

Urban recreation during COVID-19 pandemic – the case of the Vistula river in Warsaw

Wiktor Budziński, Mikołaj Czajkowski



Motivation

- Vistula riverside is a popular hotspot for recreation in Warsaw
 - Around 80% of citizens visit it regularly
- Provides diverse recreational opportunities
 - Left side is more urbanized
 - Boulevards, restaurants, clubs
 - Right side is more natural
 - Green spaces (Natura 2000), beaches



©Agencja Gazeta



©Agencja Gazeta

Why COVID?

- COVID pandemic has significantly affected and changed our daily life
 - Social distancing and wearing masks seem to be the most common ways to limit the rate of daily cases
 - At the same time these measure may limit certain types of outdoor activities
 - The effect is even more pronounced when a strict lockdown is introduced
- Boulevards at the left side of the river were closed for few days, and alcohol consumption became illegal there afterwards
- Estimated welfare losses associated with the pandemic maybe useful for future decision-making
- From the practical standpoint – the study was already planned before the pandemic
 - The dilemma: whether to focus on the issue of pandemic or proceed as a regular valuation study

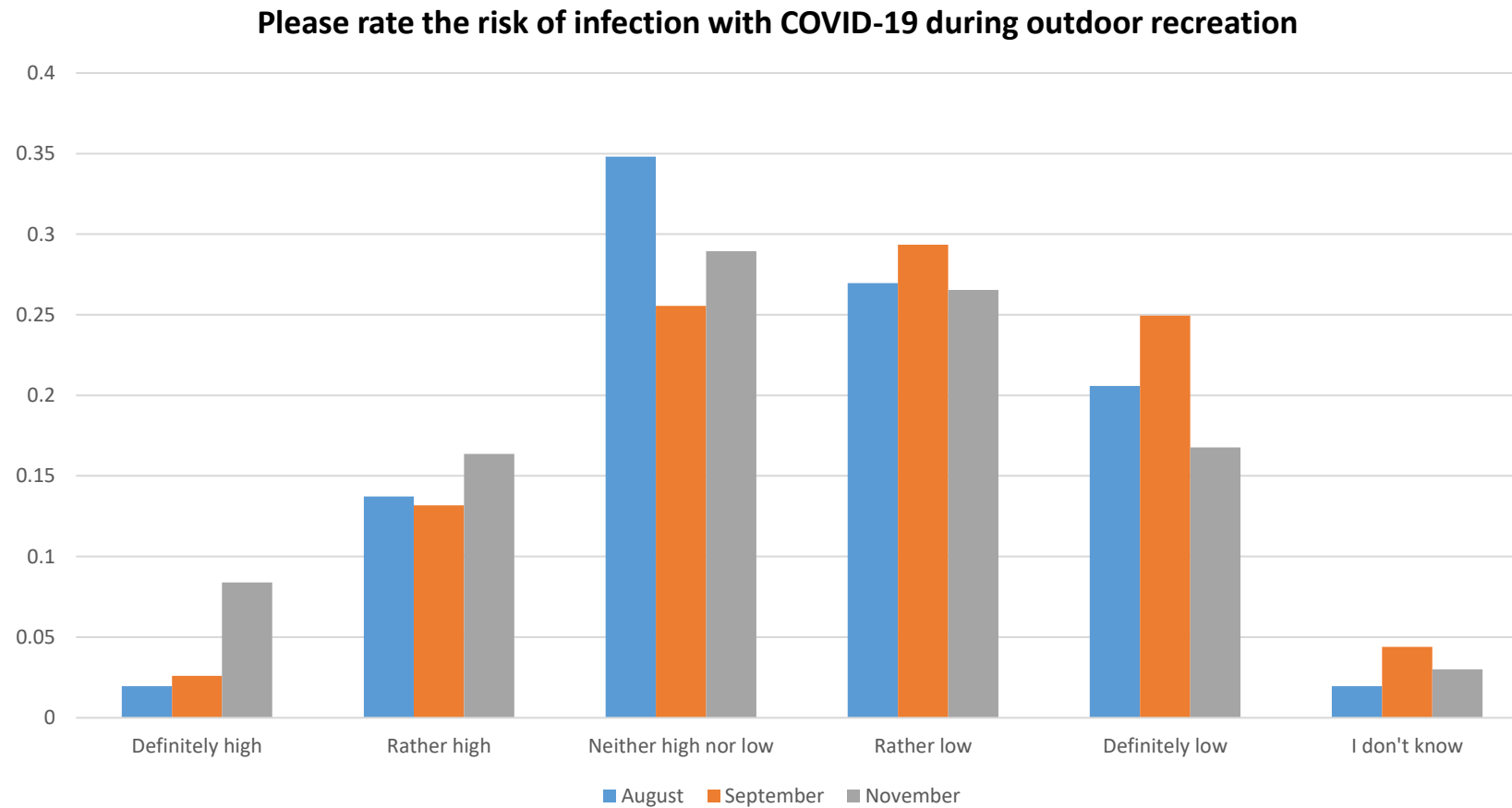
What we do?

