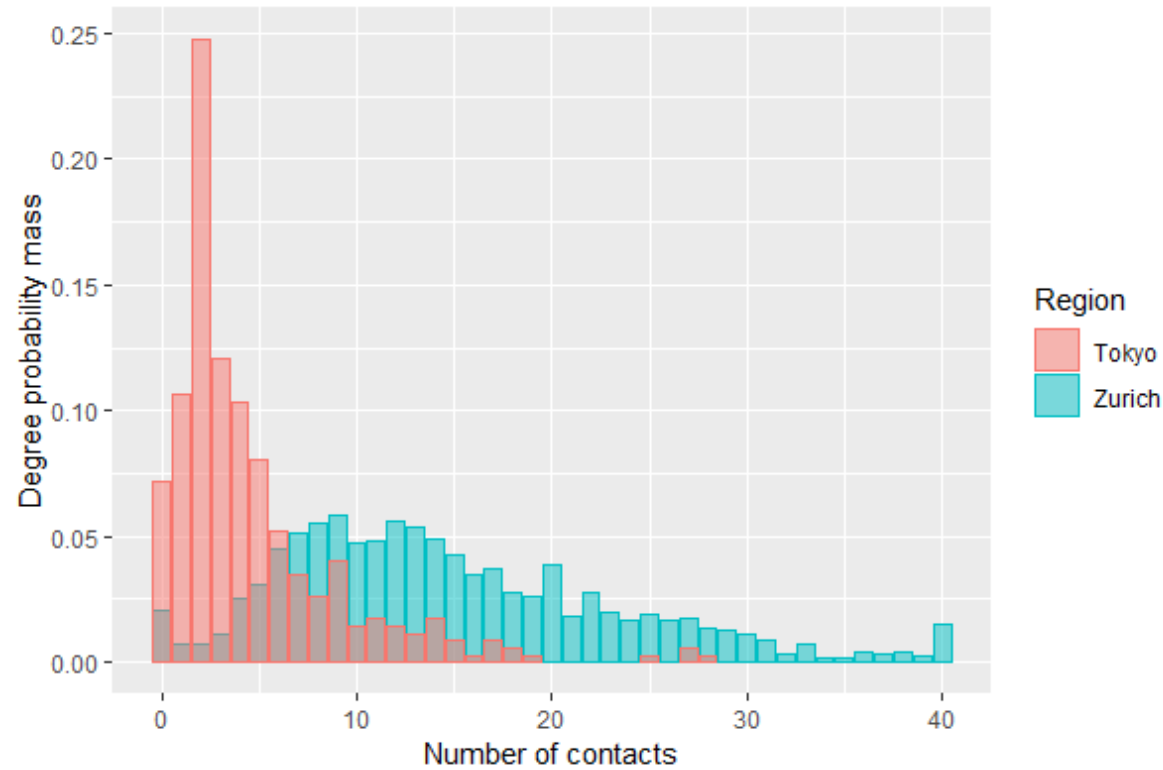
Some hypotheses:

- Resource constraints (i.e. time constraints for workers)
- The nature of Japanese social relationships (See Nakane 1970)

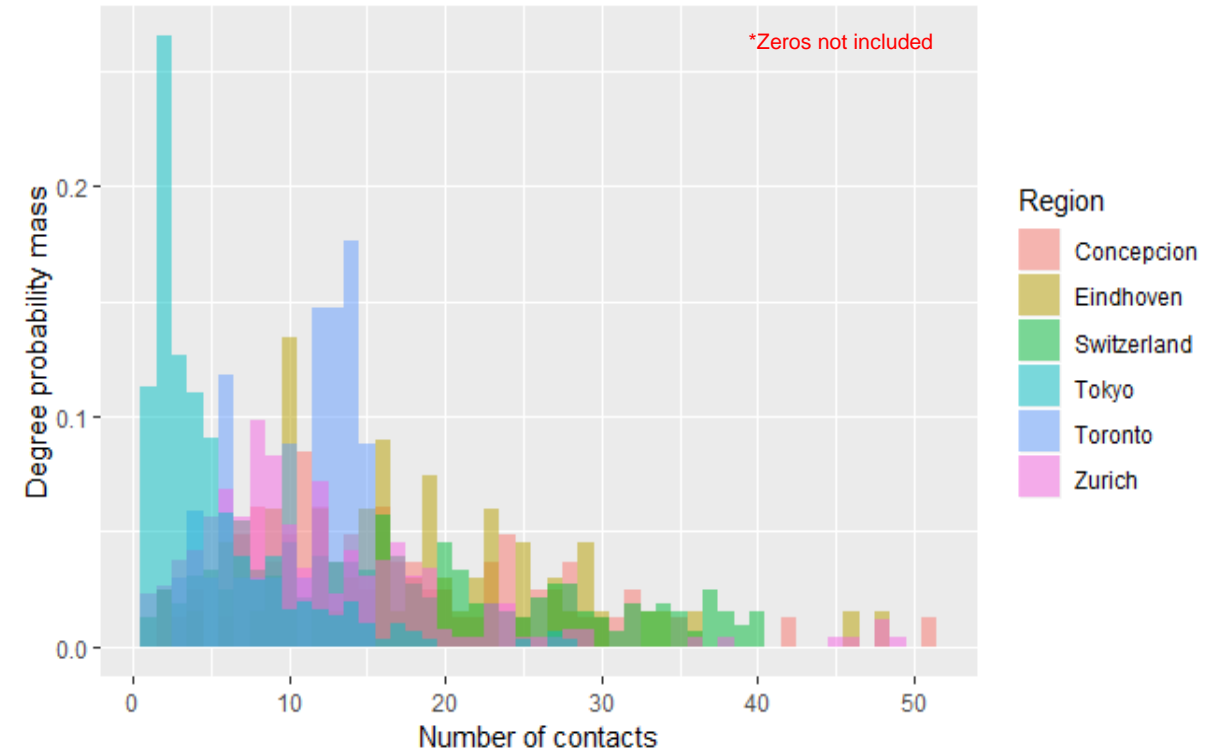
Group consciousness : Strengthens sense of unity and group solidarity, but also exacerbates the awareness between “our people” and “outsiders” (Nakane 1970)

