

DTU



Influence of Parental Safety Perception on School Travel Independence

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Children's Travel behaviour

Safety Perception on the Way to School



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Independent Travel

(to school)



Why focus on independent travel for children?

Health and well-being

Promotes physical activity, social connection, and cognitive development in children

(Deenihan et al. 2014; Dinu et al. 2019; Waygood, Friman, et al. 2017; Waygood, van den Berg, et al. 2021; Varela et al. 2018).

Long-Term Implications

Shapes future travel behavior and reduces car dependency, yet many countries see a negative trend

(Smart et al. 2018; Fyhri et al. 2011).

Perceived safety as a key barrier

Influence on travel choices

(Sanders 2015; Ferencsak et al. 2020).

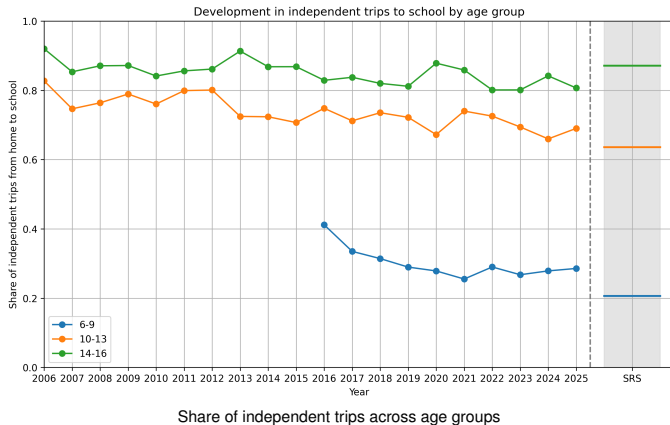
Perceived safety affected by

Traffic, lighting, road design, cycling infrastructure, cycling volume and driver behavior (Lawson et al. 2013; Manton et al. 2016; Møller et al. 2008; Ng et al. 2017; Nordengen et al. 2019).

Parental restrictions

Parents often limit children's independent cycling despite their willingness (Municipality of Esbjerg 2022; Operate 2022; Vejdirektoratet 2022).

Independent travel among children in Denmark



Research gap

- Lack of robust mode choice studies on childrens travel including perceived safety information
- Many studies suffer from low number of respondents
- Unexpected or unclear results from intervention studies, i.e. Dowling et al. 2025
- Often the focus is on active vs. non-active travel

Research Objectives

- Identify factors affecting childrens' independent travel to school
 - Household factors
 - Street environment including motor traffic levels
 - Geographical factors
- Measure and analyse the effect of *parental concern*
- Validate results against Danish National Travel Survey data
- Can minor interventions improve the level of independent travel?

Method



Data Sources

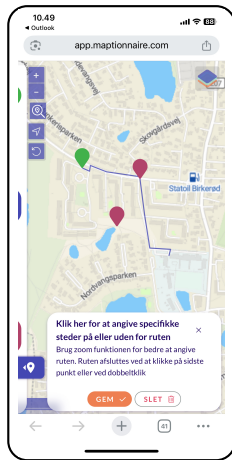
- Danish National Travel Survey data (TU)
 - One day travel diary, national level, all year round (from 6yo since 2016)

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- Danish National Travel Survey data (TU)
 - One day travel diary, national level, all year round (from 6yo since 2016)
- School Route Survey
 - Hand-picked questions from TU, related to childrens independent transport
 - Added questions about perceived safety (from the parents' perspective)
 - Parents indication of "most preferred route if their child would travel independently"



3 Barnets seneste skoledag

I det følgende beder vi dig tænke på den seneste hverdag hvor barnet overnattede hos dig natten før og barnet var i skole.

Hvilken dato var dette?

<

August

>

2026

Mon	Tue	Wed	Thu	Fri	Sat	Sun
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6

Hvordan kom barnet i skole?

- ☐ Blev kørt i bil
- ☐ Gang eller løb alene eller med andre børn
- ☐ Gang eller løb i følgeskab med en voksen
- ☐ Cykel eller knallert alene eller med andre børn
- ☐ Cykel eller knallert i følgeskab med en voksen
- ☐ Blev kørt på cykel (eks cykelsæde eller i ladcykel)
- ☐ Med offentlig transport eller skolebus alene eller med andre børn
- ☐ Med offentlig transport i følgeskab med en voksen
- ☐ Andet transportmiddel (f.eks. løbehjul, skateboard, kørestol) alene eller med andre børn
- ☐ Andet transportmiddel (f.eks. løbehjul, skateboard, kørestol) i følgeskab med en voksen

Parental indicators of concern

4c Tryghed

Prøv at besvare følgende spørgsmål om dine eventuelle bekymringer når eller hvis dit barn skulle færdes færdes på egen hånd **uden en voksen** når det skal **fra** dit hjem **til** barnets skole?

