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# Data Patterns for COS Ratings: What to Expect and What to Question

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This document provides guidance on analyzing and displaying Child Outcome Summary (COS) data to investigate the quality of the COS ratings. This guidance is based on several sources: findings from a validity study of the data produced through the COS process<sup>1</sup>; what technical assistance centers have learned from supporting states in the collection, analysis, and use of COS data; and what is known about the functioning and progress of children with delays and disabilities.

When state and program/district leaders question the quality of their child outcomes data it is often because the data do not agree with other information. For example, a state leader may see the disconnect between the fact that a local program/district with the highest percentage of children exiting at age expectations serves children with the most severe disabilities. Concerns about data quality can also arise from anecdotal information practitioners and program leaders share with the state. For example, the staff conducting the COS process may worry that they are not implementing the process correctly or may report that they have been provided guidance that does not align with state policies.

When state leaders have concerns about the quality of the child outcomes data, it is critical that they conduct analyses to identify problems and how the problems are impacting the data quality. The State Child Outcomes Measurement Framework describes seven components of a child outcomes measurement system to support collection, analysis, reporting, and use of high-quality child outcomes data. States can use this tool to assess their current system and plan for improvement in areas of concern.

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<sup>1</sup> Barton, L., Spiker, D., Hebbeler, K., Taylor, C., & Williamson, C. (2015). *ENHANCE final report*. SRI International: Menlo Park, CA.

## Using Patterns to Examine Data Quality

This document presents analyses to help state and local EI/ECSE programs and districts explore the quality of the child outcomes data generated through the COS process. The underlying assumption is that data of high quality show predictable patterns. Thus, one way to check data quality is to look for these patterns in a state or local program/district's COS data.

Six expected patterns and corresponding analyses are summarized in Table 1. General expectations about predicted patterns are based on national data trends and developmental theory. The first column describes an expected pattern of outcomes data across key child or program characteristics such as assessment point and disability. The second column presents the rationale for the expectation. The third column lists possible analyses examining the degree to which the state or local program's data matches expected patterns. The remainder of this document is a detailed description of each pattern and examples of analyses that reveal the expected and unexpected patterns.

Before examining patterns, it is important to know details about the population of children served in the state, region, or local program/district in order to form appropriate expectations. In particular, it is important to understand the proportion of children served with mild versus more severe delays and disabilities. Patterns are not expected to describe individual children's outcomes, functioning, and progress but instead provide information about the performance of a group of children. Caution should be used in interpreting patterns for programs/districts or subgroups that include fewer than 20 children.

A state or local program's expected pattern may differ from the patterns in Table 1 depending on the population served. Readers should examine the table carefully to determine if the expected pattern as summarized can be expected to apply to their population. If alternative expectations would be more appropriate, users are encouraged to develop and use them for assessing the quality of their data.

Table 1. Summary of expected patterns

Expected Pattern	Rationale	Analyses
<p><b>1. Children will differ from one another in reasonable ways.</b></p> <p>1a. Very few children will have an entry COS rating of 1.</p> <p>1b. The mean of the entry COS ratings will be lower than the mean of the exit COS ratings for paired data.</p> <p>1c. Few children will have entry COS ratings at or above age expectations on all three outcomes.</p> <p>1d. The percentage of children in Office of Special Education Programs (OSEP) progress categories will fall within expected ranges.</p>	<p>Evidence suggests EI and ECSE programs serve children with a variety of functional levels, but they generally serve more children with mild delays. Children with severe disabilities tend to have impaired functioning in two or three domains, whereas children with milder delays have impaired functioning in one or two domains and may show functioning typical of their chronological age in others. Children tend to improve and gain skills as they get older regardless of services so very few children are expected in progress category 'a.'</p>	<ol style="list-style-type: none"> <li>1. Distribution of COS ratings at entry</li> <li>2. Mean of COS ratings at entry and exit</li> <li>3. Percentage of children who scored at or above age expectations on all three outcomes at entry</li> <li>4. Distribution of progress categories</li> </ol>
<p><b>2. Functioning in one outcome area will be related to functioning in the other outcome areas.</b></p> <p>2a. Functioning at one time point in one outcome is related to functioning at the same time point in the other outcomes.</p> <p>2b. Progress between entry and exit in one outcome is related to progress in the other outcomes.</p>	<p>Most children gain skills over their time in early childhood programs. Development tends to progress in predictable stages across outcomes. As children's abilities in one outcome increase, their abilities in the other outcomes also tend to increase.</p>	<ol style="list-style-type: none"> <li>1. Cross tabulations of ratings between outcomes (Outcome A by Outcome B, etc.)</li> <li>2. Correlation coefficients of ratings between outcomes (correlation between Outcome A and Outcome B, etc.)</li> <li>3. Cross tabulations of progress categories between outcomes</li> </ol>
<p><b>3. Functioning at entry in one outcome area will be related to functioning at exit in the same outcome area.</b></p>	<p>Most children served in EI and ECSE programs will maintain or improve their rate of growth in the three outcome areas over time given participation in intervention activities that promote skill development. Children who entry with relatively high ratings will exit with relatively high ratings.</p>	<ol style="list-style-type: none"> <li>1. Cross tabulations between entry and exit ratings for each outcome</li> <li>2. Distribution of exit minus entry change patterns</li> <li>3. Correlation coefficients of ratings within an outcome between entry and exit</li> </ol>
<p><b>4. States and local programs/districts will have similar results across years.</b></p> <p>4a. Distributions of OSEP progress categories are similar from year to year</p> <p>4b. Distributions of OSEP summary statements are similar from year to year, assuming the same kinds of children are being served. In states that undertake effective program improvement activities, summary statement percentages increase over years.</p>	<p>If child, family, and program factors do not meaningfully change, similar levels of child progress would be expected between entry and exit across exiting cohorts.</p>	<ol style="list-style-type: none"> <li>1. Frequency distributions of OSEP progress categories over time (2014, 2015, 2016, etc.).</li> <li>2. Frequency distribution of OSEP summary statements over time</li> </ol>
<p><b>5. Similar programs/districts should have similar results at entry.</b></p>	<p>If programs/districts are serving children with similar level of delay and disability, we would expect that programs would produce similar results.</p>	<ol style="list-style-type: none"> <li>1. Distribution of mean entry COS ratings by program/district</li> </ol>

<p><b>6. Ratings will be related to the severity of the child's disability.</b></p> <p>6a. Children with more severe disabilities will have lower entry ratings than children with less severe disabilities.</p> <p>6b. A larger percentage distribution of children with more severe disabilities will be in categories a–c; a larger percentage distribution of children with less severe disabilities will be in categories d and e.</p> <p>6c. Children with more severe disabilities will have lower percentages on summary statements 1 and 2 than groups of children with less severe disabilities.</p>	<p>Children with less severe disabilities have more functional skills across the three outcomes than children with more severe disabilities. The true differences in functional abilities should be reflected in COS ratings on the three outcome areas.</p>	<ol style="list-style-type: none"> <li>1. Mean entry ratings by disability type</li> <li>2. Progress category distribution by disability type</li> <li>3. Summary statements 1 and 2 percentages by disability type</li> </ol>
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Data analysis is most successful when it starts with an analysis plan. Planning before an analysis ensures that the analysis and interpretation will be manageable with the resources available. When planning includes making predictions about the expected results of the analysis, planning can improve the validity of the conclusions drawn from the data. A data analysis plan should include the purpose of the analysis (e.g. to examine data quality), the variables used in the analysis, proposed types of analysis (e.g. mean, percentage, cross tabulation), and brief documentation of the rationale for the analyses. Listed below are steps for planning and conducting data quality analysis.

First, identify concerns about the child outcomes data collection process that might be impacting quality. Two commonly reported concerns are described in Table 2. If there are no apparent concerns about the data collection process, start with analyzing and reviewing the first pattern in Table 1.

Select patterns related to the identified concern and develop a data analysis plan including expected results.

Conduct analyses associated with the selected patterns and create displays of the resulting data.

Interpret the data displays with relevant stakeholders and determine appropriate actions to improve data quality.