Vertical nature of relations: Strong awareness of ranking order in relationships might impose additional costs to creating and maintaining ties, which might help explain smaller networks.

1. Are Japanese personal networks smaller than European and Pan-American networks?

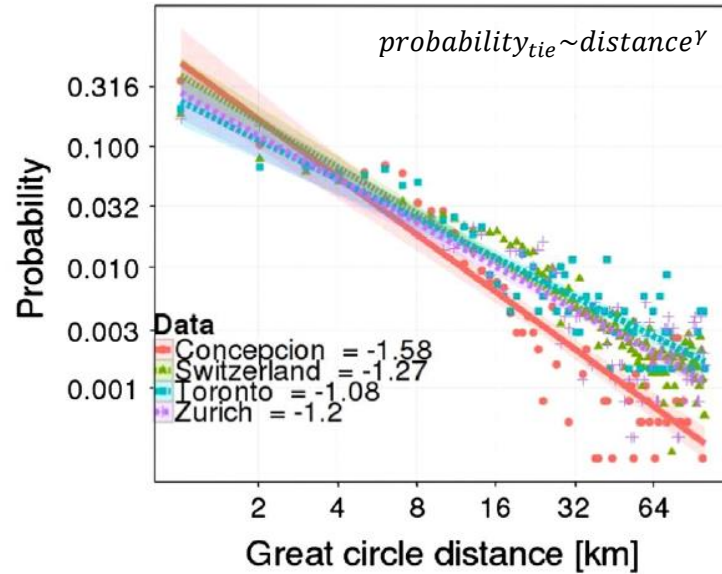


Zurich data source: Guidon, S., Wicki, M., Axhausen, K.W. and Bernauer, T. (2017) Social Networks, Mobility Behaviour and Societal Implications - Metadata Report, *ISTP Metadata Series*, 1, Institute of Science, Technology and Policy (ISTP), ETH Zurich, Zurich.

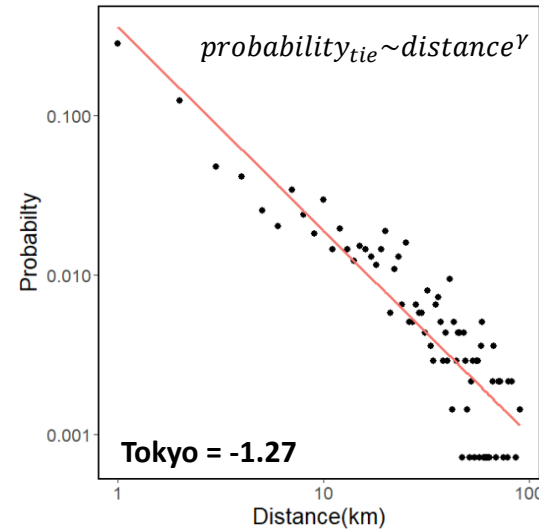


Data source for other cities: Kowald, M. et al. Distance patterns of personal networks in four countries: a comparative study. *Journal of Transport Geography* Vol. 31, pp. 236–248, 2013.

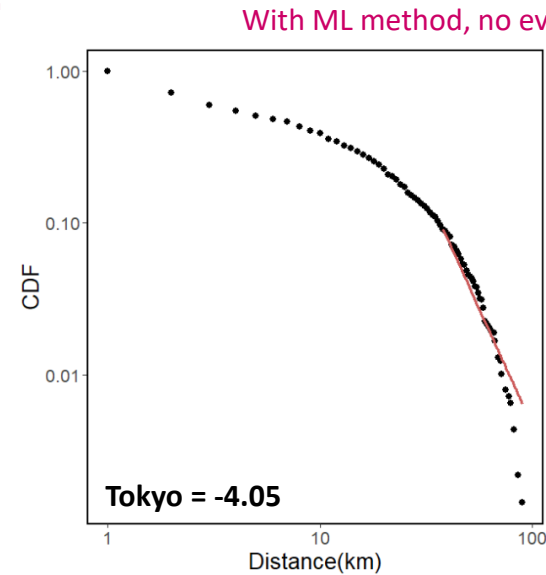
2. Do ego-alter distances follow a power law distribution?



