A travel mode choice model considering self-selection of vaccination

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- In the COVID-19 pandemic, many people got vaccinated.

コロナ禍では，ワクチン接種が進められた．

- There is a literature that examined the effect of vaccination on travel mode choice behavior. However, we can consider the opposite effect that people decided to get vaccinated with taking account of their daily transportation mode, i.e. self-selection of vaccination.

ワクチン接種が交通手段選択に及ぼす影響を検討した文献が存在する．一方，普段の利用交通手段を念頭にワクチンを接種するか否かを決めるという逆の影響，すなわちワクチン接種の自己選択も考えられる．

- By considering this, we can more accurately analyze the relationship between vaccination and changes in travel behavior. This would be helpful in predicting transportation patterns during the outbreak of a new infectious disease.

これを考慮することで，ワクチン接種と交通行動の変化との関係をより正確に分析することができる．これは新たな感染症の流行時における，交通利用状況の予測に役立つだろう．

**Evaluating the effect of vaccination on
travel mode choice
considering self-Selection**
自己選択を考慮しながら，ワクチン接種が
交通行動に与える影響を検証

COVID-19 pandemic affects traffic behavior
(Public Transportation →decrease
The others →increase)
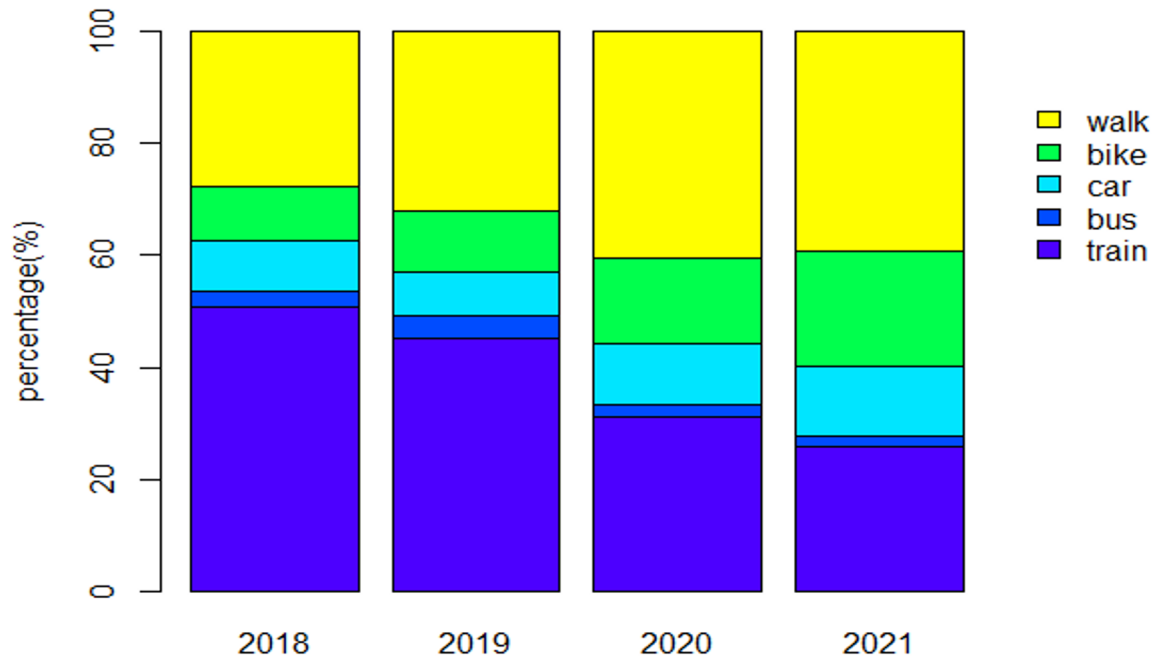
COVID-19のパンデミックにより、交通行動に変化があった
（公共交通機関→減少、その他→増加）

