Kidney Disease Quality of Life 36-Item Short Form Survey (KDQOL-36™) Normative Values for the United States Dialysis Population and New Single Summary Score

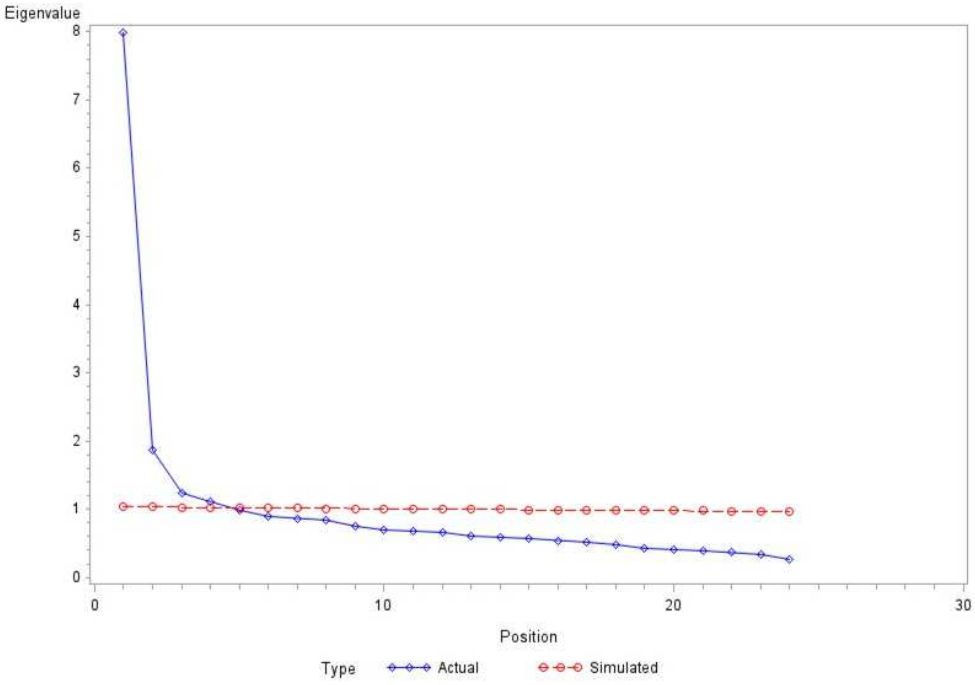
Supplementary Materials

Table of Contents

Appendix 1. Exploratory Factor Analysis Results

In an initial exploratory factor analysis (EFA), the first 5 eigenvalues were: 7.99, 1.86, 1.23, 1.10, and 0.98. By Kaiser's rule, this suggests retaining 4 factors. (Figure S1) Similarly, the parallel analysis suggested retaining 4 factors, as the last eigenvalue from the study data that was larger than the simulated random data was the 4th.

Figure S1. Tests to Determine the Number of Factors to Retain from Exploratory Factor Analysis for KDQOL-36



Examining the loadings from a 4-factor EFA solution with oblique rotation (oblimin), a factorial structure very similar to the original KDQOL-36 structure emerges. (Table S1) The additional (4th) factor was an item doublet consisting of i20 "Itchy skin?" and i21 "Dry skin?" Both of these items have traditionally been included in the KDQOL-36's Symptoms and Problems of Kidney Disease scale. Since it is less practical to assess and score these items as a two-item scale separate from the Symptoms and Problems of Kidney Disease scale, including them in their original scale to preserve the KDQOL-36's original factorial structure is reasonable. With a similar 3-factor solution, all items load on their expected factor at >0.40, including i20 and i21, with the exception of i28 ("Problems with your access/catheter site?"). (Table S2) Since this item's wording differs based on the type of dialysis (hemodialysis vs. peritoneal), heterogeneous response pattern may emerge between subgroups of respondents. Nonetheless, this item is clinically important. Taken together, these EFA results provide reasonable evidence for the KDQOL-36's original factor structure.