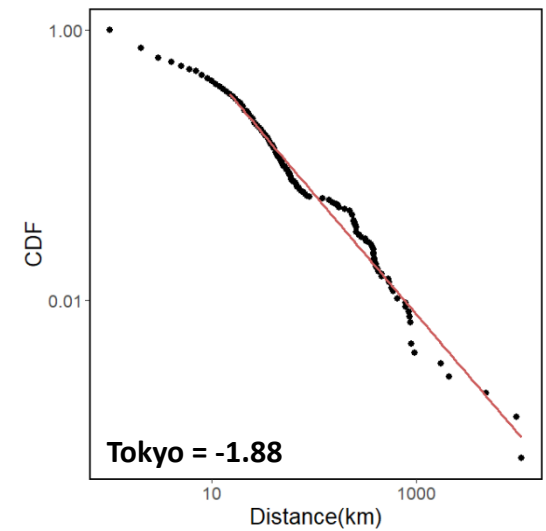
Log-log plot of relationship probability and distance.
Linear regression fit, 100km for several cities
Source: Kowald et al. 2013



Log-log plot of relationship probability and distance. Linear regression fit,
100km, Greater Tokyo sample



Log-log plot of relationship cumulative probability and distance. Maximum likelihood fit, 100km cutoff, $\gamma = -4.05$, $x_{min} = 38\text{km}$ ($p < 0.00$)

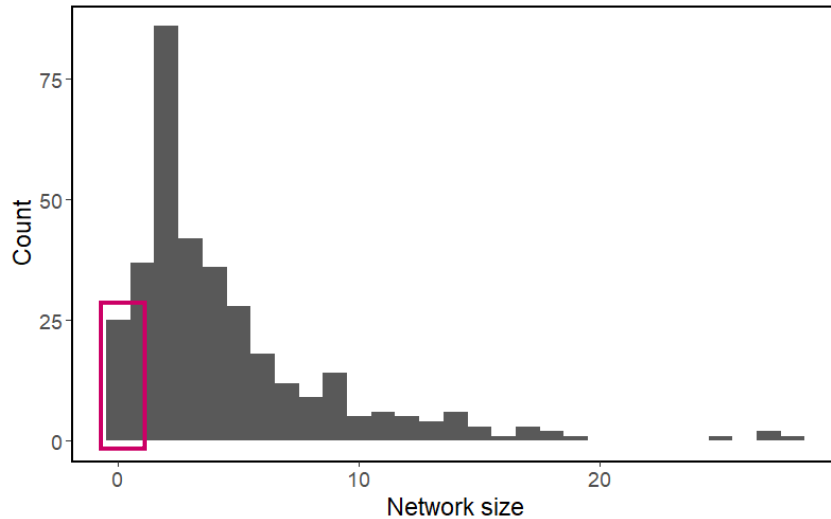


Log-log plot of relationship cumulative probability and distance. Maximum likelihood fit, no cutoff, $\gamma = -1.88$, $x_{min} = 15\text{km}$ ($p < 0.00$)

Criticism to the linear regression approach (Clauset et al., 2009):

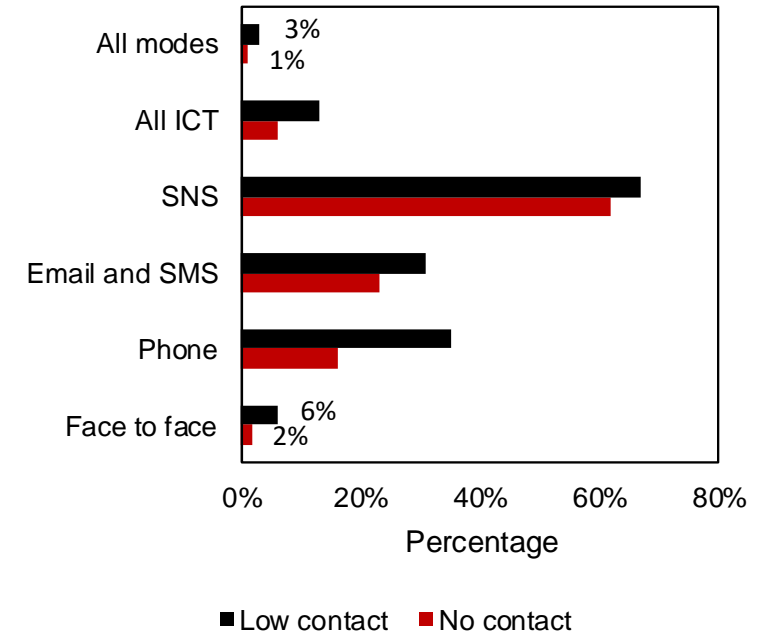
- Assumptions to estimate standard errors from linear regression are not valid.
- Linear regression fits can account for a large share of variance even when data does not follow a power law distribution.
- Fits extracted from a linear regression are not valid probability distributions.
- Proposed alternative method to estimate exponent coefficient and calculate goodness of fit.