Table 2. Two commonly reported data concerns

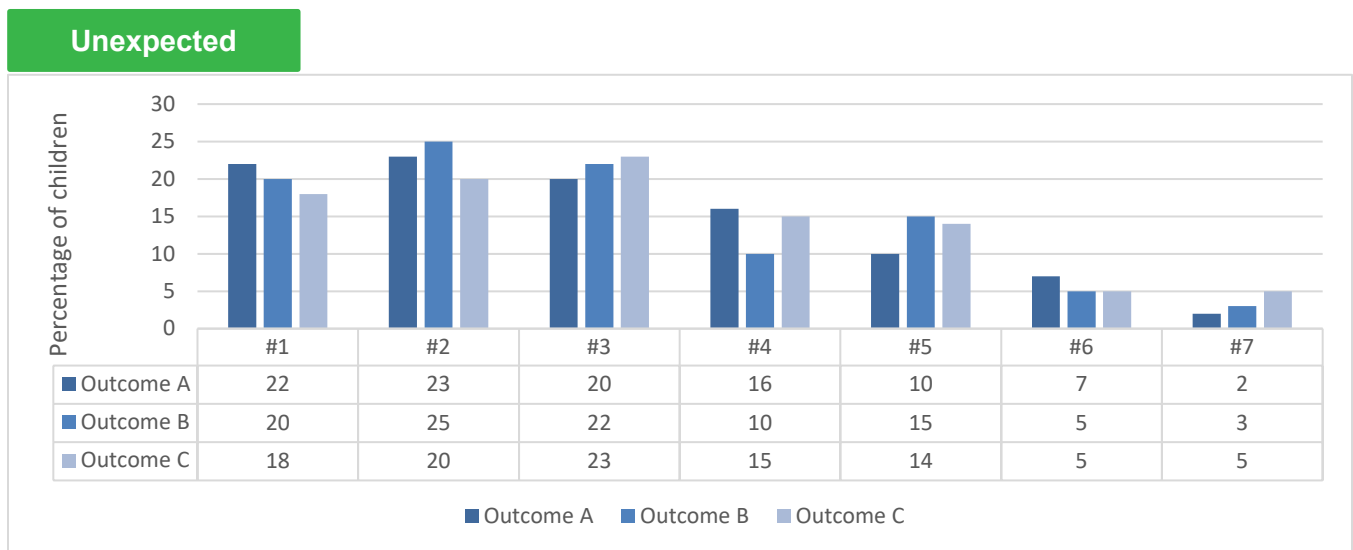
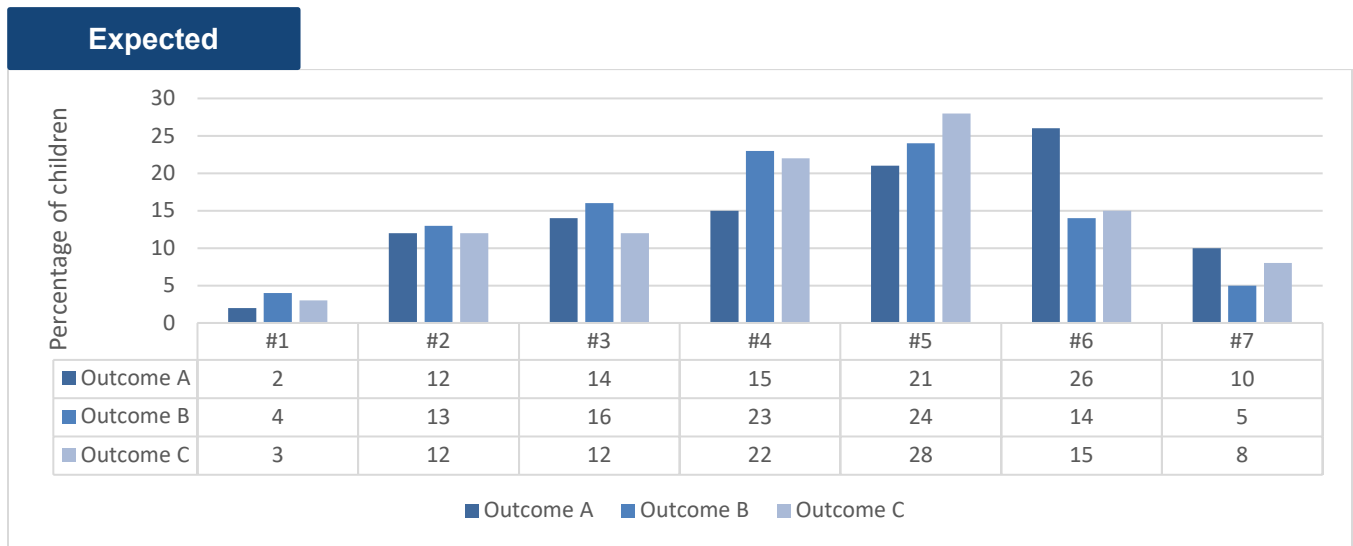
Concern	Possible Analysis
<p>The tools used to inform entry COS ratings are not sensitive to social-emotional delays in young children.</p>	<p>Compute the average entry rating for Outcome A by age group (e.g., 0–1, 1–2, 2–3). Display the averages in a bar graph. Does the average entry rating go down with increased age? Alternatively, look at the percentage of children in progress category b across age at entry. Is there a higher percentage of children in progress category b who entered the program/district earlier?</p>
<p>Because providers and practitioners complete the COS, they intentionally rate low at entry and high at exit to make the program look better.</p>	<p>Compute the average rating change (exit rating – entry rating) for the state and for programs/districts. Array the average across programs from lowest to highest average change. Do some programs/districts stand out as having very high average change compared with other programs and the state?</p>

## Descriptions of Patterns

### Pattern 1. Children will differ from one another in reasonable ways

Pattern 1a. Very few children will have an entry COS rating of 1.

**Suggested analysis:** *Distribution of COS ratings at entry*



**Interpretation.** The **expected pattern** shows very few children entered with a COS rating of 1; that rating means that the child does not use immediate foundational skills on which to build age-appropriate functioning.

In the **unexpected pattern**, nearly 20% of children entered with a COS rating of 1—unusual because not that many children would be expected to have low scores relative to same-age peers.



Pattern 1b. The mean of the entry COS ratings will be lower than the mean of the exit COS ratings for paired data.

**Suggested analysis:** Mean of COS ratings at entry and at exit

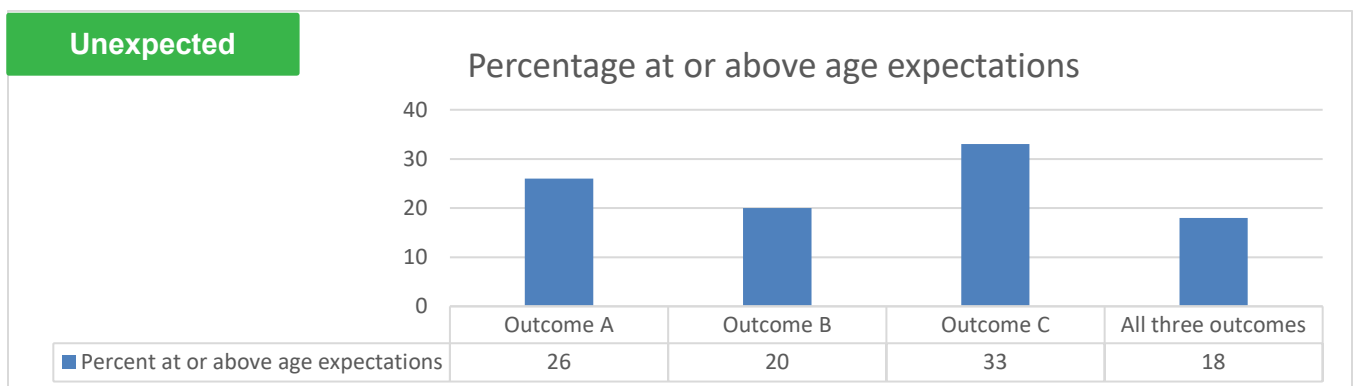
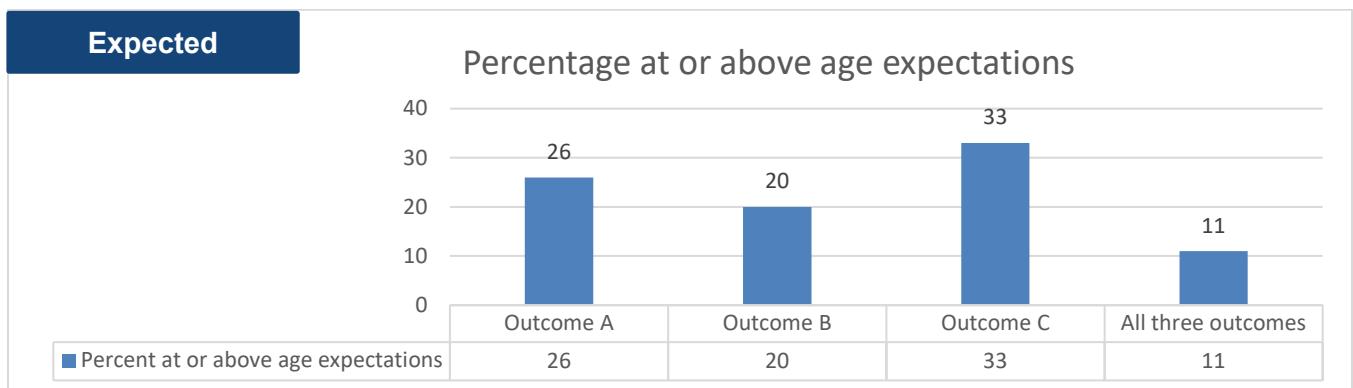
Outcome	Expected		Unexpected	
	Mean at Entry	Mean at Exit	Mean at Entry	Mean at Exit
A	5	7	5	3
B	5	7	5	4
C	4	6	4	2

