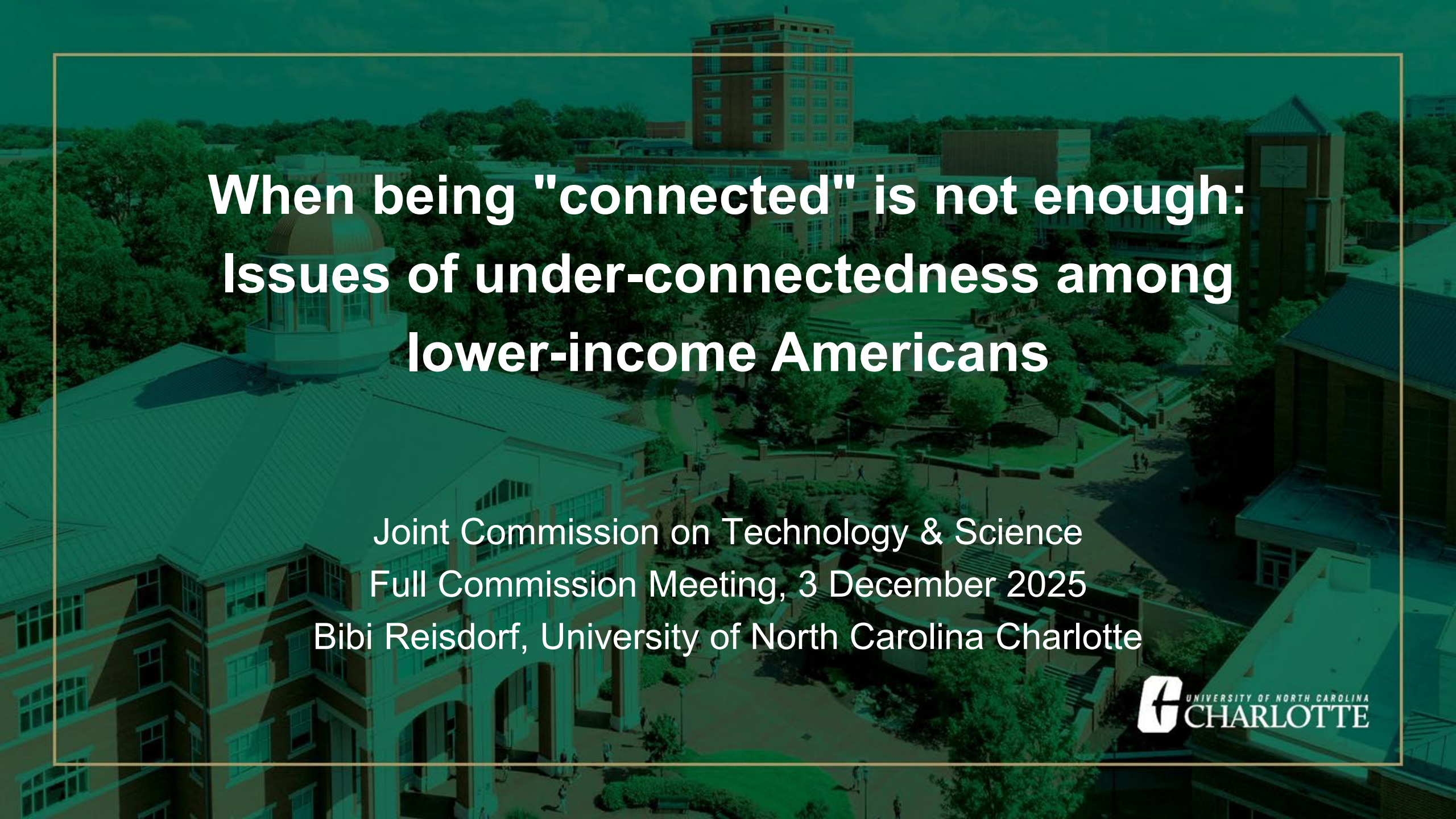


When being "connected" is not enough: Issues of under-connectedness among lower-income Americans

Joint Commission on Technology & Science
Full Commission Meeting, 3 December 2025
Bibi Reisdorf, University of North Carolina Charlotte