3. What about social isolation?



Histogram of network size in the Tokyo sample

- **7.2%** did not state having a person to spend free time with, or to discuss important problems with.
- Data from the 2013 Japan General Social Survey also reported a value **8.9%**.
- **Hard to distinguish social isolates from non-responses.**



Shares of egos with low-contact* and no-contact

*Egos with low-contact frequencies were defined as those for which the sum of the annual contact frequencies with all alters is less or equals to 12.

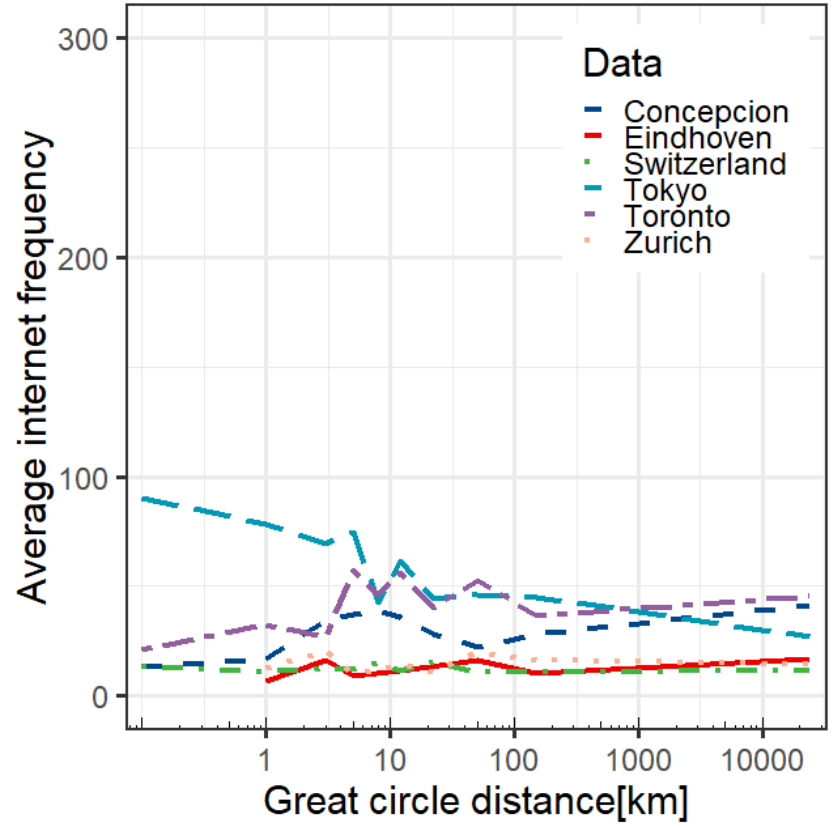
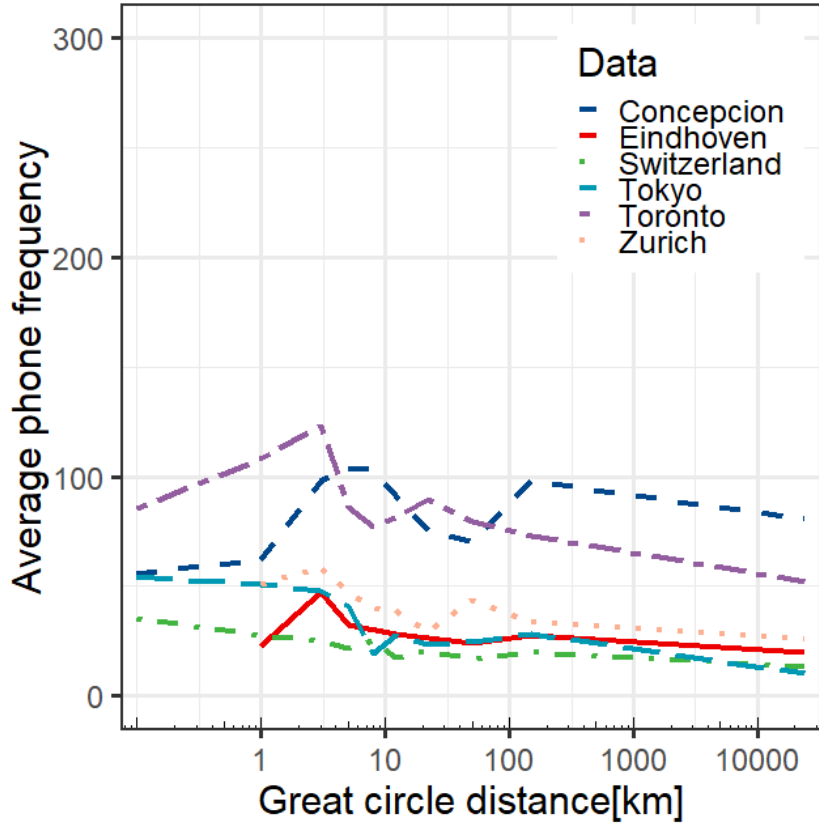
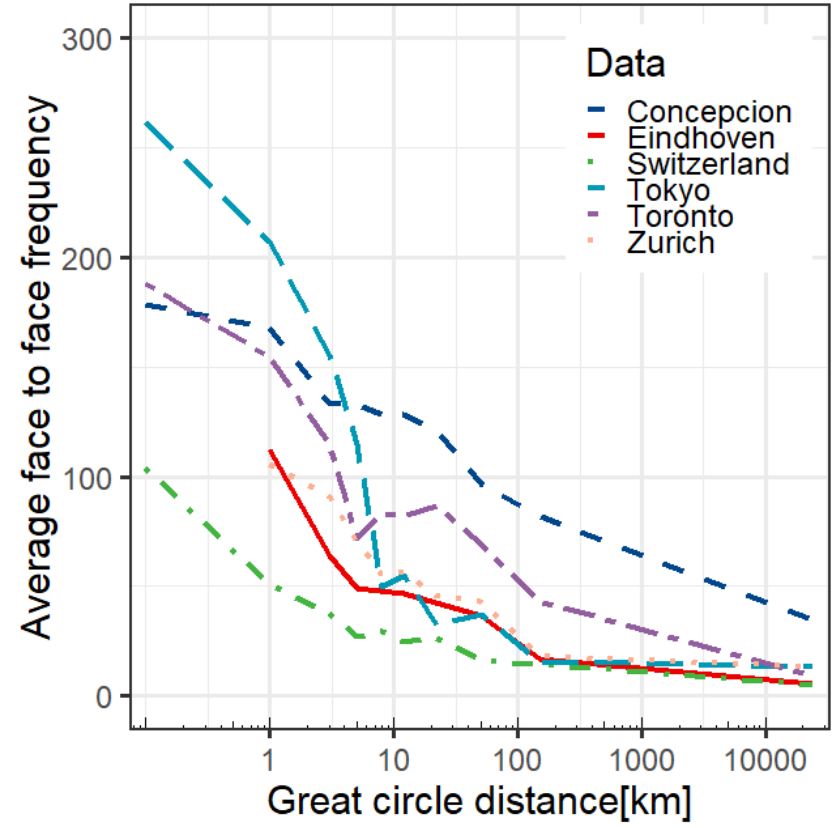
4. What about friendship formation?

