Associations between neighborhood-level socioeconomic disadvantage and multiple cognitive domains in a community sample of older adults

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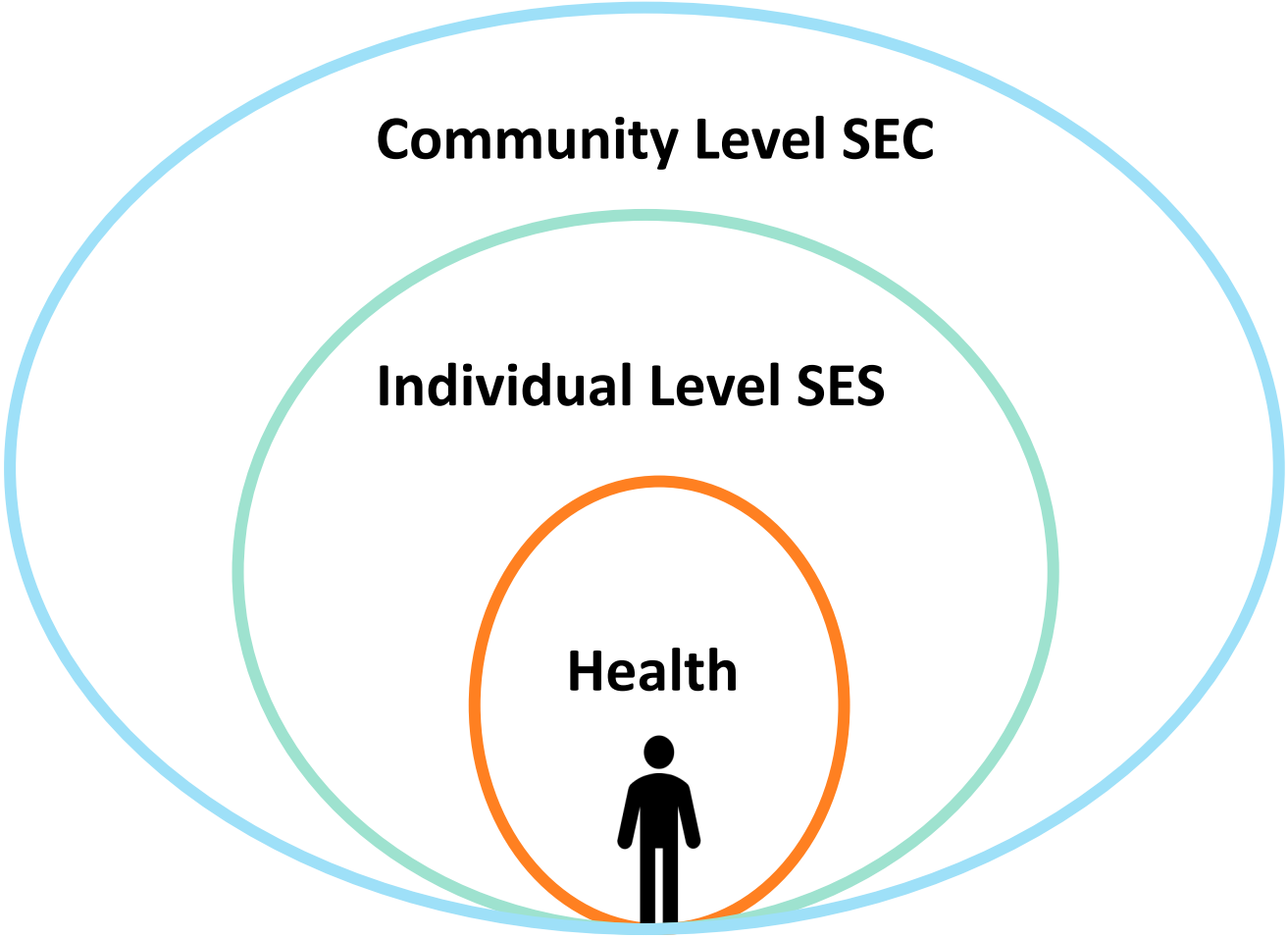
SIERA
IMMUNOLOGY AND AGING

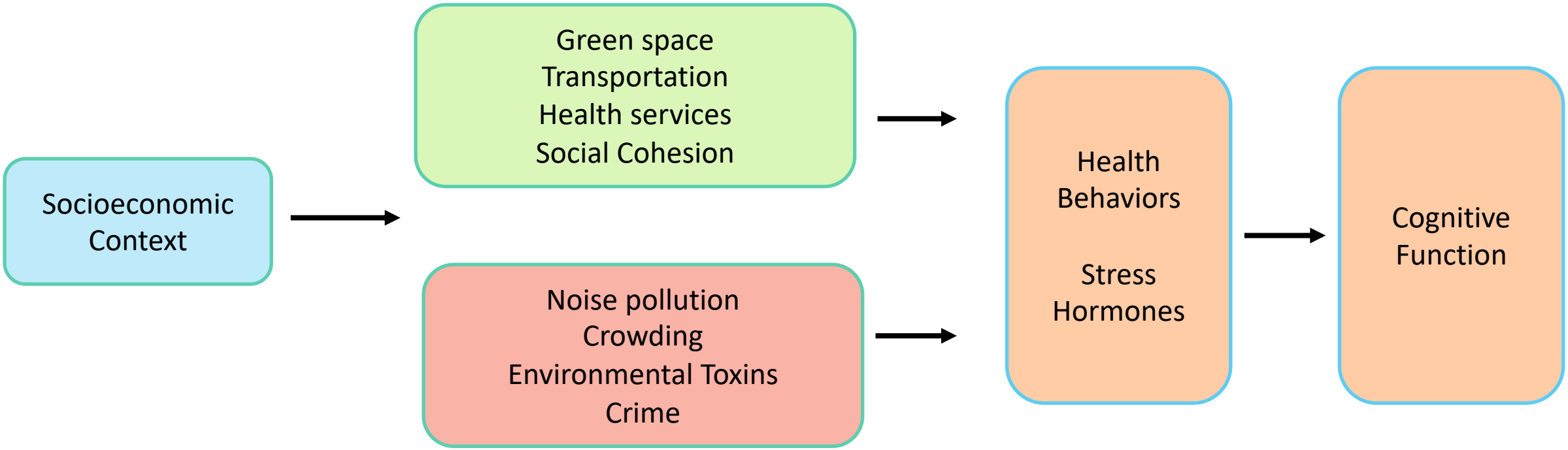
Socioeconomic context

- Socioeconomic Status Individual:
  - Occupation
  - Income
  - Education
  - Wealth