We also took note of the strong first eigenvalue from the EFA. The ratio of the first to second eigenvalues was 7.99/1.86 = 4.30. This result indicates the presence of a general factor, motivating an examination of an exploratory bifactor analysis. (Table S3) In the exploratory bifactor analysis, most items loaded either

strongly on both the general factor and a specific factor (e.g., i13—i16, or the Burdens of Kidney Disease scale), or only on the general factor (i29-i36, or the Effects of Kidney Disease scale). The ω_h was 0.78, indicating that 78% of the items' variance is explained by the general factor.

Table S1. Loadings for the Exploratory Factor Analysis 4 Factor Solution with Oblique Rotation

	Factor1	Factor 2	Factor 3	Factor 4
My kidney disease interferes too much with my life (i13)	-0.01	-0.04	**0.89**	0.04
Too much time is spent dealing with kidney disease (i14)	-0.06	-0.05	**0.96**	0.02
I feel frustrated dealing with my kidney disease (i15)	0.09	0.07	**0.72**	-0.01
I feel like a burden on my family (i16)	0.17	0.13	**0.46**	-0.02
Soreness in your muscles? (i17)	0.11	**0.50**	0.02	0.08
Chest pain? (i18)	-0.10	**0.75**	0.02	-0.05
Cramps? (i19)	0.02	**0.43**	0.01	0.10
Itchy skin? (i20)	-0.04	0.05	0.03	**0.77**
Dry skin? (i21)	0.02	-0.01	0.01	**0.87**
Shortness of breath? (i22)	-0.06	**0.67**	0.02	0.03
Faintness or dizziness? (i23)	-0.03	**0.70**	0.03	-0.04
Lack of appetite? (i24)	0.06	**0.53**	-0.02	0.02
Washed out or drained? (i25)	0.17	**0.52**	0.08	0.05
Numbness in hands or feet? (i26)	0.08	**0.46**	-0.01	0.11
Nausea or upset stomach? (i27)	0.04	**0.64**	-0.01	0.01
Problems with your access/catheter site? (i28)	0.19	**0.29**	0.00	0.02
Fluid restriction? (i29)	**0.62**	-0.01	-0.02	0.05
Dietary restriction? (i30)	**0.68**	-0.03	-0.02	0.05
Your ability to work around the house? (i31)	**0.54**	0.20	0.05	0.02
Your ability to travel? (i32)	**0.73**	-0.06	0.05	0.00
Being dependent on doctors and other medical staff? (i33)	**0.72**	0.01	0.06	-0.03
Stress or worries caused by kidney disease? (i34)	**0.62**	0.14	0.17	-0.03
Your sex life? (i35)	**0.61**	-0.01	0.01	-0.02
Your personal appearance? (i36)	**0.66**	0.07	0.01	0.03
% of variance explained	29%	25%	29%	17%

Table S2. Loadings for the Exploratory Factor Analysis 3 Factor Solution with Oblique Rotation			
	Factor1	Factor 2	Factor 3
My kidney disease interferes too much with my life (i13)	-0.01	-0.01	**0.89**
Too much time is spent dealing with kidney disease (i14)	-0.04	-0.06	**0.96**
I feel frustrated dealing with my kidney disease (i15)	0.05	0.09	**0.73**
I feel like a burden on my family (i16)	0.11	0.17	**0.47**
Soreness in your muscles? (i17)	**0.57**	0.09	0.02
Chest pain? (i18)	**0.71**	-0.12	0.03
Cramps? (i19)	**0.52**	0.00	0.01
Itchy skin? (i20)	**0.56**	0.02	-0.01
Dry skin? (i21)	**0.55**	0.08	-0.03
Shortness of breath? (i22)	**0.69**	-0.08	0.02
Faintness or dizziness? (i23)	**0.67**	-0.05	0.04
Lack of appetite? (i24)	**0.55**	0.05	-0.01
Washed out or drained? (i25)	**0.57**	0.15	0.08
Numbness in hands or feet? (i26)	**0.56**	0.05	-0.02
Nausea or upset stomach? (i27)	**0.65**	0.02	-0.01
Problems with your access/catheter site? (i28)	**0.31**	0.18	0.00
Fluid restriction? (i29)	0.03	**0.61**	-0.02
Dietary restriction? (i30)	0.01	**0.68**	-0.02
Your ability to work around the house? (i31)	0.21	**0.53**	0.06
Your ability to travel? (i32)	-0.06	**0.73**	0.05
Being dependent on doctors and other medical staff? (i33)	-0.02	**0.73**	0.07
Stress or worries caused by kidney disease? (i34)	0.11	**0.61**	0.17
Your sex life? (i35)	-0.03	**0.61**	0.01
Your personal appearance? (i36)	0.08	**0.66**	0.01
% of variance explained	30%	24%	46%