**Interpretation.** The **expected pattern** indicates that the exit ratings have a mean of 6 or 7 and the entry ratings a mean of 4 or 5. This shift indicates that the children in this group were rated higher at exit than entry.

The **unexpected pattern** shows that the exit ratings have a mean between 2 and 4 while the entry ratings have a mean of 4 or 5. This shift indicates that the children in this group tended to be rated lower at exit than entry. This is unexpected because most children make progress.

Pattern 1c. Few children will have entry COS ratings at or above age expectations on all three outcomes. (COS rating of 6 or 7).

**Suggested analysis:** Percentage of children who scored at or above age expectations on all three outcomes at entry



**Interpretation.** In the **expected pattern**, only 11% of children entered the program/district functioning like their same-age peers on all three outcomes. National data trends indicate that 10–15% of children will enter the program/district functioning like their same-age peers on all three outcomes.

In the **unexpected pattern**, more than 18% of children entered the program/district functioning like their same-age peers on all three outcomes. In addition to being outside the expected range of 10-15%, the chart indicates that nearly all children who were at or above age expectations for Outcome B were also at or above age expectations for Outcomes A and C. This is not likely to occur because few children are expected to be above age expectations on all outcomes.

Pattern 1d. The percentage of children in OSEP progress categories will fall within expected ranges.

**Suggested analysis:** *Distribution of progress categories*

Pattern of Progress Categories for Outcome A: Positive Social-Emotional Skills (%)					
	a	b	c	d	e
<b>Expected range</b>	0–5	5–50	5–50	5–50	5–65
<b>Expected pattern</b>	4	15	22	35	24
<b>Unexpected pattern-1</b>	2	65	6	7	20
<b>Unexpected pattern-2</b>	15	20	20	27	18

**Interpretation.** The **expected range** indicates the expected ranges for the percentage of children for each of the progress categories. The **expected pattern** shows that the percentages for each progress category falls within the expected ranges. In the first **unexpected pattern**, 65% of children are in progress category b, which is outside the expected range of 5–50%. This means that 65% of children in progress category b made progress but did not move closer to age expectations. This percentage is expected to be lower than 50% because more children should be moving closer to age expectations. In the **second unexpected pattern**, 15% of children are in progress category a, which is not within the expected range of 0–5%. This means that 15% of children gained no new skills or regressed. This percentage is expected to be lower than 5% because most children will gain new skills as they get older, even if they do not receive intervention or services.

## Pattern 2. Functioning in one outcome area will be related to functioning in the other outcome areas

Pattern 2a. Functioning at one time point in one outcome is related to functioning at the same time point in the other outcomes.

*Suggested analysis: Cross tabulations of ratings between outcomes*

A cross tabulation can be used to compare a rating in one outcome with a rating in another outcome at the same time point, either entry or exit. In a cross tabulation, the number in each cell represents the number of children with the rating described (“Outcome C Rating at Entry” and “Outcome A Rating at Entry”). The examples below show ratings at entry for Outcomes A and C. The blue cells (shaded) indicate the rating for one outcome is within  $\pm 1$  of a rating for another outcome. The white cells (unshaded) indicate the number of children for whom the difference between the two ratings was 2 or more points.

Expected		Outcome C Rating at Entry							
Outcome A Rating at Entry	1	2	3	4	5	6	7	Totals	
1	51	17	8	2				78	
2	23	66	25	3	4	3		124	
3	7	30	72	18	9	1		137	
4		2	25	37	13	3	1	81	
5	1	3	12	17	34	8	1	76	
6		2	3	10	11	22	5	53	
7				3	8	9	1	21	
<b>Totals</b>	82	120	145	90	79	46	8	570	

Unexpected		Outcome C Rating at Entry							
Outcome A Rating at Entry	1	2	3	4	5	6	7	Totals	
1	21	14	15	11	13	16	11	82	
2	10	15	11	14	11	13	13	124	
3	11	6	12	14	13	9	10	137	
4	14	12	9	11	8	13	10	77	
5	8	7	13	18	10	8	11	76	
6	13	7	12	9	9	14	12	53	
7	13	9	9	11	12	16	12	21	
<b>Totals</b>	90	70	78	88	76	89	79	570	

**Interpretation.** In the **expected pattern**, most children (~80–90%) received a COS entry rating on one outcome that was within  $\pm 1$  of a COS entry rating on another outcome. Less than 20% of children received a COS entry rating that was 2 points or more above or below a COS entry rating on another outcome.

In the **unexpected pattern**, only 40% of children had a COS entry rating on one outcome that was within  $\pm 1$  of a COS entry rating on another outcome. The majority of children have data in the white cells, indicating they had entry ratings for Outcome A and Outcome C that were 2 or more points apart. The patterns expected when comparing entry ratings across outcomes are similar to the those expected when comparing exit ratings across outcomes.

**Suggested analysis:** *Correlation coefficients of ratings between outcomes*

States and local programs/districts can also calculate correlation coefficients between COS ratings at entry across outcomes. A correlation coefficient captures the same relationship shown in analysis 2a.1 above but it quantifies it with a single number. Correlation coefficients provide more accurate estimates of association when the sets of numbers compared have a wide range of possible values. Given that both COS ratings and progress categories have a narrow range of possible values (seven values for COS ratings and five for progress categories), it is recommended that correlation coefficients be interpreted in conjunction with the cross tabulation.

Example of correlation coefficients for entry COS ratings

	Expected	Unexpected
<b>Correlations Between Entry COS Ratings</b>		
Outcome A - Outcome B	0.75	0.12
Outcome A - Outcome C	0.78	0.17
Outcome C - Outcome B	0.81	0.21

**Interpretation.** In the **expected pattern**, correlations between outcome ratings at entry are positive and large, above 0.5. This means that to a large degree a child’s performance on one outcome could be predicted by his or her performance on another outcome and that the performance moved in the same direction.

In the **unexpected pattern**, correlations between outcomes at entry are all less than 0.5. This means that it would be hard to predict how a child would score on one outcome based on his or her performance on another outcome.

The patterns expected when comparing entry ratings across outcomes are similar to the patterns expected when comparing exit ratings across outcomes.

Pattern 2b. Progress between entry and exit in one outcome is related to progress in the other outcomes.