På en skala fra 0 til 10, i hvor høj grad er du bekymret for følgende hændelser:

At barnet kommer ud for en trafikulykke



At barnet bliver udsat for kriminalitet



At barnet ikke er tryk ved at tage turen selv



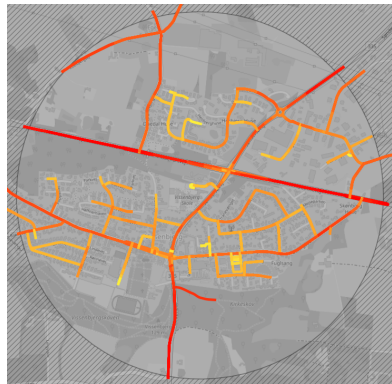
Additional data sources

Variables used directly or derived from:

- Home location
- School location
- Preferred route indicated by parents

Added data sources include:

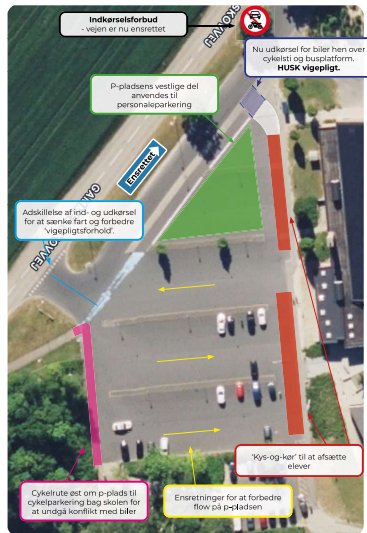
- Digital representation of road network including paths (Enriched OSM network)
- Aggregate income at church district level
- Traffic data from TomTom (Rambøll fonden)



Average traffic speed from TomTom data

Sample and modelling

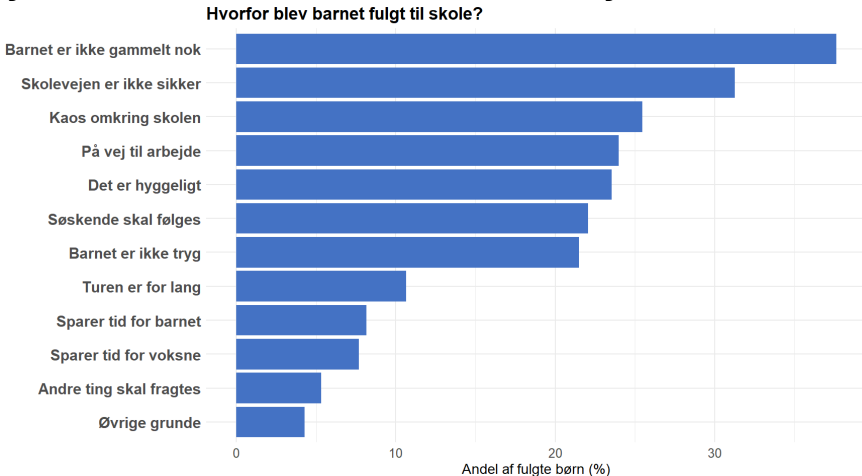
- School Route Survey distributed to parents at schools participating in an intervention study (before and after)
- Two different models:
 - Independent travel
 - TU
 - SRS
 - Parental concern
 - Traffic safety
 - Crime
 - Whether the child is comfortable travelling independently



Results



Why was the child followed to school by an adult?

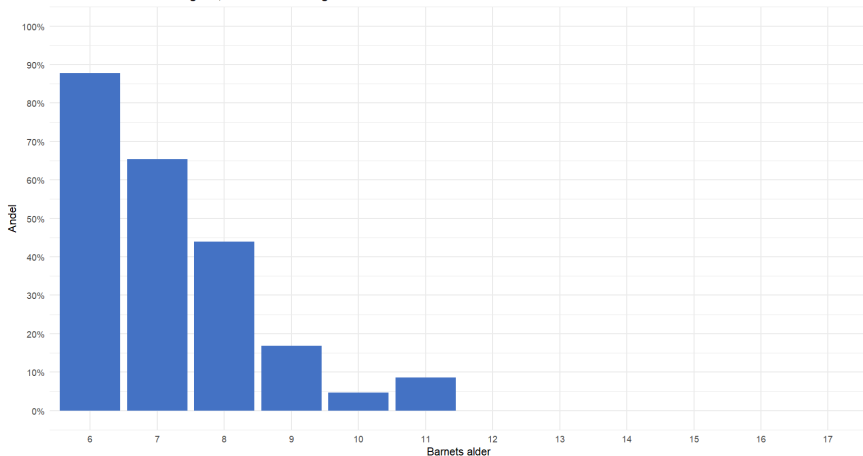


Share of parents who indicated that their child was followed to school, by reason

Results

Why was the child followed to school by an adult?

