Analysis of the Virginia Family Survey Data Addressing

Part C SPP/APR Indicator #4:

Final Report

Report prepared for the

The Social Science Research Center at Old Dominion University

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SECTION 1

EXECUTIVE SUMMARY

In accordance with federal reporting requirements mandated by the U.S. Department of Education, Office of Special Education Programs (OSEP), Part C Lead Agencies under the Individuals with Disabilities Education Act must report annually on 14 performance indicators related to early intervention services for children ages birth to three. This report presents findings of a survey conducted by the State of Virginia to address Indicator #4, the "percent of families participating in Part C who report that early intervention services have helped the family a) know their rights, b) effectively communicate their children's needs, and c) help their children develop and learn."

The survey administered by the State of Virginia included one rating scale developed and validated by the National Center for Special Education Accountability Monitoring (NCSEAM), and four additional items pertaining to the family's experience with early interventions. The 22-item Impact on Family Scale (IFS) measures the extent to which early intervention helped families achieve positive outcomes, including the three outcomes specified in Indicator #4.

Surveys were returned by 2,180 families receiving early intervention services. From these responses, a random sample of 1,385 families reflecting the distribution of race/ethnicity in the larger population was selected for data analysis.

Data from the IFS were analyzed through the Rasch measurement framework, which produces a measure for each survey respondent. Individual measures can range from 0 to 1,000. For the IFS, each family's measure reflects the extent to which the family perceives that early intervention has helped them achieve positive family

outcomes. The IFS measures of all respondents were averaged to yield a mean measure reflecting the overall performance of the state in regard to the impact of early intervention on family outcomes.

As noted above, OSEP requires that the state's performance be reported as the *percent* of families who report that early intervention services helped them achieve specific outcomes. Deriving a percent from a continuous distribution requires application of a standard, or cut-score. The State of Virginia elected to apply the Part C standards recommended by a nationally representative stakeholder group convened by NCSEAM. The recommended standards, established based on item content expressed in the scale, were as follows: for Indicator 4a, know their rights, a measure of 539; for Indicator 4b, effectively communicate their children's needs, a measure of 556; and for Indicator 4c, help their children develop and learn, a measure of 516.

The following points represent the major findings related to Indicator #4:

1. Statewide Mean Measure on the IFS

The mean measure on the IFS was 662.4. The standard deviation was 166.9, and the standard error of the sample mean was 4.5. The 95% confidence interval for the population mean was 653.6 – 671.2. This means that there is a 95% likelihood that the true value of the mean is between these two values.

2. Statewide Percent on Indicators 4a, 4b, and 4c

The percent of families who reported that early intervention services helped them *know their rights* (Indicator 4a) was 77.6%. The 95% confidence interval for the true population percentage is 75.3% – 79.7%. This means that there is a 95% likelihood that the true value of the state percentage for Indicator 4a is between these two values.

The percent of families who reported that early intervention services helped them *communicate their child's needs* (Indicator 4b) was 75.1%. The 95% confidence interval for the true population percentage is 72.8% - 77.3%.

The percent of families who reported that early intervention services helped them *help their child develop and learn* (Indicator 4c) was 86.6%. The 95% confidence interval for the true population percentage is 84.7% - 88.3%.

3. Comparison to 2022 Outcomes

The observed percentage of families meeting the standards for Indicators 4a, 4b, and 4c were consistent with those obtained for a sample of families measured in 2022 who were administered the same version of the IFS as was used for the 2023 reporting. Specifically, the observed percentages of 77.6%, 75.1%, and 86.6% for Indicators 4a, 4b, and 4c in 2023 are within approximately one percentage point of the values of 77.7%, 74.0%, and 87.5% observed in 2022.

4. Items Pertaining to the Family's Experience in Early Intervention

The percentage of families responding that they agreed, strongly agreed, or very strong agreed was at or above 95% for each of the four items pertaining to the family's experience in receiving early intervention services. The percentage of families responding that they strongly agreed or very strongly agreed exceeded 73% for each of the four items.

SECTION 2

BACKGROUND

2.1. Federal Requirements

State Lead Agencies under Part C of the Individuals with Disabilities Education Improvement Act (IDEA 2004) are currently required to report data annually addressing 14 key performance indicators. Each state was required to submit a State Performance Plan (SPP) to OSEP detailing its plan to collect data addressing the 14 indicators, as well as baseline data for indicators on which the states had previously been required to report data to the federal government. Indicator #4, the "percent of families participating in Part C who report that early intervention services have helped the family: (a) know their rights, (b) effectively communicate their children's needs, and (c) help their children develop and learn," is a new indicator in the federal accountability system. Thus, states did not have to report baseline data on this indicator until February 2007.

State-level performance on the indicator must be reported annually. Data on program-level performance on the indicator must be collected at least once in the 6-year period of the SPP.

2.2. Survey Instrument

The Impact on Family Scale (IFS) was developed by the National Center for Special Education Accountability Monitoring (NCSEAM) to provide states with valid and reliable instruments to measure positive outcomes that families experience as a result of their participation in early intervention. Items were developed with substantial input from families and other key stakeholders across the country.

As part of its National Item Validation Study, NCSEAM collected data from a nationally representative sample of over 1,700 families participating in early intervention. Results of NCSEAM's data analyses supported the high reliability and validity of both scales. It was determined that scale reliabilities of .90 or above could be achieved with 22 items for the IFS. NCSEAM provided states with an appropriate sample item set for each scale, as well as instructions for customizing the scales by drawing on the larger bank of piloted items that NCSEAM made available on its website.

2.3. Standards

The State of Virginia elected to apply the standards recommended by NCSEAM as a way of deriving the percents to be reported for Indicators 4a, 4b, and 4c. To establish a recommended standard, NCSEAM convened a group of nationally representative stakeholders, including parents of children with disabilities, state directors of special education, state early intervention coordinators, district and program personnel, advocates, attorneys, and community representatives. Participants were invited to examine a set of items from the IFS, laid out in their calibration order (see Table 4.2). The items towards the bottom of the scale, having lower calibrations, are items that families tend to agree with most. The items towards the top of the scale, having higher calibrations, are items that families tend to agree with least. Because of the robust structure of the scale, a respondent who agrees with a given statement will have a very high likelihood of agreeing, or agreeing even more strongly, with all the items below it on the scale.

For indicator 4a, the stakeholder group agreed that families needed to endorse all items up to and including the item, "Over the past year, early intervention services

have helped me and/or my family know about my child's and family's rights concerning Early Intervention services." For indicator 4b, the stakeholder group agreed that families needed to endorse all items up to and including the item, "Over the past year, early intervention services have helped me and/or my family communicate more effectively with the people who work with my child and family. For indicator 4c, the stakeholder group agreed that families needed to endorse all items up to and including the item, "Over the past year, early intervention services have helped me and/or my family understand my child's special needs." These standards were operationalized by designating as the numerical standard the measure that, in each case, corresponds to the threshold item's calibration. For indicators 4a, 4b, and 4c, the measures representing the standards are 539, 556, and 516, respectively. This ensures that in each case, families with a measure at or above the standard have a .95 likelihood of agreeing with the threshold item.

SECTION 3

CHARACTERISTICS OF THE SAMPLE DATA

Surveys were returned by 2,180 families. A random sample of 1,385 cases was drawn to yield a final analytic sample with a distribution of race/ethnicity that was representative of that observed in the population of families served under Part C for the State of Virginia.

3.1. Distribution of Race/Ethnicity in the Sample

The two tables below display the distribution of race/ethnicity in the total survey sample of 2,180 (Table 3.1), and the representative sample of 1,385 (Table 3.2). As can be seen in the Table 3.2, the distribution of race/ethnicity in the representative sample is highly reflective of the distribution of race/ethnicity in the population of families receiving early intervention services in Virginia.

