Requirements for Modelling Bicycle Traffic

A project funded by Ministry of Transportation and Telecommunications (Finland)

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Goal

- study factors why people choose bike for their trips
- clarify possibilities to use mathematical models for bicycle trips

Method

To analyse data from six travel behaviour surveys
- Oulu region, 1989
- Helsinki Metropolitan Area, 1995 (all modes)
- Helsinki Metropolitan Area, 1997 (only bikers)
- Vaasa region, 1997
- Turku region, 1997
- The area of Mid-Uusimaa and cities of Hyvinkää and Riihimäki, 1998

In most cases the surveys were carried out in September or early spring

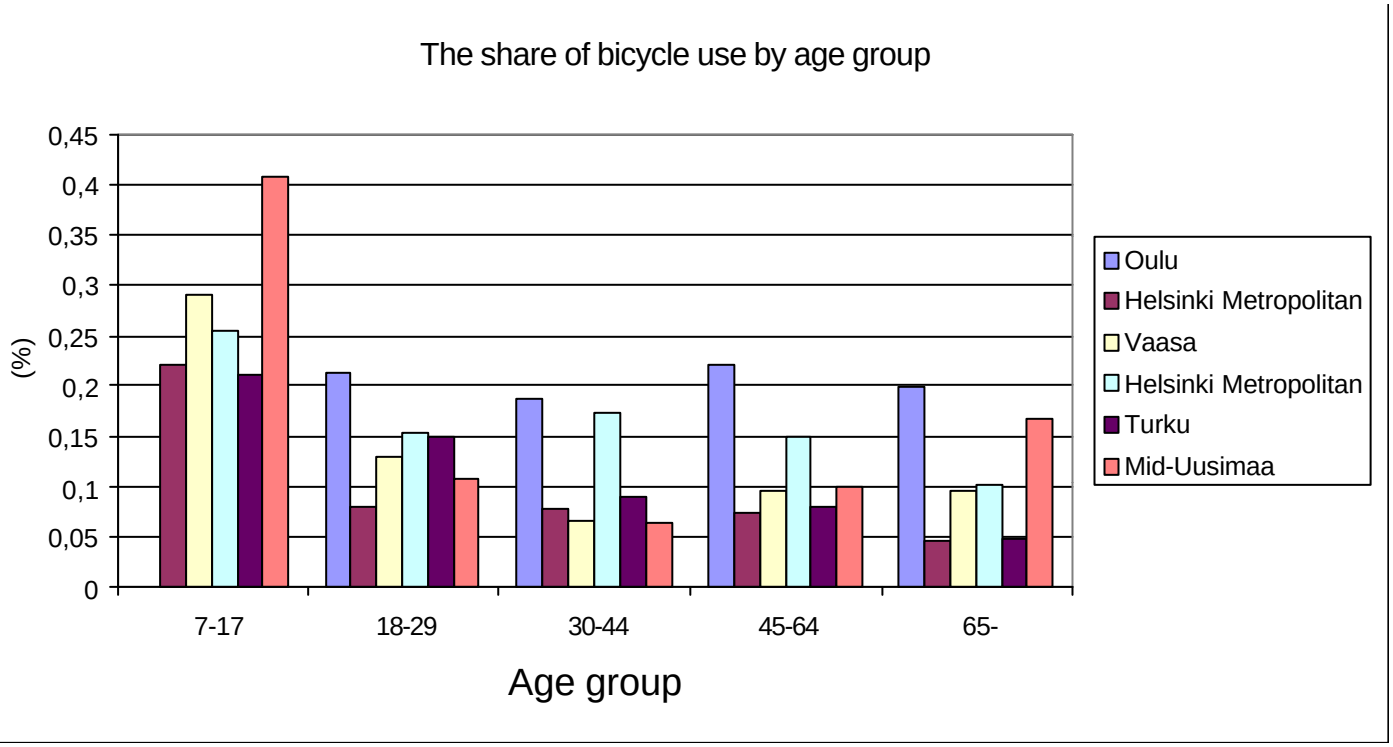
The main purpose of the surveys was to collect base data for transportation model estimation (demand, mode choice, destination and route choice models)