- Socioeconomic Context Community:
  - **Employment Status**
  - Income
  - Education
  - **Housing Quality**

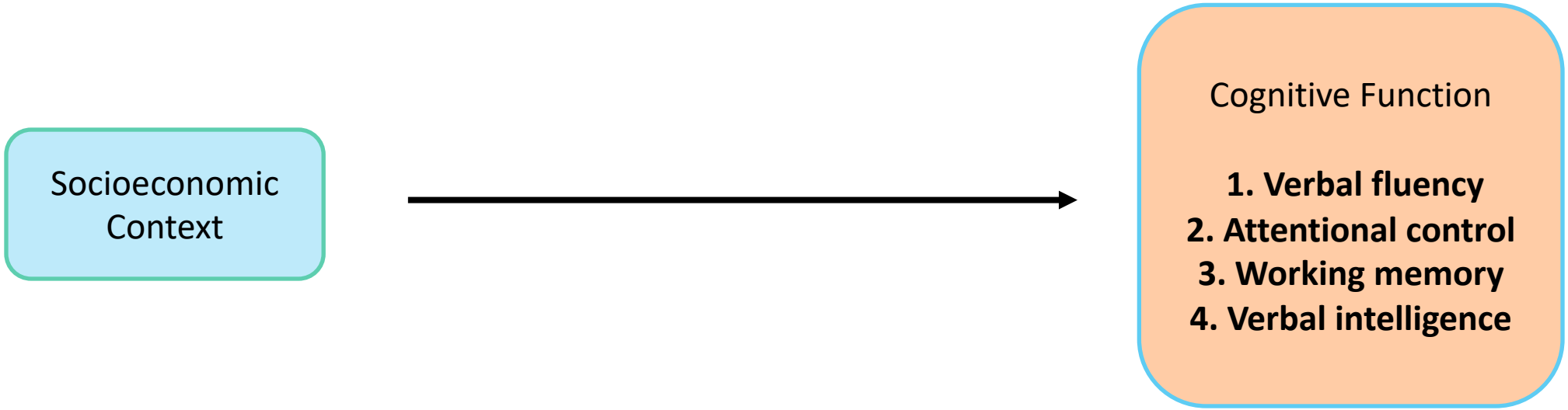


SEC links to healthy aging



Current Investigation

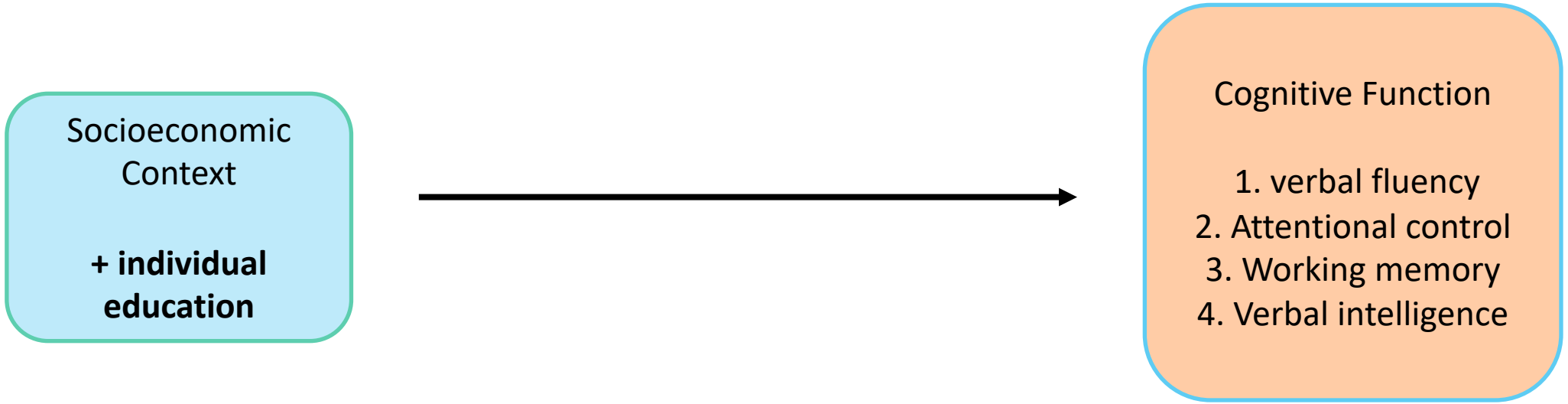
To test the association between neighborhood ADI and cognition across **four different cognitive domains**



(Wight et al., 2006; Zuelsdorff et al., 2020)

Current Investigation

To test the association between neighborhood ADI and cognition across four different cognitive domains, **above and beyond individual level SES.**



Participant Demographics

- N= 162
- 48.7% male
- Age= 72.52 [range: 61-96]

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- N= 162
- 48.7% male
- Age= 72.52 [range: 61-96]
- Education years= 17.27 [range: 12-30]
- Annual income= 85,000 [range: 12,000-280,000]
- Race
  - 77% White
  - 17% Black
  - 6% other

Area Deprivation Index

- The relative socioeconomic conditions of neighborhoods at the Census block group level using:
  - Income
  - Education
  - Employment
  - Housing quality