Table 3.1. Distribution of Child's Race/Ethnicity in the Total Sample

Race/Ethnicity	N	Percentage
White	1220	56.0%
Black or African-American	288	13.2%
Hispanic or Latino	196	9.0%
Asian	106	4.9%
American Indian or Alaskan Native	3	0.1%
Pacific Islander or Hawaiian Native	2	0.1%
Two or More Races	347	15.9%
Missing	18	0.8%
Total	2180	100%

Table 3.2. Distribution of Child's Race/Ethnicity in the Representative Sample		
Race/Ethnicity	**N**	**Percentage**
White	705	50.9%
Black or African-American	288	20.8%
Hispanic or Latino	142	10.3%
Asian	71	5.1%
American Indian or Alaskan Native	1	0.1%
Pacific Islander or Hawaiian Native	1	0.1%
Two or More Races	177	12.8%
Total	1385	100%
Note. The distribution of race/ethnicity for the children receiving early intervention services in Virginia under Part C are: White = 50.94%, Black/African American = 20.81%, Hispanic or Latino = 10.26%, Asian = 5.10%, American Indian or Alaskan Native = 0.04%, Pacific Islander of Hawaiian Native = 0.07%, Two or more races = 12.77%.		

3.2. Distribution of Child's Gender in the Sample

Tables 3.4 and 3.5, below, display the distribution of child's gender in the total and representative samples, respectively.

Table 3.4. Distribution of Child's Gender in the Total Sample		
Gender	**N**	**Percentage**
Male	1320	60.6%
Female	812	37.2%

Missing	48	2.2%
Total	2180	100%

Table 3.5. Distribution of Child's Gender in the Representative Sample

Gender	N	Percentage
Male	846	61.1%
Female	512	37.0%
Missing	27	1.9%
Total	1385	100%

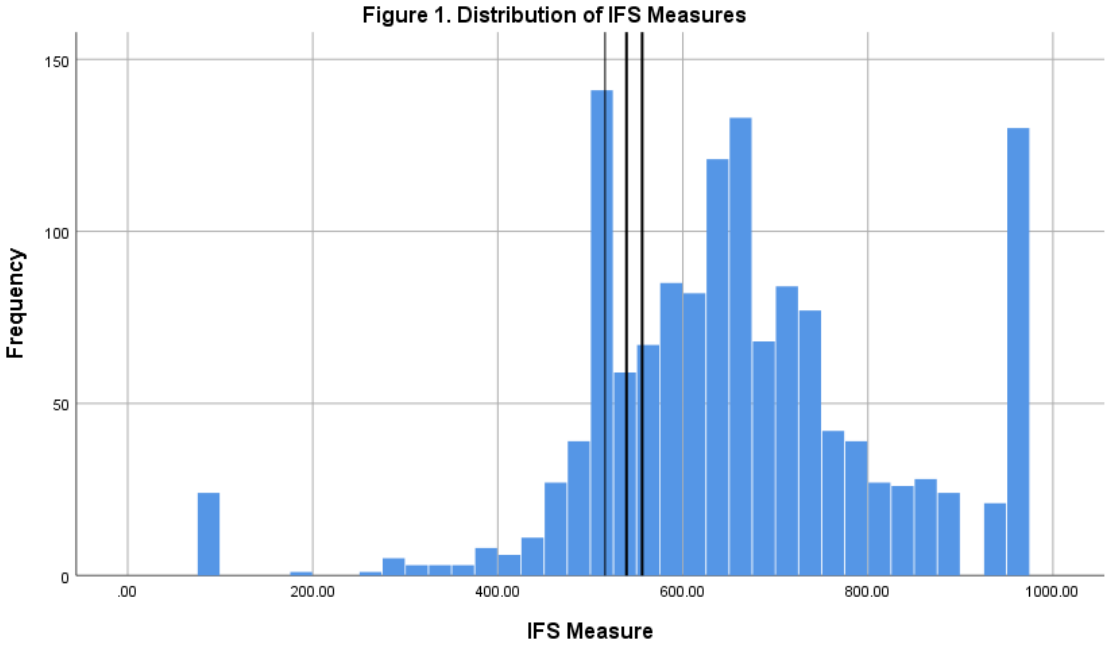
SECTION 4

RESULTS PERTAINING TO INDICATOR #4

4.1 Distribution of IFS Measures

Of the 1,385 respondents in the representative sample, all had valid responses to the IFS. The distribution of IFS measures for the 1,385 respondents is shown in the figure below.

Each bar indicates the number of respondents with measures at the value indicated on the x-axis. The vertical black lines correspond to the three standards applied to Indicator 4a (539), 4b (556), and 4c (516).



As can be seen in Figure 1, the values representing the three standards lie in the lower half of the measure distribution. That is, the majority of respondents reported a level of impact (i.e., had an IFS measure) that exceeded the three standards.

The distribution of measures approximates a normal distribution, with two exceptions. The first exception is the unexpectedly high number of respondents with measures at the extreme positive end of the scale, represented by the high bar at the extreme right of the graph. These individuals responded in the “very strongly agree” category to each and every item. The second exception is the unexpectedly high number of respondents with measures at a value close to the

standard values, represented by the high bar at the lowest standard value. Many of these individuals responded in the “agree” category to each and every item.

The statistical properties of the IFS measures are displayed in Table 4.1 below.

Table 4.1. Properties of IFS Measures for the Representative Sample

Sample Mean	Standard Deviation	Standard Error of the Sample Mean	95% Confidence Interval for the Population Mean
662.4	166.9	4.5	653.6 – 671.2

4.2. Interpretation of the Mean IFS Measure

The state’s performance on the IFS conveys information that goes beyond the three outcomes that are addressed in OSEP’s Indicator #4. A mean measure of 662.4 on the IFS indicates that the Virginia early intervention system is helping families to achieve many positive outcomes. These positive outcomes are evident from the response percentages displayed in Table 4.2, below. (The table also displays each item’s calibration value, to be discussed in Section 5.)

Table 4.2. Percent of Families Expressing Agreement with IFS Items

Item Calibration	Item ***Stem*: Over the past year, Early Intervention services have helped me and/or my family:**	% Strongly/ Very strongly agree	% Agree in any category
678	participate in typical activities for children and families in my community	54%	88%

656	know about services in my community	49%	90%
640	know where to go for support to meet my family's needs	52%	89%
625	keep up friendships for my child and family	47%	84%
609	know where to go for support to meet my child's needs	60%	93%
577	find information I need	55%	93%
570	improve my family's quality of life	61%	94%
565	feel that I can get the services and supports that my child and family need	62%	93%
559	feel more confident in my skills as a parent	64%	94%
559	feel that my child will be accepted and welcomed in the community	63%	94%
557	know how to make changes in family routines that will benefit my child	64%	94%
556	communicate more effectively with the people who work with my child and family	62%	94%
554	feel more confident in finding ways to meet my child's needs	65%	95%
553	understand how the Early Intervention system works	60%	94%
546	feel that I can handle the challenges of parenting my child with his/her needs	65%	94%
546	understand the roles of the people who work with my child and family	62%	95%
540	figure out solutions to problems as they come up	62%	94%
539	know about my child's and family's rights concerning Early Intervention services	58%	93%
534	be able to evaluate how much progress my child is making	65%	94%
526	understand my child's needs	69%	96%
498	feel that my efforts are helping my child	71%	96%
498	do things with and for my child that are good for my child's development	72%	97%

As seen in the table, over 96% of families agreed, with over 69% expressing strong or very strong agreement, that early intervention helped them do things with and for their child that are good for their child's development, feel

that their efforts are helping their child, and understand their child's special needs.

Over 94% of families agreed, with somewhat over 60% expressing strong or very strong agreement, that early intervention helped them be able to evaluate how much progress their child is making, figure out solutions to problems as they come up, understand the roles of the people who work with their child and family, understand how the early intervention system works, and communicate more effectively with the people who work with their child and family.

Approximately 94% of families agreed, with over 61% expressing strong or very strong agreement, that early intervention helped them feel that their family will be accepted and welcomed in the community, feel that they can get the services and supports that their child and family need, and improve their family's quality of life.

Approximately 84% of families agreed, with about 47% expressing strong or very strong agreement, that early intervention helped them keep up friendships for their child and family. 88% of families agreed, with 54% expressing strong or very strong agreement, that early intervention helped them participate in typical activities for children and families in their community.

For reference, the frequency distribution of responses to all the items in the IFS is provided in Appendix A.

4.3. Percentage Meeting Each of the Standards for Indicator #4

All 1,385 respondents in the representative sample had an IFS measure. Table 4.3 presents the percentage of these 1,385 respondents in the representative sample for which the IFS measure meets or exceeds each of the three standards for Indicator #4, as well as a 95% confidence interval for the true population percentage. Note that the confidence interval is asymmetric about the sample percentage, in that there is a greater distance in the confidence interval below the sample percentage than above the sample percentage. The asymmetric confidence interval represents a more accurate confidence interval for percentages than normal-distribution based symmetric confidence intervals (due to the fact that percentages are bounded between 0 and 100). The asymmetric confidence interval reported here is the Score interval proposed by Wilson (1927), and described in greater detail in Agresti (1996) and Penfield (2003).