UNIVERSITY OF NORTH CAROLINA CHARLOTTE

Background/Literature

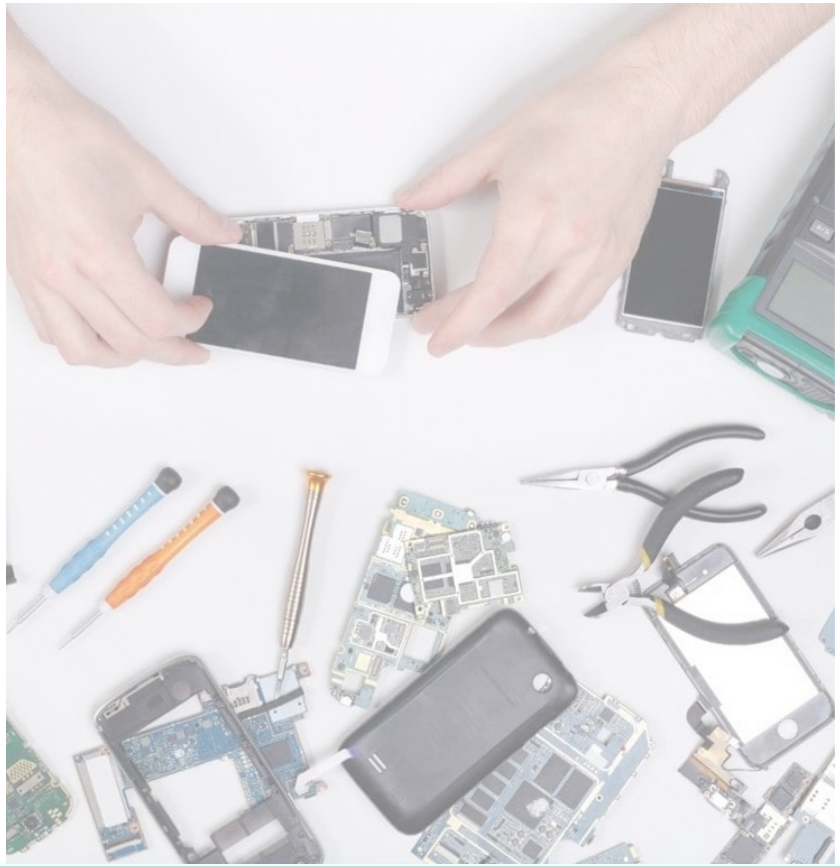
- Reliance on traditional binary digital divide measures of access to internet and devices since the beginning of digital divide research in the 1990s
  - Have/have-not binary still dominates how data are collected via yes/no questions like “do you have home broadband access?” or “do you have a laptop computer?”
- Technology maintenance and under-connectedness provides more nuanced view of lived experiences of digital inequalities

Technology Maintenance

- Coined by Amy Gonzales (UC Santa Barbara)

- Cost of maintaining technology
  - Broken or malfunctioning devices
  - Home internet connections
  - Mobile data