Multilevel binary probit model of friendship probability

- Multilevel model to account for individual heterogeneity.
- Since non-ties are not observed:
 - In addition to the observed ties ($y=1$), we randomly sampled 25 egos from the data and added them to the data with dependent variable valued $y=0$.
 - Bootstrap estimates of the friendship formation model with 1000 replications, each with a different set of randomly sampled non-ties.
 - Relatives were excluded from the model.

Variable	Coefficient	t-stat
Constant	-2.96	-37.12
Ego and alter are both male	0.72	9.56
Ego and alter are both female	0.88	12.74
Same civil status	0.38	7.04
Same employment status	0.48	9.09
Same age cohort	1.27	23.85
Inverse of geodesic distance	1.03	15.05
Sigma	0.81	13.31
Initial likelihood	-2919.13	
Final likelihood	-1847.21	
Pseudo Rho-square	0.37	

4. What about contact frequency?



Multivariate ordinal probit of contact frequency by mode

Contact frequency levels:

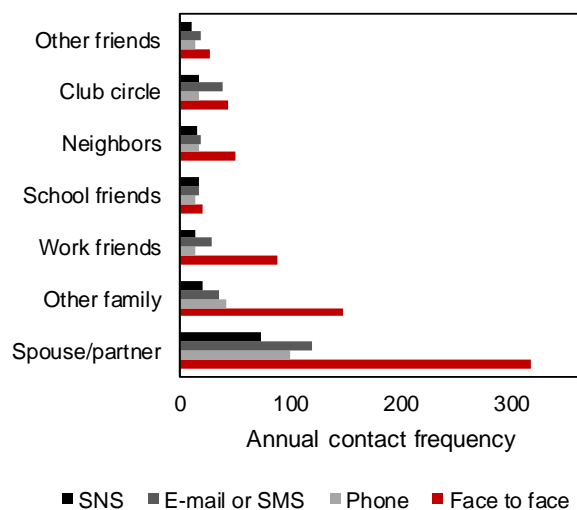
1. Never
2. 1-3 times per year
3. 4-11 times per year
4. 1-2 times per month
5. 3-4 times per month
6. 1-3 times per week
7. 4-7 times per week
8. Several times per day