**Suggested analysis:** *Cross tabulations of progress categories between outcomes*

A cross tabulation can be used to compare the progress categories in one outcome with those in another outcome. In a cross tabulation, the number in each cell represents the number of children with the rating described above the cell (Outcome B a-e) and to the left of the cell (Outcome A a-e). The blue cells (shaded) indicate that the progress categories for two outcomes are within one step of each other (e.g., a to b, b to c, c to d, and d to e). The white cells (unshaded) indicate the number of children for whom the difference between the two ratings was two or more steps.

Expected						
	Outcome B a	Outcome B b	Outcome B c	Outcome B d	Outcome B e	Total
Outcome A a	3	6	5	3	0	17
Outcome A b	2	57	12	13	5	89
Outcome A c	3	15	54	46	13	131
Outcome A d	2	12	17	103	16	150
Outcome A e	1	8	15	25	64	113
Total	11	98	103	190	98	500

Unexpected						
	Outcome B a	Outcome B b	Outcome B c	Outcome B d	Outcome B e	Total
Outcome A a	6	5	15	8	7	41
Outcome A b	4	20	36	25	12	97
Outcome A c	8	23	35	34	19	119
Outcome A d	5	27	23	41	26	122
Outcome A e	6	22	21	44	28	121
Total	29	97	130	152	92	500

**Interpretation.** In the **expected pattern**, most children (75–90%) were placed in a progress category for one outcome that is the same as or one step above/below the progress category in a second outcome. Rarely will cases fall in the white cells (unshaded), meaning that they received progress categories two steps away from each other (e.g., rating of a and c, b and d, or c and e).

In the **unexpected pattern**, ratings are more distributed across the cells in the table; only 65% of cases fall in the blue cells (shaded), even though a higher proportion of children are expected will make similar progress in outcomes. Notice that when more children fall into those white cells (unshaded), there are also more children in progress category a than when more children fall into the blue cells (shaded). For both Outcome A and Outcome B in the unexpected pattern, the percentage of children in Outcome A is greater than 5% which is also not expected, as shown in Pattern 1d.

**Pattern 3. Functioning at entry in one outcome area will be related to functioning at exit in the same outcome area.**

*Suggested analysis: Cross tabulations between entry and exit ratings for each outcome*

A cross tabulation can be used to compare the entry and exit ratings in one outcome. The number in each cell represents the number of children with the rating described above the cell (Outcomes A Rating at Exit) and to the left of the cell (Outcomes A Ratings at Entry). Most cases will be on the diagonals, and the others will be clustered on either side of the diagonal. The medium blue cells (center) indicate an exit rating that is within  $\pm 1$  of the entry rating. The light blue cells (right) indicate an exit rating that is 2 or more points above the entry rating. The dark blue cells (left) indicate an exit rating that is 2 or more points below the entry rating.

Expected		Outcome A Rating at Exit						
Outcome A Rating at Entry	1	2	3	4	5	6	7	Totals
1	30	19	21	8	2	1	1	82
2	15	41	33	28	6		1	124
3	2	15	45	33	21	2	3	121
4		1	16	42	27	18	5	109
5	1		3	15	43	18	15	95
6				2	7	15	9	33
7		1			1	2	2	6
<b>Totals</b>	48	77	118	128	107	56	36	570

Unexpected		Outcome A Rating at Exit						
Outcome A Rating at Entry	1	2	3	4	5	6	7	Totals
1	9	8	11	16	19	20	17	100
2	13	12	12	10	15	19	17	98
3	8	12	14	11	9	9	13	76
4	5	11	15	13	12	11	12	79
5	10	10	12	11	12	10	10	75
6	13	13	14	9	14	9	3	75
7	9	12	12	13	8	11	2	67
<b>Totals</b>	67	78	90	83	89	89	74	570

**Interpretation.** In the **expected pattern**, most ratings are clustered in medium blue cells (center), which demonstrates that entry and exit ratings remained stable or increased/decreased by no more than 1 points. Generally, it is expected that 60–70% of children’s ratings will fall in the medium blue cells (center), indicating that they were stable or increased or decreased by 1 point. An additional 20–40% of ratings are in the light blue cells (right), as expected. Also, as expected, fewer than 10% of the ratings are in the dark blue cells (left).

In the **unexpected pattern**, many more children have ratings in the dark blue (left) and light blue (right) cells. Only 35% of ratings are in the medium blue cells (center), instead of 60–70%. Furthermore, 28% are in the dark blue (left) cells, meaning that more than one-quarter of children received a lower exit rating than entry rating, which is very unusual. While 36% of ratings are in the light blue (right) cells, which is within the expected range, note that the rest of the pattern does not fall within the expected ranges.

**Suggested analysis: Distribution of exit minus entry change patterns**

Another analysis designed to help understand the change between ratings is the distribution of the differences between the entry and exit COS ratings. Entry and exit ratings are not expected to differ by more than 3 points, with most exit ratings higher than entry ratings. Only children entering with a rating of 1, 2, or 3 can have a rating increase of more than 3 points, and increasing from a 3 to a 7 would mean a child's entering a program without any age-expected functioning and exiting a program with age-expected functioning and no concerns.

Expected			
Exit Minus Entry Change Patterns	Outcome A (%)	Outcome B (%)	Outcome C (%)
4+ point decrease	0	0	0
2- to 3-point decrease	6	3	3
No change or $\pm 1$ point	67	60	64
2- to 3-point increase	20	27	24
4+ point increase	7	10	9

Unexpected			
Exit Minus Entry Change Patterns	Outcome A (%)	Outcome B (%)	Outcome C (%)
4+ point decrease	13	14	17
2- to 3-point decrease	18	21	20
No change or $\pm 1$ point	20	13	25
2- to 3-point increase	25	30	23
4+ point increase	24	22	23

**Interpretation.** In the **expected pattern**, most of the ratings did not change between entry and exit or changed within 1 point (e.g., 67% for Outcome A), and a significant group of children had a 2- to 3-point increase (e.g., 20% for Outcome A). Very few children had an increase of 4 or more points or decrease of 2 or more points.

In the **unexpected pattern**, a very high percentage of children had a change in ratings of 2 or more points. Across all three outcomes, 22–24% had an increase of 4 or more points and 31–37% had a decrease of 2 or more points. This is unexpected because most children's COS rating does not increase that much, nor is it expected that so many children will show those kinds of decreases.

**Suggested analysis: Correlation coefficients of ratings within an outcome between entry and exit**

Another way to understand the change between entry and exit for a specific outcome is to examine the correlation coefficient between ratings for that outcome at entry and exit. A correlation coefficient captures the relationship between the two categories and quantifies it with a single number. Correlations between ratings at entry and ratings at exit on the same outcome are expected to be large (above 0.5). The relationship between entry ratings and exit ratings on the same outcome is not expected to be small or below 0.5. Correlation coefficients provide more accurate estimates of association when the sets of numbers

compared have a wide range of possible values. Please see page 24 for additional information on correlations.

Example of correlation coefficients for COS ratings at entry and exit

	Expected	Unexpected
Outcome A entry – Outcome A exit	0.77	0.21
Outcome B entry – Outcome B exit	0.65	0.13
Outcome C entry – Outcome C exit	0.82	0.16

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**Interpretation.** In the **expected pattern**, the correlations between outcome ratings at entry and exit are positive and large, above 0.5. This means that children who received high ratings at entry tended to be rater high at exit and the same held for children who received lower ratings.

In the **unexpected pattern**, correlations between outcome ratings at entry and exit are small and less than 0.5. This means that it is hard to predict how a child will score on an outcome at exit from his or her rating on the same outcome at entry.