- We conducted a travel cost survey in which we asked respondents about their recreation at the Vistula riverside in Warsaw in the last 12 months
- There were three waves of the survey in August, September and November 2020, respectively
- We try to control for the effect of pandemic in two ways:
 - Using qualitative measures of perceptions and attitudes
 - Using stated behavior (*how many visits would you make if there were no pandemic*)

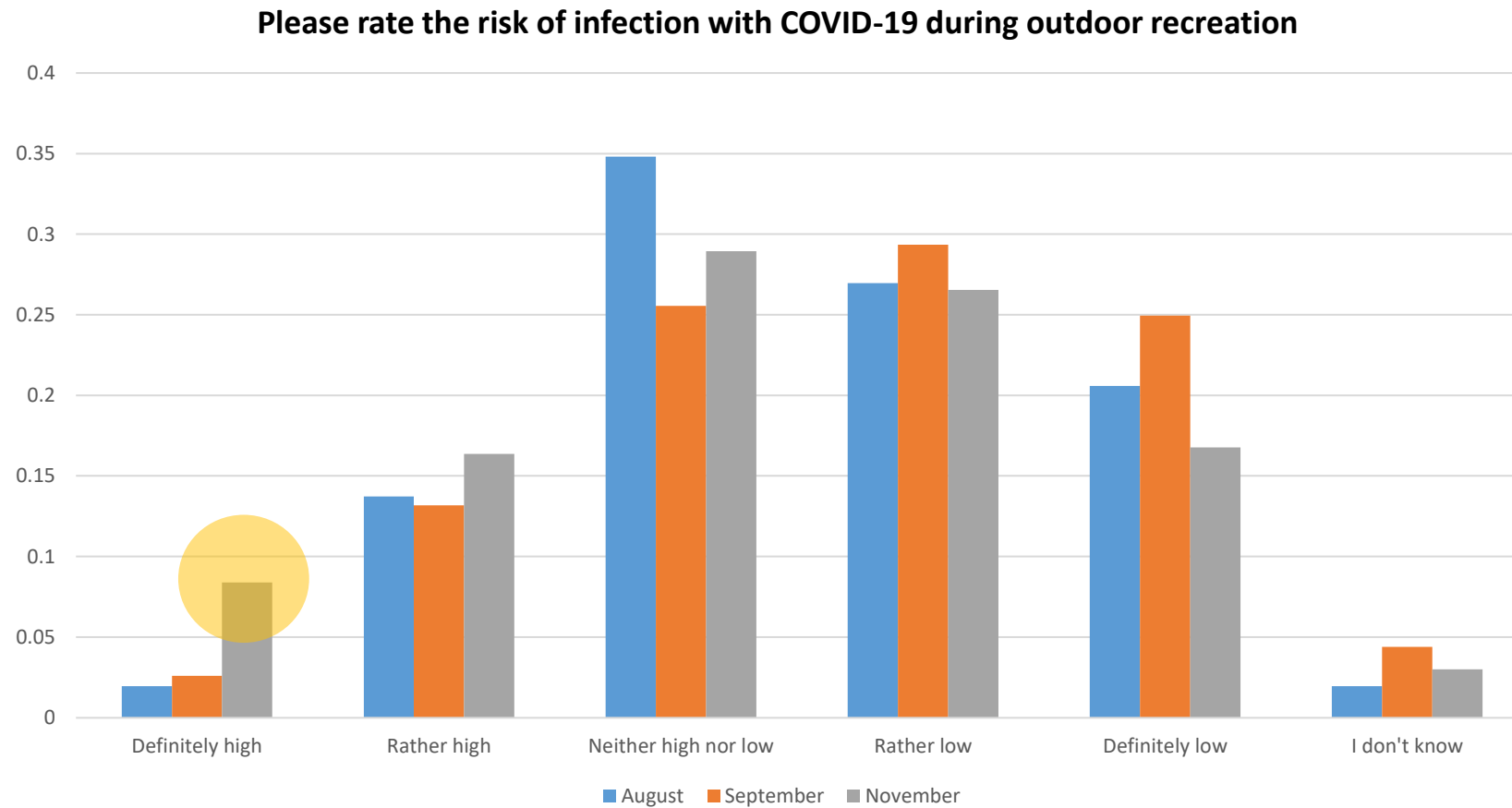
General information

- We analyze a sample of 1205 citizens of Warsaw
- 85% of respondents reported that they have visited the riverside at least once in the last 12 months for recreational purposes
 - In line with reports from before the pandemic
- Average number of visits was 16.5 (median is 10)