Kind & Buckingham, 2018

Area Deprivation Index

- The relative socioeconomic conditions of neighborhoods at the Census block group level using:
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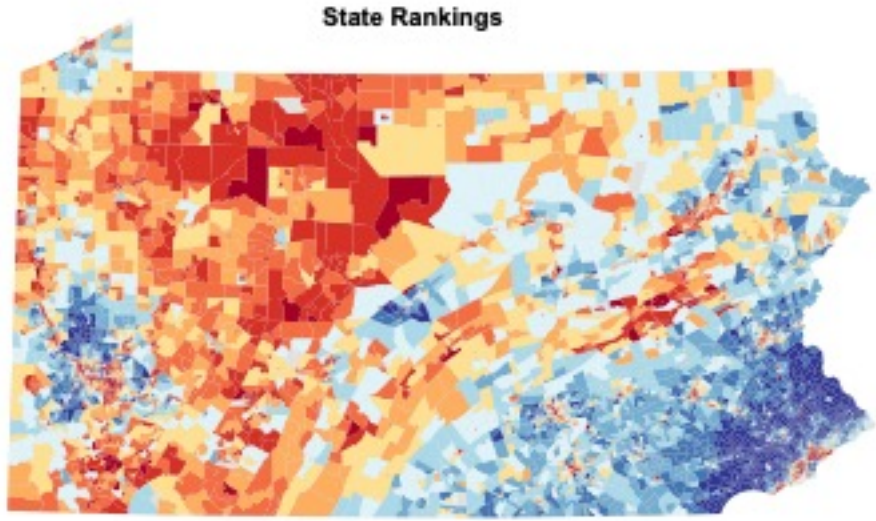
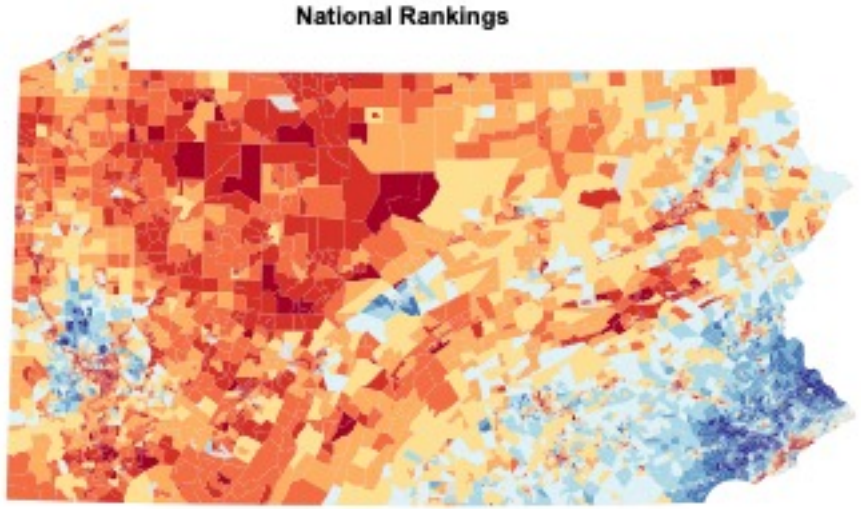
- Compared to the state and national rankings
  - State rankings may provide more relevant information because national rankings do not account for variation in cost of living.

