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EXTENSION CENTER FOR COMMUNITY VITALITY

Methodological Appendix: Steps Before Confirmatory Factor Analysis

Accompanies report: Developing and Validating University
of Minnesota Extension's Social Capital Model and Survey

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INTRODUCTION

This appendix describes two steps undertaken by University of Minnesota Extension researchers prior to conducting confirmatory factor analysis to validate their social capital model and survey: 1) Imputing missing data, and 2) Exploratory factor analysis.

IMPUTING MISSING DATA

Before undertaking exploratory factor analysis to identify patterns of co-variations in the data, we needed to fill in missing data. We used a two-step process to impute values. First, we identified variables that had missing values for under (and including) 10 percent of the observations in the sample. We used list-wise deletion to remove these observations from the data set. Second, we used the linear trend at point analysis in IBM SPSS to impute missing values for variables that were missing values for more than 10 percent of the observations.

This technique regresses the existing data for a variable on an index variable scaled 1 to n. Missing values are replaced with their predicted values based on this regression. This method of data imputation may result in artificially low standard errors and have the effect of making some statistical tests seem significant when in fact they are not.

Ultimately we deleted 429 observations from the dataset, leaving 864 complete records. Tables 1A and 1B show that reducing the sample size had little effect on the overall demographic characteristics of the sample, but as mentioned in the report, the sample was already biased toward more affluent and more educated residents of the four communities surveyed.

	Southern Community #1			Southern Community #2		
Data collection period	December 2007—February 2008			December 2007—February 2008		
Scope of community	School district ²	Original sample	Final sample	Zip code area ¹	Original sample	Final sample
Population/sample size	19,526	286	200	8,771	374	285
Percent female	48	74	72	51	70	69
Percent minority	7	11	14	2	2	2
Percent of adults with high school education or less	54	23	20	50	23	18
Percent of households with \$75,000 or higher income	15	34	36	22	55	58
Percent of adults age 60 or older	18	21	17	16	15	13

¹ American Fact Finder, index of data provided by the US Census Bureau (2000 census), <http://factfinder.census.gov/>
 School District Census Data (2000) <http://nces.ed.gov/surveys/sdds/>

TABLE 1A: Demographic Characteristics of the Population and Sample of Southern Communities #1 & #2

	Western Community			Northeastern Community		
Data collection period	November 2007—January 2008			December 2007—January 2008		
Scope of community	Zip code area ¹	Original sample	Final sample	County ¹	Original sample	Final sample
Population/sample size	4,331	168	136	5,168	465	243
Percent female	52%	70	69	49%	65%	65
Percent minority	10%	3	3	9%	2%	3
Percent of adults with high school education or less	50%	19	15	40%	9%	10
Percent of households with \$75,000 or higher income	11%	33	34	14%	30%	33
Percent of adults age 60 or older	25%	30	29	30%	37%	33

¹ American Fact Finder, index of data provided by the US Census Bureau (2000 census), <http://factfinder.census.gov/>

² School District Census Data (2000) <http://nces.ed.gov/surveys/sdds/>

TABLE 1B: Demographic Characteristics of the Population and Sample of Western & Northeastern Communities

EXPLORATORY FACTOR ANALYSIS

We then ran an exploratory factor analysis (EFA) with all 56 survey items designed to measure the six domains of social capital we had identified at the time. The results of the initial EFA are shown in Table 2 on the next page, with factor loadings greater than 0.500 in boxes and bold text (DeVellis, 2003).