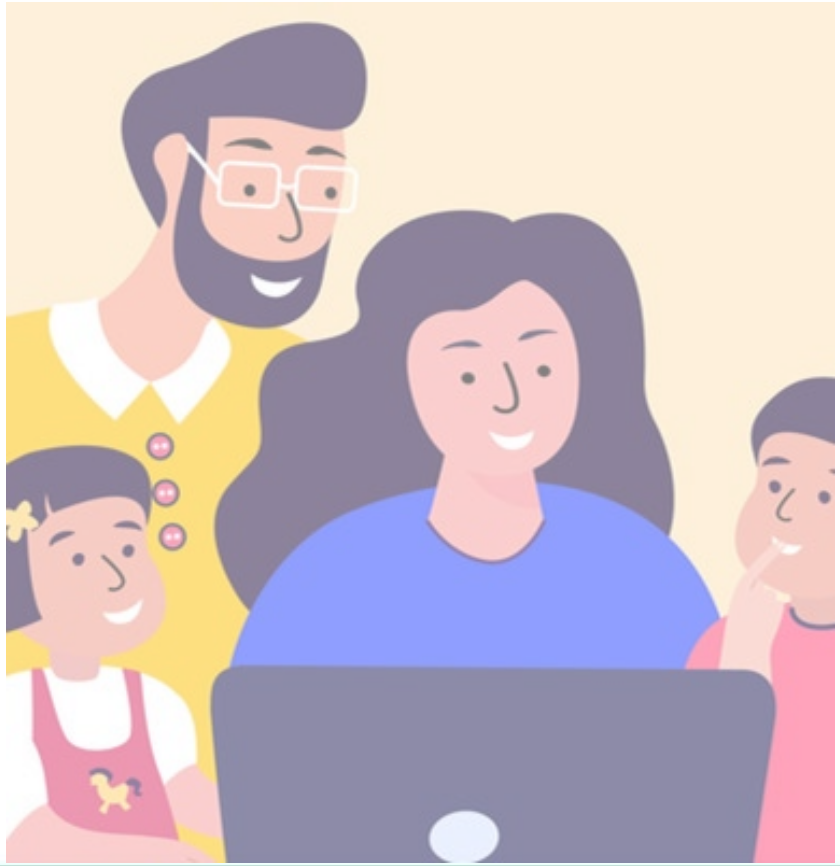
- Consequences
  - Forgone earnings and savings
  - Reconnection fees and other penalties



Under-Connectedness

- Coined by Vikki Katz (Chapman University)

- More nuanced survey measurements of lived digital inequalities
  - Quality and reliability of the internet
  - Slow, intermittent, unstable, or unreliable internet access at home, slow or poorly functioning devices, or having to share devices with others in the home
- Definition of under-connectedness relies on what individuals feel is the level of connectedness they need to fulfill their own needs
  - Not a researcher- or policymaker-imposed notion of what constitutes sufficient digital access



Example: Under-Connectedness Study

- Conducted with Dr. Vikki Katz (Chapman University)
- Among lower-income families, under-connectedness is a major concern
- Hypothesis: Under-connectedness measures will have greater explanatory power than digital divide measures for remote learning experiences among lower-income children, one year into pandemic learning.

Data & Methods

- Nationally representative, probability-based cellular and landline telephone survey of lower-income U.S. families conducted between March 10 and April 18, 2021
- 1,010 parents raising children ages 3 to 13, total household incomes below $75,000
- Logistic regression analyses—four models
  - Model 1 IVs: Only socio-demographics
  - Model 2 IVs: Socio-demographics and traditional digital divide measures
  - Model 3 IVs: Socio-demographics and under-connectedness measures
  - Model 4 IVs: Socio-demographics, digital divide, and under-connectedness

Measures

- DVs children’s learning experiences during remote learning (yes/no):
  - Did your child ever have to attend class or do schoolwork on a cellphone?
  - Was your child ever unable to attend class or do schoolwork because they didn't have access to a computer?
  - Was your child ever unable to attend class or do schoolwork because they didn't have an internet connection?
- IVs:
  - Socio-demographics
  - Traditional digital divide measures (access and devices)
  - Under-connectedness measures (quality, reliability, and availability of access and devices)

Sample Characteristics

Focal child demographics	
Female (%)	46
Median age (years)	8
Parent demographics	
Female (%)	61
Living with partner (%)	73
Median age (years)	37
Race/ethnicity (%)	
White	47
Black	18
Hispanic (English-dominant)	16
Hispanic (Spanish-dominant)	18
Education (%)	
High school, no degree	19
High school degree/GED	31
Some college, no degree	22
Associates or college degree	28
Household demographics	
Household income below federal poverty level (%)	27

Sample Characteristics Pt. 2

Digital Divide Measures (% yes)	
Smartphone	96
Internet Access	89
Laptop	86
Tablet	75
Desktop	33
Under-connectedness Measures (% yes)	
Computer too slow/broken	59
Internet too slow	56
Reached data limit	24
Too many people sharing computer	22
Too many people sharing smartphone/tablet	22
Cell service cut off	18
Internet cut off at home	18
Children's Remote Learning Issues (% yes)	
Child was unable to attend class/do schoolwork because they didn't have an internet connection	36
Child had to attend class or do schoolwork on a cellphone	31
Child was unable to attend class/do schoolwork because they didn't have access to a computer	22