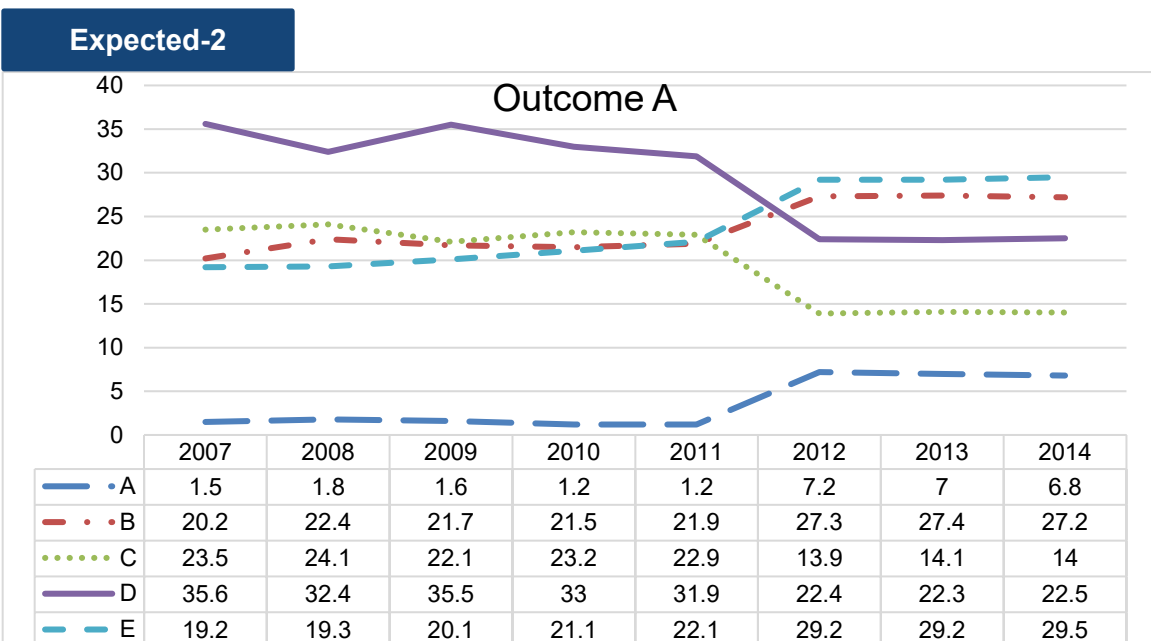
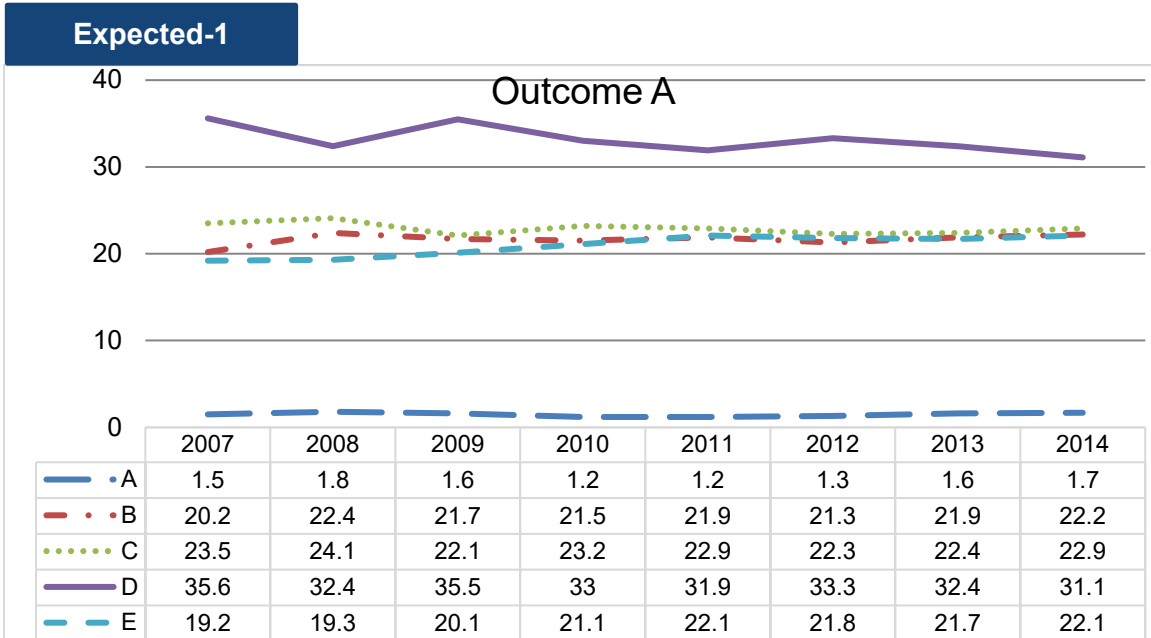


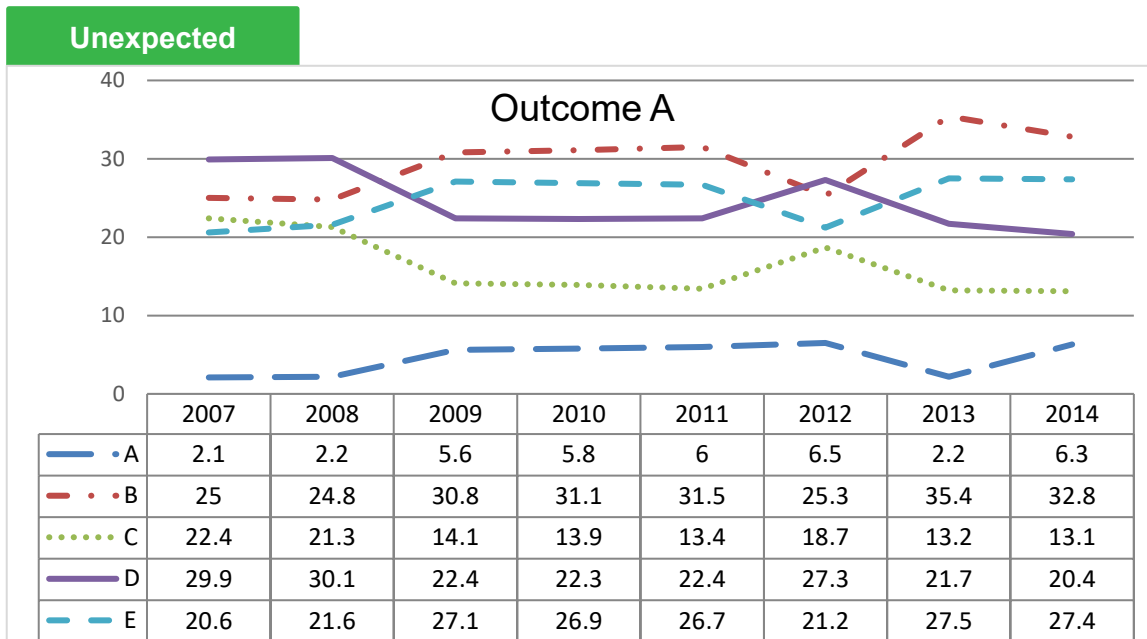
**Pattern 4. States and local programs/districts will have similar results across years.**

Pattern 4a. Distributions of OSEP progress categories are similar from year to year.

**Suggested analysis:** Frequency distributions of OSEP progress categories over time

The examples below show the frequency distribution of progress categories for Outcome A.