Survey items	1	2	3	4	5	6	7	8	9	10	11	12	13
Can count on someone in the community if you need some extra help	0.121	0.147	0.019	0.101	0.659	0.123	0.073	-0.072	0.141	-0.096	0.016	0.102	-0.070
You and people in your community do favors for each other	0.102	0.030	0.146	0.097	0.725	0.117	0.062	0.116	0.140	-0.039	0.068	-0.041	-0.045
You would ask your neighbors for help if you were sick	0.023	0.044	0.031	0.028	0.731	-0.046	0.123	0.084	0.021	0.049	0.076	0.061	-0.032
Community members would get together to help a neighbor with a serious problem	0.105	0.091	0.087	0.061	0.710	0.076	0.096	0.024	0.063	0.087	-0.011	-0.004	-0.016
Hard to make good friends	0.051	0.150	-0.048	0.195	0.451	0.162	0.006	0.167	0.016	0.041	-0.148	0.060	-0.417
Welcoming to newcomers	0.034	-0.108	0.003	-0.099	-0.270	-0.187	-0.043	-0.064	0.030	0.008	0.087	0.006	0.658
Trust immediate neighbors	0.076	0.144	0.000	0.038	0.501	0.076	0.269	0.345	-0.092	0.112	0.014	0.005	0.034
Trust co-workers	0.126	0.192	0.007	-0.002	0.127	0.230	0.214	0.544	0.005	0.069	0.061	-0.096	-0.115
Trust people at church	-0.021	0.218	-0.040	0.123	0.157	0.031	0.292	0.557	0.123	0.114	0.035	0.095	-0.003
Trust people in common activities	0.015	0.146	0.086	0.206	0.132	0.065	0.521	0.397	-0.011	0.199	-0.003	0.079	-0.086
Trust people from other cultural or ethnic groups	0.083	0.107	0.024	0.115	0.115	0.139	0.800	0.051	0.057	0.008	0.069	0.051	-0.011
Trust people of other religious beliefs	0.082	0.098	0.003	0.122	0.142	0.218	0.733	0.233	-0.066	0.016	-0.027	0.039	0.030
Trust people new to the community	-0.002	0.123	0.061	0.068	0.151	0.211	0.724	0.011	0.049	0.046	0.034	-0.036	0.011
Trust local government officials	-0.023	0.158	0.097	0.049	0.125	0.710	0.274	0.129	0.038	0.163	0.062	0.022	-0.099
Trust business people	0.100	0.163	0.115	0.073	0.075	0.528	0.253	0.342	-0.067	0.045	0.019	0.088	-0.140
Trust people in law enforcement	0.039	0.183	0.038	0.060	0.199	0.432	0.069	0.367	-0.064	0.460	0.091	-0.096	-0.013
Trust teachers/educators	0.044	0.382	-0.087	0.138	0.044	0.189	0.122	0.256	0.126	0.524	0.104	-0.234	-0.159
Trust nurses and doctors	0.050	0.397	-0.015	0.122	0.043	0.205	0.142	0.142	-0.028	0.605	0.038	0.079	0.010
Trust local news media	0.019	0.100	0.021	-0.018	0.007	0.513	0.264	0.080	-0.001	0.283	0.000	0.211	-0.150
World events important because affect community	0.145	-0.057	0.118	0.070	-0.010	0.034	0.183	-0.190	0.126	-0.172	-0.275	-0.273	0.472
Trust local government	0.051	0.322	0.027	0.060	0.132	0.768	0.103	0.012	-0.003	-0.033	-0.037	-0.066	-0.033
Trust state government	0.012	0.309	-0.011	0.094	0.051	0.724	0.069	-0.017	0.059	-0.044	0.019	0.024	0.104
Trust educational organizations in your community	0.020	0.732	0.029	0.055	0.067	0.236	0.070	0.025	0.103	0.123	0.068	-0.169	-0.119
Trust health care organizations in your community	0.012	0.760	0.035	0.038	0.139	0.200	0.087	-0.032	-0.078	0.216	-0.058	0.068	0.023
Trust social service organizations in your community	-0.007	0.708	0.006	0.139	0.140	0.202	0.144	0.048	-0.013	0.116	0.000	-0.013	-0.099
Trust faith-based organizations in your community	0.022	0.645	0.007	0.061	0.046	0.130	0.054	0.394	0.027	-0.003	0.056	0.013	0.058
Trust businesses in the community	0.076	0.560	0.021	0.076	0.130	0.186	0.156	0.282	0.016	-0.267	0.068	0.103	-0.067
Contact with older people	0.534	-0.023	0.018	0.122	0.056	0.057	-0.028	0.255	0.008	-0.121	-0.196	0.209	-0.039
Contact with younger people	0.483	0.104	0.029	0.109	0.074	0.038	-0.032	0.253	-0.007	-0.339	-0.042	-0.161	-0.016