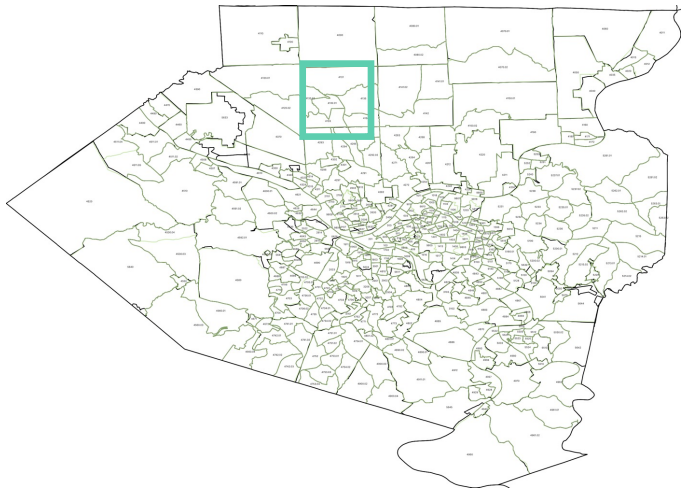




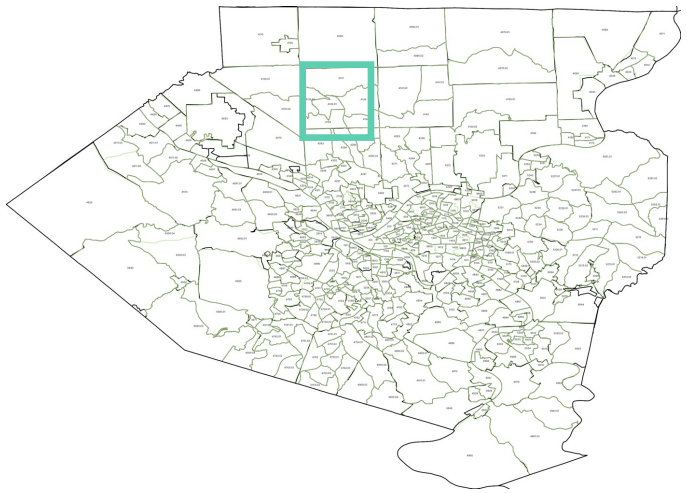
Kind & Buckingham, 2018

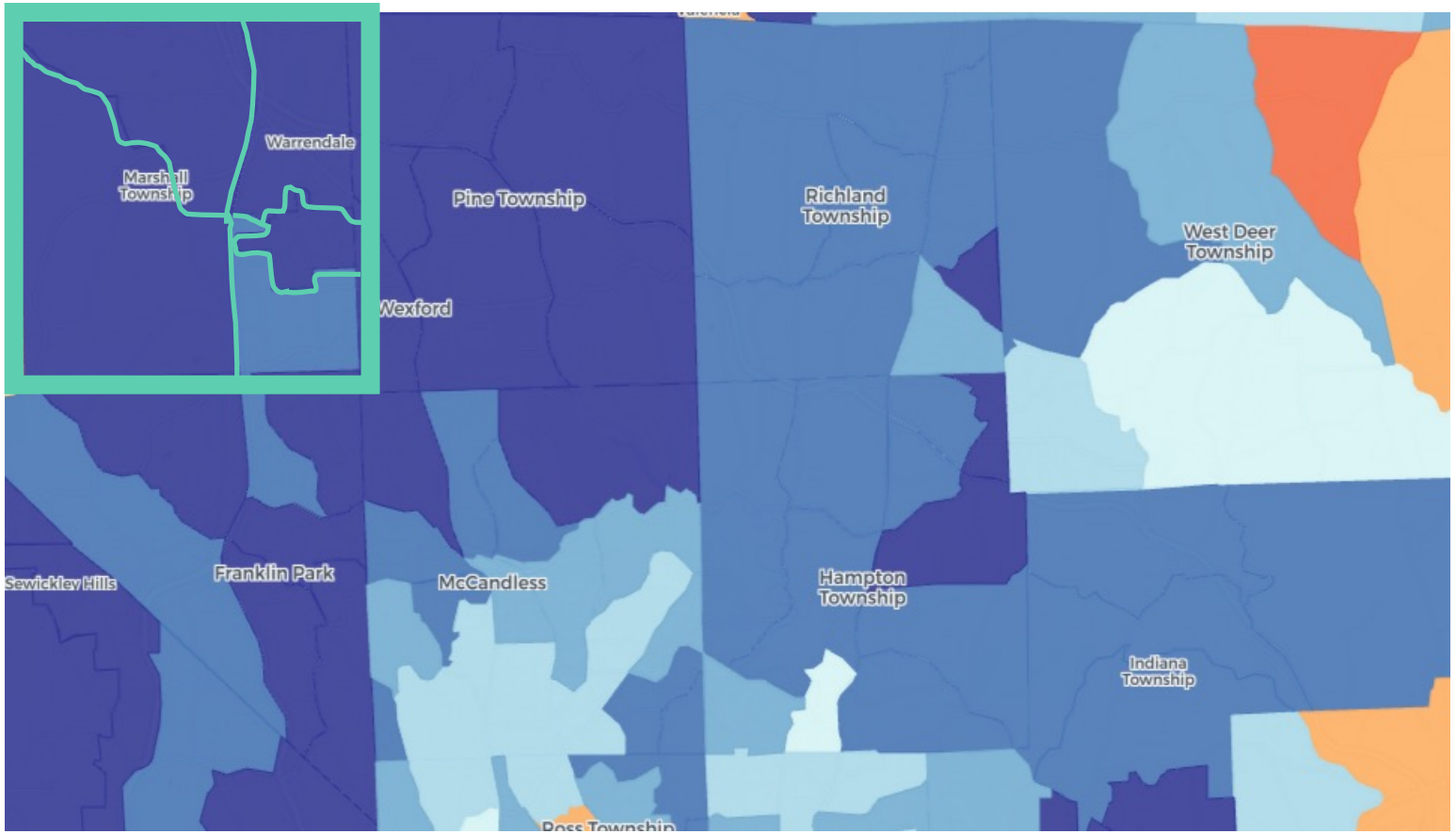
Pennsylvania has 67 counties

3,218 Census tracts



9,740 Census block group

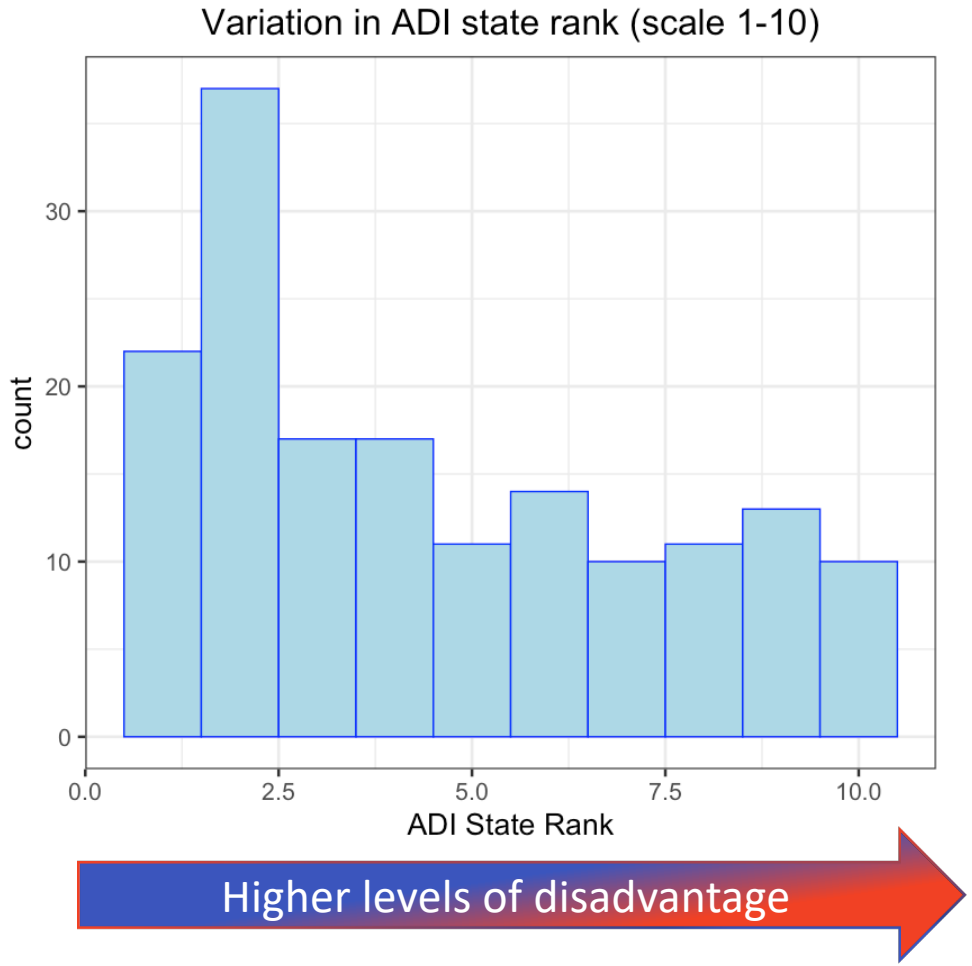


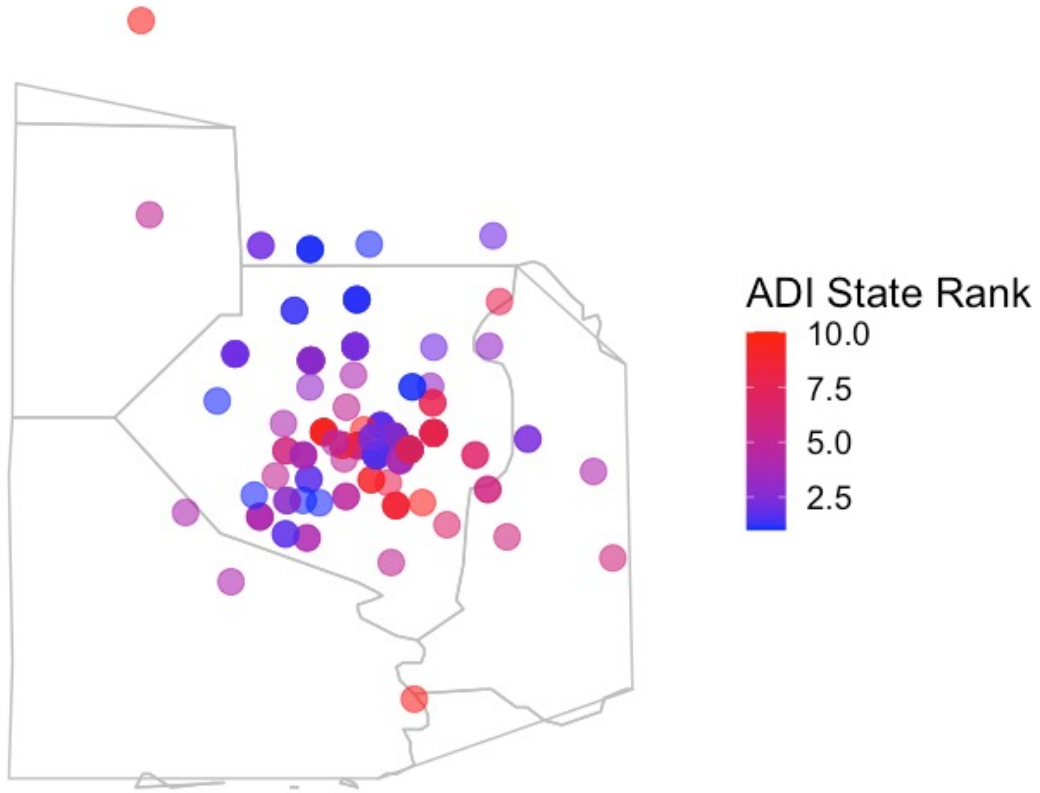


Kind & Buckingham, 2018

ADI in our sample

- State rank ranges from 0-10
  - Sample mean 4.5