Qualitative measures



Qualitative measures



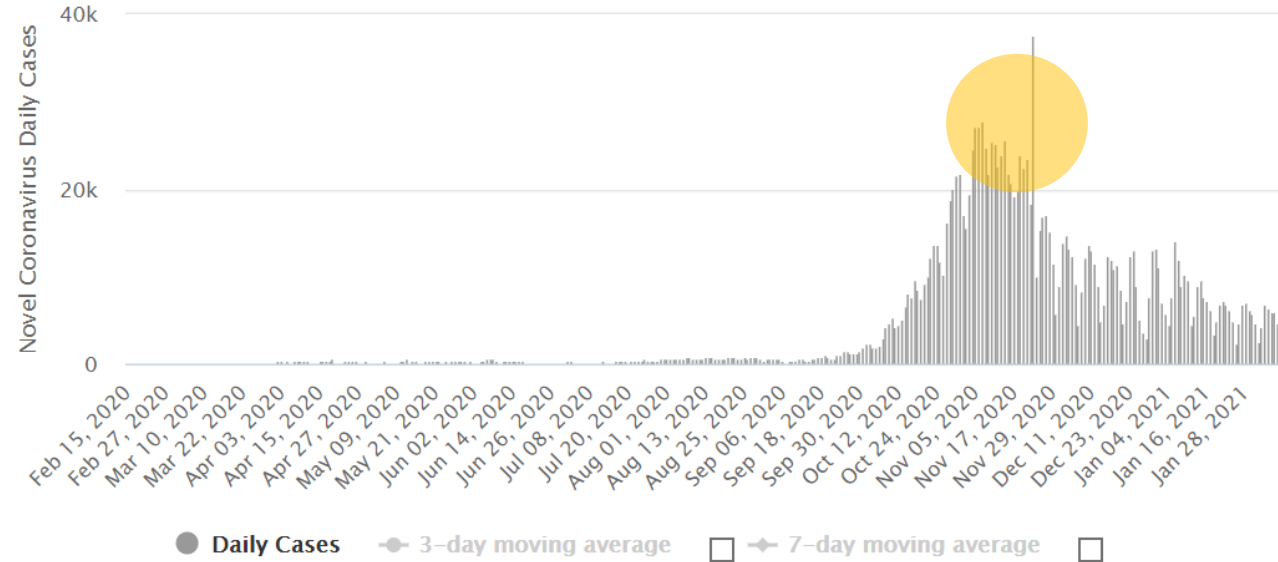
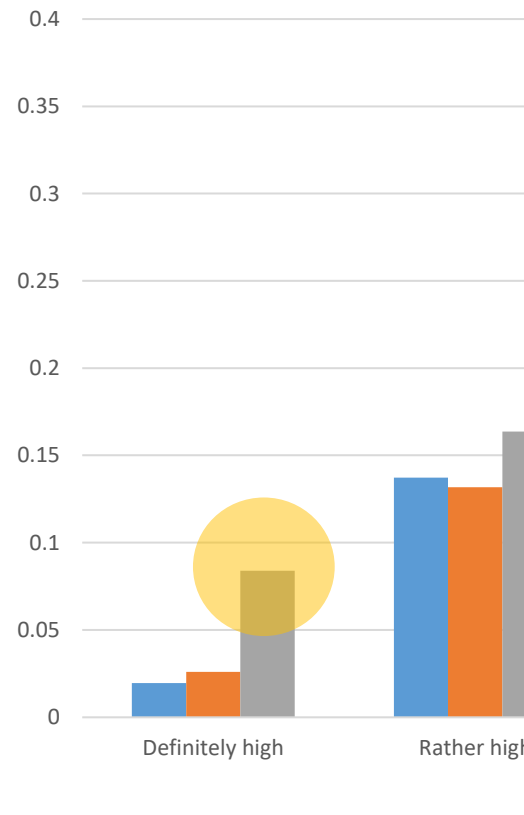
Qualitative mea