Table S3. Exploratory Bifactor Model Factor Loadings				
	General Factor	Specific Factor 1	Specific Factor 2	Specific Factor 3
My kidney disease interferes too much with my life (i13)	0.57	-[a]	-	0.63
Too much time is spent dealing with kidney disease (i14)	0.55	-	-	0.66
I feel frustrated dealing with my kidney disease (i15)	0.59	-	-	0.47
I feel like a burden on my family (i16)	0.53	-	-	0.28
Soreness in your muscles? (i17)	0.47	0.37	-	-
Chest pain? (i18)	0.32	0.37	-	-
Cramps? (i19)	0.36	0.34	-	-
Itchy skin? (i20)	0.37	0.41	-	-
Dry skin? (i21)	0.42	0.41	-	-
Shortness of breath? (i22)	0.39	0.41	-	-
Faintness or dizziness? (i23)	0.40	0.40	-	-
Lack of appetite? (i24)	0.37	0.35	-	-
Washed out or drained? (i25)	0.58	0.38	-	-
Numbness in hands or feet? (i26)	0.41	0.36	-	-
Nausea or upset stomach? (i27)	0.42	0.40	-	-
Problems with your access/catheter site? (i28)	0.30	-	-	-
Fluid restriction? (i29)	0.56	-	-	-
Dietary restriction? (i30)	0.59	-	-	-
Your ability to work around the house? (i31)	0.65	-	-	-
Your ability to travel? (i32)	0.65	-	-	-
Being dependent on doctors and other medical staff? (i33)	0.68	-	-	-
Stress or worries caused by kidney disease? (i34)	0.74	-	-	-
Your sex life? (i35)	0.50	-	-	-
Your personal appearance? (i36)	0.63	-	-	-
[a] "-" indicates factor loading of <0.20				

Appendix 2. Confirmatory Factor Analysis Model Results

The following figures (S2-S4) show the factor loadings for each item in confirmatory factor analysis (CFA) model, along with CFA model fit. Model fit was evaluated using the model's χ^2 statistic, the comparative fit index (CFI), and the root mean squared error of approximation (RMSEA). Non-significant χ^2 statistics, CFI values of >0.95, and RMSEA values of <0.06 indicate good model fit.