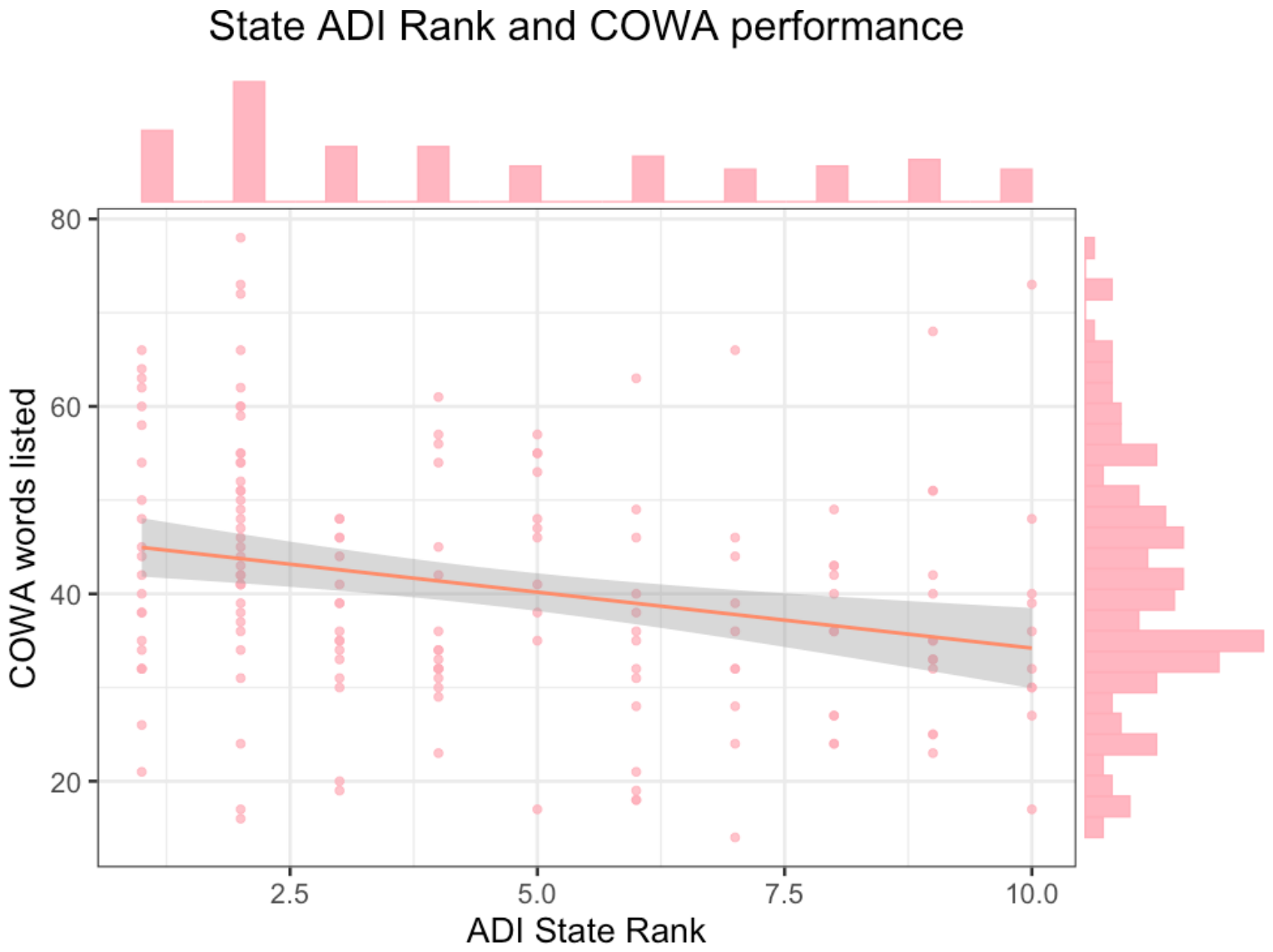


Cognitive Assessments

Assessment:	**Tests for:**	**Example:**
Controlled Oral Word Association (COWA)	Verbal fluency	Trial: in one minute, list all words you can think of beginning with “T” Response: tip, top, tape, tree…

State Rank predicting Cognitive Outcomes

	COWA		
	Verbal Fluency		
Predictors	*ß*	*SE*	*p*
State ADI Rank	-0.20	0.37	**0.013**
Age	-0.10	0.16	0.186
Education (years)	0.22	0.39	**0.006**