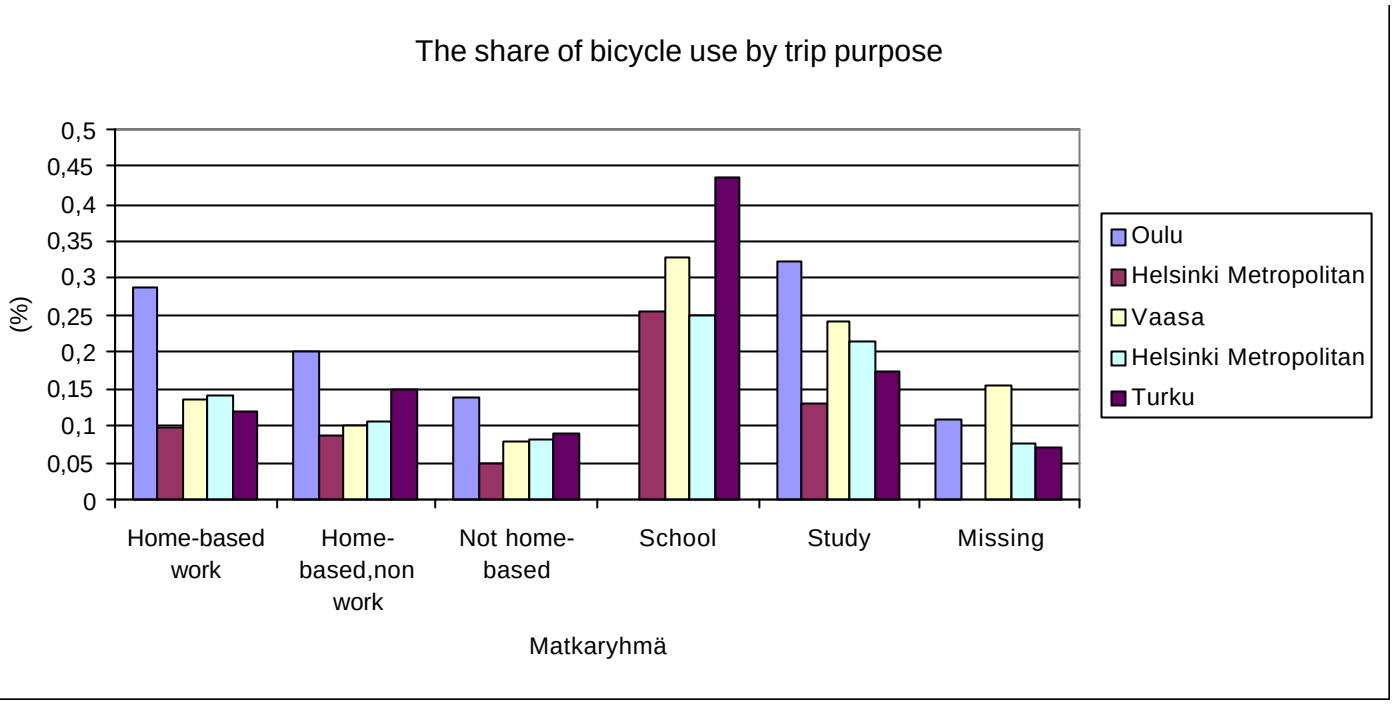
Area	Year	Time	Method	Age groups	Sample	Return %
Oulu	1989	11.9.-10.10.	Postal	≥7 (trip diary),	3923	48 %
		(Tue-Thur)		≥18 (backgroud info)		
Helsinki Metropolita	1995	18.9.-12.10.	Phone interview/	≥7	8065	38 %
		(Mon-Thur)	Postal			
Vaasa	1997	17.-20.3.	Postal	7-90	9842	36 %
		(Mon-Thur)				
Helsinki Metropolita	1997	3.-17.6. ja 11.-29.8.	Phone interview/	7-80	8000	30 %
		(Mon-Fri)	Postal			
Turku	1997	20.-23.10. ja 3.11.-4.12.	Phone interview/	7-90	21000	43 %
		(Mon-Thur)	Postal			
Mid-Uusimaa,	1998	22.9.-8.10., (29.8.-7.11.)	Phone interview/	7-90	12000	38 %
Hyvinkää-Riihimäki		(Tue-Thur)	Postal			