Figure S2. Unidimensional CFA Model: Factor Loadings and Model Fit

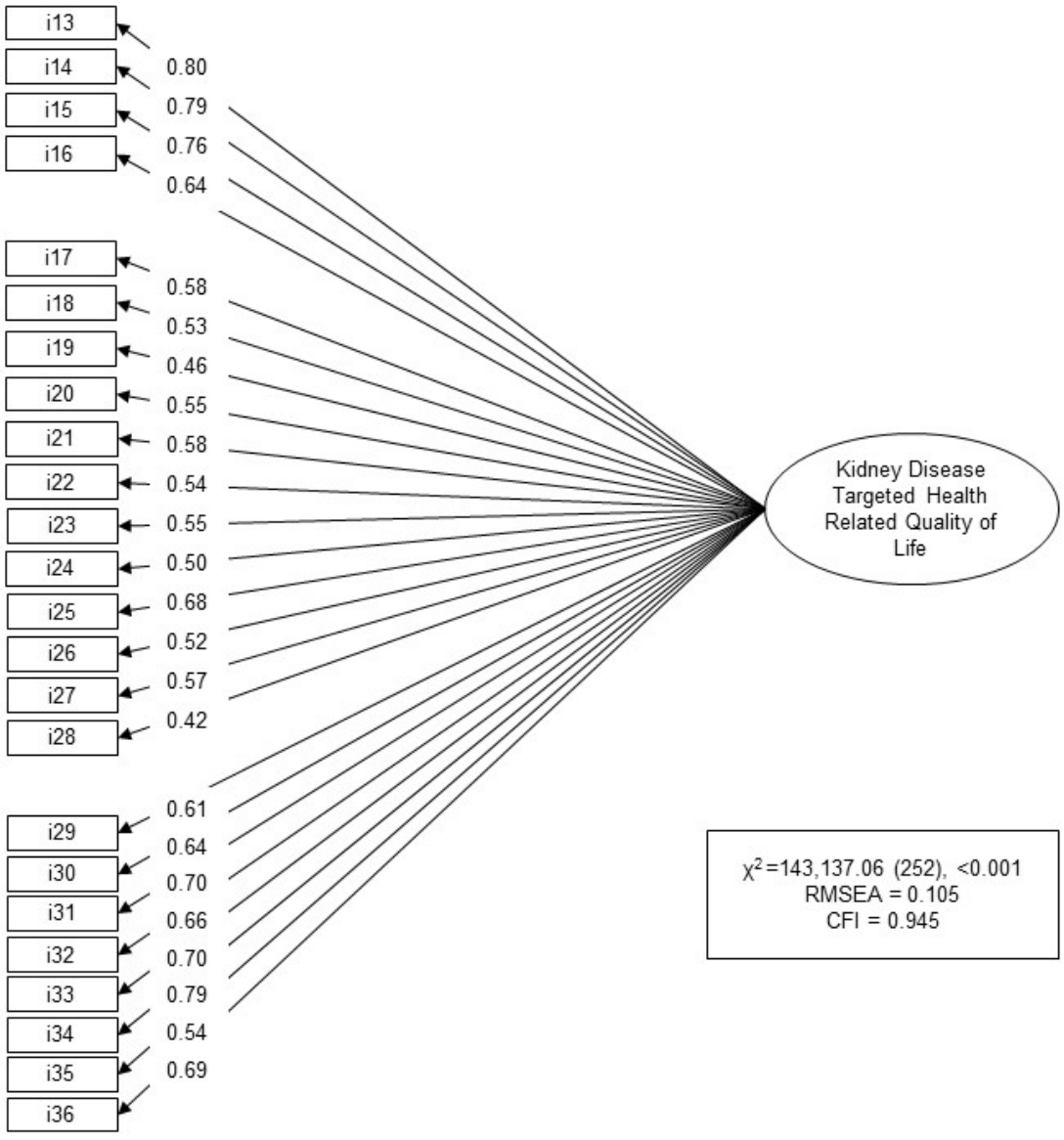


Figure S3. 3 Correlated Factors CFA Model: Factor Loadings, Factor Correlations, and Model Fit

