A radically simple way
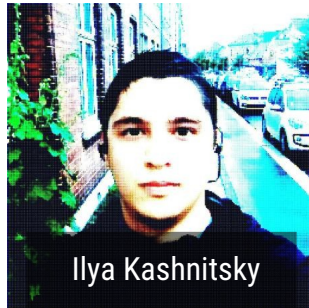# to **monitor life expectancy**

Jonas Schöley

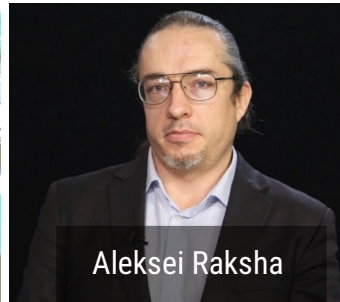@jschoeley

0000-0002-3340-8518

schoeley@demogr.mpg.de

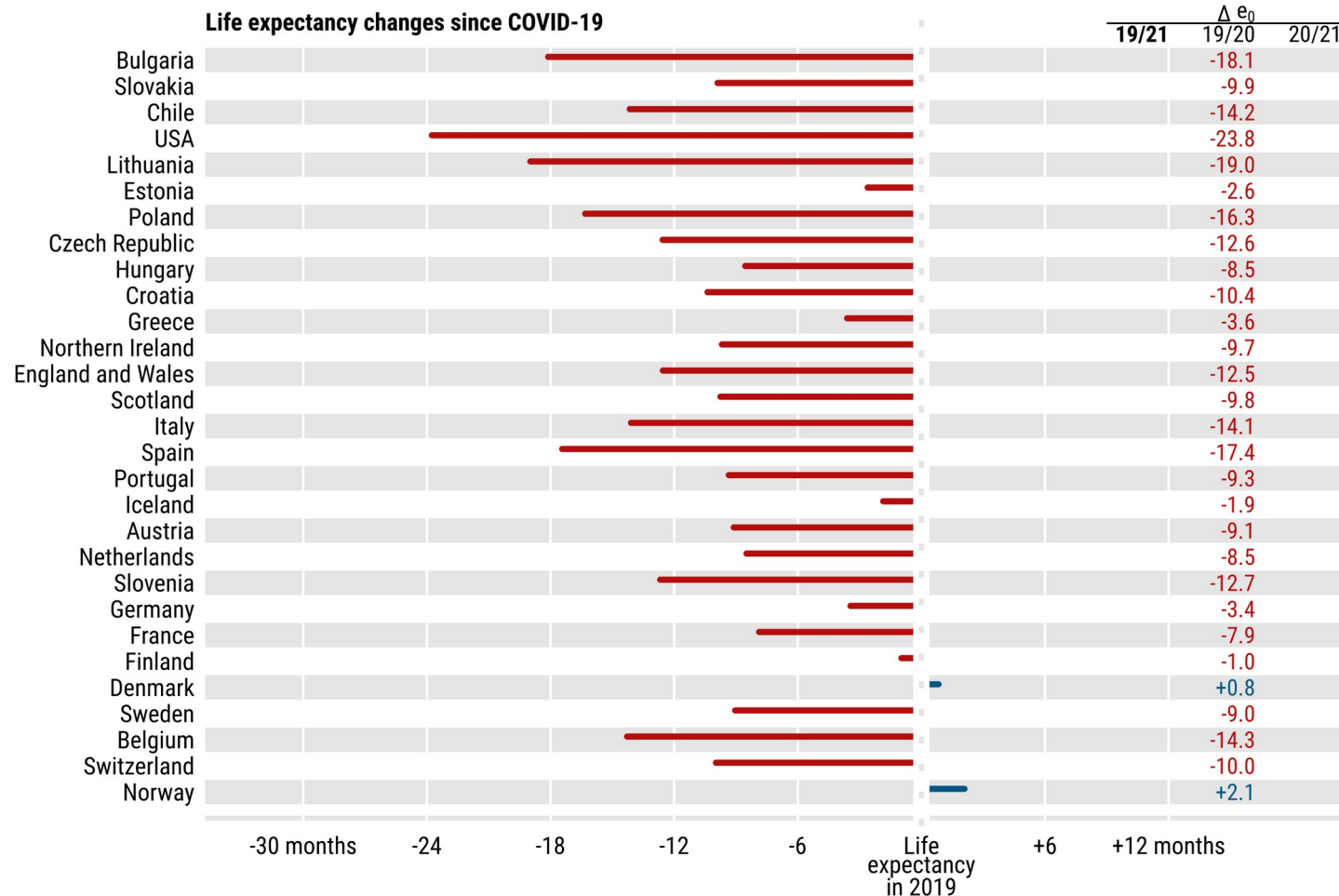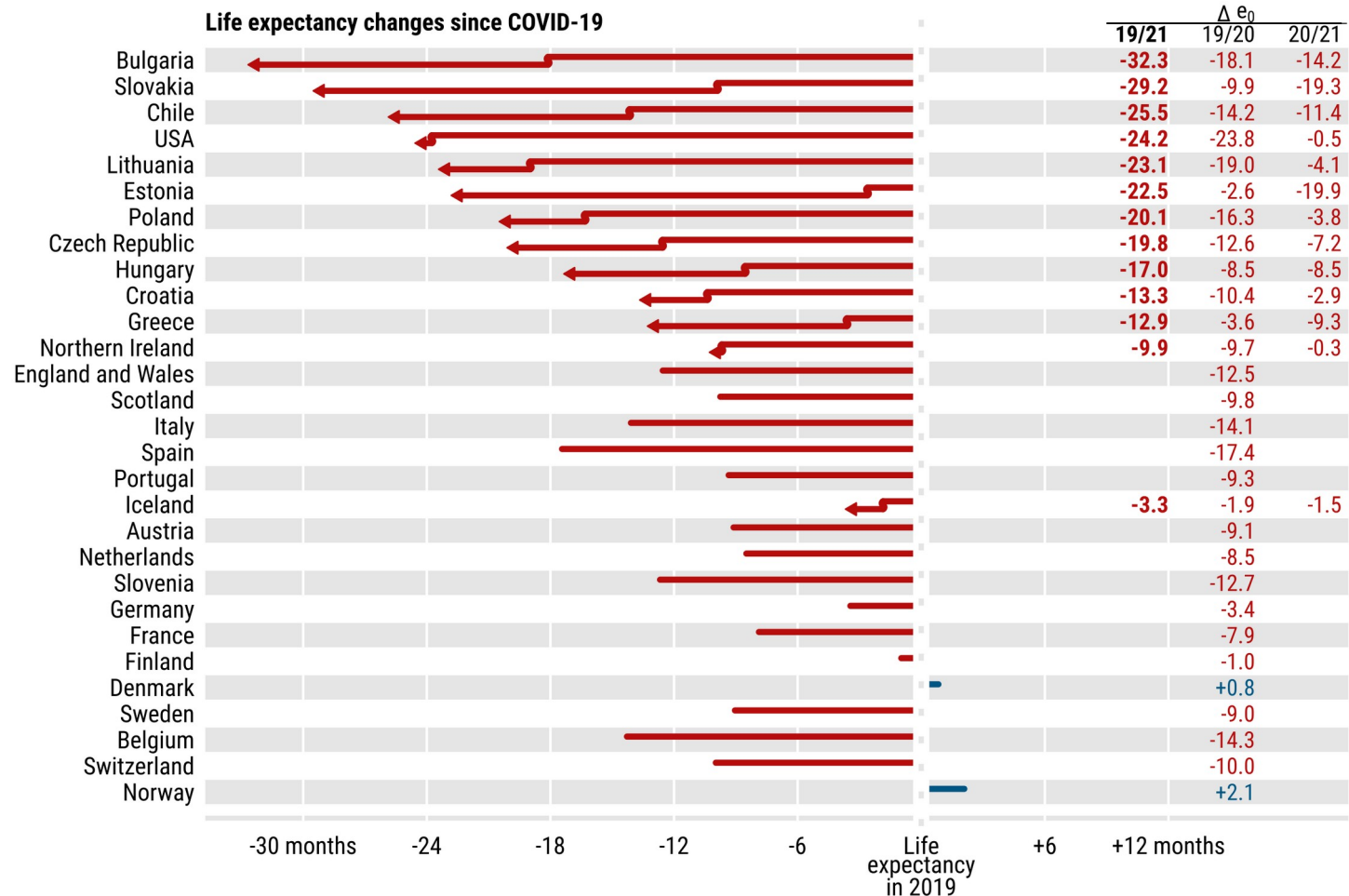Ilya Kashnitsky