Figure1：Percentage change in representative transportation by age group

Transportation choices are different for vaccinated and unvaccinated people.
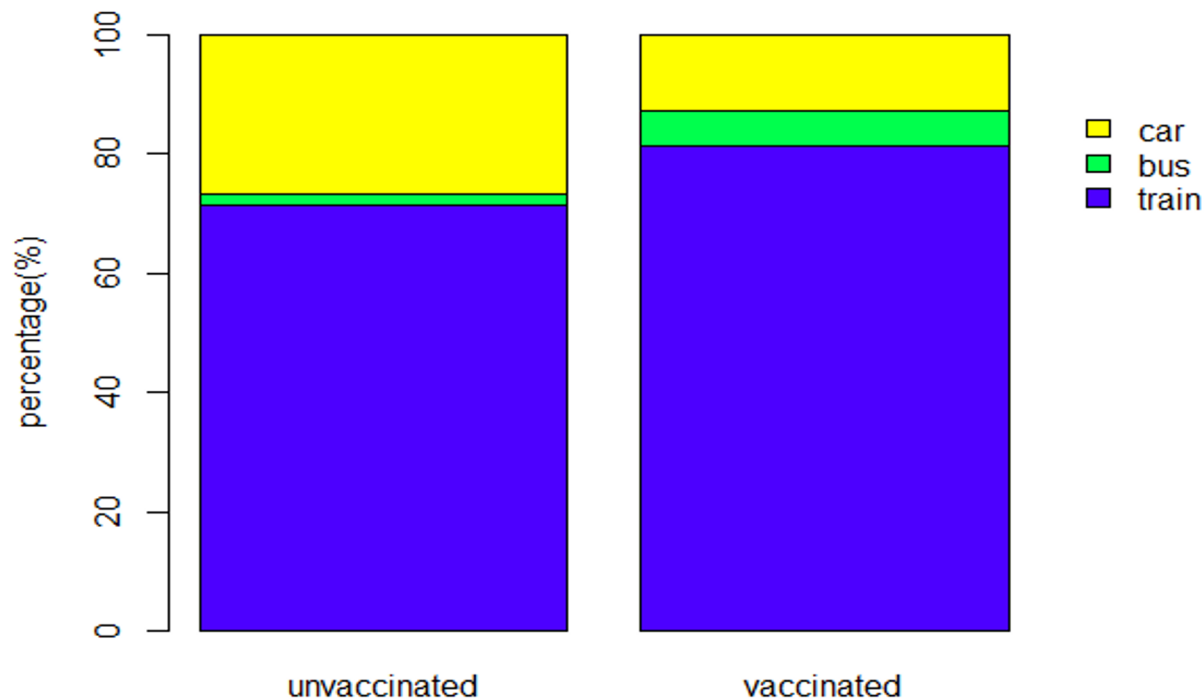
ワクチンを接種した人と接種していない人の交通機関選択に違いがあった。

Figure 2 ： Differences in representative transportation between vaccinated and unvaccinated persons

1. Toyosu 2021 PP data

・ Travel time （所要時間）
・ Primary mode of transportation （代表交通手段）
・ Departure date and time （出発日時）

2. 2019-2021 Toyosu personal attributes data

・ Vaccination timing （ワクチン接種時期）
・ Ownership of a car (Yes/No) （自動車保有有無）

daily transportation mode

- Utility function

- Variables and parameters

Variables		Parameters
-	Interpret	
	Train time（hour）	
	Car possession dummy	
	Subjective main travel mode	

Model without daily transportation mode

Parameters	Estimate	s.e.	t value
	-0.9161	0.2757	-3.3231
	-3.3828	0.2652	-12.7574
	0.5047	0.1573	3.2078
	-1.2686	0.5351	-2.3705
	-3.5315	0.6109	-5.7807
	-0.1593	0.3005	-0.5301
	2.7862	0.2279	12.2274

Model with daily transportation mode

Parameters	Estimate	s.e.	t value
	0.6023	0.3136	1.9209
	-2.1664	0.3086	-7.0208
	0.2457	0.1890	1.2997
	-0.6909	0.5873	-1.1764
	-3.3269	0.6260	-5.3149
	0.2235	0.3366	0.6639
	3.0127	0.2568	11.7313
	2.8950	0.1842	15.7129

Train choice

Considering self-selection. Vaccination has a limited impact on travel mode choice.