Table 4.3. Percent of Respondents Meeting or Exceeding Each of the Standards for Indicator #4 (Using Representative Sample of n = 1,385)

	Indicator 4A Percent of families who report that early intervention services helped them know their rights	**Indicator 4B** Percent of families who report that early intervention services helped them effectively communicate their children's needs	**Indicator 4C** Percent of families who report that early intervention services helped them help their child develop and learn
Percentage	77.6% 1075 of 1385 met standard	75.1% 1040 of 1385 met standard	86.6% 1199 of 1385 met standard

95% Confidence Interval	75.3% - 79.7%	72.8% – 77.3%	84.7% – 88.3%

4.4 Percentage Meeting Each of the Standards by Race/Ethnicity

Table 4.4. presents the percentage of respondents with IFS measures that met or exceeded each of the three standards, by racial/ethnic category.

Table 4.4. Percent of Respondents Meeting or Exceeding Each of the Standards for Indicator #4%, by Race/Ethnicity

Race/Ethnicity	**Indicator 4A** **Percent of families who report that early intervention services helped them know their rights**	**Indicator 4B** **Percent of families who report that early intervention services helped them effectively communicate their children's needs**	**Indicator 4C** **Percent of families who report that early intervention services helped them help their child develop and learn**
White (N = 1220)	78.4% 95% CI:	75.0% 95% CI:	86.4% 95% CI:

	76.0% - 80.6%	72.5% - 77.3%	84.4% - 88.2%
Black or African American (N = 288)	79.2% 95% CI: 74.1% - 83.5%	78.1% 95% CI: 73.0% - 82.5%	87.5% 95% CI: 83.2% - 90.8%
Hispanic or Latino (N = 196)	74.5% 95% CI: 68.0% - 80.1%	70.4% 95% CI: 63.7% - 76.3%	86.2% 95% CI: 80.7% - 90.3%
Asian (N = 106)	68.9% 95% CI: 59.6% - 76.9%	65.1% 95% CI: 55.6% - 73.5%	85.9% 95% CI: 78.0% - 91.3%
American Indian Or Alaskan Native (N = 3)	100% 95% CI: --	100% 95% CI: --	100% 95% CI: ---
Pacific Islander Or Hawaiian Native (N = 2)	0% 95% CI: --	0% 95% CI: --	0% 95% CI: --
Two or More Races (N = 347)	77.8% 95% CI: 73.1% - 81.9%	72.3% 95% CI: 67.4% - 76.7%	88.8% 95% CI: 85.0% - 91.7%

4.5. Percentage Meeting Each of the Standards by Program Location

Table 4.5 presents the percentage of respondents with IFS measures that met or exceeded each of the three standards, by program location.

Table 4.5. Percent of Respondents Meeting or Exceeding Each of the Standards for Indicator #4%, by Program Location

Program Location	N	Indicator 4A	Indicator 4B	Indicator 4C
Alexandria	35	69%	60%	77%
Alleghany Highlands	5	60%	40%	60%
Arlington County	31	68%	61%	71%
Augusta-Highland	25	72%	68%	84%
Blue Ridge	87	78%	74%	85%
Central Virginia	89	79%	74%	88%
Chesapeake	83	76%	76%	89%
Chesterfield	106	76%	76%	89%
Crater District	27	78%	70%	85%
Cumberland Mountain	22	73%	68%	91%
Danville-Pittsylvania	19	84%	84%	95%
DILENOWISCO	24	83%	83%	92%
Eastern Shore	21	71%	71%	90%
Fairfax-Falls Church	375	75%	71%	85%
Goochland-Powhatan	17	82%	71%	88%
Hampton-Newport News	40	78%	75%	90%
Hanover County	39	77%	72%	87%
Harrisonburg-Rockingham	50	86%	82%	94%
Heartland	35	83%	80%	91%
Henrico Area	74	70%	68%	77%
Highlands	23	96%	96%	96%
Loudoun County	110	75%	70%	89%
Middle Peninsula-Northern Neck	28	68%	68%	79%
Mount Rogers	30	87%	80%	90%
New River Valley	40	83%	83%	90%
Norfolk	60	82%	78%	90%
Piedmont	19	74%	68%	89%
Portsmouth	24	79%	79%	92%
Prince William	127	72%	69%	87%
Rappahannock Area	60	65%	62%	73%
Rappahannock-Rapidan	40	83%	75%	93%
Richmond	52	83%	81%	87%
Roanoke Valley	58	76%	72%	81%
Rockbridge Area	20	95%	95%	100%
Shenandoah Valley	61	84%	77%	92%
Southside	22	82%	82%	86%

Staunton-Waynesboro	19	89%	84%	100%
Virginia Beach	85	81%	80%	87%
Western Tidewater	43	81%	79%	86%
Williamsburg	55	87%	84%	93%

4.6. Comparison to 2022 Outcomes

Table 4.6 presents the observed percentage of families meeting indicators 4a, 4b, and 4c, along with the values obtained for the representative sample in the 2022 study. Across all three indicators, the obtained percentage of families meeting the indicator in the 2023 study was similar to what was found in the 2022 study.

Table 4.6. Comparing the Obtained Outcomes in 2023 to the Values Obtained in 2022

	Target % for Indicator 4A Percent of families who report that early intervention services helped them know their rights	Target % for Indicator 4B Percent of families who report that early intervention services helped them effectively communicate their children's needs	Target % for Indicator 4C Percent of families who report that early intervention services helped them help their child develop and learn
Obtained Outcomes in 2023 for Representative Sample	77.6%	75.1%	86.6%
Obtained Outcomes in 2022 for Representative Sample	77.7%	74.0%	87.5%

SECTION 5

MEASUREMENT FRAMEWORK FOR THE IFS

The measurement approach used by NCSEAM, known as the Rasch framework, applies a series of parametric models to estimate the properties of each survey item and each respondent in a way that places individuals and items on a common metric (Bond & Fox, 2001; Fischer & Molenaar, 1995; Rasch, 1960; Wright & Masters, 1982). The Rasch approach offers many advantages over typical approaches to survey development. First, it is possible to test whether the items administered belong together, that is, whether they are all

related to the construct that the scale is supposed to measure. Ongoing confirmation of the fit of the items helps to maintain the quality of the measurement system. It is also possible to test whether the response categories are operating in the expected fashion. Often, the way in which respondents actually use the response categories does not correspond to the equidistant way in which they are laid out on paper. Extreme categories (e.g., “very strongly disagree”) are sometimes used so infrequently that it makes sense to combine them with an adjacent, less extreme, category (“very strongly disagree/strongly disagree”).

Second, it is possible to determine where each item is located on the measurement ruler. The item’s location is referred to as the item’s “calibration.” Typically, items in a test or survey are not all equal with respect to the amount of the attribute or quality that the items are measuring. It has been empirically demonstrated, in fact, that items in the IFS are not all of equal agreeability. Items range from those that are most likely to draw agree responses to those that are least likely to draw agree responses. Highly agreeable items have low calibrations; less agreeable items have higher calibrations. Table 5.1, below, displays the IFS items in calibration order.

Table 5.1. IFS Items in Calibration Order

Item Calibration	Item ***Stem*: Over the past year, Early Intervention services have helped me and/or my family:**
678	participate in typical activities for children and families in my community
656	know about services in my community

640	know where to go for support to meet my family's needs
625	keep up friendships for my child and family
609	know where to go for support to meet my child's needs
577	find information I need
570	improve my family's quality of life
565	feel that I can get the services and supports that my child and family need
559	feel more confident in my skills as a parent
559	feel that my child will be accepted and welcomed in the community
557	know how to make changes in family routines that will benefit my child
556	communicate more effectively with the people who work with my child and family
554	feel more confident in finding ways to meet my child's needs
553	understand how the Early Intervention system works
546	feel that I can handle the challenges of parenting my child with his/her needs
546	understand the roles of the people who work with my child and family
540	figure out solutions to problems as they come up
539	know about my child's and family's rights concerning Early Intervention services
534	be able to evaluate how much progress my child is making
526	understand my child's needs
498	feel that my efforts are helping my child
498	do things with and for my child that are good for my child's development

The fact that items have highly stable calibrations (agreeability levels) regardless of the population that is asked to respond to the items is a very important attribute of well-constructed measurement scales. This stability means that items with similar calibrations are, for all intents and purposes, interchangeable. As an example, this is why the SAT is the “same” test each time it is administered, even though it contains different items each time. The score achieved on any particular version of the SAT is comparable to the score achieved on any other version. Thus, a state can change some of the items on

the survey from year to year, and still have validly comparable IFS measures across successive years.