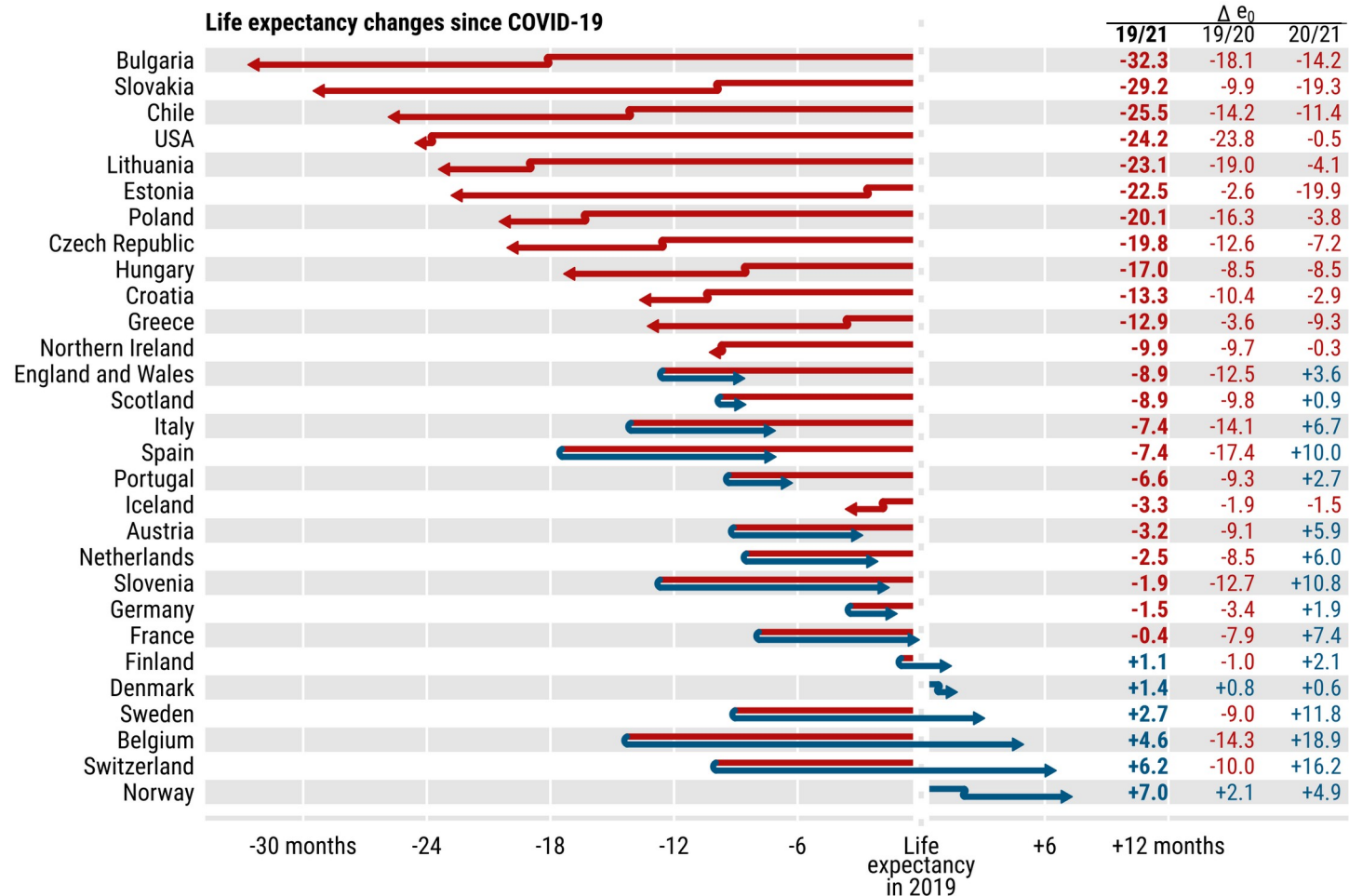Aleksei Raksha

MAX PLANCK INSTITUTE
FOR DEMOGRAPHIC RESEARCH

Bounce backs or continued losses?

Life expectancy changes since COVID-19

Country	Δ e₀ 19/21	Δ e₀ 19/20	Δ e₀ 20/21
Bulgaria		-18.1	
Slovakia		-9.9	
Chile		-14.2	
USA		-23.8	
Lithuania		-19.0	
Estonia		-2.6	
Poland		-16.3	
Czech Republic		-12.6	
Hungary		-8.5	
Croatia		-10.4	
Greece		-3.6	
Northern Ireland		-9.7	
England and Wales		-12.5	
Scotland		-9.8	
Italy		-14.1	
Spain		-17.4	
Portugal		-9.3	
Iceland		-1.9	
Austria		-9.1	
Netherlands		-8.5	
Slovenia		-12.7	
Germany		-3.4	
France		-7.9	
Finland		-1.0	
Denmark		+0.8	
Sweden		-9.0	
Belgium		-14.3	
Switzerland		-10.0	
Norway		+2.1	

-30 months   -24   -18   -12   -6   Life expectancy in 2019   +6   +12 months

Schöley, Kashnitsky, Raksha et al. – Monitoring life expectancy

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Bounce backs or continued losses?

Life expectancy changes since COVID-19

	Δ e₀		
	19/21	19/20	20/21
Bulgaria	**-32.3**	-18.1	-14.2
Slovakia	**-29.2**	-9.9	-19.3
Chile	**-25.5**	-14.2	-11.4
USA	**-24.2**	-23.8	-0.5
Lithuania	**-23.1**	-19.0	-4.1
Estonia	**-22.5**	-2.6	-19.9
Poland	**-20.1**	-16.3	-3.8
Czech Republic	**-19.8**	-12.6	-7.2
Hungary	**-17.0**	-8.5	-8.5
Croatia	**-13.3**	-10.4	-2.9
Greece	**-12.9**	-3.6	-9.3
Northern Ireland	**-9.9**	-9.7	-0.3
England and Wales		-12.5	
Scotland		-9.8	
Italy		-14.1	
Spain		-17.4	
Portugal		-9.3	
Iceland	**-3.3**	-1.9	-1.5
Austria		-9.1	
Netherlands		-8.5	
Slovenia		-12.7	
Germany		-3.4	
France		-7.9	
Finland		-1.0	
Denmark		+0.8	
Sweden		-9.0	
Belgium		-14.3	
Switzerland		-10.0	
Norway		+2.1	