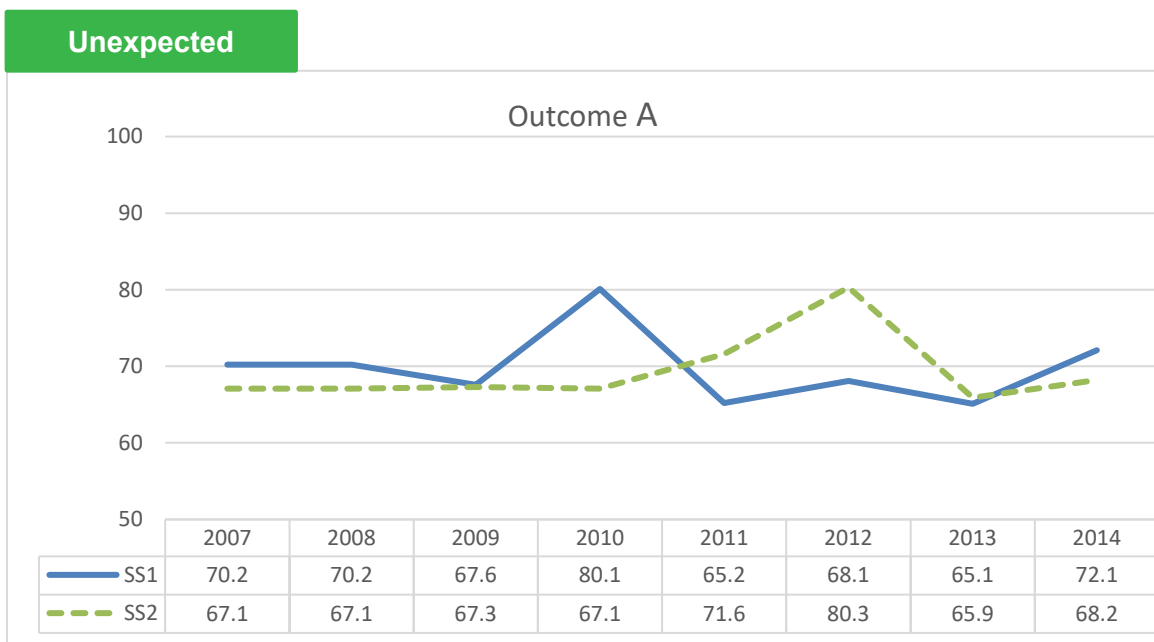
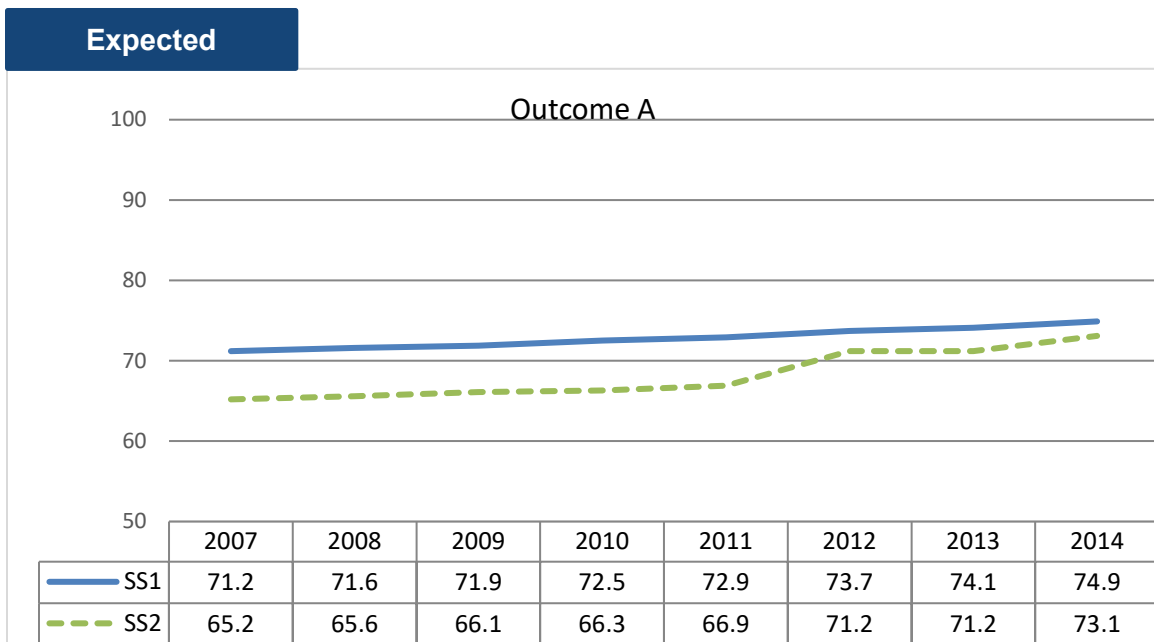


**Interpretation.** In the **first expected pattern**, progress categories are similar from year to year, with normal fluctuations of 1–3%. In the **second expected pattern**, progress categories are similar from year to year with a large change between years 2011 and 2012. This would be expected if there were a change in part of the protocol and process. In the **unexpected pattern**, there are several changes in the data across time. For example, when examining progress category d over time, there is a decrease between 2008 and 2009, an increase again in 2012, followed immediately by a decrease in 2013. Several fluctuations within a short time period are not expected unless there are several changes in protocol or process.

Pattern 4b. Distributions of OSEP summary statements are similar from year to year, assuming the same kinds of children are being served. In states that undertake effective program improvement activities, summary statements increase over years.

**Suggested analysis:** *Frequency distributions of OSEP summary statements over time*

The example below shows the frequency distributions of summary statements for Outcome A.



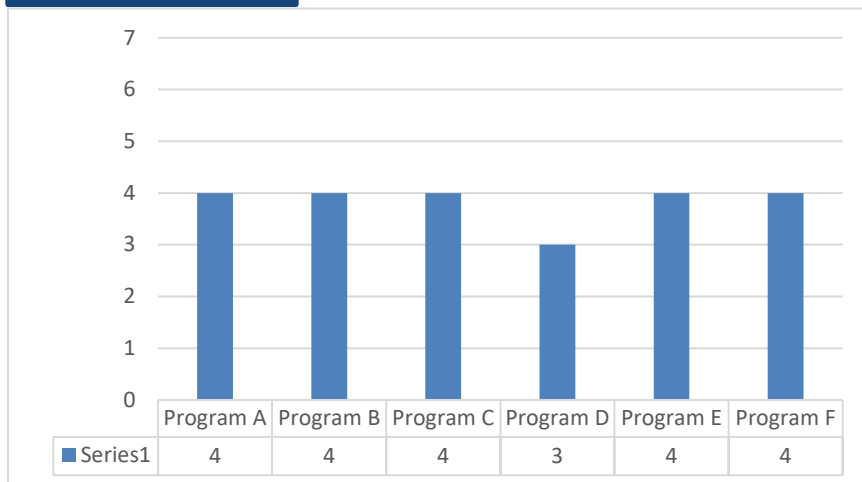
**Interpretation.** In the **expected pattern**, the summary statement percentages stay consistent across the years or show small improvement. In the **unexpected pattern**, large changes occur in the summary statements from year to year. For example, in 2010 a higher percentage of children were reported to have increased their rate of growth relative to the average of the other years. Similarly, in 2012 a larger percentage of children reportedly were functioning at age expectations compared with the average of other years.

The [Meaningful Differences Calculator](#) can be used to compute the statistical significance of the difference between summary statement data from year to year.

**Pattern 5. Similar programs/districts should have similar results at entry.**

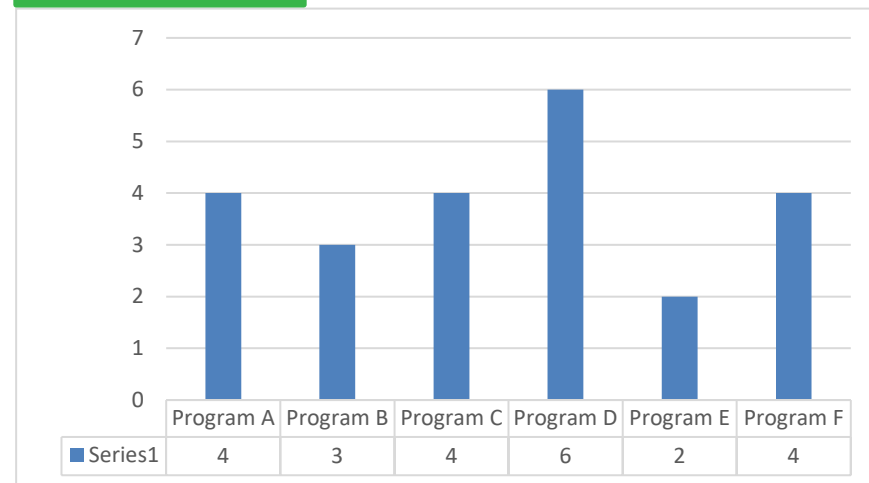
*Suggested analysis: Distribution of mean entry COS ratings by program/district*

**Expected**



Program Name	Mean Entry COS Rating
Program A	4
Program B	4
Program C	4
Program D	3
Program E	4
Program F	4

**Unexpected**



Program Name	Mean Entry COS Rating
Program A	4
Program B	3
Program C	4
Program D	6
Program E	2
Program F	4

**Interpretation.** Within a given state, **the expected pattern** shows that programs and districts serving similar populations had similar entry COS ratings, with a normal fluctuation of 1 point from the median for similar programs.