Dependent variable:

Child was unable to attend class or do schoolwork because they didn't have access to a computer (yes/no)

Variable	Model 1		Model 2		Model 3		Model 4	
	Odds ratios	Sig.	Odds ratios	Sig.	Odds ratios	Sig.	Odds ratios	Sig.
Parent age	.992	.549	.988	.394	.975	.181	.974	.171
Parent gender (father)	1.660*	.037	1.683*	.035	1.052	.869	1.054	.865
Living w/o partner (w/ partner)	1.730*	.017	1.591*	.051	.930	.815	.939	.839
Child age	.985	.722	.997	.949	1.022	.706	1.025	.665
Child gender (son)	.562**	.007	.611*	.025	.620	.080	.608	.073
Race/ethnicity (white)								
Black	.740	.321	.766	.391	1.047	.902	1.053	.890
Hispanic (Eng. dominant)	1.044	.889	1.111	.737	1.791	.123	1.843	.109
Hispanic (Span. dominant)	2.084*	.020	1.969*	.041	2.072	.096	2.219	.083
Parent education (no HS degree)								
High school degree/GED	.740	.341	.807	.508	.588	.230	.580	.222
Some college, no degree	.957	.900	.972	.938	.911	.845	.898	.823
Associates or college degree	.407*	.017	.467*	.053	.543	.211	.536	.210
Household income below federal poverty level (above)	2.080***	.001	2.078***	.001	2.137**	.011	2.159**	.010
Digital Divide measures (yes)								
Laptop			1.337	.365			.982	.987
Desktop			1.013	.956			.926	.799
Smartphone			1.194	.844			[a]	[a]
Tablet			1.044	.871			.859	.666
Internet access			2.273**	.012			[a]	[a]
Under-connectedness (no)								
Too many people sharing smartphone/tablet					1.684	.147	1.699	.141
Cell service cut off					2.582**	.006	2.567**	.007
Reached data limit					1.480	.212	1.493	.207
Computer too slow/broken					1.403	.347	1.405	.347
Too many people sharing computer					2.575**	.004	2.555**	.004
Internet cut off at home					1.586	.195	1.575	.205
Internet too slow					.621	.137	.619	.136
Constant	.329	.145	.121	.020	.209	.121	.227	.158
Nagelkerke R^2	.165		.186		.334		.335	
N	683		667		570		569	

Notes: Reference categories listed in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$.

[a] Variables excluded from logistic regression model due to collinearity.

Dependent variable:

Child was unable to attend class or do schoolwork because they didn't have an internet connection (yes/no)

Variable	Model 1		Model 2		Model 3		Model 4	
	Odds ratios	Sig.	Odds ratios	Sig.	Odds ratios	Sig.	Odds ratios	Sig.
Parent age	1.004	.714	1.003	.783	1.003	.816	1.005	.726
Parent gender (father)	1.830**	.003	1.923**	.002	1.534	.092	1.537	.093
Living w/o partner (w/ partner)	2.255***	<.001	2.231***	<.001	1.669*	.040	1.633*	.052
Child age	1.014	.704	1.013	.739	1.033	.477	1.035	.450
Child gender (son)	.988	.945	1.033	.863	1.149	.530	1.183	.455
Race/ethnicity (white)								
Black	1.065	.799	1.061	.813	1.061	.839	1.053	.860
Hispanic English dominant	1.234	.414	1.217	.454	1.582	.126	1.557	.145
Hispanic Spanish dominant	3.207***	<.001	3.236***	<.001	2.924**	.007	3.101**	.007
Parent education (no HS degree)								
High school degree/GED	.765	.363	.804	.473	.922	.841	.974	.950
Some college, no degree	.841	.596	.818	.551	.795	.594	.845	.702
Associates or college degree	.532	.056	.546	.080	.712	.432	.737	.494
Household income below federal poverty level (above)	1.484*	.054	1.495*	.054	1.422	.176	1.454	.154
Digital Divide measures (yes)								
Laptop			.715	.079			.153	.123
Desktop			1.048	.818			.867	.554
Smartphone			1.257	.786			[a]	[a]
Tablet			1.007	.978			1.036	.903
Internet access			1.890*	.047			[a]	[a]
Under-connectedness (no)								
Too many people sharing smartphone/tablet					1.543	.175	1.625	.136
Cell service cut off					1.636	.125	1.588	.150
Reached data limit					1.707*	.050	1.746*	.043
Computer too slow/broken					1.341	.281	1.273	.380
Too many people sharing computer					1.159	.615	1.156	.626
Internet cut off at home					2.146*	.019	2.154*	.019
Internet too slow					2.269***	.001	2.350***	<.001
Constant	.203	.018	.100	.005	.048	<.001	.046	<.001
Nagelkerke R^2	.166		.181		.331		.319	
N	684		668		570		.596	