Variable	Face to face		Phone		Email/SMS		SNS		
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	
Thresholds.1 2	-2.94	-10.77	-0.21	-0.77	-0.10	-0.36	1.88	5.11	
Thresholds.2 3	-1.32	-4.98	0.37	1.36	0.28	1.01	2.03	5.50	
Thresholds.3 4	-0.68	-2.58	0.68	2.51	0.56	2.04	2.18	5.95	
Thresholds.4 5	0.03	0.10	1.20	4.39	1.02	3.71	2.47	6.70	
Thresholds.5 6	0.23	0.86	1.53	5.63	1.30	4.68	2.71	7.32	
Thresholds.6 7	0.79	2.98	2.05	7.56	1.83	6.51	3.15	8.52	
Thresholds.7 8	1.13	4.21	2.49	9.03	2.33	8.17	3.51	9.47	
Ego characteristics									
Ego is male	-0.02	-0.15	0.19	1.73	0.09	0.81	0.12	0.89	
Age of ego									
20-29	-0.12	-0.77	-0.44	-2.76	-0.69	-4.46	1.25	6.53	
30-39	0.12	1.09	-0.40	-3.71	-0.34	-3.22	0.95	7.55	
40-49	-0.22	-2.30	-0.32	-3.49	-0.29	-2.96	0.64	5.46	
50-59	-0.10	-0.89	-0.43	-4.07	-0.07	-0.65	0.06	0.37	
60 and over (reference)	0		0		0		0		
Employment status of ego									
Full time employee	0.37	3.45	0.05	0.50	-0.05	-0.49	0.08	0.59	
Freelancer	0.22	0.75	0.41	1.80	0.30	1.25	0.06	0.26	
Part timer	0.18	1.37	0.09	0.76	0.03	0.26	0.03	0.21	
Home maker	0.27	2.19	0.15	1.30	0.13	1.09	0.13	0.89	
Student	0.97	3.84	0.24	0.89	-0.63	-1.89	0.23	0.68	
Unemployed/retired (reference)	0		0		0		0		
Civil status of ego									
In a relationship	-0.30	-1.40	0.58	2.41	0.73	3.35	0.30	1.35	
Married with children	0.11	1.03	0.08	0.81	-0.10	-1.02	0.05	0.36	
Married with no children	-0.14	-1.09	-0.03	-0.22	0.28	2.26	-0.18	-1.25	
Divorced	-0.13	-0.51	0.06	0.26	-0.01	-0.03	0.63	2.57	
Widowed	-0.11	-0.63	0.43	2.59	0.13	0.79	0.40	2.04	
Single (reference)	0		0		0		0		

Multivariate ordinal probit of contact frequency by mode

Contact frequency levels:

1. Never
2. 1-3 times per year
3. 4-11 times per year
4. 1-2 times per month
5. 3-4 times per month
6. 1-3 times per week
7. 4-7 times per week
8. Several times per day



Variable	Face to face		Phone		Email/SMS		SNS	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Relational characteristics								
Gender homophily								
Ego and alter are both male	-0.11	-1.07	-0.06	-0.52	0.02	0.14	-0.10	-0.65
Ego and alter are both female	-0.18	-1.77	0.00	-0.01	0.23	2.28	0.31	2.58
Different gender (reference)	0		0		0		0	
Other homophily								
same occupation type	-0.06	-0.78	0.15	2.20	0.11	1.53	0.16	1.81
same age cohort	-0.28	-4.01	-0.17	-2.33	-0.23	-3.21	-0.10	-1.15
Relationship type								
Spouse	2.07	15.32	0.91	7.60	0.89	7.34	0.71	4.29
Relative 1st degree	0.87	8.14	0.33	3.16	0.14	1.35	0.03	0.23
Relative 2nd degree	0.01	0.06	0.00	0.03	-0.50	-2.98	-0.15	-0.67
Work friend	0.43	4.08	-0.13	-1.08	0.37	2.95	0.16	1.08
School friend	-0.02	-0.19	-0.24	-1.88	0.11	0.81	0.30	1.95
Club/circle friend	0.35	2.87	-0.17	-1.39	0.25	1.94	0.19	1.25
Neighbor	0.04	0.26	-0.19	-1.22	-0.09	-0.56	0.22	1.03
Other (reference)	0		0		0		0	
Relationship duration								
Less than 1 year (reference)	0		0		0		0	
1 to 5 years	0.15	0.72	-0.09	-0.44	0.06	0.27	0.23	0.82
5 to 10 years	0.04	0.20	0.29	1.38	0.28	1.31	0.19	0.69
Over 10 years	-0.13	-0.65	0.37	1.85	0.39	1.93	0.32	1.16
Strong tie (Tiers 1,2)	0.14	1.93	0.27	3.89	0.16	2.29	0.22	2.76
Log of geodesic distance (km)	-0.25	-17.55	0.03	2.10	0.02	1.46	0.00	0.19
Correlations								
Face to face	-	-	0.25	8.66	0.15	5.30	0.07	1.88
Phone	-	--	-	-	0.42	18.47	0.20	6.26
Email/SMS	-	--	-	-	-	-	0.01	0.17
log-likelihood	-26694.44							

Ego-alter yearly contact frequency by relationship type

To summarize and conclude

Presented the results of the first ego-centric personal network survey in Japan using an almost unrestricted name generator, which allowed for better capturing network geographies and fine-grained relation attributes.