Third, a Rasch analysis condenses information from a person's responses to all the items in a scale into a single number. That number is the person's measure on the scale. Since the Rasch framework puts measures on the same metric as item calibrations, a person's measure on a scale can be meaningfully interpreted in terms of the items on the scale. A person with a higher measure is expressing more agreement with items, overall, than a person with a lower measure. When IFS measures from a representative sample of parents are aggregated, the average value represents a reliable and highly interpretable measure of the extent to which schools are facilitating parent involvement.

Fourth, a Rasch analysis yields an estimate of the reliability of both the calibration values (related to the items) and the measures (related to people's responses). Scientific approaches to measurement require that the amount of "error," or imprecision, in the system be estimated, so that interpretations based on the measures can take this into consideration.

For a more detailed explanation of these concepts, please refer to Bond and Fox (2001) and Wright and Masters (1982).

SECTION 6

RESULTS PERTAINING TO THE PSYCHOMETRIC PROPERTIES OF THE IMPACT ON FAMILIES SCALE (IFS)

6.1 Psychometric Properties of the IFS Measures

In assessing the quality of the person-level measures derived from the IFS, it is germane to consider the issues of reliability and validity. The reliability of the obtained IFS measures pertains to the extent to which a particular individual is expected to attain the same IFS measure if the IFS were to be administered to the individual multiple times. That is, reliability concerns the stability of the IFS measure[1] (Crocker & Algina, 1986; Lord, 1980; Traub, 1994); low reliability coincides with a low level of stability, and high reliability coincides with a high level of stability. Reliability can range from 0 (lack of any stability) to 1 (perfect stability). In contrast to reliability, the validity of the IFS measures concerns the extent to which they are actually representative of the intended trait (i.e., level of impact on family).[2] The validity of the IFS measures can be assessed using numerous approaches, several of which are described below.

[1] A definition of reliability that is more theoretically accurate describes reliability as the extent to which a given respondent's measure is determined by random error versus his or her true level of the trait being measured; low reliability coincides with a high level of measurement error, and high reliability coincides with a high low level of measurement error (Crocker & Algina, 1986; Lord, 1980; Traub, 1994).

[2] This definition of validity is a simplification of the definition now endorsed by the technical measurement community. The contemporary definition of validity describes it as the extent to which evidence and theory support the interpretations of the scale measures entailed by the proposed use of the scale (AERA/APA/NCME, 2014; Osterlind, 2006). That is, the validity of the IFS measures is based on how much evidence we have that the measures support the intended purposes of the use of the measures (i.e., are the measures behaving as they are supposed to behave, and leading to the correct decisions about individuals).

Statistics used to express measurement reliability range from 0 (indicating lack of any stability) to 1 (indicating perfect stability). The reliability of the IFS measures for the Virginia sample was measured in the Rasch framework to be .92. An alternative approach to estimating the reliability of the IFS measures is to employ Cronbach's alpha, which makes no assumptions about the fit of the responses to any particular model (Cronbach's alpha is based on the simpler true score model, and is commonly used in the behavioral sciences as a model-free index of reliability). The value of Cronbach's alpha was 0.97, which is consistent with the value of .92 obtained from the Rasch analysis. These results suggest that the measures obtained from the IFS serve as stable measures of the underlying trait.

Support for the validity of the measures obtained by the IFS comes from several lines of evidence. First, items for the IFS were developed in consultation with multiple groups of individuals, including parents, school personnel, district-level administrators, and advocates, with direct and extensive experience related to schools' efforts to encourage parent involvement and to ensure that parents are active participants in decision-making related to their child's education. Subsequent review of the items by expert panels, researchers, and NCSEAM's Parent/Family Involvement Workgroup confirmed that the item content maps onto the intended content domain of the IFS. Second, dimensionality analysis (i.e., principal components analysis and factor analysis) indicates that the items of the IFS are all measuring one primary construct, which is likely the intended one, i.e., positive family outcomes achieved as a result of early intervention services. A

third line of evidence is related to a characteristic of items known as discrimination, discussed in section 6.2 below. The high discrimination indices of the IFS items (see Table 6.1) indicate that the items are providing useful information concerning the construct that is intended to be measured. All of these types of evidence support the claim that the measures obtained using the IFS are valid.

6.2 Psychometric Properties of the IFS Items

Table 6.1, below, gives the calibration of each item (previously presented in Table 5.1 above), along with indices of the item's fit to the Rasch model. The column labeled "Item Calibration" provides the value of the location parameter of the item. The higher the value of the item calibration, the greater the overall positive impact of early intervention services on family outcomes. The "Infit" and "Outfit" columns provide two measures of how well the Rasch model fits the responses provided to each item. In general, values of 1.0 indicate very good fit. Values approaching 2 suggest poorer fit (Bond & Fox, 2001).

Table 6.1. Calibration, Fit, and Discrimination of the IFS Items

Item	Item Calibration	Infit	Outfit	Discrimination
Q1	677.5	2.56	2.71	0.72
Q2	656.0	1.67	1.89	0.76
Q3	569.8	1.13	1.32	0.79
Q4	608.8	1.00	1.00	0.83
Q5	639.8	1.04	1.03	0.84
Q6	545.9	0.90	0.98	0.82
Q7	559.3	0.86	0.98	0.83
Q8	624.8	1.18	1.21	0.82
Q9	576.8	0.82	0.81	0.85
Q10	556.8	0.80	0.83	0.83

Q11	540.4	0.84	0.95	0.84
Q12	564.5	0.78	0.75	0.84
Q13	552.9	1.03	1.18	0.81
Q14	534.4	0.91	0.95	0.83
Q15	559.1	0.95	0.97	0.81
Q16	553.9	0.59	0.58	0.86
Q17	555.9	0.73	0.73	0.84
Q18	545.5	0.76	0.78	0.84
Q19	538.9	1.21	1.40	0.81
Q20	497.8	0.81	0.75	0.82
Q21	526.1	0.68	0.65	0.83
Q22	498.1	0.88	0.92	0.81

The rightmost column of the table presents an index of discrimination for each item, calculated as the item-measure correlation coefficient. The values in this column are all relatively high (> 0.7), indicating that each item is discriminating well between respondents who had more positive versus more negative perceptions of schools' facilitation of parent involvement.

While Item Q1 ("Over the past year, early intervention services helped me and/or my family participate in typical activities for children and families in my community") displays a less than ideal level of fit, it nevertheless has a strong discrimination index, which provides evidence that it is a useful item. Therefore, this item appears to be measuring the intended construct relatively well, but is not a very good fit for the Rasch framework, which employs specific assumptions concerning the properties of the items.

SECTION 7

RESULTS OF THE FOUR ITEMS PERTAINING TO THE FAMILY'S EXPERIENCE IN EARLY INTERVENTION

The survey contained four items that were not part of the IFS, but that addressed family's experiences with the early intervention services they received. These items were:

1. What I say about my child and family is understood and respected.
2. The people who work with my child and family answer our questions.
3. I can easily get in touch with my service coordinator.
4. The services provided to my child and family help reach the outcomes/goals that are important to my family.

Table 7.1 displays the percentage of families reporting: (a) strongly or very strongly agreeing with each of the four items, and (b) any category of agree for each of the four items. Across the four items, the percentage of families strongly or very strongly agreeing met or exceeded 73%, and the percentage of families agreeing in any category met or exceeded 95%. The percentage of respondents in each of the possible response categories for each item is displayed in Appendix A.