Notes: Reference categories listed in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$.

[a] Variables excluded from logistic regression model due to collinearity.

Dependent variable:

Did your child ever have to attend class or do schoolwork on a cellphone? (yes/no)

Variable	Model 1		Model 2		Model 3		Model 4	
	Odds ratios	Sig.	Odds ratios	Sig.	Odds ratios	Sig.	Odds ratios	Sig.
Parent age	.990	.381	.992	.531	.979	.192	.978	.170
Parent gender (father)	1.444	.081	1.456	.082	1.064	.814	1.049	.857
Living w/o partner (w/ partner)	1.197	.382	1.166	.470	.913	.727	.960	.877
Child age	1.121**	.003	1.121**	.005	1.166***	.001	1.147**	.005
Child gender (son)	1.441*	.048	1.522*	.030	1.900**	.005	2.011**	.003
Race/ethnicity (white)								
Black	1.566	.074	1.682*	.043	1.474	.190	1.508	.168
Hispanic (Eng. dominant)	1.664*	.051	1.730*	.040	1.948*	.033	1.854*	.052
Hispanic (Span. dominant)	2.846***	<.001	2.494**	.004	3.540**	.002	2.934**	.010
Parent education (no HS degree)								
High school degree/GED	.779	.406	.760	.382	1.350	.464	1.295	.535
Some college, no degree	.908	.773	.984	.963	1.692	.236	1.663	.262
Associates or college degree	.746	.384	.785	.494	1.694	.236	1.640	.278
Household income below federal poverty level (above)	1.284	.238	1.301	.225	1.393	.219	1.395	.219
Digital Divide measures (yes)								
Laptop			1.034	.915			2.916	.176
Desktop			.973	.895			.958	.862
Smartphone			.073	.237			[a]	[a]
Tablet			1.637*	.036			1.885*	.030
Internet access			1.609	.142			[a]	[a]
Under-connectedness (no)								
Too many people sharing smartphone/tablet					1.736	.086	1.671	.113
Cell service cut off					1.034	.919	1.066	.848
Reached data limit					2.315**	.002	2.338**	.002
Computer too slow/broken					3.023***	<.001	3.229***	<.001
Too many people sharing computer					1.343	.306	1.351	.297
Internet cut off at home					1.912*	.051	1.853	.067
Internet too slow					.931	.786	.912	.729
Constant	.104	.001	.049	<.001	.017	<.001	.019	<.001
Nagelkerke R^2	.112		.140		.300		.314	
N	684		668		570		569	

Notes: Reference categories listed in parentheses. *$p < .05$, **$p < .010$, ***$p < .001$.

[a] Variables excluded from logistic regression model due to collinearity.

Why It Matters

- Results demonstrate importance of including under-connectedness and/or under-connectedness measures for comprehensive assessments of digital inequality
  - Show the lived reality of many people on the (digital) margins
- Under-connectedness measures should be used to inform development of digital equity programs capable of effectively responding to the day-to-day challenges of affected individuals, families, and communities

Policy Implications

- Crucial to move beyond traditional measures of access and use
  - Can lure us into thinking the issue is “resolved”
- Providing access/devices/skills is just the beginning
  - Digital inequality is a moving target
- Under-connectedness and technology maintenance issues are just as detrimental to digital equity as a lack of access or device
  - If not more…

Thank you!

Bibi Reisdorf, bianca.reisdorf@charlotte.edu