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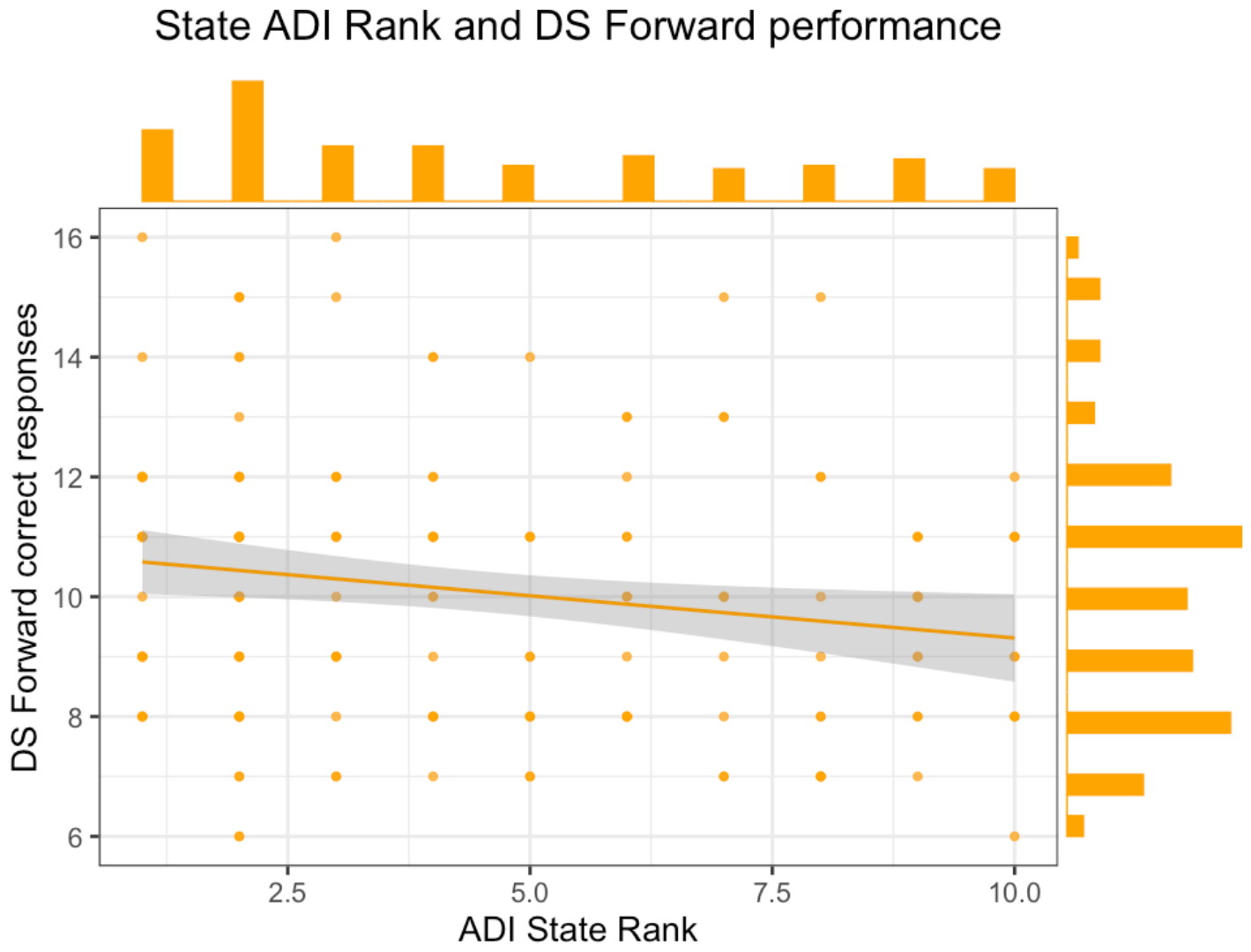
Digit Span (DS) • Forward	Attentional control	**Forward |** Trial: 5-8-2 Correct Response: 5-8-2

State Rank predicting Cognitive Outcomes

	DS Forward		
	Attentional control		
Predictors	*ß*	*SE*	*p*
State ADI Rank	-0.19	0.06	**0.022**
Age	-0.14	0.03	0.078
Education (years)	0.04	0.07	0.620



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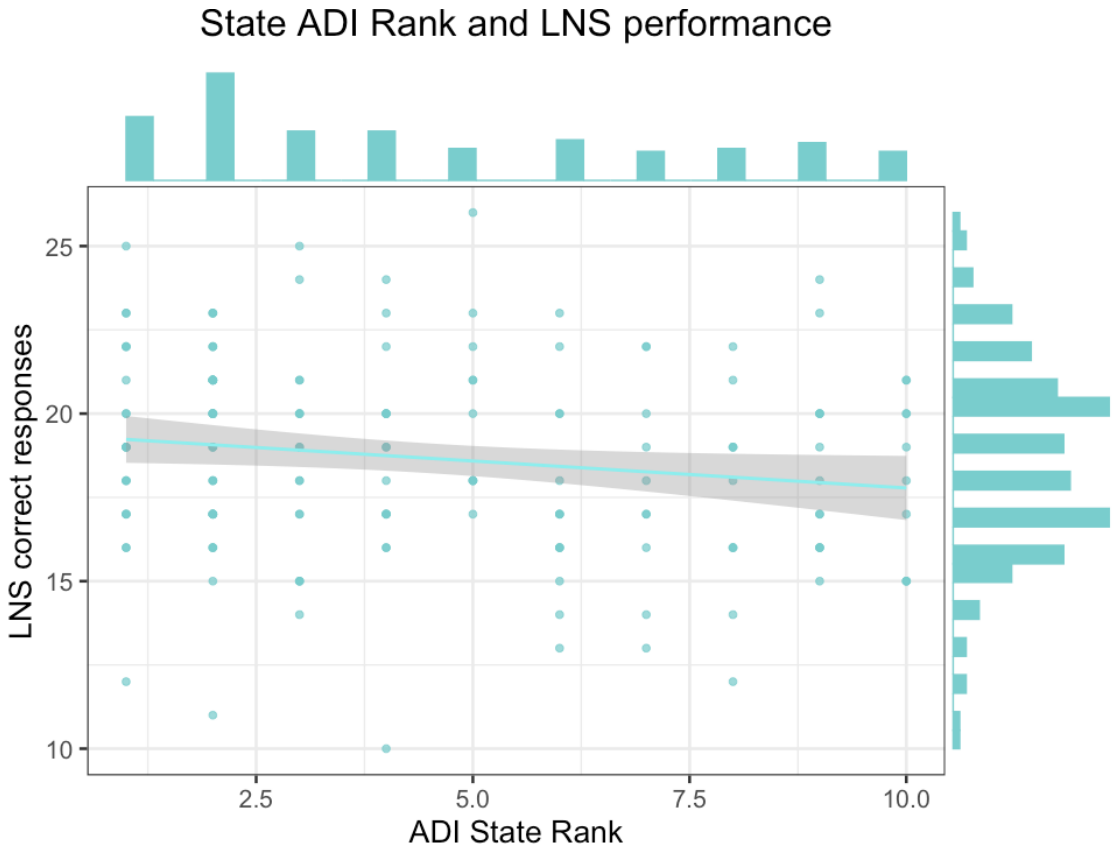
Digit Span (DS) • Backward • Sequence	Working memory	**Backward |** Trial: 6-2-9 Correct Response: 9-2-6 **Sequencing |** Trial: 0-9-4 Correct Response: 0-4-9
10-minute break		
Letter-Number Sequencing (LNS)	Working memory	Trial: 8-E-6-F-1 Correct Response: 1-6-8-E-F