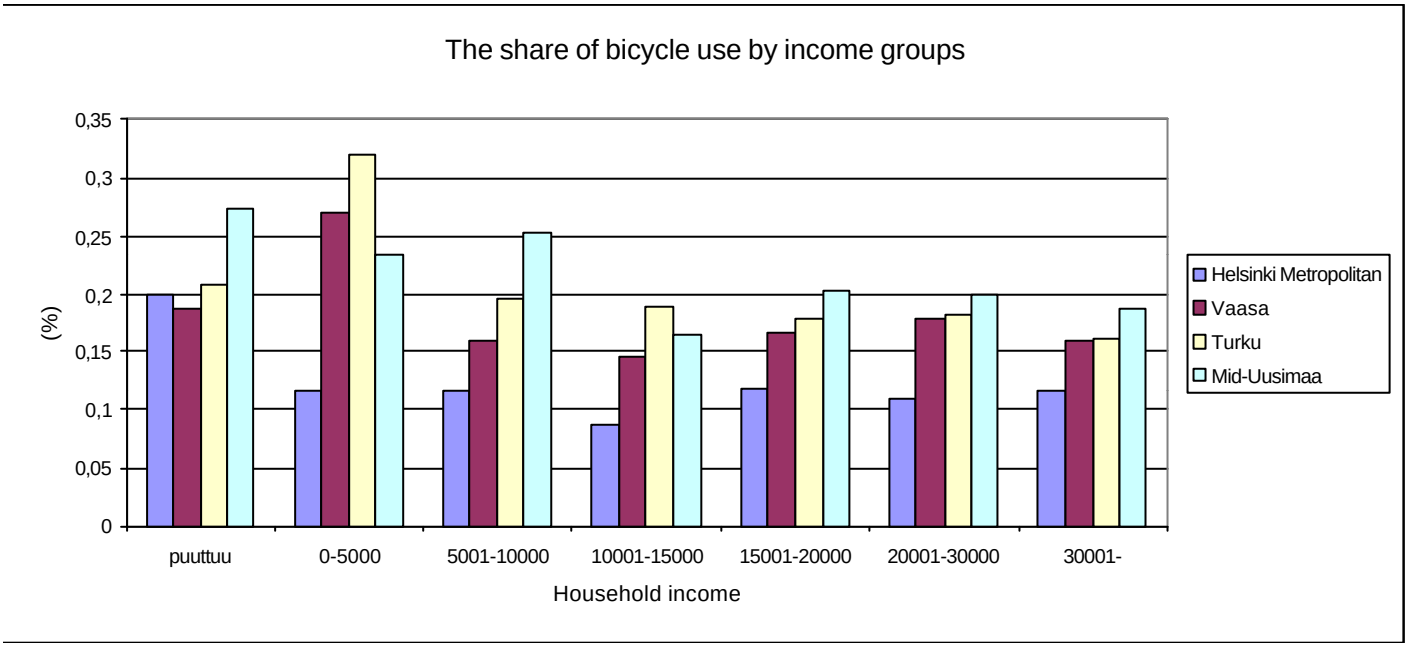
Area	Year	Towns included	Population	Area (squear km)	Population / km2
Oulu	1989	Oulu, Haukipudas, Kempele, Kiiminki, Muhos,	162086 a	5095	32
		Oulunsalo, Ii, Liminka, Ylikiiminki,			
		Hailuoto, Temmes			
Helsinki Metropolita	1995	Helsinki, Vantaa, Espoo, Kauniainen	891056 b	743	1199
Vaasa	1997	Vaasa, Mustasaari, Laihia, Maalahti, Isokyrö, Jurva,	110295 c	4008	28
		Vähäkyrö, Vöyri, Oravainen, Korsnäs, Maksamaa			
Helsinki Metropolita	1997	Helsinki, Vantaa, Espoo, Kauniainen	905555 c	743	1219
Turku	1997	Turku, Raisio, Naantali, Lieto, Piikkiö	240481 d	633	380
Mid-Uusimaa	1998	Hyvinkää, Järvenpää, Kerava, Nurmijärvi, Tuusula,	397888 e	6260	64
		Loppi, Hausjärvi, Riihimäki, Inkoo, Karkkila,			
		Kirkkonummi, Lohja, Mäntsälä, Nummi-Pusula,			
		Pornainen, Porvoo, Sipoo, Siuntio, Vihti			