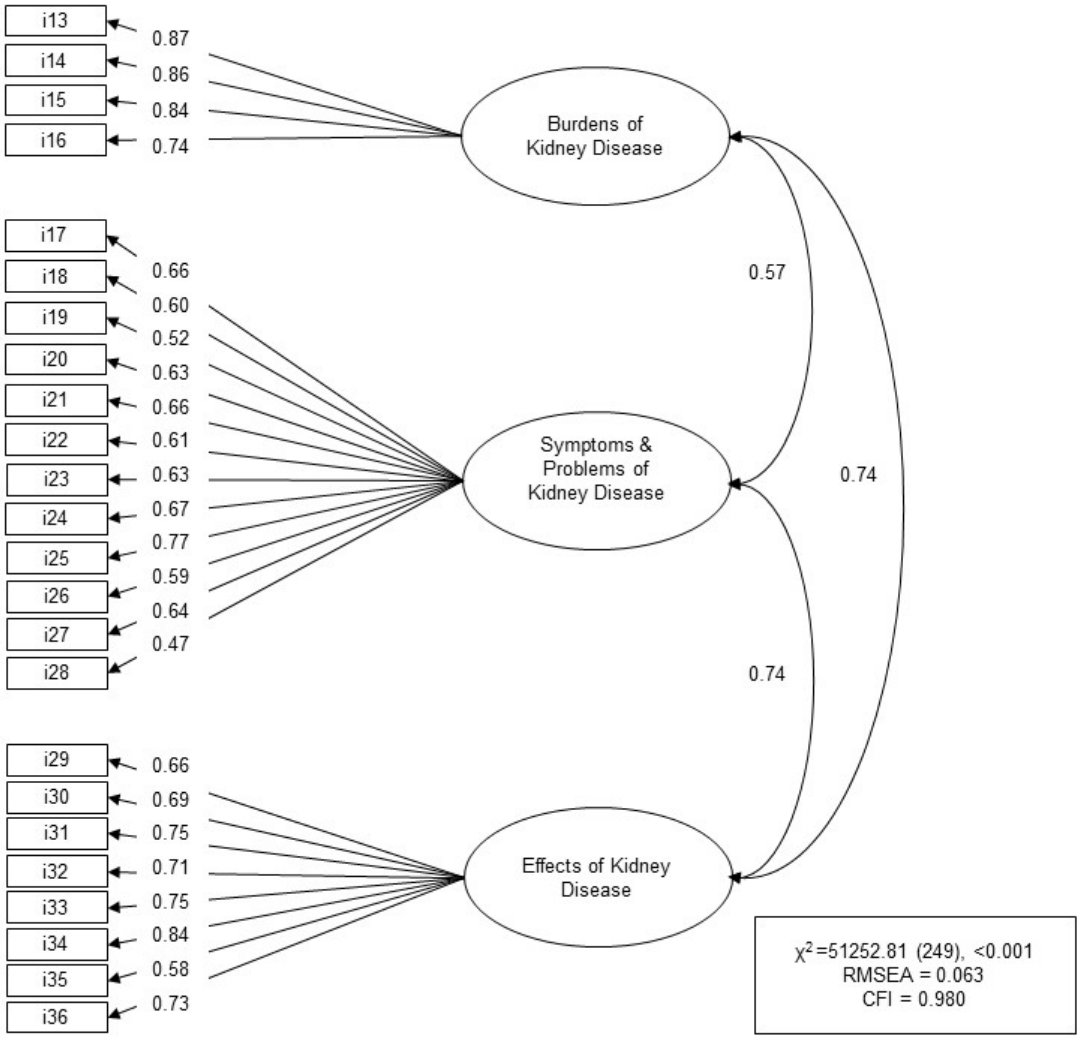
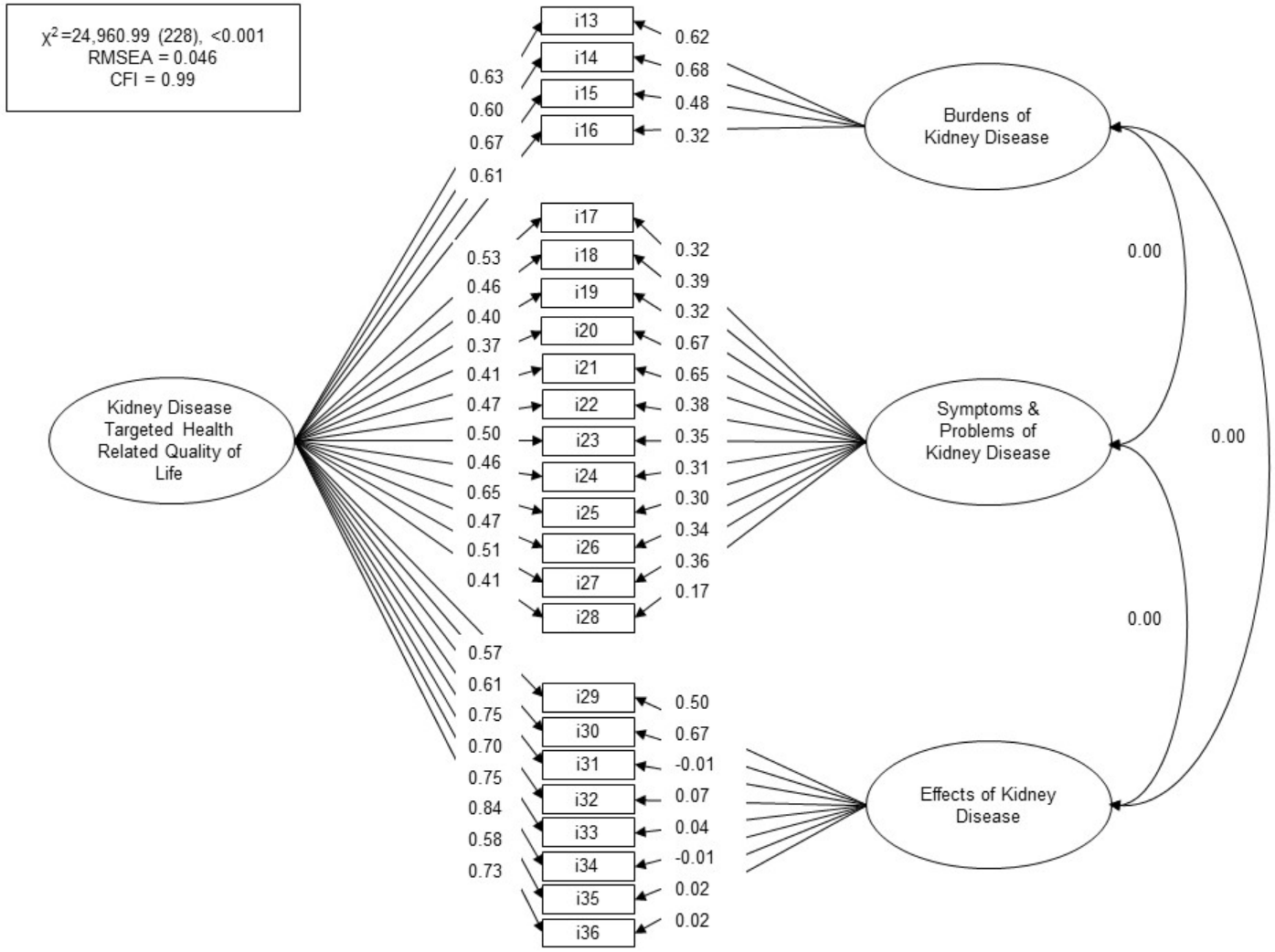