State Rank predicting Cognitive Outcomes

	DS Backward			DS Sequence			LNS		
	Working Memory			Working Memory			Working Memory		
Predictors	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*
State ADI Rank	-0.19	0.06	**0.022**	-0.17	0.05	**0.042**	-0.19	0.08	**0.018**
Age	-0.16	0.03	**0.046**	-0.24	0.02	**0.002**	-0.34	0.04	**<0.001**
Education (years)	0.12	0.07	0.133	0.04	0.06	0.659	0.07	0.08	0.345



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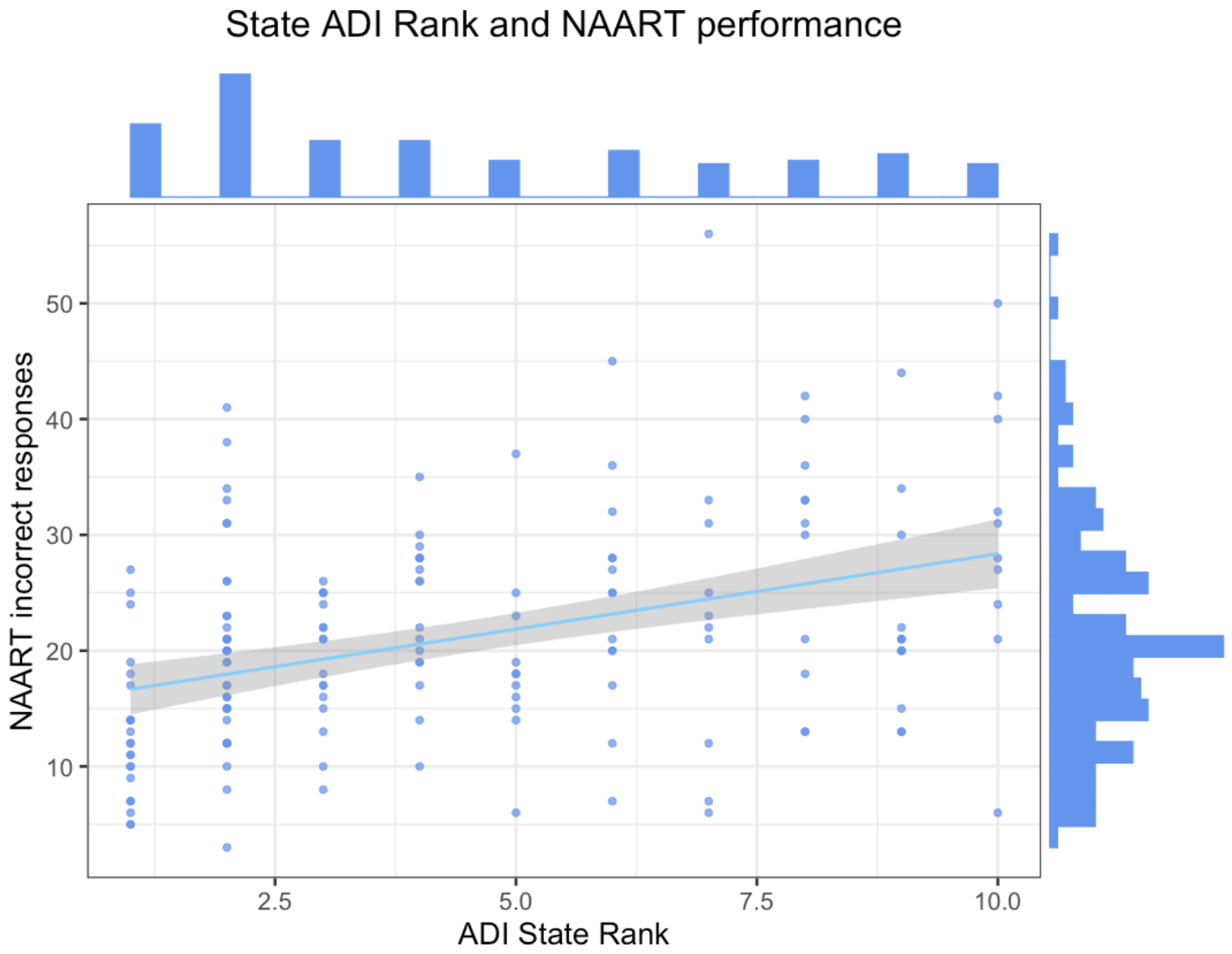
Letter-Number Sequencing (LNS)	Working memory	Trial: 8-E-6-F-1 Correct Response: 1-6-8-E-F
North American Adult Reading Test (NAART)	Verbal intelligence	Trial: Synecdoche Correct Response: [si-nek-duh-kee]

State Rank predicting Cognitive Outcomes

	NAART		
	Verbal Intelligence		
Predictors	*ß*	*SE*	*p*
State ADI Rank	0.30	0.25	**<0.001**
Age	0.09	0.11	0.213
Education (years)	-0.31	0.26	**<0.001**



State Rank predicting Cognitive Outcomes

	COWA			DS Forward			DS Backward			DS Sequence			LNS			NAART		
	Verbal Fluency			Attentional control			Working Memory			Working Memory			Working Memory			Verbal Intelligence		
Predictors	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*
State ADI Rank	**-0.20**	**0.37**	**0.013**	**-0.19**	**0.06**	**0.022**	**-0.19**	**0.06**	**0.022**	**-0.17**	**0.05**	**0.042**	**-0.19**	**0.08**	**0.018**	**0.30**	**0.25**	**<0.001**
Age	-0.10	0.16	0.186	-0.14	0.03	0.078	**-0.16**	**0.03**	**0.046**	**-0.24**	**0.02**	**0.002**	**-0.34**	**0.04**	**<0.001**	0.09	0.11	0.213
Education (years)	**0.22**	**0.39**	**0.006**	0.04	0.07	0.620	0.12	0.07	0.133	0.04	0.06	0.659	0.07	0.08	0.345	**-0.31**	**0.26**	**<0.001**
R^2	**12.1%**			**5.4%**			**7.9%**			**7.8%**			**14%**			**24.4%**		