In the **unexpected pattern**, four programs had very similar entry ratings with a median of 4 (Programs A, B, C, and F). Similar programs and districts with a median entry rating 2 points below or above the median for similar program should be flagged. In this case, Program E is 2 points below and Program D is 2 points above.

**Pattern 6. Ratings will be related to the severity of the child's disability.<sup>2</sup>**

Pattern 6a. Children with more severe disabilities will have lower entry ratings than children with less severe disabilities.

**Suggested analysis:** Mean entry ratings by disability type

<b>Expected</b>			
Child's Disability Type at Program Entry	Outcome A Mean COS Rating at Entry	Outcome B Mean COS Rating at Entry	Outcome C Mean COS Rating at Entry
Multiple disabilities	1.97	1.45	1.82
Developmental delay	4.1	3.9	4.3

<b>Unexpected</b>			
Child's Disability Type at Program Entry	Outcome A Mean COS Rating at Entry	Outcome B Mean COS Rating at Entry	Outcome C Mean COS Rating at Entry
Multiple disabilities	1.97	1.45	1.82
Developmental delay	2.12	1.87	2.31

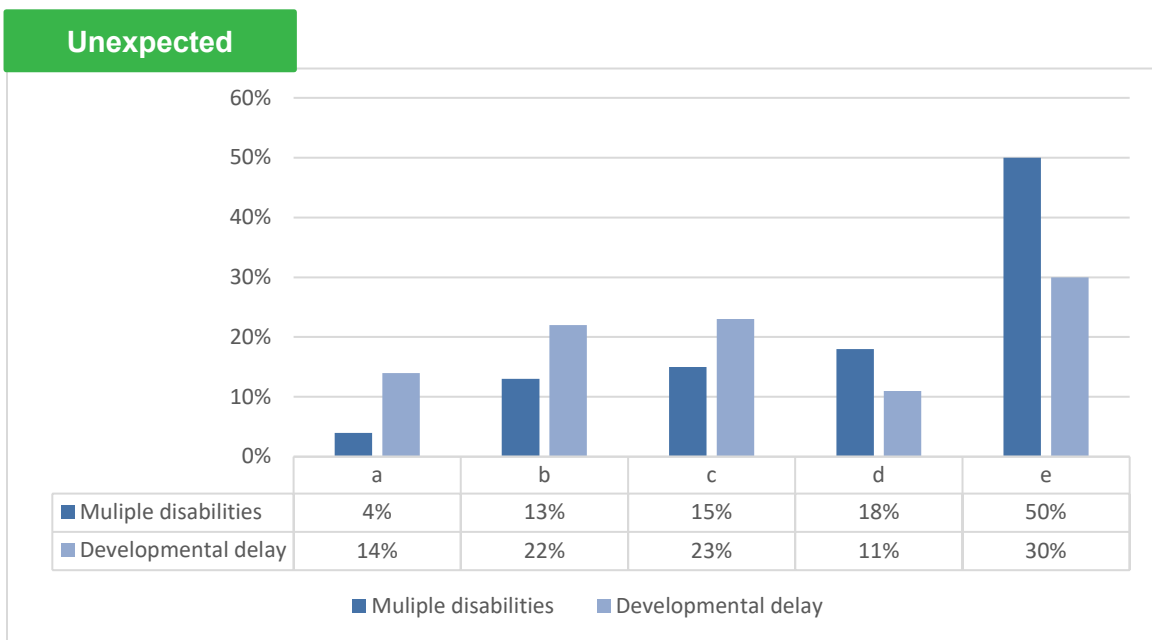
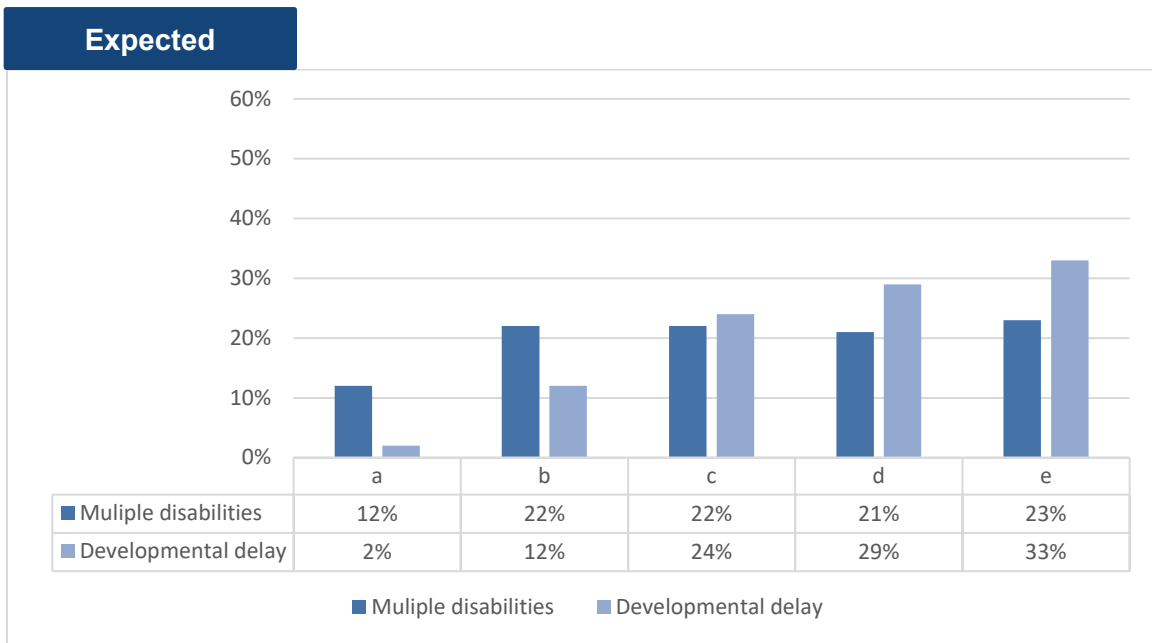
**Interpretation.** In the **expected pattern**, children with multiple disabilities had lower COS ratings at entry on all three outcomes than children with a developmental delay. It is expected that children with multiple disabilities have more severe functional impairments than children with a developmental delay.

In the **unexpected pattern**, children entering a program/district with multiple disabilities and children entering with a developmental delay have similar COS ratings.

Pattern 6b. A larger percentage distribution of children with more severe disabilities will be in categories a-c; a larger percentage distribution with less severe disabilities will be in categories d and e.

**Suggested analysis:** Progress category distribution by disability type

<sup>2</sup> Disability categories for comparison should be selected based on how disability is captured in the state data system and the extent to which the state can predict performance differences among disability groups.