Figure S4. 3 Bifactor CFA Model: Factor Loadings, Factor Correlations, and Model Fit



Appendix 3. Reliability of KDQOL-36 Scales by Age and Race/Ethnicity Groups

Table S4. Cronbach's Alpha Coefficients of KDQOL-36 Scales by Age and Race/Ethnicity Groups

	All Races α	Hispanic α	Asian α	Black α	White α
KDQOL-36 Summary Score (KSS)					
All ages	0.91	0.92	0.92	0.91	0.90
18-29	0.90	0.92	0.92	0.91	0.90
30-44	0.91	0.92	0.91	0.91	0.91
45-59	0.91	0.92	0.92	0.91	0.91
60-74	0.91	0.92	0.93	0.91	0.90
75 or greater	0.90	0.91	0.93	0.90	0.89
KDQOL-36 Burdens of Kidney Disease Scale					
All ages	0.85	0.85	0.87	0.84	0.84
18-29	0.82	0.82	0.78	0.81	0.81
30-44	0.83	0.83	0.85	0.83	0.83
45-59	0.85	0.85	0.86	0.84	0.84
60-74	0.85	0.86	0.88	0.84	0.84
75 or greater	0.85	0.85	0.87	0.83	0.84
KDQOL-36 Symptoms and Problems of Kidney Disease Scale					
All ages	0.83	0.85	0.87	0.84	0.80
18-29	0.86	0.86	0.89	0.86	0.84
30-44	0.84	0.85	0.85	0.84	0.81
45-59	0.84	0.86	0.87	0.84	0.82
60-74	0.83	0.86	0.87	0.83	0.80
75 or greater	0.81	0.83	0.86	0.83	0.77
KDQOL-36 Effects of Kidney Disease Scale					
All ages	0.85	0.86	0.87	0.85	0.84
18-29	0.83	0.83	0.83	0.84	0.81
30-44	0.85	0.86	0.87	0.85	0.85
45-59	0.86	0.87	0.87	0.86	0.85
60-74	0.85	0.86	0.87	0.85	0.84
75 or greater	0.83	0.85	0.88	0.83	0.82