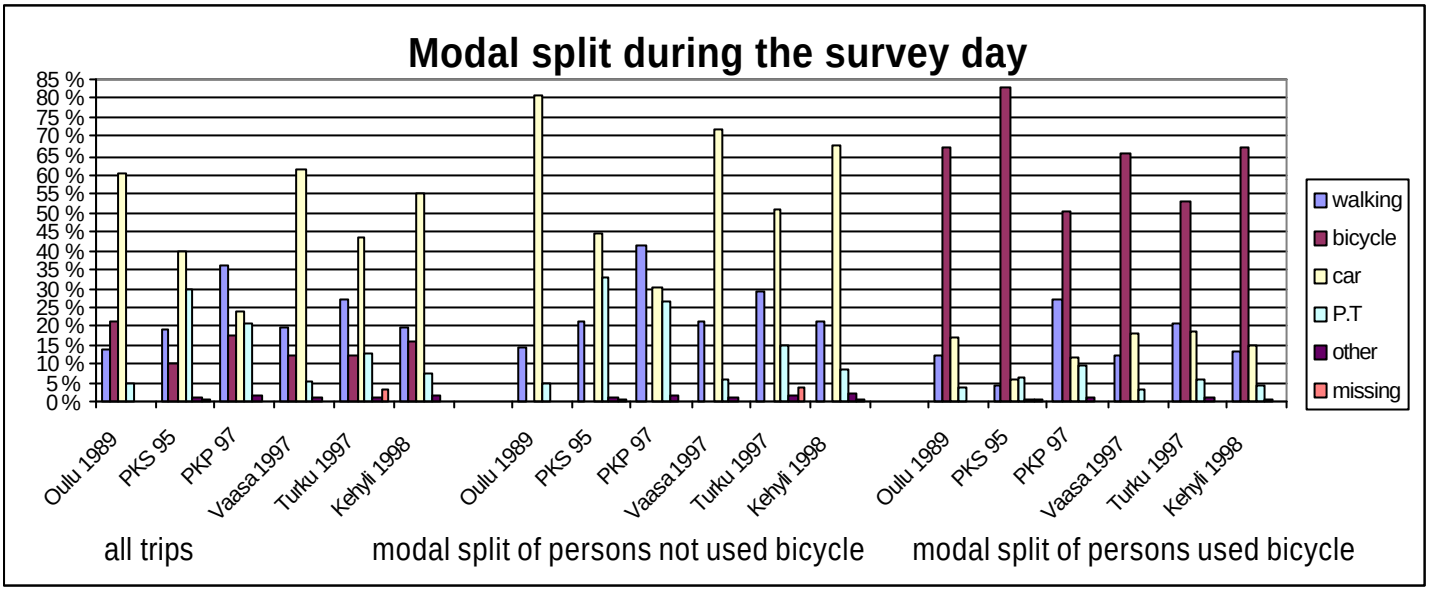
Area		Information of data						
	Year	persons	age group	7-17	18-29	30-44	45-64	65-
Oulu	1989	1872	share		25,1 %	34,0 %	28,2 %	12,7 %
			women		272	350	269	155
			men		198	287	258	83
Helsinki Metropolita	1995	3082	share	16,8 %	13,4 %	26,4 %	30,9 %	12,5 %
			women	282	241	481	563	242
			men	235	172	334	388	144
Vaasa	1997	3581	share	11,2 %	14,6 %	19,3 %	31,2 %	23,7 %
			women	209	301	412	622	516
			men	191	222	279	496	333
Helsinki Metropolita	1997	2356	share	15,3 %	18,7 %	26,5 %	31,9 %	7,6 %
			women	202	289	381	430	96
			men	159	152	243	322	82
Turku	1997	8922	share	20,0 %	19,3 %	21,0 %	22,7 %	17,0 %
			women	943	1049	1050	1168	981
			men	841	677	822	857	534
Mid-Uusimaa,	1998	4581	share	18,4 %	11,5 %	25,8 %	31,7 %	12,7 %
Hyvinkää-Riihimäki			women	425	271	685	768	355
			men	420	254	495	683	225