Table 7.1. Percent of Families Expressing Agreement with Items Pertaining to Experiences with Early Interventions

Item	% Strongly/ Very strongly agree	% Agree in any category
What I say about my child and family is understood and respected.	73%	97%
The people who work with my child and family answer our questions.	77%	97%
I can easily get in touch with my service coordinator.	75%	95%
The services provided to my child and family help reach the outcomes/goals that are important to my family.	73%	96%

SECTION 8

CALIBRATION METHODOLOGY FOR THE IFS

The Rasch calibrations of the IFS were conducted using the Winsteps software program. All items were fit using the Rating Scale Model (Wright & Masters, 1982). The metric of the current calibration was set by fixing the parameters of all items to those obtained in the previous year's analysis. Note that previous calibrations fixed the parameters for 18 of the 22 items to calibrated values obtained by Dr. William Fisher, Consultant to NCSEAM, for a large dataset of five states. Four new items were added to the IFS scale (Items 6, 10, 16, and 21), and the parameters of these four items were estimated during an initial calibration of the updated IFS scale in the 2012 equating study. The parameters of the IFS items for this year's analysis were fixed to those established in the 2012 equating study. The mean and logit scale of the current calibration were also set equal to those generated in the larger analysis on five states conducted by Dr. Fisher. These equating procedures were conducted so that the scale measures obtained in the current calibration have equivalent meanings across multiple years and to those of other states' data calibrated by Dr. Fisher.

Based on the analysis of the current data and on the results of Dr. Fisher's combined multi-state analysis, it was decided to combine the response categories "very strongly disagree" and "strongly disagree" into a single category. The rationale for combining the two categories was based on two factors: (a) low response rates (i.e., < 5%) in these two categories making their corresponding

threshold parameter estimates relatively unstable, and (b) the two category threshold estimates were not far enough apart to indicate that the two categories served to meaningfully distinguish between individuals having substantially different levels of the trait being measured. As a result, the final analysis was based on five-category response structure for each item. The control file used in the current analysis is given in Appendix B. The pertinent output related to the Rasch analysis of the IFS is given in Appendix C.

REFERENCES

Agresti, A. (1996). *An introduction to categorical data analysis*. New York: Wiley.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (2014). *Standards for educational and psychological testing*. Washington, DC: APA.

Bond, T. G., Fox, C. M. (2001). *Applying the Rasch model: Fundamental measurement in the human sciences*. Mahwah, NJ: Erlbaum.

Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*. Fort Worth: Harcout Brace Jovanovich.

Fischer, G. H., & Molenaar, I. W. (Eds.). (1995). *Rasch models: Foundations, recent developments, and applications*. New York: Springer-Verlag.

Lord, F. M. (1980). *Applications of item response theory to practical testing problems*. Hillsdale, NJ: Lawrence Erlbaum.

Osterlind, S. J. (2006). *Modern Measurement: Theory, principles, and applications of mental appraisal*. Upper Saddle River, NJ: Pearson.

Penfield, R. D. (2003). A method of constructing asymmetric confidence intervals for the mean of a rating scale item. *Psychological Methods*, *8*, 149-163.

Rasch, G. (1960). *Probabilitic models for some intelligence and attainment tests*. Copenhagen, Denmark:Danmarks Paedogogiske Institut.

Traub, R. (1994). *Reliability for the social sciences*. Thousand Oaks: Sage.

Wilson, E. B. (1927). Probable inference, the law of succession, and statistical inference. *Journal of the American Statistical Association*, *22*, 209-212.

Wright, B. D., & Masters, G. N. (1982). Rating scale analysis. Chicago: MESA Press.

Appendix A: Item Response Frequencies for the Items of the Survey

participate in typical activities for children and families in my community

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	56	2.6	2.6	2.6
	Strongly disagree	25	1.1	1.1	3.7
	Disagree	133	6.1	6.1	9.8
	Agree	597	27.4	27.5	37.3
	Strongly agree	365	16.7	16.8	54.1
	Very strongly agree	603	27.7	27.7	81.8
	Does not apply	395	18.1	18.2	100.0
	Total	2174	99.7	100.0	
Missing	System	6	.3		
Total		2180	100.0		

know about services in my community

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	47	2.2	2.2	2.2
	Strongly disagree	32	1.5	1.5	3.6
	Disagree	125	5.7	5.8	9.4
	Agree	822	37.7	37.9	47.3
	Strongly agree	432	19.8	19.9	67.2
	Very strongly agree	558	25.6	25.7	92.9
	Does not apply	154	7.1	7.1	100.0
	Total	2170	99.5	100.0	
Missing	System	10	.5		
Total		2180	100.0		

improve my family's quality of life

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	47	2.2	2.2	2.2
	Strongly disagree	19	.9	.9	3.0
	Disagree	56	2.6	2.6	5.6
	Agree	683	31.3	31.5	37.1
	Strongly agree	554	25.4	25.5	62.7
	Very strongly agree	719	33.0	33.1	95.8
	Does not apply	91	4.2	4.2	100.0
	Total	2169	99.5	100.0	
Missing	System	11	.5		
Total		2180	100.0		

know where to go for support to meet my child's needs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	41	1.9	1.9	1.9
	Strongly disagree	22	1.0	1.0	2.9
	Disagree	86	3.9	4.0	6.9
	Agree	688	31.6	31.7	38.6
	Strongly agree	565	25.9	26.0	64.6
	Very strongly agree	707	32.4	32.6	97.2
	Does not apply	61	2.8	2.8	100.0
	Total	2170	99.5	100.0	
Missing	System	10	.5		
Total		2180	100.0		

know where to go for support to meet my family's needs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	42	1.9	1.9	1.9
	Strongly disagree	26	1.2	1.2	3.1
	Disagree	151	6.9	7.0	10.1
	Agree	720	33.0	33.3	43.4
	Strongly agree	467	21.4	21.6	65.0
	Very strongly agree	563	25.8	26.0	91.1
	Does not apply	193	8.9	8.9	100.0
	Total	2162	99.2	100.0	
Missing	System	18	.8		
Total		2180	100.0		

feel that I can handle the challenges of parenting my child with his/her needs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	43	2.0	2.0	2.0
	Strongly disagree	17	.8	.8	2.8
	Disagree	57	2.6	2.6	5.4
	Agree	630	28.9	29.0	34.4
	Strongly agree	572	26.2	26.3	60.8
	Very strongly agree	793	36.4	36.5	97.3
	Does not apply	59	2.7	2.7	100.0
	Total	2171	99.6	100.0	
Missing	System	9	.4		
Total		2180	100.0		

feel more confident in my skills as a parent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	44	2.0	2.0	2.0
	Strongly disagree	14	.6	.6	2.7
	Disagree	72	3.3	3.3	6.0
	Agree	639	29.3	29.4	35.4
	Strongly agree	586	26.9	27.0	62.4
	Very strongly agree	753	34.5	34.7	97.0
	Does not apply	65	3.0	3.0	100.0
	Total	2173	99.7	100.0	
Missing	System	7	.3		
Total		2180	100.0		

keep up friendships for my child and family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	41	1.9	1.9	1.9
	Strongly disagree	27	1.2	1.2	3.1
	Disagree	201	9.2	9.3	12.4
	Agree	618	28.3	28.5	40.9
	Strongly agree	353	16.2	16.3	57.2
	Very strongly agree	437	20.0	20.2	77.4
	Does not apply	491	22.5	22.6	100.0
	Total	2168	99.4	100.0	
Missing	System	12	.6		
Total		2180	100.0		

find information I need

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	45	2.1	2.1	2.1
	Strongly disagree	20	.9	.9	3.0
	Disagree	85	3.9	3.9	6.9
	Agree	796	36.5	36.7	43.6
	Strongly agree	513	23.5	23.6	67.2
	Very strongly agree	633	29.0	29.2	96.4
	Does not apply	78	3.6	3.6	100.0
	Total	2170	99.5	100.0	
Missing	System	10	.5		
Total		2180	100.0		

know how to make changes in family routines that will benefit my child

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	43	2.0	2.0	2.0
	Strongly disagree	15	.7	.7	2.7
	Disagree	61	2.8	2.8	5.5
	Agree	631	28.9	29.0	34.5
	Strongly agree	564	25.9	25.9	60.4
	Very strongly agree	761	34.9	35.0	95.4
	Does not apply	100	4.6	4.6	100.0
	Total	2175	99.8	100.0	
Missing	System	5	.2		
Total		2180	100.0		

figure out solutions to problems as they come up

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	45	2.1	2.1	2.1
	Strongly disagree	12	.6	.6	2.6
	Disagree	65	3.0	3.0	5.6
	Agree	675	31.0	31.1	36.7
	Strongly agree	549	25.2	25.3	61.9
	Very strongly agree	751	34.4	34.6	96.5
	Does not apply	76	3.5	3.5	100.0
	Total	2173	99.7	100.0	
Missing	System	7	.3		
Total		2180	100.0		