-30 months -24 -18 -12 -6 Life expectancy in 2019 +6 +12 months

IUSSP Schöley, Kashnitsky, Raksha et al. – Monitoring life expectancy

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Bounce backs or continued losses?

Life expectancy changes since COVID-19

	Δ e$_0$		
	19/21	19/20	20/21
Bulgaria	**-32.3**	-18.1	-14.2
Slovakia	**-29.2**	-9.9	-19.3
Chile	**-25.5**	-14.2	-11.4
USA	**-24.2**	-23.8	-0.5
Lithuania	**-23.1**	-19.0	-4.1
Estonia	**-22.5**	-2.6	-19.9
Poland	**-20.1**	-16.3	-3.8
Czech Republic	**-19.8**	-12.6	-7.2
Hungary	**-17.0**	-8.5	-8.5
Croatia	**-13.3**	-10.4	-2.9
Greece	**-12.9**	-3.6	-9.3
Northern Ireland	**-9.9**	-9.7	-0.3
England and Wales	**-8.9**	-12.5	+3.6
Scotland	**-8.9**	-9.8	+0.9
Italy	**-7.4**	-14.1	+6.7
Spain	**-7.4**	-17.4	+10.0
Portugal	**-6.6**	-9.3	+2.7
Iceland	**-3.3**	-1.9	-1.5
Austria	**-3.2**	-9.1	+5.9
Netherlands	**-2.5**	-8.5	+6.0
Slovenia	**-1.9**	-12.7	+10.8
Germany	**-1.5**	-3.4	+1.9
France	**-0.4**	-7.9	+7.4
Finland	**+1.1**	-1.0	+2.1
Denmark	**+1.4**	+0.8	+0.6
Sweden	**+2.7**	-9.0	+11.8
Belgium	**+4.6**	-14.3	+18.9
Switzerland	**+6.2**	-10.0	+16.2
Norway	**+7.0**	+2.1	+4.9

-30 months   -24   -18   -12   -6   Life expectancy in 2019   +6   +12 months

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$$e_{0,\,[t0,t0+w)} = f(\text{deaths}_{x,\,[t0,t0+w)}, \text{ exposure-time}_{x,\,[t0,t0+w)})$$

$$e_{0,\ [t0,t0+w)} = f(\text{deaths}_{x,\ [t0,t0+w)},\ \text{exposure-time}_{x,\ [t0,t0+w)})$$

$$e_{0,\,[t0,t0+w)} = f(\text{deaths}_{x,\,[t0,t0+w)},\ \text{exposure-time}_{x,\,[t0,t0+w)})$$

$$e_{0,\ [t0,t0+w)} = f(\text{deaths}_{x,\ [t0,t0+w)}, \text{exposure-time}_{x,\ [t0,t0+w)})$$