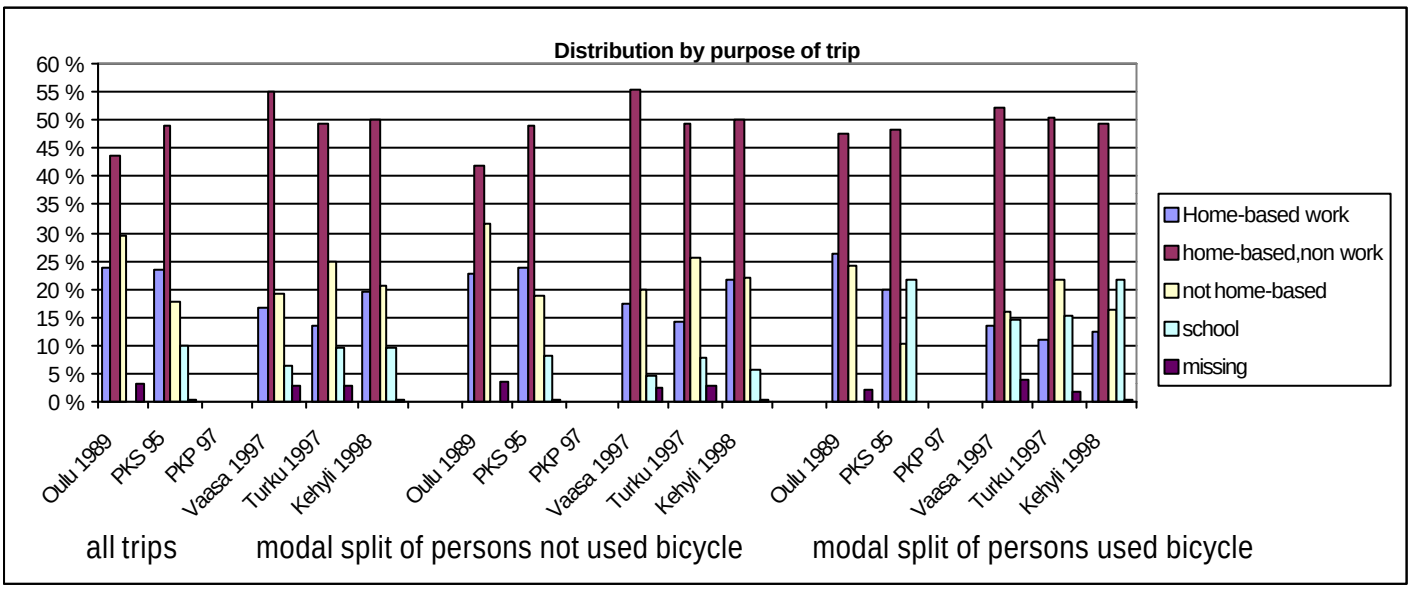
Area	Year		persons	trips	agegroup share of all trips	mode							
						walking		bicycle		car		public transport	
Oulu	1989	all	1872	5875		788	13,4 %	1196	20,4 %	3429	58,4 %	270	4,6 %
		7-17	0										
		18-29	470	1802	30,7 %	259	14,4 %	382	21,2 %	1050	58,3 %	78	4,3 %
		30-44	637	2420	41,2 %	307	12,7 %	454	18,8 %	1503	62,1 %	99	4,1 %
		45-64	527	1380	23,5 %	169	12,2 %	306	22,2 %	772	55,9 %	72	5,2 %
		65-	238	273	4,6 %	53	19,4 %	54	19,8 %	104	38,1 %	21	7,7 %
Helsinki Metropolitan	1995	all	3082	8921		1692	19,0 %	905	10,1 %	3546	39,7 %	2656	29,8 %
		7-17	517	1707	19,1 %	581	34,0 %	378	22,1 %	254	14,9 %	479	28,1 %
		18-29	413	1324	14,8 %	215	16,2 %	105	7,9 %	494	37,3 %	502	37,9 %
		30-44	815	2533	28,4 %	322	12,7 %	195	7,7 %	1275	50,3 %	703	27,8 %
		45-64	951	2636	29,5 %	394	14,9 %	193	7,3 %	1307	49,6 %	697	26,4 %
		65-	386	721	8,1 %	180	25,0 %	34	4,7 %	216	30,0 %	275	38,1 %
Vaasa	1997	all	3581	10242		1996	19,5 %	1260	12,3 %	6337	61,9 %	556	5,4 %
		7-17	400	1435	14,0 %	350	24,4 %	416	29,0 %	415	28,9 %	240	16,7 %
		18-29	523	2024	19,8 %	400	19,8 %	263	13,0 %	1297	64,1 %	58	2,9 %