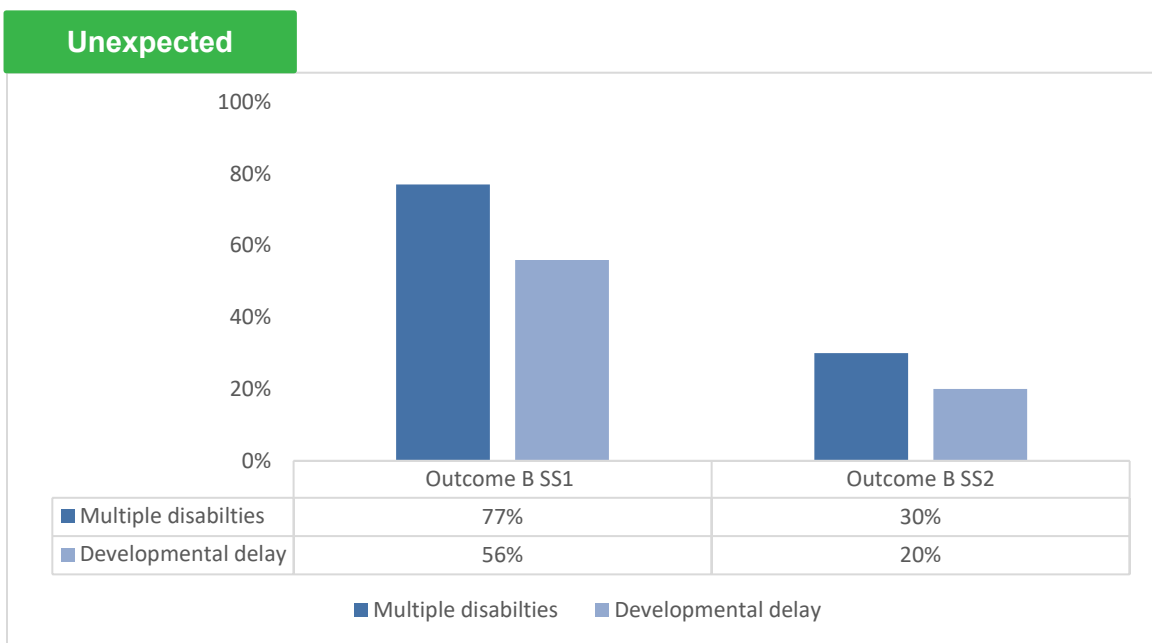
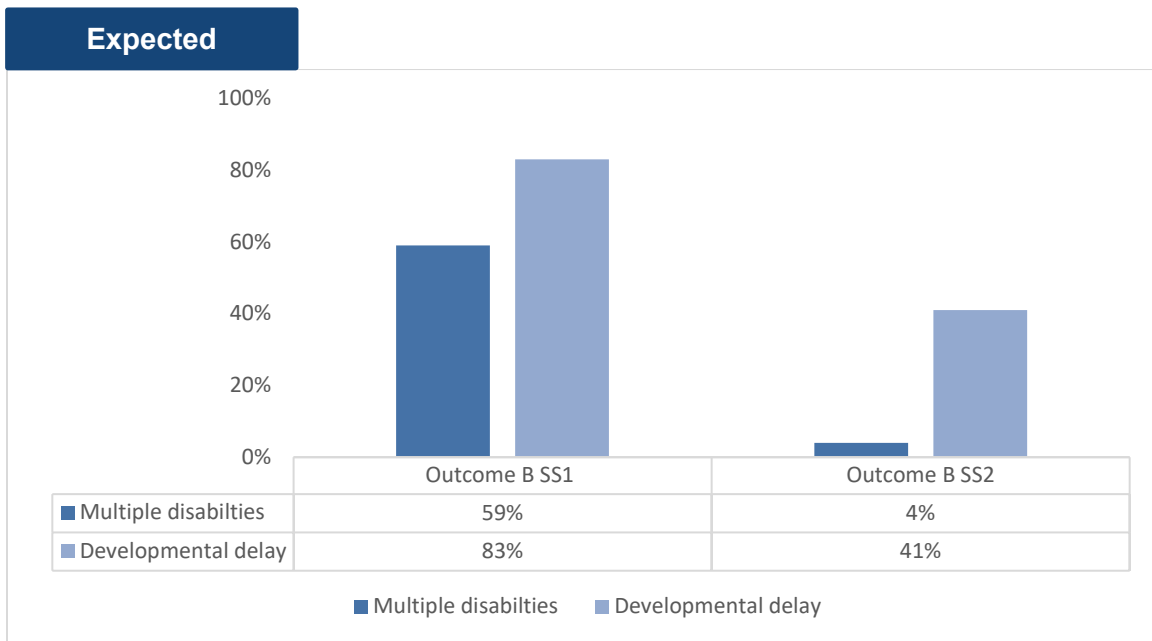


**Interpretation.** In the **expected pattern**, children with multiple disabilities were more likely to be in progress categories a, b, and c, presumably because they made less progress given their severe functional impairments. Children with a developmental delay were more likely to be in progress categories d and e. It is expected that a higher percentage of these children to be able to function like same-age peers when they exit the program.

The **unexpected pattern** shows that 50% of children with multiple disabilities were in progress category e, whereas only 30% of children with a developmental delay were in progress category e.

Pattern 6c. Children with more severe disabilities will have lower percentages on summary statements 1 and 2 than groups of children with less severe disabilities.

**Suggested analysis:** Summary statements 1 and 2 percentages by disability type.



**Interpretation.** In the **expected pattern**, summary statements 1 and 2 for children categorized as having multiple disabilities were lower than those for children with a developmental delay. This is expected because children with multiple disabilities are less likely to both increase their rate of growth and exit at age expectations than children with a developmental delay.

The **unexpected pattern** shows that more children with multiple disabilities increased their rate of growth and exited at age expectations than children with a developmental delay.

## Definitions

<b>COS</b>	Child Outcomes Summary
<b>EI</b>	early intervention
<b>ECSE</b>	early childhood special education
<b>OSEP</b>	Office of Special Education Programs
<b>Outcome A</b>	Positive social-emotional skills (including social relationships)
<b>Outcome B</b>	Acquisition and use of knowledge and skills (including early language/communication/early literacy)
<b>Outcome C</b>	Use of appropriate behaviors to meet needs
<b>Progress category a</b>	Children who did not improve functioning
<b>Progress category b</b>	Children who improved functioning but not sufficiently to move nearer to functioning comparable to same-age peers
<b>Progress category c</b>	Children who improved functioning to a level nearer to same-age peers but did not reach it
<b>Progress category d</b>	Children who improved functioning to reach a level comparable to same-age peers
<b>Progress category e</b>	Children who maintained functioning at a level comparable to same-age peers
<b>Summary statement 1</b>	Of those children who entered the program below age expectations in each outcome, the percentage who increased their rate of growth by the time they exited the program
<b>Summary statement 2</b>	The percent of children who were functioning within age expectations in each outcome by the time they exited the program
<b>Correlation Coefficient</b>	A correlation coefficient, $r$ , quantifies the association between two sets of numbers. A correlation coefficient is always between -1 and +1. A positive correlation coefficient means that the two numbers move in the same direction. For example, a low rating on one outcome at entry would predict a low rating on another outcome at entry. A negative correlation coefficient means that the two numbers move in opposite directions. For example, a low rating on one outcome would predict a high rating on another. An $r$ close to 0 indicates a weak correlation between the two sets of numbers, meaning that movement in one number does not predict movement in another. Correlations closer to 1 or -1 indicate a strong correlation between two sets of numbers. See the following table for guidelines on interpreting the strength of correlations.

### Interpreting Pearson correlation coefficients

Strength of Correlation	Pearson Correlation Coefficient
Small	0.1
Medium	0.3
Large	0.5

Source: Cohen, J. (1988), *Statistical power analysis for behavioral sciences*, 2nd ed. Hillsdale, NJ: Erlbaum.



## **Additional Recommended Resources**

Having quality data requires targeted activities before, during, and after data collection. Examples of activities to prepare for data collection include developing well-defined data collection procedures and providing staff with sufficient training to carry out the procedures as intended. Activities during data collection include providing supervision and feedback to those involved in data collection. Activities after data collection include conducting various kinds of analyses to check for data quality including pattern checking.

Additional resources for improving data quality are available on the ECTA website. Several especially relevant resources are the following:

- **COS Process Module: Collecting & Using Data to Improve Programs.** This online module provides key information about the COS process and the practices that contribute to consistent and meaningful COS decision-making. <https://dasycenter.org/child-outcomes-summary-cos-process-module-collecting-using-data-to-improve-programs/>
- **Converting COS Data to OSEP Progress Categories/Summary Statements.** This online resource includes an engaging, easy-to-understand video that explains how individual COS data are converted to the national OSEP data reports. <http://dasyonline.org/cos-osep-reporting>
- **COS Team Collaboration (COS-TC) Checklist.** Built around a set of quality practices, this checklist provides a mechanism for those who implement, supervise, or train on the COS process to identify, observe, and assess team collaboration. <http://ectacenter.org/eco/pages/costeam.asp>
- **Scale for Assessing State Implementation of a Child Outcomes Measurement System.** This framework and self-assessment define the components of a high-quality state-level child outcomes measurement system. <http://ectacenter.org/eco/assets/pdfs/selfassessment.pdf>
- **L-COMS Guide.** This framework, developed by ECTA and DaSy, identifies seven key components of a high-quality child outcomes measurement system at the local level. [http://ectacenter.org/eco/assets/pdfs/L-COMS\\_Self-Assessment\\_Guidance.pdf](http://ectacenter.org/eco/assets/pdfs/L-COMS_Self-Assessment_Guidance.pdf)