Real time estimates of life expectancy

$$e_{0,\,[t0,t0+w)} = f(\text{deaths}_{x,\,[t0,t0+w)}, \text{exposure-time}_{x,\,[t0,t0+w)})$$

$$e_{0,\ [t0,t0+w)} = f(\text{deaths}_{x,\ [t0,t0+w)},\ \text{exposure-time}_{x,\ [t0,t0+w)})$$

$$e_{0,\,[t0,t0+w)} = f(\text{deaths}_{x,\,[t0,t0+w)},\ \text{exposure-time}_{x,\,[t0,t0+w)})$$

Real time estimates of life expectancy

Death counts by age group in South Korea 2020
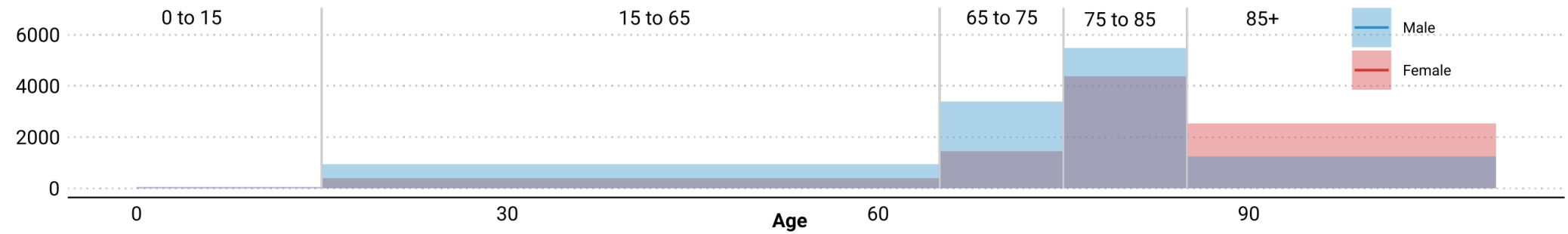
PCLM estimated singe age death counts in South Korea 2020
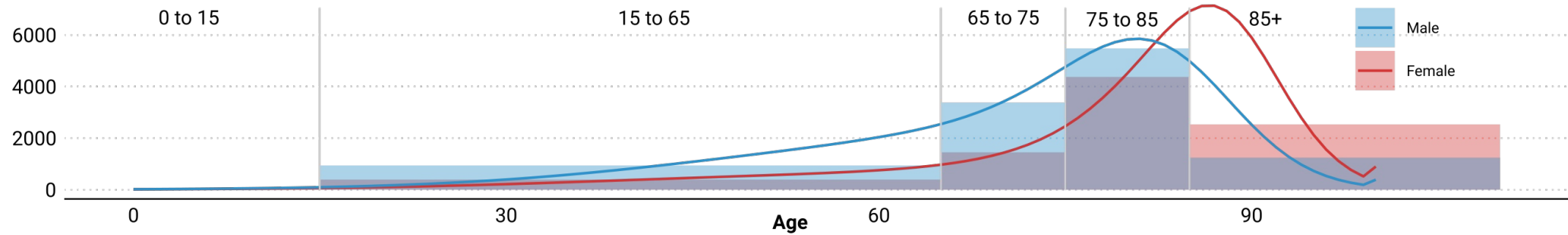
Rizzi et al. 2015. Efficient Estimation of Smooth Distributions From Coarsely Grouped Data. 10.1093/aje/kww225

Pascariu et al. 2018. ungroup: An R package for efficient estimation of smooth distributions from coarsely binned data. 10.21105/joss.00937

$$e_0 = f($$

$$\text{this years total deaths,}$$
$$\text{last years total deaths,}$$
$$\text{last years } e_0$$
$$)$$
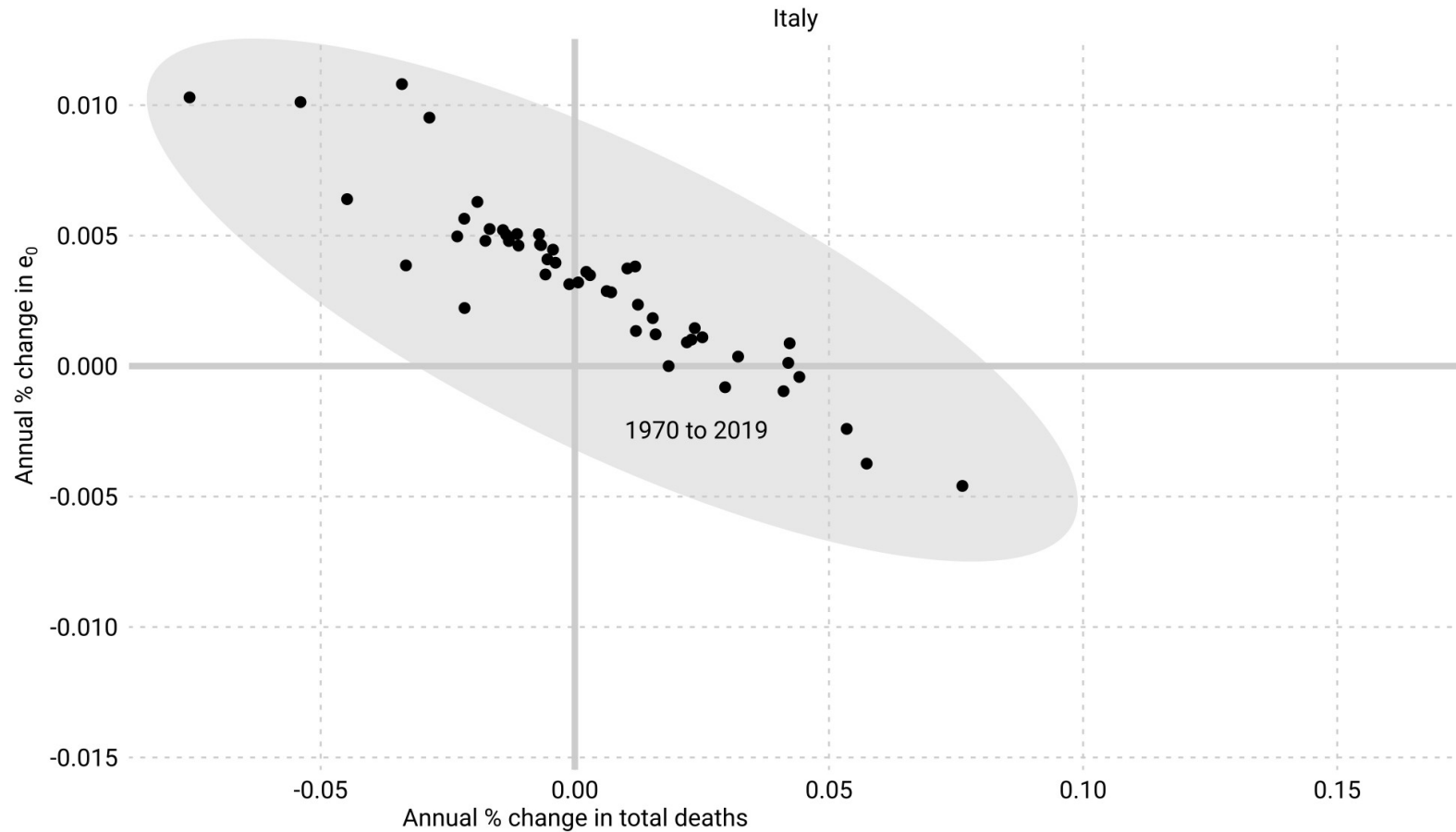
Real time estimates of life expectancy