		30-44	691	2459	24,0 %	357	14,5 %	165	6,7 %	1862	75,7 %	59	2,4 %
		45-64	1118	3088	30,2 %	532	17,2 %	297	9,6 %	2117	68,6 %	111	3,6 %
		65-	849	1236	12,1 %	357	28,9 %	119	9,6 %	646	52,3 %	88	7,1 %
Turku	1997	all	8922	33296,5		9084,5	27,3 %	4116	12,4 %	14489	43,5 %	4191	12,6 %
		7-17	1784	7034	21,1 %	2381	33,8 %	1477	21,0 %	1569	22,3 %	1354	19,2 %
		18-29	1726	8067	24,2 %	2412	29,9 %	1203	14,9 %	3518	43,6 %	794	9,8 %
		30-44	1872	8074	24,2 %	1769,5	21,9 %	723	9,0 %	4639	57,5 %	717	8,9 %
		45-64	2025	6965,5	20,9 %	1511	21,7 %	559	8,0 %	3728,5	53,5 %	791	11,4 %
		65-	1515	3156	9,5 %	1011	32,0 %	154	4,9 %	1034	32,8 %	535	17,0 %
Mid-Uusimaa, Hyvinkää-Riihimäki	1998	all	4581	15705		3062	19,5 %	2494	15,9 %	8669	55,2 %	1184	7,5 %
		7-17	845	3232	20,6 %	888	27,5 %	1319	40,8 %	607	18,8 %	306	9,5 %
		18-29	525	1914	12,2 %	347	18,1 %	208	10,9 %	1173	61,3 %	163	8,5 %
		30-44	1180	4657	29,7 %	703	15,1 %	301	6,5 %	3279	70,4 %	308	6,6 %
		45-64	1451	4791	30,5 %	746	15,6 %	479	10,0 %	3120	65,1 %	363	7,6 %
		65-	580	1111	7,1 %	378	34,0 %	187	16,8 %	490	44,1 %	44	4,0 %