State Rank predicting Cognitive Outcomes

	COWA			DS Forward			DS Backward			DS Sequence			LNS			NAART		
	Verbal Fluency			Attentional control			Working Memory			Working Memory			Working Memory			Verbal Intelligence		
Predictors	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*	*ß*	*SE*	*p*
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Age	-0.10	0.16	0.186	-0.14	0.03	0.078	**-0.16**	**0.03**	**0.046**	**-0.24**	**0.02**	**0.002**	**-0.34**	**0.04**	**<0.001**	0.09	0.11	0.213
Education (years)	**0.22**	**0.39**	**0.006**	0.04	0.07	0.620	0.12	0.07	0.133	0.04	0.06	0.659	0.07	0.08	0.345	**-0.31**	**0.26**	**<0.001**
R^2	**12.1%**			**5.4%**			**7.9%**			**7.8%**			**14%**			**24.4%**		

Note: results consistent when controlling for income instead of education and when using National ADI rank as a predictor

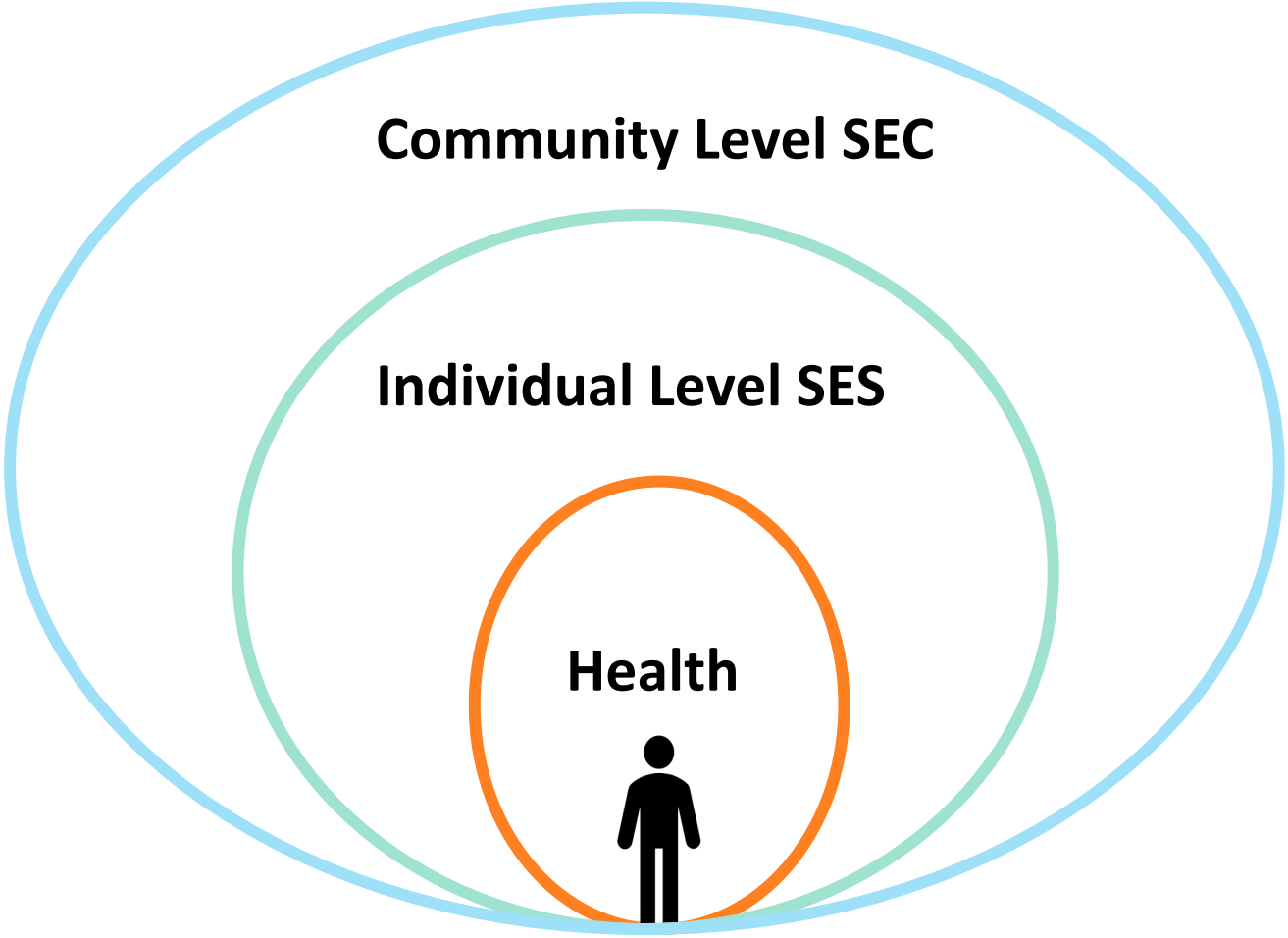
	ADI	Age	Education	COWA	DS Forward	DS Backward	DS Sequence	Letter Number	NAART
ADI	1.00								
Age	-0.16	1.00							
Education	-0.34	0.08	1.00						
COWA	-0.26	-0.05	0.28	1.00					
DS Forward	-0.18	-0.10	0.10	0.29	1.00				
DS Backward	-0.21	-0.11	0.17	0.26	0.48	1.00			
DS Sequence	-0.14	-0.21	0.07	0.24	0.30	0.43	1.00		
Letter Number	-0.16	-0.30	0.11	0.29	0.40	0.52	0.49	1.00	
NAART	0.39	0.01	-0.41	-0.43	-0.32	-0.39	-0.30	-0.39	1.00

Largest correlations between verbal fluency and verbal intelligence.

And the working memory assessments digit span and letter number sequencing.

Conclusions

- ADI was significantly associated with all four cognitive domains
  - Verbal fluency
  - Attentional control
  - Working memory
  - Verbal intelligence



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- ADI was significantly associated with all four cognitive domains

- ADI had the largest effect on Verbal Intelligence
  - Uniquely explaining **8%** of the variance in NAART performance
  - Equivalent to the effect of years of education in the same model

Conclusions

- ADI was significantly associated with all four cognitive domains
- ADI had the largest effect on Verbal Intelligence
  - Uniquely explaining **8%** of the variance in NAART performance
  - Equivalent to the effect of years of education in the same model
- ADI captures factors relevant for cognitive function above and beyond individual level SES
  - ADI was moderately correlated with education (r= -.34)

Future directions

- Limited by cross-sectional data

- Currently collecting data on participant lifetime addresses
  - Capture the influence of neighborhood level disadvantage trajectories on cognition
  - Reduce chance of reverse causality

Thank you

- Co-author: Rebecca Reed

- University of Pittsburgh PNI Research Lab
- Supported by NIH/NHLBI grant T32HL007560 (Thurston & Gianaros)

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