Contact with people different religion	0.635	0.027	0.060	0.068	0.066	0.138	0.046	0.126	-0.077	-0.134	0.031	-0.087	0.045
Contact with people different race/ethnicity	0.671	0.009	-0.036	0.029	-0.121	0.000	0.067	-0.064	0.132	-0.015	0.264	-0.010	-0.079
Contact with people much wealthier	0.668	-0.041	0.183	0.040	0.000	-0.062	0.039	0.100	0.099	0.035	-0.007	-0.060	-0.132
Contact with people much poorer	0.744	0.011	0.164	0.086	-0.014	0.032	0.014	-0.020	0.010	-0.051	-0.011	-0.021	-0.030
Contact with people different sexual orientation	0.547	-0.046	0.063	0.055	0.095	-0.098	0.089	-0.124	0.120	0.270	-0.054	0.049	0.018
Contact with people less education	0.676	-0.006	0.159	0.112	0.092	0.061	0.015	0.026	0.013	0.061	-0.094	-0.039	0.089
Contact with people more education	0.563	0.072	-0.057	-0.083	0.151	-0.150	-0.013	0.028	0.120	-0.011	0.066	0.190	-0.005
Contact with people with disabilities	0.629	0.051	-0.015	0.029	0.050	0.089	0.067	-0.085	0.025	0.083	0.268	0.138	0.158
Contact with people different political views	0.687	0.040	0.142	0.069	0.154	0.069	-0.030	-0.054	0.061	0.099	-0.029	0.060	0.168
Difference in strengthening circle of friends	0.130	0.108	0.017	0.642	0.078	0.046	0.141	0.093	0.212	-0.013	-0.058	-0.067	-0.070
Difference in strengthening clubs	0.103	0.064	0.165	0.801	0.026	0.088	0.119	0.093	0.055	0.085	0.048	0.067	-0.061
Difference in helping newcomers get involved in clubs	0.092	0.070	0.113	0.784	0.153	0.023	0.083	-0.007	0.043	0.029	0.170	0.096	0.003
Difference in connecting your orgs with others	0.101	0.077	0.166	0.749	0.088	0.058	0.067	-0.002	-0.054	-0.012	0.270	0.147	0.044
Difference in helping community institutions be responsive	0.133	0.080	0.175	0.458	0.161	0.042	0.043	0.024	0.005	0.119	0.583	-0.122	0.084
Difference in helping institutions outside community be responsive	0.077	0.047	0.087	0.422	0.041	0.067	0.055	0.067	-0.023	0.026	0.701	0.064	-0.047
How many times attended any public meeting	0.193	0.015	0.779	0.075	0.002	0.078	0.024	0.086	-0.012	0.007	0.054	-0.068	0.084
How many times attended political meeting	0.061	0.022	0.662	0.045	-0.041	0.052	0.098	-0.091	0.100	-0.139	0.048	0.104	-0.205
How many times attended club meeting	0.087	0.119	0.504	0.309	0.071	0.027	-0.012	0.220	0.102	0.065	-0.192	0.248	0.134
How many times visited sick/elderly	0.119	-0.106	0.093	0.041	0.146	0.126	0.048	0.125	0.146	-0.118	0.082	0.574	0.022
How many times in home of non-family from community	0.212	0.040	0.131	0.136	0.227	0.006	-0.011	0.093	0.739	0.029	-0.152	0.124	0.069
How many times in home of non-family outside of community	0.108	0.032	0.022	0.041	0.062	-0.035	0.036	0.003	0.839	0.031	0.098	0.065	0.086
How many times been in home of a community leader	0.104	-0.056	0.446	0.129	0.105	0.131	0.016	-0.032	0.489	-0.089	0.004	-0.031	-0.054
How many times joined with others in community to address an issue	0.157	0.013	0.729	0.173	0.138	0.047	-0.039	0.029	0.104	0.041	0.000	0.071	0.052
How many times donated to a charity	0.153	0.005	0.231	0.137	0.214	0.128	-0.119	0.330	0.172	0.028	-0.059	0.248	0.508
How many times participated in fraternal org	0.020	0.045	0.268	0.173	-0.031	-0.001	0.056	-0.161	0.012	0.137	-0.092	0.619	-0.068
How many times tried to get your local government to pay attention	0.112	-0.025	0.739	0.022	0.105	-0.041	0.037	-0.081	-0.040	0.071	0.088	0.117	0.134
How many times organized a community effort	0.008	0.038	0.412	0.099	0.041	-0.074	0.077	0.108	0.066	-0.068	0.341	0.370	0.060
Percent of variance explained (rotation sums of squared loadings)	8.388	5.843	5.744	5.675	5.571	5.453	4.797	3.724	3.286	2.824	2.727	2.725	2.61