feel that I can get the services and supports that my child and family need

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	52	2.4	2.4	2.4
	Strongly disagree	20	.9	.9	3.3
	Disagree	73	3.3	3.4	6.7
	Agree	668	30.6	30.7	37.4
	Strongly agree	513	23.5	23.6	60.9
	Very strongly agree	826	37.9	38.0	98.9
	Does not apply	24	1.1	1.1	100.0
	Total	2176	99.8	100.0	
Missing	System	4	.2		
Total		2180	100.0		

understand how the Early Intervention system works

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	40	1.8	1.8	1.8
	Strongly disagree	19	.9	.9	2.7
	Disagree	69	3.2	3.2	5.9
	Agree	745	34.2	34.3	40.2
	Strongly agree	524	24.0	24.1	64.3
	Very strongly agree	768	35.2	35.3	99.6
	Does not apply	9	.4	.4	100.0
	Total	2174	99.7	100.0	
Missing	System	6	.3		
Total		2180	100.0		

be able to evaluate how much progress my child is making

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	47	2.2	2.2	2.2
	Strongly disagree	21	1.0	1.0	3.1
	Disagree	70	3.2	3.2	6.3
	Agree	618	28.3	28.4	34.7
	Strongly agree	568	26.1	26.1	60.8
	Very strongly agree	844	38.7	38.8	99.6
	Does not apply	8	.4	.4	100.0
	Total	2176	99.8	100.0	
Missing	System	4	.2		
Total		2180	100.0		

feel that my child will be accepted and welcomed in the community

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	41	1.9	1.9	1.9
	Strongly disagree	10	.5	.5	2.3
	Disagree	65	3.0	3.0	5.3
	Agree	618	28.3	28.5	33.8
	Strongly agree	457	21.0	21.0	54.8
	Very strongly agree	786	36.1	36.2	91.0
	Does not apply	195	8.9	9.0	100.0
	Total	2172	99.6	100.0	
Missing	System	8	.4		
Total		2180	100.0		

feel more confident in finding ways to meet my child's needs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	51	2.3	2.3	2.3
	Strongly disagree	8	.4	.4	2.7
	Disagree	56	2.6	2.6	5.3
	Agree	627	28.8	28.8	34.1
	Strongly agree	575	26.4	26.4	60.6
	Very strongly agree	806	37.0	37.1	97.7
	Does not apply	51	2.3	2.3	100.0
	Total	2174	99.7	100.0	
Missing	System	6	.3		
Total		2180	100.0		

communicate more effectively with the people who work with my child and family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	40	1.8	1.8	1.8
	Strongly disagree	12	.6	.6	2.4
	Disagree	67	3.1	3.1	5.5
	Agree	649	29.8	29.9	35.3
	Strongly agree	506	23.2	23.3	58.6
	Very strongly agree	766	35.1	35.2	93.8
	Does not apply	134	6.1	6.2	100.0
	Total	2174	99.7	100.0	
Missing	System	6	.3		
Total		2180	100.0		

understand the roles of the people who work with my child and family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	41	1.9	1.9	1.9
	Strongly disagree	9	.4	.4	2.3
	Disagree	50	2.3	2.3	4.6
	Agree	682	31.3	31.4	36.0
	Strongly agree	520	23.9	23.9	59.9
	Very strongly agree	765	35.1	35.2	95.1
	Does not apply	107	4.9	4.9	100.0
	Total	2174	99.7	100.0	
Missing	System	6	.3		
Total		2180	100.0		

know about my child's and family's rights concerning Early Intervention services

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	39	1.8	1.8	1.8
	Strongly disagree	23	1.1	1.1	2.8
	Disagree	85	3.9	3.9	6.8
	Agree	747	34.3	34.3	41.1
	Strongly agree	489	22.4	22.5	63.6
	Very strongly agree	764	35.0	35.1	98.7
	Does not apply	29	1.3	1.3	100.0
	Total	2176	99.8	100.0	
Missing	System	4	.2		
Total		2180	100.0		

do things with and for my child that are good for my child's development

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	39	1.8	1.8	1.8
	Strongly disagree	12	.6	.6	2.3
	Disagree	23	1.1	1.1	3.4
	Agree	537	24.6	24.7	28.1
	Strongly agree	525	24.1	24.1	52.3
	Very strongly agree	1016	46.6	46.7	99.0
	Does not apply	22	1.0	1.0	100.0
	Total	2174	99.7	100.0	
Missing	System	6	.3		
Total		2180	100.0		

understand my child's needs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	39	1.8	1.8	1.8
	Strongly disagree	11	.5	.5	2.3
	Disagree	38	1.7	1.7	4.0
	Agree	587	26.9	27.0	31.0
	Strongly agree	526	24.1	24.2	55.2
	Very strongly agree	956	43.9	44.0	99.2
	Does not apply	17	.8	.8	100.0
	Total	2174	99.7	100.0	
Missing	System	6	.3		
Total		2180	100.0		

feel that my efforts are helping my child

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	39	1.8	1.8	1.8
	Strongly disagree	8	.4	.4	2.2
	Disagree	29	1.3	1.3	3.5
	Agree	547	25.1	25.2	28.7
	Strongly agree	517	23.7	23.8	52.5
	Very strongly agree	1015	46.6	46.7	99.2
	Does not apply	17	.8	.8	100.0
	Total	2172	99.6	100.0	
Missing	System	8	.4		
Total		2180	100.0		

What I say about my child and family is understood and respected.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	39	1.8	1.8	1.8
	Strongly disagree	10	.5	.5	2.3
	Disagree	22	1.0	1.0	3.3
	Agree	503	23.1	23.2	26.5
	Strongly agree	452	20.7	20.9	47.4
	Very strongly agree	1128	51.7	52.1	99.5
	Does not apply	11	.5	.5	100.0
	Total	2165	99.3	100.0	
Missing	System	15	.7		
Total		2180	100.0		

The people who work with my child and family answer our questions.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	41	1.9	1.9	1.9
	Strongly disagree	6	.3	.3	2.2
	Disagree	20	.9	.9	3.1
	Agree	438	20.1	20.2	23.3
	Strongly agree	458	21.0	21.2	44.5
	Very strongly agree	1188	54.5	54.9	99.4
	Does not apply	12	.6	.6	100.0
	Total	2163	99.2	100.0	
Missing	System	17	.8		
Total		2180	100.0		

I can easily get in touch with my service coordinator.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	50	2.3	2.3	2.3
	Strongly disagree	16	.7	.7	3.0
	Disagree	44	2.0	2.0	5.1
	Agree	439	20.1	20.3	25.3
	Strongly agree	402	18.4	18.6	43.9
	Very strongly agree	1203	55.2	55.5	99.4
	Does not apply	13	.6	.6	100.0
	Total	2167	99.4	100.0	
Missing	System	13	.6		
Total		2180	100.0		

The services provided to my child and family help reach the outcomes/goals that are important to my family.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very strongly disagree	47	2.2	2.2	2.2
	Strongly disagree	5	.2	.2	2.4
	Disagree	40	1.8	1.9	4.3
	Agree	481	22.1	22.3	26.5
	Strongly agree	449	20.6	20.8	47.3
	Very strongly agree	1123	51.5	52.0	99.3
	Does not apply	16	.7	.7	100.0
	Total	2161	99.1	100.0	
Missing	System	19	.9		
Total		2180	100.0		