Andel af forældre der angiver, at barnet ikke er gammelt nok



Share of parents who indicated that their child was followed to school and their child was not old enough to do so, by age

Results

Travel independence

- The SRS model reproduces the main patterns observed in TU.
- Exposure to roads where at least 20% of vehicles exceed 40 km/h is associated with a substantially lower likelihood of independent travel.
- Perceived traffic safety is strongly associated with independent mobility.
- Among children living close to school, traffic conditions appear more strongly associated with independent travel than distance.
- The TU model indicates a declining trend in independent travel over time.

Variable		TU	SRS (TomTom)
Child & trip	Distance	-0.04***	-0.04
	Female	-0.04***	-0.07*
	Age 6–9	-0.38***	-0.46***
	Age 13–16	0.16***	0.22***
	Younger sibs.	0.00	0.01
	Older sibs.	0.01***	0.07***
Household	No car	0.05*	
	≥ 2 cars	-0.01	
Residential environment	Village	-0.05*	
	Small town	0.04**	
	Medium city	0.02	
	Aar, Od, Aal	0.05*	
	Area income (100k DKK)	0.02.	0.15*
Weather	Cold weather	-0.03*	-0.01
	Warm weather	0.02	-0.05
	Rain	-0.02	0.04
	Low wind	0.01	-0.02
	High wind	-0.02	-0.03
Context	High speed road		-0.11**
	Traffic safety concern		-0.02***
	Survey year	-0.03**	
Intercept		0.71***	0.47*
Observations		6265	732
R^2		0.255	0.395 [†]
Schools		—	15
School SD		—	0.10

. $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. [†] Marginal R^2 from mixed-

effects model. Coefficients are percentage-point effects from linear probability models.

Reference categories: male, age 10–12, one car, Copenhagen/Frederiksberg (TU).

Parental concern

	Traffic accident	Crime	Does the child feel safe?
Parent is a woman		++	
Child is a girl		+ + +	+
Age	- - -		- - -
Distance to school			+
Suburban area		-	
Rural area		- - -	
Median disposable income			
Lighting		-	
Surroundings along the route		- - -	- -
Safety measures along the route	- - -	++	
Route accessibility for the child	- -		- - -
Access to school conditions	-		-

Note: Positive coefficients indicate factors associated with a higher level of parental concern, while negative coefficients indicate factors associated with a lower level of parental concern. Three symbols (+ + +/ - - -) indicate a strong statistically significant association ($p < 0.001$), two symbols (++/ --) indicate significance at the 1% level ($p < 0.01$), and one symbol (+/ -) indicates significance at the 5% level ($p < 0.05$).

Kalvebod Bølge	0.3 km	2 min
DGI Byen	0.2 km	1 min
Nørrebro St.	1.6 km	
Vesterport St.	0.6 km	

Conclusion



Conclusion

- The School Route Survey is a robust tool to analyse childrens travel
- No robust effects were found from minor school interventions (independence and parental concern)
- Lower level of independence for
 - girls, younger kids, high distance to school
 - kids without older siblings
 - Cold weather (not reproduced in SRS, lack of season variability)
 - Lower income areas
 - rural areas (not reproduced in SRS)
 - Routes that follow or cross roads with high speed or high level of traffic
- Parents perception of traffic safety has a significant influence on independent travel to school for their children

Conclusion

- Parental concern varies across different dimensions of school travel safety
- Higher parental concern is associated with
 - girls (Crime + Child feeling safe)
 - younger children (Traffic + Child feeling safe)
 - longer distance to school (Child feeling safe)
 - urban areas, (Crime)
 - less favourable route conditions and accessibility
- The results identify and quantify how both child and school route characteristics are associated with parental concern.

Thank you for listening

The next steps

- Finalise data collection at all participating schools and update the model
- Better representation of indicated routes and TomTom traffic data in the models
- Work on more elaborate model specification
(Integrated perceived safety and independent travel model?)

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