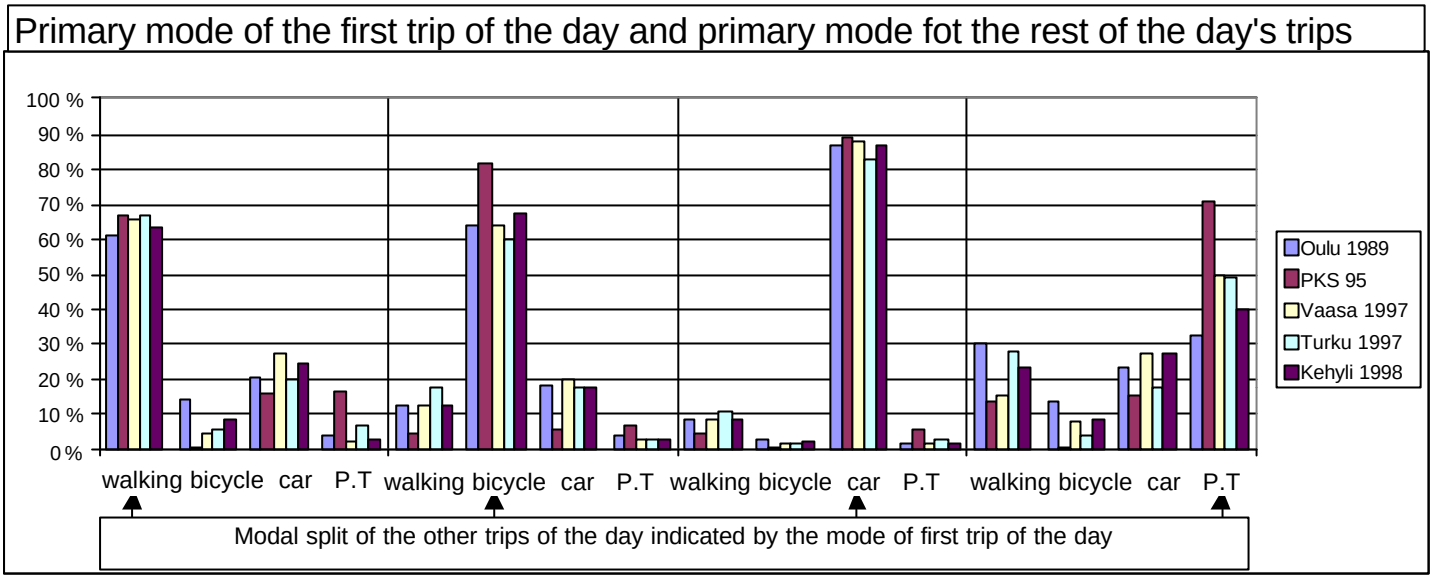



The share of bicycle use by trip purpose
0,5
0,45
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
(%)
Home-based work
Home-based,non work
Not home-based
School
Study
Missing
Matkaryhmä
Oulu
Helsinki Metropolitan
Vaasa
Helsinki Metropolitan
Turku


The share of bicycle use by income groups
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
(%)
puuttuu
0-5000
5001-10000
10001-15000
15001-20000
20001-30000
30001-
Household income
Helsinki Metropolitan
Vaasa
Turku
Mid-Uusimaa


Modal split during the survey day
85 %
80 %
75 %
70 %
65 %
60 %
55 %
50 %
45 %
40 %
35 %
30 %
25 %
20 %
15 %
10 %
5 %
0 %
walking
bicycle
car
P.T
other
missing
Oulu 1989
PKS 95
PKP 97
Vaasa 1997
Turku 1997
Kehyli 1998
all trips
modal split of persons not used bicycle
modal split of persons used bicycle


Distribution by purpose of trip
60 %
55 %
50 %
45 %
40 %
35 %
30 %
25 %
20 %
15 %
10 %
5 %
0 %
Home-based work
home-based,non work
not home-based
school
missing
Oulu 1989
PKS 95
PKP 97
Vaasa 1997
Turku 1997
Kehyli 1998
all trips
modal split of persons not used bicycle
modal split of persons used bicycle



Summary

- 30% to 50% of the data gathered consists of young people's (aged 7 to 17) trips
- Decision over the primary mode used during the whole day is done before the first trip
- Standard survey methods do not produce data that is usable for analysis or for estimation of models for bicycle traffic

Conclusions

- Geocoding has to be used in coding the data
- Specially targeted surveys are recommended for the analysis of bicycle use
- Surveys have to place emphasis on trip-chains and to the mode-choice-determining trip of the day

Why bicycle traffic should be modelled:

- Biking and walking should have equal position with other modes in Transportation Master Plans
- (Bicycle) network planning and impact analysis become easier and more solid
- Cost-benefit and other economic analyses need quantitative methods
- Promotion of bicycle use is more convincing by using 'scientific' methods