Daily New Cases in Poland

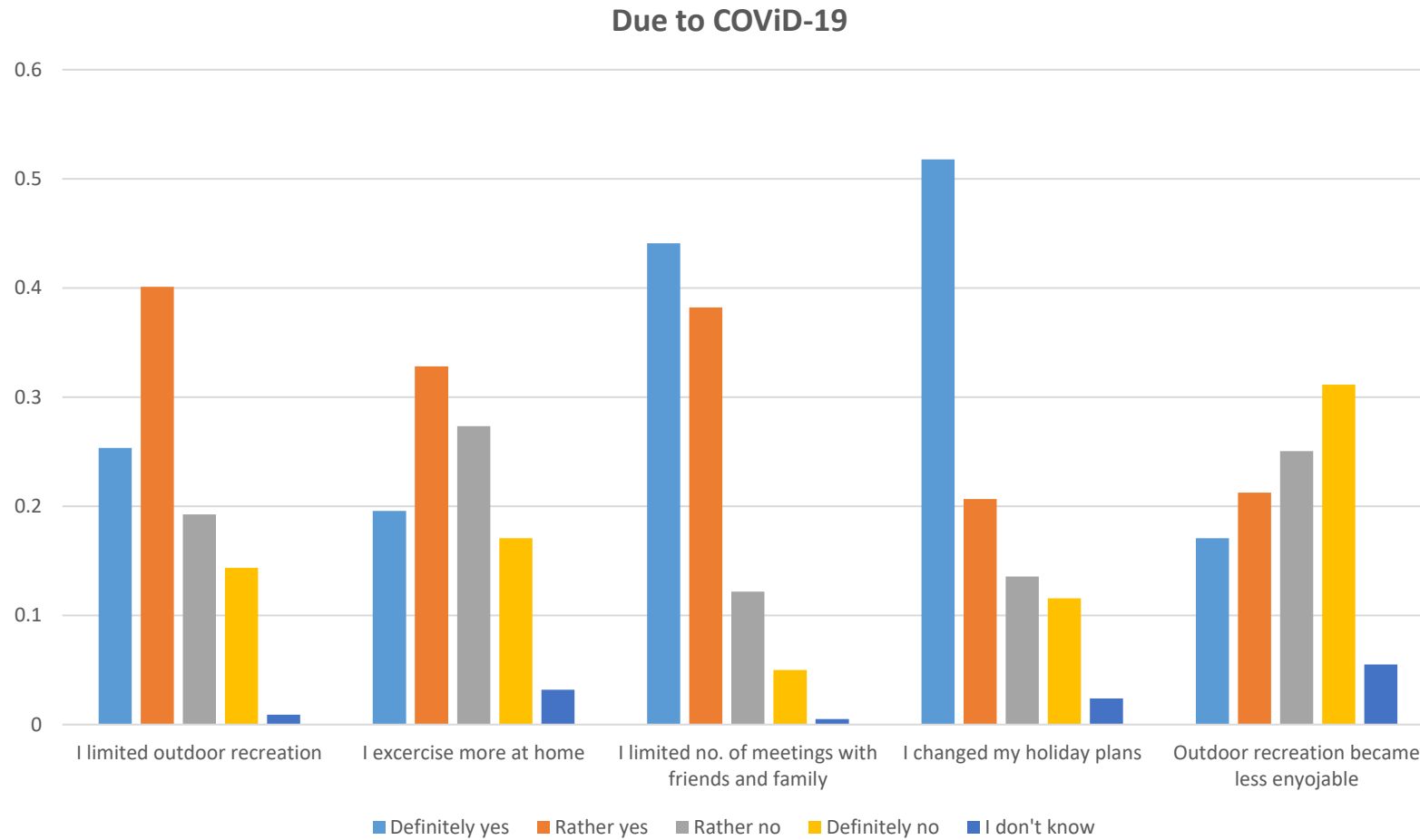
Daily New Cases

Cases per Day
Data as of 0:00 GMT+0

Please rate the r



Qualitative measures



Qualitative measures

- Perceived Vulnerability to Disease Questionnaire

- Díaz, A., Soriano, J. F., & Beleña, Á. (2016). Perceived vulnerability to disease questionnaire: factor structure, psychometric properties and gender differences. *Personality and Individual Differences*, 101, 42-49.

If an illness is “going around”, I will get it.

My past experiences make me believe I am not likely to get sick even when my friends are sick.

I have a history of susceptibility to infectious disease.

In general, I am very susceptible to colds, flu and other infectious diseases.

I am unlikely to catch a cold, flu or other illness, even if it is “going around”.

My immune system protects me from most illnesses that other people get.

It really bothers me when people sneeze without covering their mouths.

I am comfortable sharing a water bottle with a friend.

I prefer to wash my hands pretty soon after shaking someone's hand.

I dislike wearing used clothes because you do not know what the last person who wore it was like.

My hands do not feel dirty after touching money.

It does not make me anxious to be around sick people.

I avoid using public toilets because of the risk that I may catch something from the previous user.

Qualitative measures

- Perceived Vulnerability to Disease Questionnaire

- Díaz, A., Soriano, J. F., & Beleña, Á. (2016). Perceived vulnerability to disease questionnaire: factor structure, psychometric properties and gender differences. *Personality and Individual Differences*, 101, 42-49.

If an illness is “going around”, I will get it.

My past experiences make me believe I am not likely to get sick even when my friends are sick.

I have a history of susceptibility to infectious disease.

In general, I am very susceptible to colds, flu and other infectious diseases.

I am unlikely to catch a cold, flu or other illness, even if it is “going around”.

My immune system protects me from most illnesses that other people get.

It really bothers me when people sneeze without covering their mouths.

I am comfortable sharing a water bottle with a friend.

I prefer to wash my hands pretty soon after shaking someone's hand.

I dislike wearing used clothes because you do not know what the last person who wore it was like.

My hands do not feel dirty after touching money.