Appendix B: Control File for the Winsteps Rasch Analysis of the IFS

```
&INST  ; THIS FILE MUST BE SAVED AS ASCII DOS TEXT BEFORE USE WITH WINSTEPS
Title="Virginia Impact all individuals, 2024 Data New Form"
ITEM1=2
DELIMITER=TAB ;  specifies a tab as a delimiter
;FITI=7
;FITP=7
ITLEN=15 ;max length of item label
LCONV=0.0001
RCONV=0.001
RESCOR=2
NEWSCR="112345"
DATA=C:\ Virginia\2024\VA_C_2023_Data.txt; Name of data file
NI=22
XWIDE = 1
CODES = "123456"
IAFILE=*
1 677.5
2 656.0
3 569.8
4 608.8
5 639.8
6 545.9
7 559.3
8 624.8
9 576.8
10 556.8
11 540.4
12 564.5
13 552.9
14 534.4
15 559.1
16 553.9
17 555.9
18 545.5
19 538.9
20 497.8
21 526.1
22 498.1
*
SAFILE=*
  2 = -220.93
  3 = -147.88
  4 = 55.95
  5 = 128.99
*
NAME1 = 1; Column containing person name
NAMLEN = 15; Length of person name
PRCOMP=S
UDECIM=2
UMEAN=568.3
USCALE=58.91
CSV=S
HLINES=N
IFILE=ItemStats.sav ;Name of file containing item-level statistics
PFILE=PersonStats.sav ;Name of file containing person-level statistics
REALSE=Y
TABLES=111000000100110000000100011
&END
q1
q2
q3
q4
q5
q6
q7
q8
q9
```