TABLE 2: Survey Item Factor Loadings Using Principal Components Factor Analysis and Varimax Rotation with Kaiser Normalization (n=864)

Thirteen factors, or principal components, had Eigenvalues over 1, a commonly used cutoff point for determining principal components (Kaiser, 1960). Together these 13 principal components explained 59 percent of the variance in the survey responses. As expected, several of the domains of social capital were clearly represented by items in a specific factor. Bridging engagement (contact with people different from oneself) was represented in the first factor, linking trust (trust in organizations/institutions) in the second factor, linking engagement (engagement with organizations/institutions) in the third factor, and bonding engagement (engagement/reciprocity with neighbors) in the fifth factor.

However, there were ways in which the exploratory nature of the factor analysis yielded some unexpected results that led to some questioning of our conceptual framework. The items intended to measure bonding trust (trust of neighbors and co-workers) were included in the eighth factor, but the factor loading for trust of immediate neighbors was weak (0.345). In retrospect, we realized that we had not included survey items on two crucial sources of bonding trust: family and friends.

The items intended to measure bridging trust (trust of people different from oneself) were included in the seventh factor, but included with these items was trust of people in the same clubs or activities, which we had envisioned as part of bonding trust. Also, several survey items pertaining to self efficacy, such as "I believe I can make a difference in strengthening clubs or organizations," loaded together. We had expected these items to factor with the various engagement domains. For example, we had included "believing you can make a difference helping newcomers get involved" as an aspect of bridging engagement. We concluded that we needed to either remove these items from the scales used to measure the six domains or include these items as a seventh domain of social capital related to efficacy.

Six Additional Factors

Finally, there were six additional factors that included items that did not seem to fit within our conceptual framework – the 6th, 9th, 10th, 11th, 12th and 13th factors. The 6th and 10th factors included items pertaining to trust in government, business, the media, law enforcement, education, and medicine that we had intended as measures of linking trust. These items did not load with the other linking trust items in the second factor, which suggested that these were three distinct sub-factors of linking trust – one pertaining to trust in organizations/institutions, one pertaining to trust in community leadership, and one pertaining to trust in community professionals.

The 9th factor consisted of three items that had to do with contact with non-family members and community leaders. We felt these items did not add to our analysis and should probably be deleted. The 11th factor included two items pertaining to efficacy that also loaded fairly well with factor four (the efficacy factor). Finally, the 12th and 13th factors included items that were intended to be measures of linking engagement, but we also felt these items added little to the third factor.

CONCLUSION

Based on the results of the EFA, we reduced the number of items used to measure the original six constructs (bonding trust, bonding engagement, bridging trust, bridging engagement, linking trust, and linking engagement) from 56 to 43. The results of the EFA also led to our addition of a seventh factor – efficacy – to the conceptual model before we conducted the confirmatory factor analysis.

APPENDIX REFERENCES

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