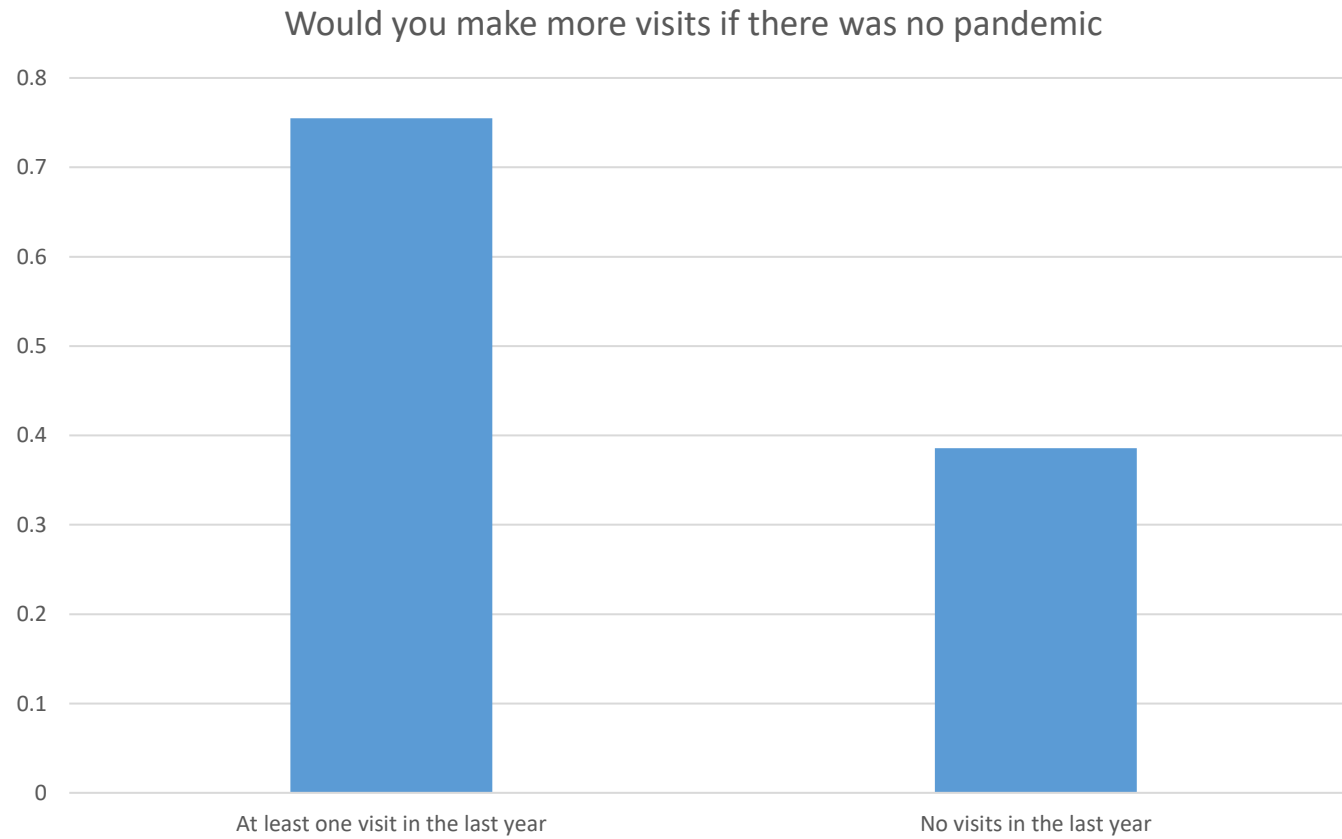
It does not make me anxious to be around sick people.

I avoid using public toilets because of the risk that I may catch something from the previous user.

Perceived
Infectability

Germ
Aversion

Stated number of visits



Results

Negative Binomial Model

var.	coef.	st.err.	p-value
Constant	2.38 ***	0.2383	0
Travel Cost (in 10 PLN)	-0.0219 ***	0.0062	0.0004
Household Income (1000 PLN)	0.2578 **	0.1207	0.0328
COVID infection risk is 'Rather high'	0.4583 **	0.1944	0.0184
COVID infection risk is 'Neither high nor low'	0.5322 ***	0.1841	0.0038
COVID infection risk is 'Rather low'	0.5191 ***	0.1847	0.0049
COVID infection risk is 'Definitely low'	0.5145 ***	0.1906	0.007
COVID infection risk is 'I don't know'	0.5243 **	0.2625	0.0458
I limited outdoor recreation	0.0872 **	0.0419	0.0373
I exercise more at home	-0.1174 ***	0.0399	0.0032
I limited no. of meetings with friends and family	-0.0069	0.0519	0.8948
I changed my holiday plans	0.0042	0.0399	0.9153
Outdoor recreation became less enjoyable	0.0037	0.039	0.9248
Perceived Infectability (Factor 1)	-0.021	0.0363	0.5622
Perceived Infectability (Factor 2)	-0.0708 **	0.0312	0.0233
Germ Aversion 1	0.0482	0.0338	0.1541
Log of theta	0.3261 ***	0.0473	0