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Real time estimates of life expectancy

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Italy

δ log e0 / δ log D = -0.1

1970 to 2019

2020 ?

Annual % change in e_0

Annual % change in total deaths
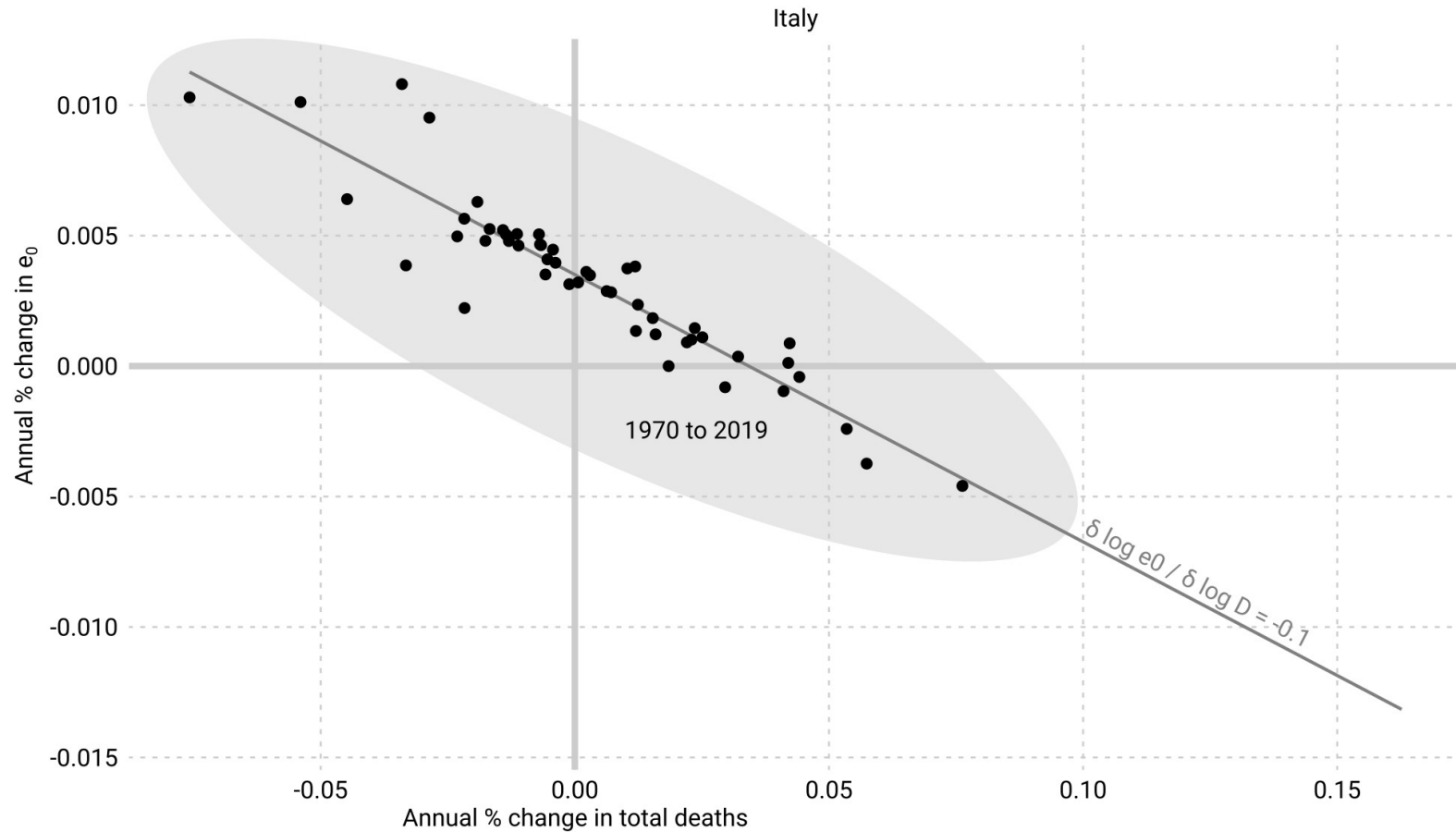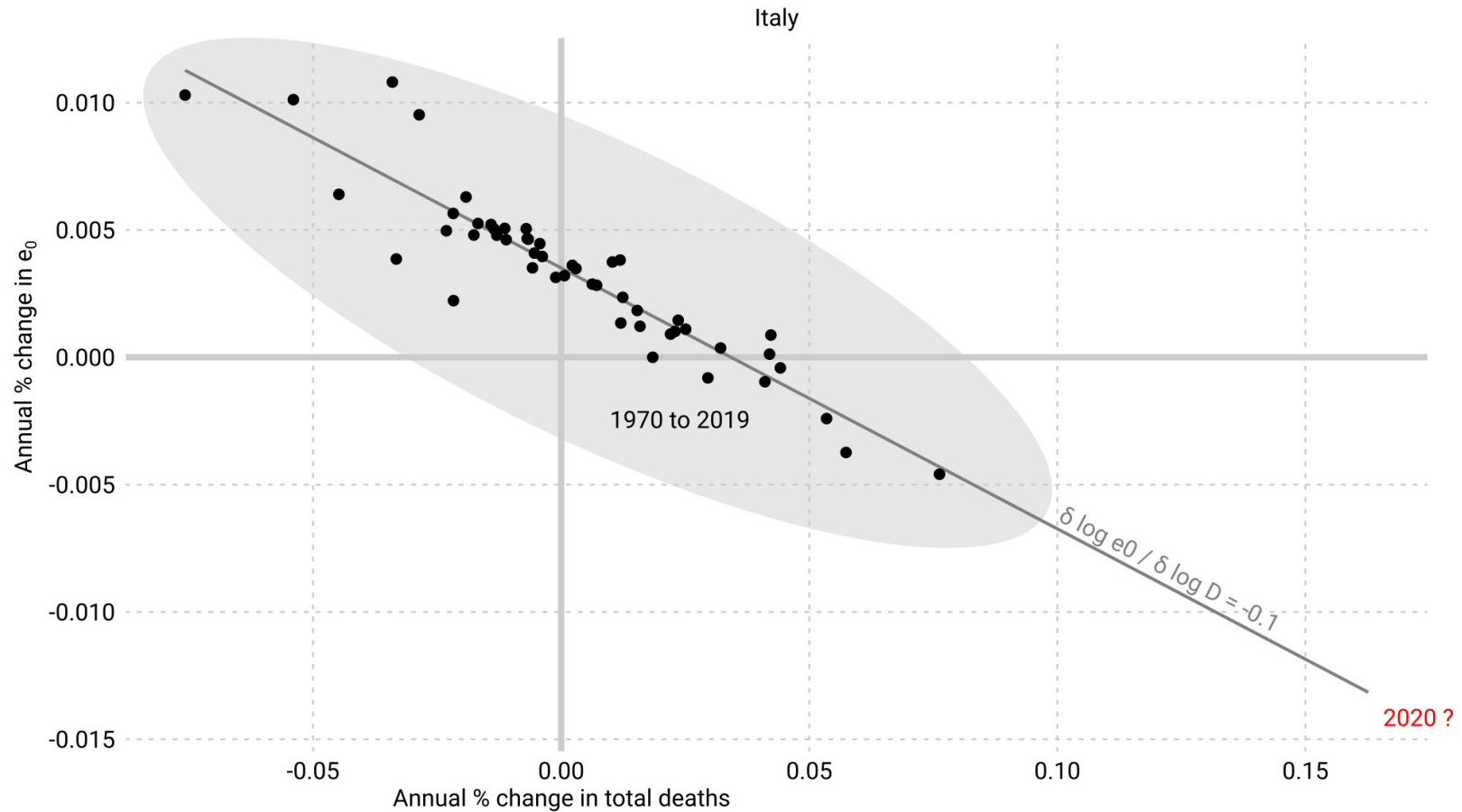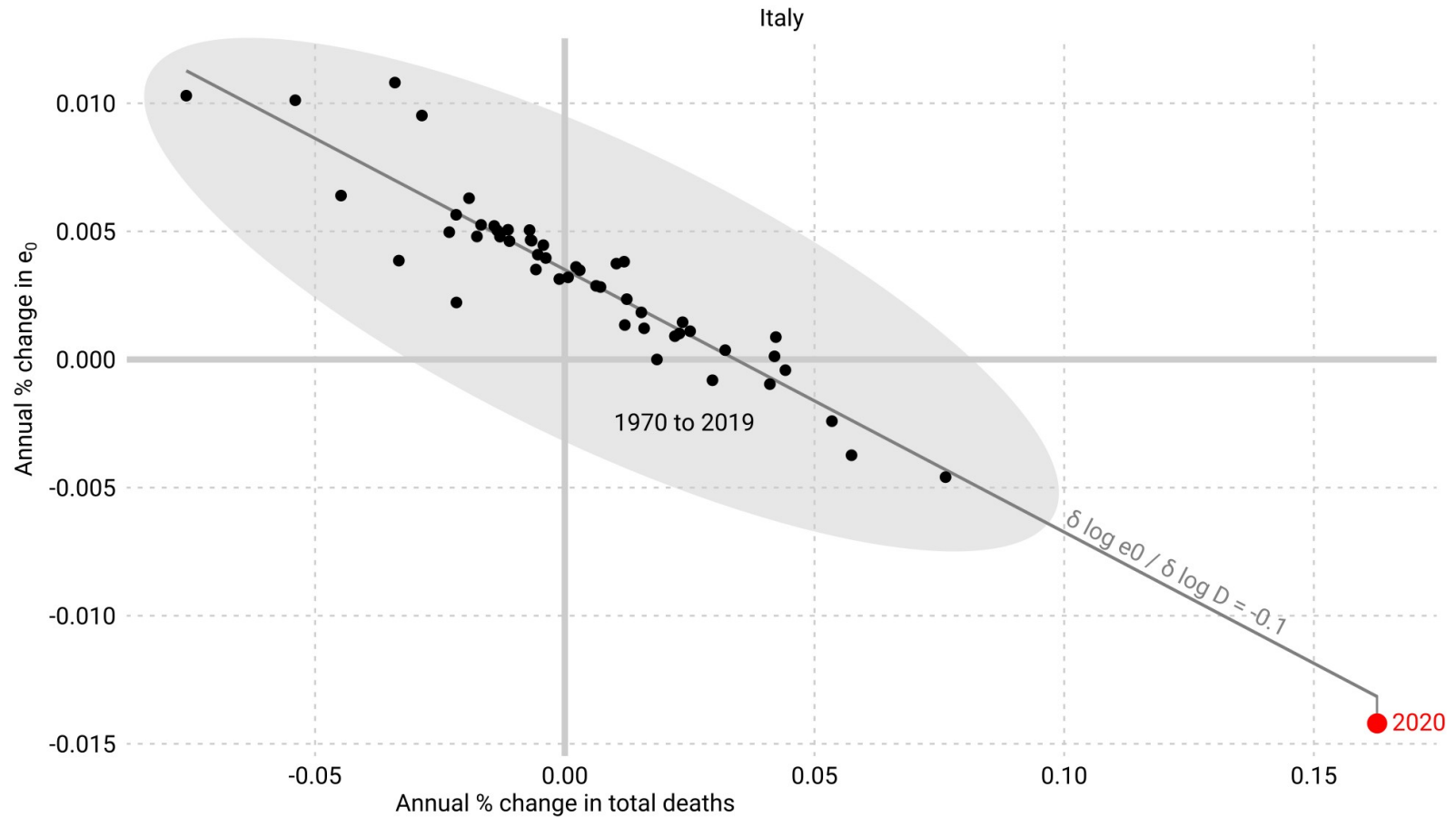
Real time estimates of life expectancy