Vaccinated

Not vaccinated
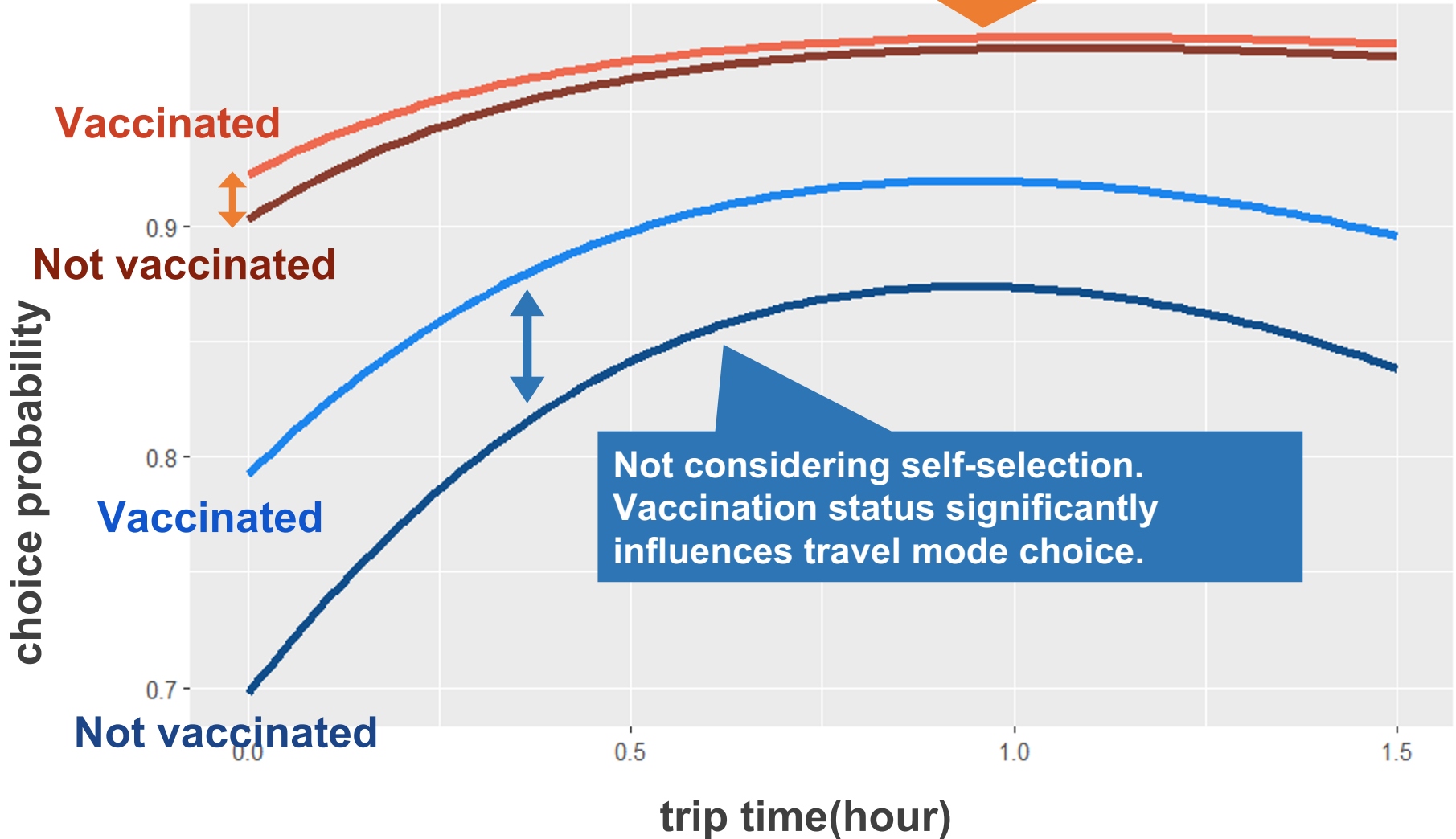
Vaccinated

Not considering self-selection. Vaccination status significantly influences travel mode choice.

Not vaccinated

choice probability

0.9

0.8

0.7

trip time(hour)

0.5   1.0   1.5

・ We observed that vaccination is overestimated when the effects of s<u>elf-selection </u>are not taken into account

・ 自己選択の影響を考慮していないとき，ワクチン接種を過大評価してしまうことを確認した

・ <u>Reverse causation </u>between vaccination and travel mode choice

| **Vaccination** | ⟷ | **Travel mode choice** |

・ ワクチン接種と交通機関選択の間に，逆の因果があった
想定：ワクチン接種→交通機関選択
結果：ワクチン接種←交通機関選択

1) 早稲田大学B：ワクチン接種が交通手段選択に与える影響と 接種者を対象とした公共交通利用促進策の提案, http://bin.t.utokyo.ac.jp/model22/presentation/final_12.pdf