q10
q11
q12
q13
q14
q15
q16
q17
q18
q19
q20
q21
q22
END NAMES

Appendix C: Selected Winsteps Output for the IFS

```
TABLE 1.2 Virginia Impact all individuals, 2024  ZOU109WS.TXT  Jun 29 2023 10:44
INPUT: 2180 PERSON  22 ITEM  REPORTED: 2180 PERSON  22 ITEM  5 CATS WINSTEPS 4.4.7
-------------------------------------------------------------------------------

MEASURE    PERSON - MAP - ITEM
              <more>|<rare>
  900 .############  +
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              .### M|  q5
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  600         .###  +  q4
               .##  |
              .###  |  q9
               .##  |M q12    q15    q3     q7
               .##  |  q10    q13    q16    q17    q18    q6
               .##  |  q11    q14    q19
          .####### S|S q21
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TABLE 3.1 Virginia Impact all individuals, 2024  ZOU109WS.TXT  Jun 29 2023 10:44
INPUT: 2180 PERSON  22 ITEM  REPORTED: 2180 PERSON  22 ITEM  5 CATS WINSTEPS 4.4.7
-------------------------------------------------------------------------------
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SUMMARY OF 1913 MEASURED (NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	REAL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	78.8	20.8	636.43	25.89	1.03	-.24	1.04	-.22
SEM	.4	.1	2.67	.23	.02	.05	.02	.05
P.SD	18.4	2.3	116.89	9.90	.71	2.05	.80	2.01
S.SD	18.4	2.3	116.92	9.90	.71	2.05	.80	2.02
MAX.	109.0	22.0	897.28	66.29	9.49	9.27	9.90	9.27
MIN.	12.0	4.0	151.73	18.06	.05	-6.29	.04	-5.87

REAL RMSE	27.72	TRUE SD	113.55	SEPARATION 4.10	PERSON RELIABILITY .94
MODEL RMSE	24.70	TRUE SD	114.25	SEPARATION 4.62	PERSON RELIABILITY .96

S.E. OF PERSON MEAN = 2.67

MAXIMUM EXTREME SCORE: 233 PERSON 10.7%
MINIMUM EXTREME SCORE: 34 PERSON 1.6%

SUMMARY OF 2180 MEASURED (EXTREME AND NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	REAL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	80.9	20.8	662.87	35.97				
SEM	.4	.0	3.56	.61				
P.SD	20.8	2.2	166.23	28.53				
S.SD	20.8	2.2	166.27	28.54				
MAX.	110.0	22.0	969.89	108.60				
MIN.	12.0	4.0	79.68	18.06				

REAL RMSE	45.91	TRUE SD	159.76	SEPARATION 3.48	PERSON RELIABILITY .92
MODEL RMSE	44.37	TRUE SD	160.20	SEPARATION 3.61	PERSON RELIABILITY .93

S.E. OF PERSON MEAN = 3.56

PERSON RAW SCORE-TO-MEASURE CORRELATION = .90
CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .99 SEM = 2.03

SUMMARY OF 22 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	REAL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	8011.8	2064.3	567.41	2.41	1.01	-2.03	1.06	-.44
SEM	151.5	26.4	9.98	.07	.09	1.25	.10	1.18
P.SD	694.4	121.1	45.74	.33	.41	5.72	.46	5.40
S.SD	710.7	124.0	46.81	.33	.41	5.86	.47	5.53
MAX.	8889.0	2168.0	677.50	3.74	2.56	9.90	2.71	9.90
MIN.	5921.0	1677.0	497.80	2.20	.59	-9.90	.58	-9.90

REAL RMSE	2.44	TRUE SD	45.67	SEPARATION 18.75	ITEM RELIABILITY 1.00
MODEL RMSE	2.29	TRUE SD	45.68	SEPARATION 19.93	ITEM RELIABILITY 1.00

S.E. OF ITEM MEAN = 9.98

ITEM RAW SCORE-TO-MEASURE CORRELATION = -.85
Global statistics: please see Table 44.
UMEAN=568.3000 USCALE=58.9100

TABLE 3.2 Virginia Impact all individuals, 2024 ZOU109WS.TXT Jun 29 2023 10:44
INPUT: 2180 PERSON 22 ITEM REPORTED: 2180 PERSON 22 ITEM 5 CATS WINSTEPS 4.4.7

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	OBSERVED SCORE	COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	ANDRICH THRESHOLD	CATEGORY MEASURE	
1	1	1344	3	-206.7	-254	1.51	1.54	NONE	-295.89)	1
2	2	1717	4	-95.55	-129	1.04	1.02	-220.93A	-185.38	3
3	3	14524	32	-7.64	-2.68	1.01	1.18	-147.88A	-45.97	4
4	4	11240	25	91.48	82.41	.89	.85	55.95A	93.44	5
5	5	16590	37	195.12	205.3	1.10	1.18	128.99A	(203.95)	6
MISSING		2545	5	19.13						

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

CATEGORY LABEL	STRUCTURE MEASURE	S.E.	SCORE-TO-MEASURE AT CAT.	----ZONE----	50% CUM. PROBABLTY	COHERENCE M->C	C->M	RMSR	ESTIM DISCR	OBSERVED-EXPECTED RESIDUAL	DIFFERENCE	
1	NONE		-295.89)	-INF -247.18		77%	43%	1.2774		-14.9%	-93.8	1
2	-220.93A	2.91	-185.38	-247.18 -127.29	-233.39	36%	33%	.8839	.84	-41.2%	-707.2	3
3	-147.88A	1.39	-45.97	-127.29 35.36	-137.31	74%	69%	.5734	1.10	6.5%	940.2	4
4	55.95A	.85	93.44	35.36 155.24	45.39	53%	65%	.5081	.97	5.5%	616.1	5
5	128.99A	.90	(203.95)	155.24 +INF	141.46	79%	69%	.6289	.94	-6.5%	-755.4	6

M->C = Does Measure imply Category?
C->M = Does Category imply Measure?

Category Matrix : Confusion Matrix : Matching Matrix
Predicted Scored-Category Frequency

Obs Cat Freq	1	2	3	4	5	Total
1	996.94	158.66	141.86	33.17	13.37	1344.00
2	178.61	452.96	882.98	167.00	35.46	1717.00
3	234.32	1530.38	8200.04	3412.09	1147.17	14524.00
4	21.08	224.16	3302.53	4242.32	3449.91	11240.00
5	6.81	58.03	1056.34	2769.29	12699.52	16590.00
Total	1437.76	2424.19	13583.76	10623.87	17345.42	45415.00

CATEGORY PROBABILITIES: MODES - Andrich thresholds at intersections

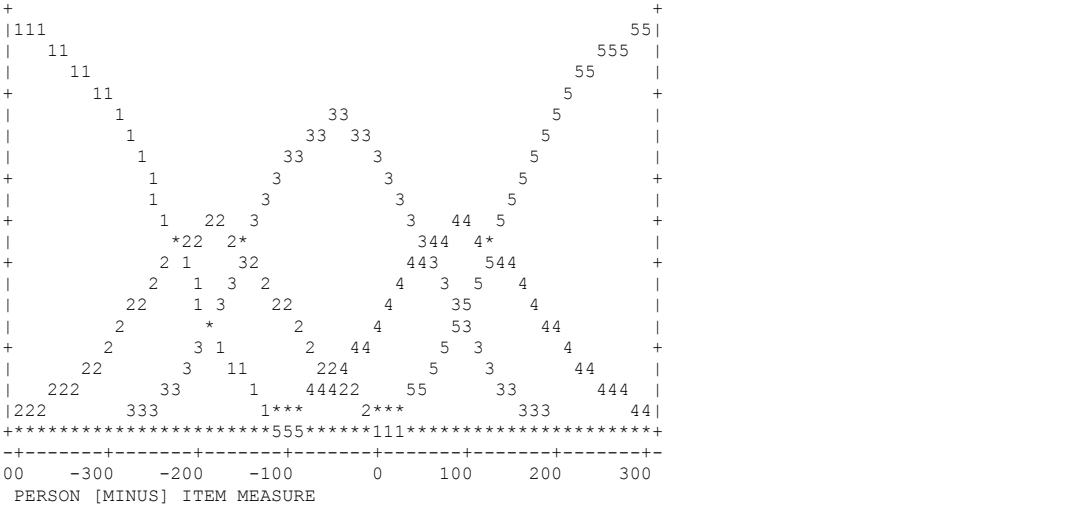

TABLE 10.1 Virginia Impact all individuals, 2024 ZOU109WS.TXTm Jun 29 2023 10:44
INPUT: 2180 PERSON 22 ITEM REPORTED: 2180 PERSON 22 ITEM 5 CATS WINSTEPS 4.4.7

PERSON: REAL SEP.: 3.48 REL.: .92 ... ITEM: REAL SEP.: 18.75 REL.: 1.00

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	REAL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	DISPLACE	ITEM
1	6613	1779	677.50A	3.74	2.56	9.90	2.71	9.90	A .72	.84	35.5	57.6	-81.87	q1
2	7313	2016	656.00A	2.85	1.67	9.90	1.89	9.90	B .76	.84	44.3	57.6	-44.50	q2
19	8249	2147	538.90A	2.50	1.21	5.79	1.40	7.26	C .81	.79	64.8	62.4	34.45	q19
3	8038	2078	569.80A	2.40	1.13	3.53	1.32	6.60	D .79	.81	60.5	61.0	.23	q3
8	5921	1677	624.80A	2.68	1.18	4.51	1.21	4.61	E .82	.84	61.1	58.6	6.58	q8
13	8368	2165	552.90A	2.27	1.03	.75	1.18	3.70	F .81	.80	66.7	62.1	14.67	q13
5	7213	1969	639.80A	2.30	1.04	1.03	1.03	.71	G .84	.84	61.3	58.9	-33.20	q5
4	8094	2109	608.80A	2.20	1.00	-.06	1.00	.03	H .83	.83	62.7	59.4	-36.42	q4
6	8317	2112	545.90A	2.28	.90	-2.90	.98	-.39	I .82	.80	67.3	62.4	11.03	q6
7	8228	2108	559.30A	2.26	.86	-4.33	.98	-.44	J .83	.81	68.2	61.8	3.74	q7
15	7793	1977	559.10A	2.35	.95	-1.50	.97	-.57	K .81	.81	68.4	61.8	.94	q15
11	8163	2097	540.40A	2.30	.84	-4.79	.95	-.91	k .84	.80	69.6	62.4	25.38	q11
14	8554	2168	534.40A	2.27	.91	-2.73	.95	-.97	j .83	.79	69.3	62.4	19.14	q14
22	8889	2155	498.10A	2.37	.88	-3.55	.92	-1.24	i .81	.76	71.3	64.5	23.03	q22
10	8134	2075	556.80A	2.29	.80	-6.06	.83	-3.88	h .83	.81	70.2	61.8	3.64	q10
9	7840	2092	576.80A	2.25	.82	-5.55	.81	-4.87	g .85	.82	68.8	60.5	13.63	q9
20	8888	2152	497.80A	2.38	.81	-5.91	.75	-4.36	f .82	.76	69.7	64.5	21.86	q20
12	8404	2152	564.50A	2.23	.78	-6.92	.75	-6.29	e .84	.81	71.5	61.4	-3.54	q12
18	8101	2067	545.50A	2.31	.76	-7.47	.78	-4.74	d .84	.80	73.1	62.5	15.72	q18
17	7987	2040	555.90A	2.31	.73	-8.54	.73	-6.36	c .84	.80	72.0	61.7	5.93	q17
21	8771	2157	526.10A	2.30	.68	-9.90	.65	-7.54	b .83	.79	75.1	62.8	4.84	q21
16	8382	2123	553.90A	2.26	.59	-9.90	.58	-9.90	a .86	.80	76.2	61.7	-.15	q16
MEAN	8011.8	2064.3	567.41	2.41	1.01	-2.0	1.06	-.4			65.8	61.4	.23	
P.SD	694.4	121.1	45.74	.33	.41	5.7	.46	5.4			9.3	1.8	26.31	

TABLE 10.1 Virginia Impact all individuals, 2023 ZOU705WS.TXTm Jun 27 2022 14:26
INPUT: 1869 PERSON 22 ITEM REPORTED: 1864 PERSON 22 ITEM 5 CATS WINSTEPS 4.4.7

PERSON: REAL SEP.: 3.36 REL.: .92 ... ITEM: REAL SEP.: 17.06 REL.: 1.00

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	REAL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	DISPLACE	ITEM
1	5154	1429	677.50A	4.09	2.46	9.90	2.71	9.90	A .71	.84	35.6	57.6	-64.85	q1
2	5992	1675	656.00A	3.20	1.75	9.90	2.41	9.90	B .74	.84	43.3	57.6	-38.13	q2
8	4828	1378	624.80A	3.10	1.29	6.32	1.42	7.75	C .80	.84	58.1	59.2	5.46	q8
19	7036	1829	538.90A	2.74	1.25	6.19	1.40	6.84	D .80	.79	64.0	62.0	31.55	q19
3	6748	1743	569.80A	2.65	1.15	3.95	1.27	5.25	E .78	.81	60.9	60.8	-2.50	q3
13	7126	1844	552.90A	2.50	1.07	1.81	1.23	4.43	F .80	.80	64.9	61.6	13.90	q13
5	6008	1643	639.80A	2.69	1.19	4.69	1.18	3.87	G .81	.84	55.6	58.9	-34.35	q5
4	6806	1773	608.80A	2.54	1.12	3.19	1.11	2.46	H .81	.83	62.1	59.6	-37.62	q4
7	6946	1779	559.30A	2.46	.85	-4.34	.97	-.55	I .82	.80	67.2	61.4	1.57	q7
11	6848	1762	540.40A	2.49	.85	-4.33	.95	-.93	J .84	.79	69.0	61.8	24.60	q11
15	6450	1637	559.10A	2.56	.90	-2.53	.95	-.89	K .81	.80	67.9	61.4	-3.80	q15
22	7550	1834	498.10A	2.55	.94	-1.76	.93	-1.08	k .80	.76	68.4	63.8	23.43	q22
6	7124	1807	545.90A	2.45	.89	-3.14	.93	-1.36	j .82	.79	67.3	61.5	9.24	q6
14	7307	1848	534.40A	2.45	.87	-3.68	.91	-1.63	i .82	.79	69.1	62.0	16.25	q14
9	6554	1757	576.80A	2.45	.89	-2.93	.85	-3.44	h .84	.82	68.2	60.6	14.90	q9
10	6855	1751	556.80A	2.47	.81	-5.53	.85	-3.08	g .83	.80	68.8	61.4	.85	q10
20	7584	1835	497.80A	2.55	.81	-5.28	.76	-3.94	f .81	.76	70.0	63.8	19.88	q20
18	6776	1734	545.50A	2.51	.79	-5.96	.76	-5.06	e .84	.80	71.8	61.7	16.48	q18
17	6635	1700	555.90A	2.52	.75	-7.33	.73	-5.79	d .84	.80	69.9	61.3	7.33	q17
12	7115	1815	564.50A	2.42	.72	-8.37	.69	-7.34	c .84	.81	71.2	61.1	-7.53	q12
21	7420	1833	526.10A	2.48	.69	-9.38	.66	-6.87	b .83	.78	74.5	62.3	7.92	q21
16	7136	1803	553.90A	2.45	.58	-9.90	.59	-9.63	a .85	.80	73.6	61.2	-3.43	q16
MEAN	6727.2	1736.8	567.41	2.65	1.03	-1.3	1.10	-.1			64.6	61.0	.05	
P.SD	684.2	122.1	45.74	.37	.40	5.9	.51	5.5			9.2	1.6	23.43	