Accuracy of Raksha's method

Accuracy of Raksha's method
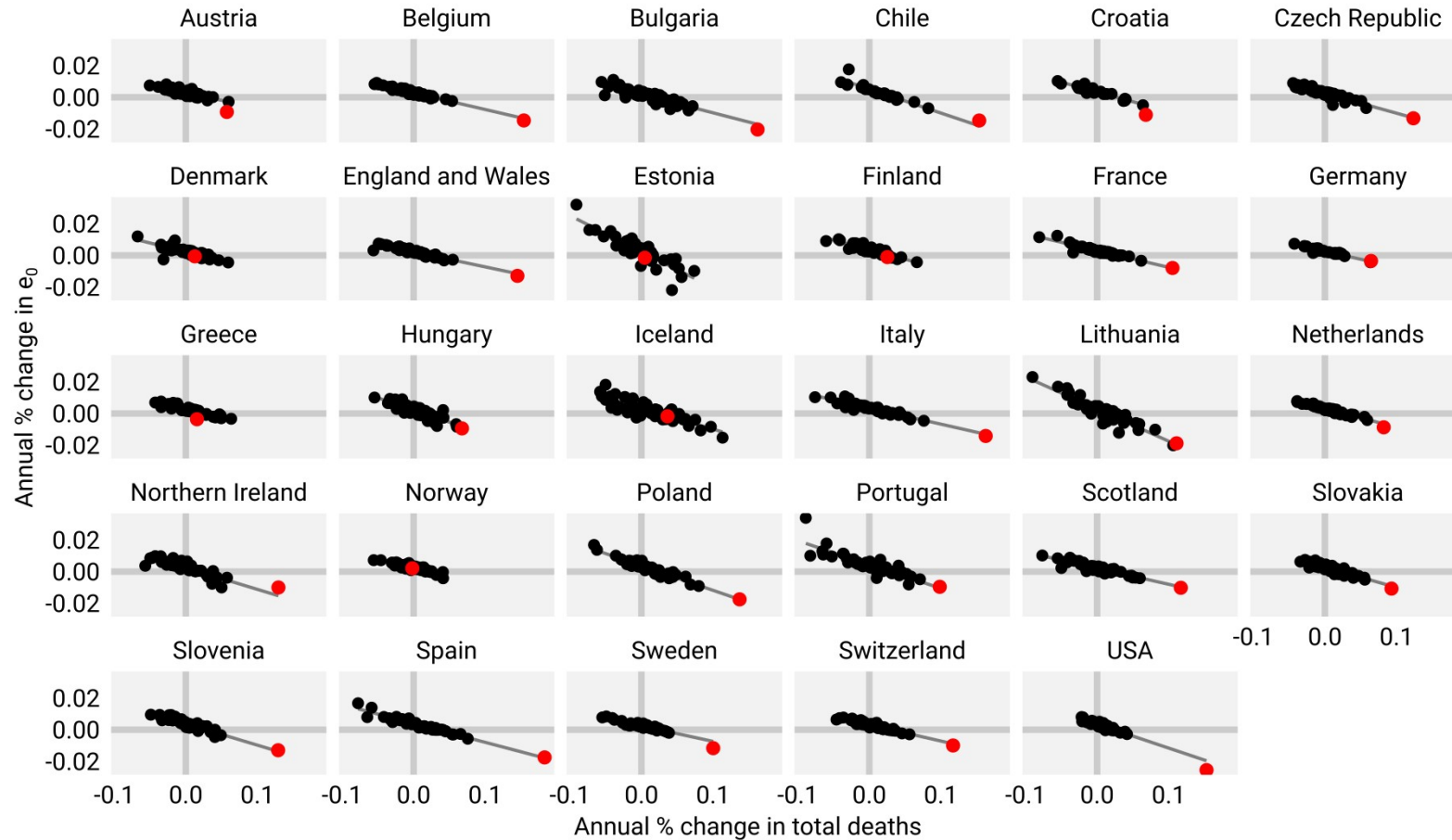
Accuracy of Raksha's method
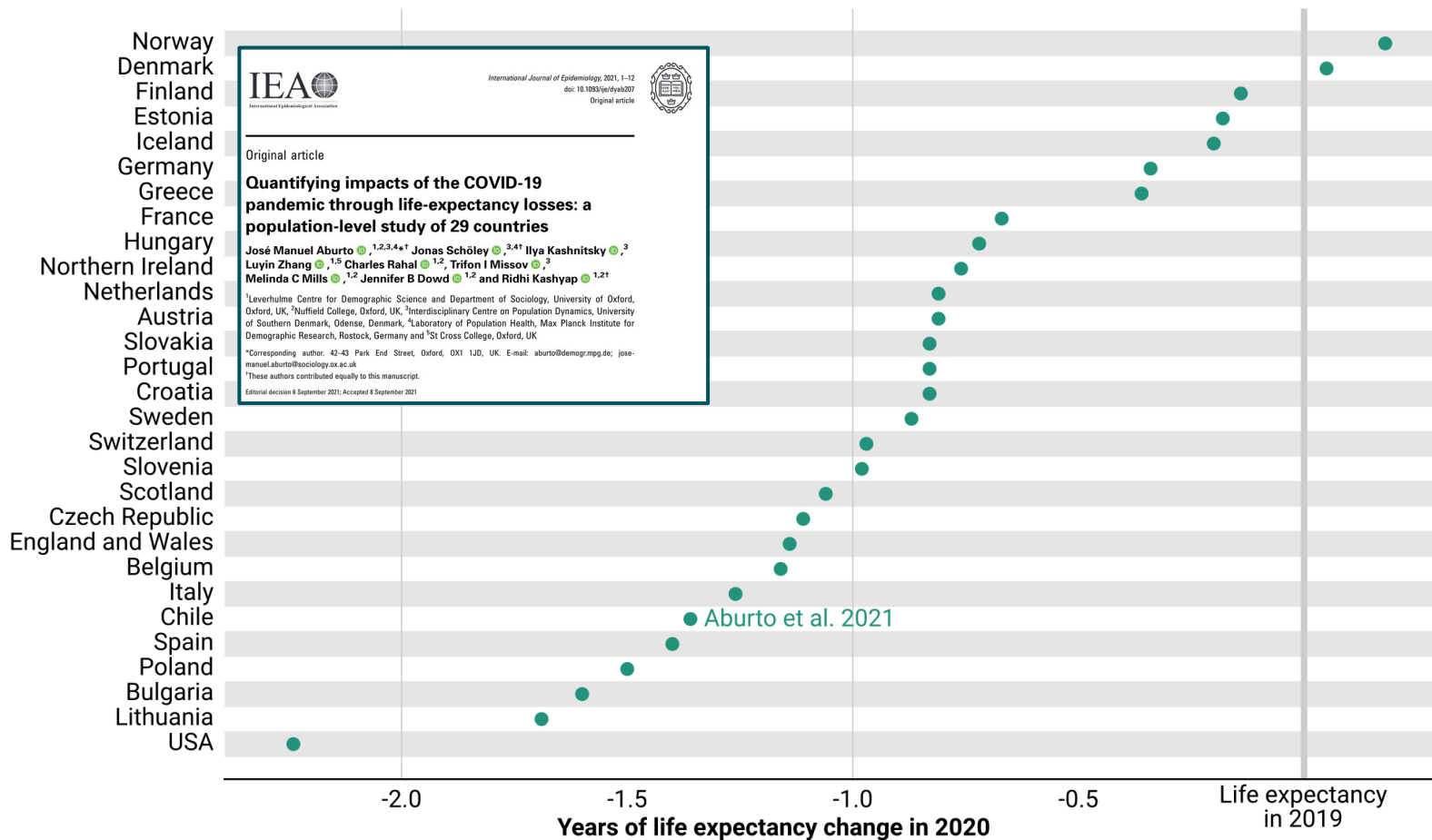
Aburto & Schöley et al. 2021. Quantifying impacts of the COVID-19 pandemic through life-expectancy losses: a population-level study of 29 countries. 10.1093/ije/dyab207

Islam & Jdanov et al. 2021. Effects of covid-19 pandemic on life expectancy and premature mortality in 2020: time series analysis in 37 countries. 10.1136/bmj-2021-066768

Islam et al. 2021

Raksha's method

Aburto et al. 2021

Years of life expectancy change in 2020

Life expectancy in 2019

-2.0   -1.5   -1.0   -0.5

Norway, Denmark, Finland, Estonia, Iceland, Germany, Greece, France, Hungary, Northern Ireland, Netherlands, Austria, Slovakia, Portugal, Croatia, Sweden, Switzerland, Slovenia, Scotland, Czech Republic, England and Wales, Belgium, Italy, Chile, Spain, Poland, Bulgaria, Lithuania, USA

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Reproducible analysis
github.com/ikashnitsky/ex-delta
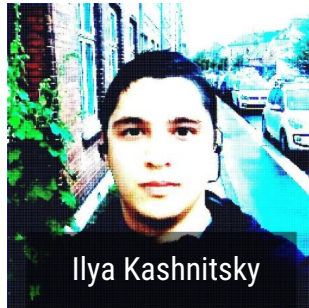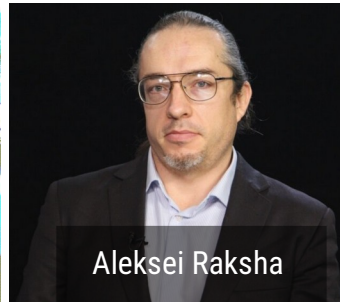

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