Results

Negative Binomial Model			
var.	coef.		
Constant	2.38 ***		
Travel Cost (in 10 PLN)	-0.0219 ***		
Household Income (1000 PLN)	0.2578 **		
COVID infection risk is 'Rather high'	0.4583 **	0.1944	0.0164
COVID infection risk is 'Neither high nor low'	0.5322 ***	0.1841	0.0038
COVID infection risk is 'Rather low'	0.5191 ***	0.1847	0.0049
COVID infection risk is 'Definitely low'	0.5145 ***	0.1906	0.007
COVID infection risk is 'I don't know'	0.5243 **	0.2625	0.0458
I limited outdoor recreation	0.0872 **	0.0419	0.0373
I exercise more at home	-0.1174 ***	0.0399	0.0032
I limited no. of meetings with friends and family	-0.0069	0.0519	0.8948
I changed my holiday plans	0.0042	0.0399	0.9153
Outdoor recreation became less enjoyable	0.0037	0.039	0.9248
Perceived Infectability (Factor 1)	-0.021	0.0363	0.5622
Perceived Infectability (Factor 2)	-0.0708 **	0.0312	0.0233
Germ Aversion 1	0.0482	0.0338	0.1541
Log of theta	0.3261 ***	0.0473	0

Travel cost is significant and has the expected sign

Results

Negative Binomial Model			
var.	coef.	st err	p-value
Constant	2.38 ***		
Travel Cost (in 10 PLN)	-0.0219 ***		
Household Income (1000 PLN)	0.2578 **		
COVID infection risk is 'Rather high'	0.4583 **		
COVID infection risk is 'Neither high nor low'	0.5322 ***	0.1841	0.0038
COVID infection risk is 'Rather low'	0.5191 ***	0.1847	0.0049
COVID infection risk is 'Definitely low'	0.5145 ***	0.1906	0.007
COVID infection risk is 'I don't know'	0.5243 **	0.2625	0.0458
I limited outdoor recreation	0.0872 **	0.0419	0.0373
I exercise more at home	-0.1174 ***	0.0399	0.0032
I limited no. of meetings with friends and family	-0.0069	0.0519	0.8948
I changed my holiday plans	0.0042	0.0399	0.9153
Outdoor recreation became less enjoyable	0.0037	0.039	0.9248
Perceived Infectability (Factor 1)	-0.021	0.0363	0.5622
Perceived Infectability (Factor 2)	-0.0708 **	0.0312	0.0233
Germ Aversion 1	0.0482	0.0338	0.1541
Log of theta	0.3261 ***	0.0473	0

Income was the only significant socio-demographic variable

Results

Negative Binomial Model

var.	coef.	st.err.	p-value
Constant	2.38 ***	0.2383	0
Travel Cost (in 10 PLN)	-0.0219 ***	0.0062	0.0004
Household Income (1000 PLN)	0.2578 **	0.1207	0.0328
COVID infection risk is 'Rather high'	0.4583 **		
COVID infection risk is 'Neither high nor low'	0.5322 ***		
COVID infection risk is 'Rather low'	0.5191 ***		
COVID infection risk is 'Definitely low'	0.5145 ***		
COVID infection risk is 'I don't know'	0.5243 **		
I limited outdoor recreation	0.0872 **	0.0419	0.0373
I exercise more at home	-0.1174 ***	0.0399	0.0032
I limited no. of meetings with friends and family	-0.0069	0.0519	0.8948
I changed my holiday plans	0.0042	0.0399	0.9153
Outdoor recreation became less enjoyable	0.0037	0.039	0.9248
Perceived Infectability (Factor 1)	-0.021	0.0363	0.5622
Perceived Infectability (Factor 2)	-0.0708 **	0.0312	0.0233
Germ Aversion 1	0.0482	0.0338	0.1541
Log of theta	0.3261 ***	0.0473	0

Perceived infection risk matters only for those who rated it as 'Definitely high'