1. Are Japanese personal networks smaller than European and Pan-American networks?

- The average network size in the Tokyo sample was 4.6, a considerably smaller network than reported values in the international literature. We hypothesize this might be a result of resource constraints and the nature of social relations.
- A random sample survey is necessary to obtain comparable, and generalizable results.

2. Do ego-alter distances follow a power law distribution?

- Goodness of fit tests rejected the hypothesis that ego-alter distances follow a power law distribution in our sample, even though the most frequently used, yielded a significant exponent coefficient. Would be cautious about the power-law distribution argument and recommend additional testing with independent samples.

3. What about social isolation?

- While smaller networks do not necessarily imply isolation, in our sample 7.2% did not state having a person to spend free time with, or to discuss important problems with. Data from the 2013 Japan General Social Survey also reported a value 8.9%.
- These values might suggest some level of social isolation. However, Two important issues must be pointed out. First, if this measure of social isolation is valid, whether this is a direct result of the collapse of intermediate social groups, as suggested by the proponents of the isolated society theory remains an open question.
- It remains to be validated whether or not this is a true measure of social isolation or just a statistical artifact.

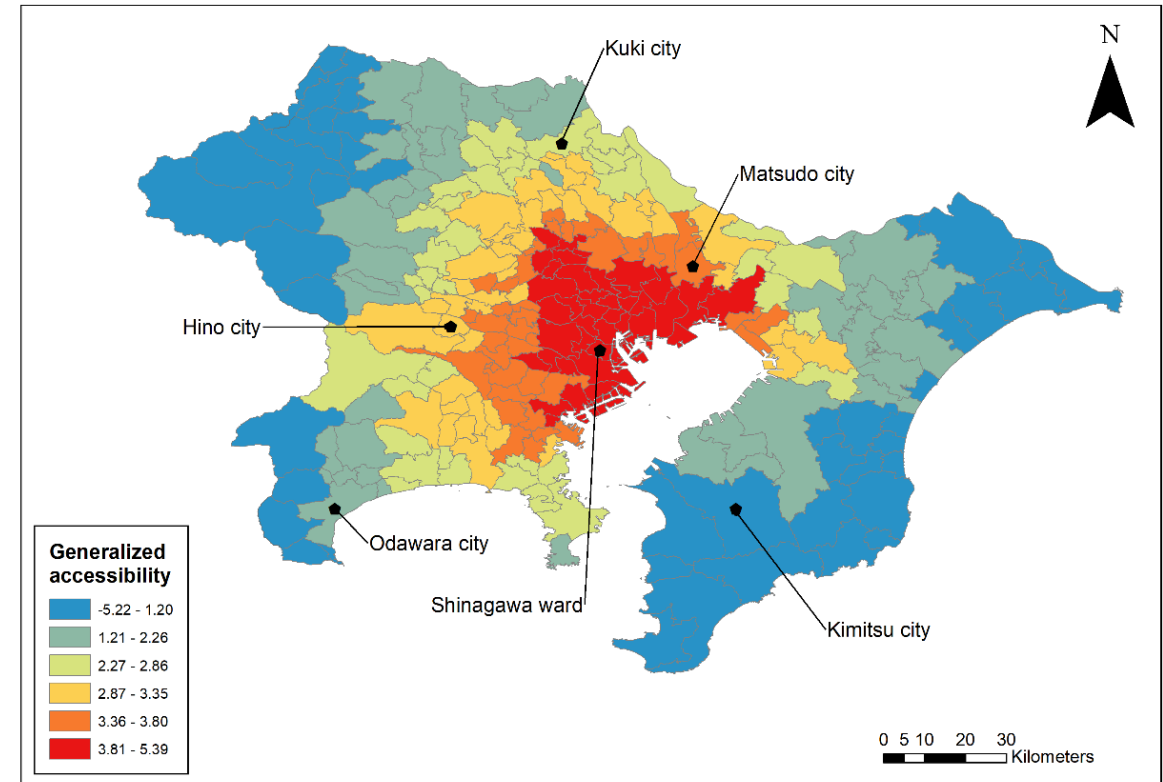
4. What about friendship formation and social contact frequency?

- The results of the friendship formation model suggest that homophily and distance are important factors in friendship probability. However, it should be noted that in the survey non-alterers are not observed.
- A meeting diary might be a good strategy to document potential new ties. Such a method could be combined with a natural experiment (i.e. persons moving to a new city, starting a new job, etc.) to observe transformations in social networks that allows for the estimation of better parameters with true panel data.
- Multilevel nature of data not accounted for in multivariate probit.
- Need to move beyond contact frequency to more specific travel behavior and add a spatial dimension to these interactions.

Next step

Probability survey underway

- Target population: Adults living in the **Greater Tokyo Area** (defined as the Tokyo Metropolitan Area, and the prefectures of Chiba, Saitama and Kanagawa).
- Execution period: From **March 2019**
- Sample size: **1000 persons**
- Sampling method: **Random sample (1 municipality per accessibility sextile)**
- Survey medium: **Online and paper**
- Survey frame: **Basic resident register**

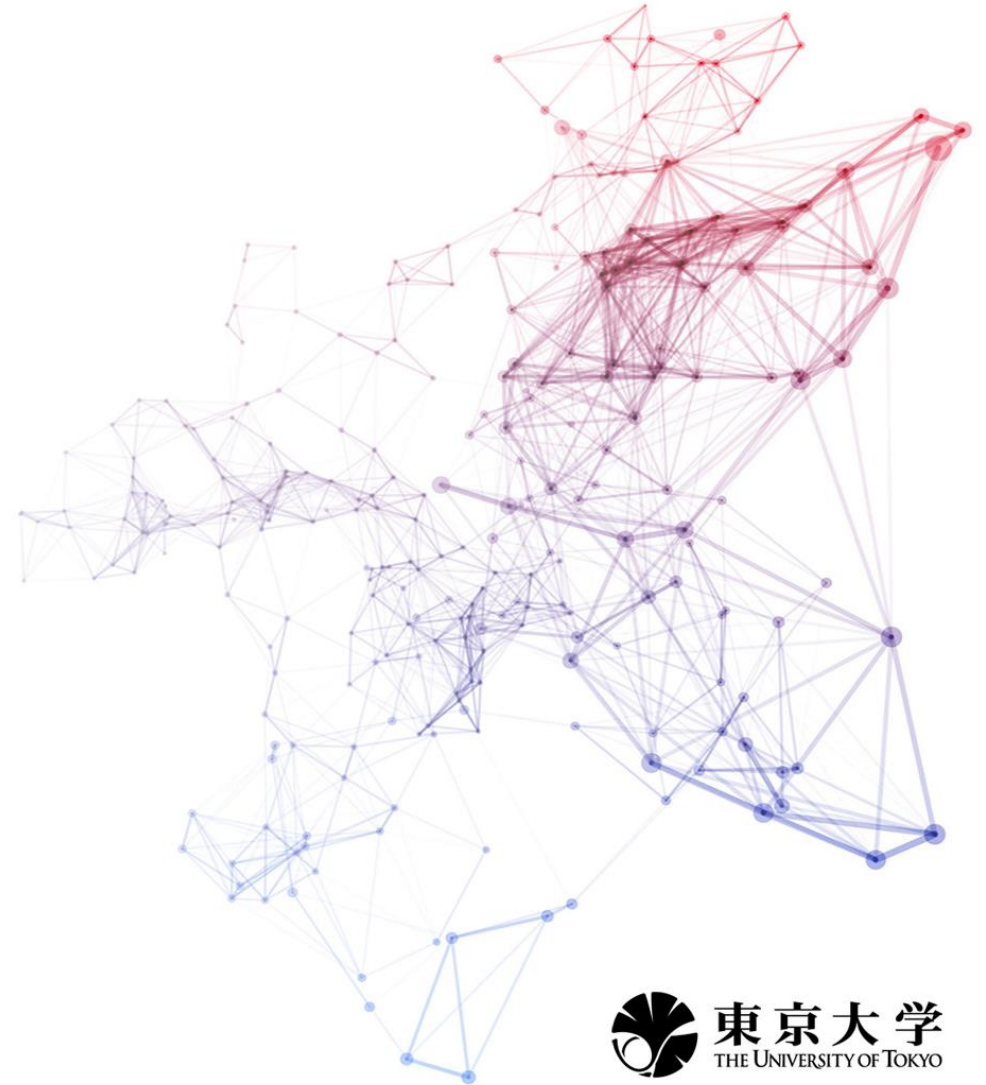


Accessibility sextiles	Population ratio	Expected responses/ Sample	Municipality Name (Accessibility)	Prefecture
1	36.2%	72/362	Shinagawa ward	Tokyo
2	21.4%	43/214	Matsudo city	Chiba
3	20.0%	43/200	Hino city	Tokyo
4	12.2%	24/122	Kuki city	Saitama
5	7.0%	14/70	Odawara city	Kanagawa
6	3.2%	6/32	Kimitsu city	Chiba

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Thank you for listening.



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