Results

Negative Binomial Model

var.	coef.	st.err.	p-value
Constant	2.38 ***	0.2383	0
Travel Cost (in 10 PLN)	-0.0219 ***	0.0062	0.0004
Household Income (1000 PLN)	0.2578 **	0.1207	0.0328
COVID infection risk is 'Rather high'	0.4583 **	0.1944	0.0184
COVID infection risk is 'Neither high nor low'	0.5322 ***	0.1841	0.0038
COVID infection risk is 'Rather low'	0.5191 ***	0.1847	0.0049
COVID infection risk is 'Definitely low'	0.5145 ***	0.1906	0.007
COVID infection risk is 'I don't know'	0.5243 **	0.2625	0.0458
I limited outdoor recreation	0.0872 **	0.0410	0.0372
I exercise more at home	-0.1174 ***	0.0355	0.0240
I limited no. of meetings with friends and family	-0.0069	0.0037	0.0335
I changed my holiday plans	0.0042	0.0037	0.2470
Outdoor recreation became less enjoyable	0.0037	0.0037	0.2470
Perceived Infectability (Factor 1)	-0.021	0.0363	0.5622
Perceived Infectability (Factor 2)	-0.0708 **	0.0312	0.0233
Germ Aversion 1	0.0482	0.0338	0.1541
Log of theta	0.3261 ***	0.0473	0

Only two items are
significant here

Results

Negative Binomial Model

var.	coef.	st.err.	p-value
Constant	2.38 ***	0.2383	0
Travel Cost (in 10 PLN)	-0.0219 ***	0.0062	0.0004
Household Income (1000 PLN)	0.2578 **	0.1207	0.0328
COVID infection risk is 'Rather high'	0.4583 **	0.1944	0.0184
COVID infection risk is 'Neither high nor low'	0.5322 ***	0.1841	0.0038
COVID infection risk is 'Rather low'	0.5191 ***	0.1847	0.0049
COVID infection risk is 'Definitely low'	0.5145 ***	0.1906	0.007
COVID infection risk is 'I don't know'	0.5243 **	0.2625	0.0458
I limited outdoor recreation	0.0872 **	0.0419	0.0373
I exercise more at home	-0.1174 ***	0.0399	0.0032
I limited no. of meetings with friends and family	-0.0069	0.0519	0.8948
I changed my holiday plans	0.0042	0.0399	0.9153
Outdoor recreation became less enjoyable	0.0037		
Perceived Infectability (Factor 1)	-0.021		
Perceived Infectability (Factor 2)	-0.0708 **		
Germ Aversion 1	0.0482		
Log of theta	0.3261 ***	0.0473	0

**Only one factor of PI
is significant**

Results

Negative Binomial Model			
var.	coef.	st.err.	p-value
Constant	2.38 ***	0.2383	0
Travel Cost (in 10 PLN)	-0.0219 ***	0.0062	0.0004
Household Income (1000 PLN)	0.2578 **	0.1207	0.0328
COVID infection risk is 'Rather high'	0.4583 **	0.1944	0.0184
COVID infection risk is 'Neither high nor low'	0.5322 ***	0.1841	0.0038
COVID infection risk is 'Rather low'	0.5191 ***	0.1847	0.0049
COVID infection risk is 'Definitely low'	0.5145 ***	0.1906	0.007
COVID infection risk is 'I don't know'	0.5243 **	0.2625	0.0458
I limited outdoor recreation	0.0872 **	0.0419	0.0373
I exercise more at home	-0.1174 ***	0.0399	0.0032
I limited no. of meetings with friends and family	-0.0069	0.0519	0.8948
I changed my holiday plans	0.0042	0.0399	0.9153
Outdoor recreation became less enjoyable	0.0037	0.039	0.9248
Perceived Infectability (Factor 1)	-0.021	0.0363	0.5622
Perceived Infectability (Factor 2)	-0.0708 **	0.0312	0.0233
Germ Aversion 1	0.0482	0.0338	0.1541
Log of theta	0.3261 ***	0.0473	0

Consumer surplus (PLN)	Per visit per person	Per person
	4.567	75.637

Results

Negative Binomial Model			
var.	coef.	st.err.	p-value
Constant	2.38 ***	0.2383	0
Travel Cost (in 10 PLN)	-0.0219 ***	0.0062	0.0004
Household Income (1000 PLN)	0.2578 **	0.1207	0.0328
COVID infection risk is 'Rather high'	0.4583 **	0.1944	0.0184
COVID infection risk is 'Neither high nor low'	0.5322 ***	0.1841	0.0038
COVID infection risk is 'Rather low'	0.5191 ***	0.1847	0.0049
COVID infection risk is 'Definitely low'	0.5145 ***	0.1906	0.007
COVID infection risk is 'I don't know'	0.5243 **	0.2625	0.0458
I limited outdoor recreation	0.0872 **	0.0419	0.0373
I exercise more at home	-0.1174 ***	0.0399	0.0032
I limited no. of meetings with friends and family	-0.0069	0.0519	0.8948
I changed my holiday plans	0.0042	0.0399	0.9153
Outdoor recreation became less enjoyable	0.0037	0.039	0.9248
Perceived Infectability (Factor 1)	-0.021	0.0363	0.5622
Perceived Infectability (Factor 2)	-0.0708 **	0.0312	0.0233
Germ Aversion 1	0.0482	0.0338	0.1541
Log of theta	0.3261 ***	0.0473	0

	Per visit per person	Per person
Consumer surplus (PLN)	4.567	75.637

- How to simulate change due to pandemic?
 - For example, calculate CS for 'Definitely low' level of perceived risk?

Results with stated behavior

Mixed Poisson Model			
var.	coef.	st.err.	p-value
Constant	1.891 ***	0.2467	0
=1 for stated visits	0.39 ***	0.025	0
x Travel Cost (in 10 PLN)	0.0044 ***	0.0012	0.0003
x I limited outdoor recreation	-0.0464 ***	0.0088	0
x I limited no. of meetings with friends and family	-0.018 *	0.0106	0.0904
x COVID infection risk is 'Definitely high'	0.1006 **	0.0413	0.0149
x Age > 65	0.0431 **	0.018	0.0169

Results with stated behavior

Mixed Poisson Model			
var.	coef.	st.err.	p-value
Constant	1.891 ***	0.2467	
=1 for stated visits	0.39 ***	0.025	
x Travel Cost (in 10 PLN)	0.0044 ***	0.0012	
x I limited outdoor recreation	-0.0464 ***	0.0088	0
x I limited no. of meetings with friends and family	-0.018 *	0.0106	0.0904
x COVID infection risk is 'Definitely high'	0.1006 **	0.0413	0.0149
x Age > 65	0.0431 **	0.018	0.0169

No. of visits without the pandemic would be significantly higher

Results with stated behavior

Mixed Poisson Model			
var.	coef.	st.err.	p-value
Constant	1.891 ***	0.2467	0
=1 for stated visits	0.39 ***	0.025	
x Travel Cost (in 10 PLN)	0.0044 ***	0.0012	
x I limited outdoor recreation	-0.0464 ***	0.0088	0
x I limited no. of meetings with friends and family	-0.018 *	0.0106	0.0904
x COVID infection risk is 'Definitely high'	0.1006 **	0.0413	0.0149
x Age > 65	0.0431 **	0.018	0.0169

Without the pandemic CS per trip increases

Results with stated behavior

Mixed Poisson Model			
var.	coef.	st.err.	p-value
Constant	1.891 ***	0.2467	0
=1 for stated visits	0.39 ***	0.025	0
x Travel Cost (in 10 PLN)	0.0044 ***	0.0012	0.0003
x I limited outdoor recreation	-0.0464 ***	0.0088	
x I limited no. of meetings with friends and family	-0.018 *	0.0106	
x COVID infection risk is 'Definitely high'	0.1006 **	0.0413	0.0149
x Age > 65	0.0431 **	0.018	0.0169

Respondents who limited their meetings and outdoor recreation would make more trips if not for pandemic

Results with stated behavior

Mixed Poisson Model			
var.	coef.	st.err.	p-value
Constant	1.891 ***	0.2467	0
=1 for stated visits	0.39 ***	0.025	0
x Travel Cost (in 10 PLN)	0.0044 ***	0.0012	0.0003
x I limited outdoor recreation	-0.0464 ***	0.0088	0
x I limited no. of meetings with friends and family	-0.018 *	0.0106	0.0904
x COVID infection risk is 'Definitely high'	0.1006 **	0.0413	(
x Age > 65	0.0431 **	0.018	(

Respondents who rate infection risk as 'Definitely high' would make more trips if not for pandemic

Results with stated behavior

Mixed Poisson Model			
var.	coef.	st.err.	p-value
Constant	1.891 ***	0.2467	0
=1 for stated visits	0.39 ***	0.025	0
x Travel Cost (in 10 PLN)	0.0044 ***	0.0012	0.0003
x I limited outdoor recreation	-0.0464 ***	0.0088	0
x I limited no. of meetings with friends and family	-0.018 *	0.0106	0.0904
x COVID infection risk is 'Definitely high'	0.1006 **	0.0413	0.018
x Age > 65	0.0431 **	0.018	0.018

Respondents over the age of 65 would make more trips if not for pandemic

Results with stated behavior

Mixed Poisson Model				With pandemic	Without pandemic
var.	coef.	st.err.	p-value		
Constant	1.891 ***	0.2467	0		
=1 for stated visits	0.39 ***	0.025	0	Consumer surplus per person(PLN)	74.03 117.33
x Travel Cost (in 10 PLN)	0.0044 ***	0.0012	0.0003		
x I limited outdoor recreation	-0.0464 ***	0.0088	0		
x I limited no. of meetings with friends and family	-0.018 *	0.0106	0.0904		
x COVID infection risk is 'Definitely high'	0.1006 **	0.0413	0.0149		
x Age > 65	0.0431 **	0.018	0.0169		

Conclusions

- COVID-19 has significantly reduced welfare from recreation at the Vistula riverside in Warsaw
 - We estimate that the loss is about 43 PLN per person
 - Around 37% loss
 - Different ways of measuring pandemic effect seem to be in accordance with each other
 - At least with direction of the effect
- This is very much work-in-progress 😊

Thank you!