APPENDIX

Appendix A. Details on Longitudinal Trajectories by Outcomes Measured

Impairments and Associated Health Conditions Balance (ECAB)

The longitudinal curves for the ECAB total score were nonlinear for each GMFCS level. The estimated population value (95% CI) at age 12 years was the largest for children at GMFCS Level I and decreased for each GMFCS level, with no overlap of 95% CIs indicating that development is different by functional ability classification. The Time-90 parameter increased from Level V (34 months) to Level III (71 months), then maintained for Level II (71 months) but was very short for Level I (35 months). This lends some support to indicate that children with lower functional ability reach their maximum ability sooner than those with greater functional ability. The mismatch with children at Level I and II may have occurred as there was a ceiling effect for the ECAB measure which started in individual children as early as 3-5 years age; therefore, we do not know what their highest balance ability was. The mean changes in scores from age 2-5 years represented a larger percent change (70-91%) as compared to age 5-12 years, indicating that younger children with CP develop balance ability at a greater rate than older children with CP.

Spinal Alignment/Range of Motion (SAROMM)

The longitudinal trajectories for the SAROMM average score were linear for each GMFCS level. The estimated population value (95% CI) at 12 years of age was the smallest for children at GMFCS Level I and increased (representing more limitations) for each GMFCS level, with no overlap of 95% CIs indicating that development is different by functional ability

classification. Due to the continual increase in the mean SAROMM scores, we could not calculate a Time-90 parameter. There was no difference in percent change in scores at 2-5 years of age as compared with 5-12 years of age for children at GMFCS Levels I to III and minimal differences for children at GMFCS Levels IV (50%) and V (33%), indicating that, in general, younger children do

not develop spinal alignment and range of motion restrictions at a greater rate than older children.

Muscle Strength (Functional Strength Assessment)

The longitudinal trajectories for strength were nonlinear for GMFCS Levels I and II and linear for Levels III to V. The estimated population value (95% CI) at 12 years of age was the largest in children at GMFCS Level I and reduced through the levels, with the smallest value for GMFCS Level V. There was no overlap in the 95% CI between levels, except for children at GMFCS Levels II and III, generally supporting that development is different by functional ability classification. The Time-90 parameter increased from Level II (23 months) to Level I (67 months) and could not be calculated for Levels III to V. This lends some support to the contention that children with lower functional ability (Level II) reach their maximum sooner than those with greater functional ability (Level I). The mean percent change in scores from 2-5 years of age was large for children at GMFCS Levels I and II (75%-100%) but small for children at Levels III to V (0%-27%), as compared with 5-12 years of age. This indicates that younger children with greater functional ability develop strength at a greater rate than older children, but those with lower functional ability do not develop strength at a greater rate than older children.

Endurance (6MWT)

The longitudinal curves for endurance (6MWT) were nonlinear for children with CP who were ambulatory (GMFCS Levels I-III). The estimated population value (95% CI) at 12 years of
a ge was highest at GMFCS Level I and decreased for each GMFCS level, with no overlap of 95% CIs indicating that development is different by functional ability classification. The Time-90 parameter increased from Level III (20 months) to Level II (69 months) then dropped for Level I (50 months). This lends some support to the hypothesis that children with lower functional ability reach their maximum score sooner than those with greater functional ability. The percent change in mean scores from 2-5 years of age represented a larger percent change (72%-

99%) as compared with 5-12 years of age, indicating that younger children develop endurance for walking at a greater rate than older children.

Endurance (EASE)

The longitudinal curves for endurance for activity were nonlinear for each GMFCS Level. The estimated population value (95% CI) at 12 years of age was the largest for children at GMFCS Level I and decreased for each GMFCS level, with no overlap of 95% CIs indicating that development is different by functional ability classification. The Time-90 parameter varied from 15 to 25 months and was not related to the children's GMFCS level. The percent change in
mean scores occurred 100% within 2-5 years of age as compared with 5-12 years of age, indicating that younger children develop endurance for activity at a greater rate than older children.

Impact of Health Conditions (Child Health Conditions Questionnaire)

The longitudinal curves for the mean impact of health conditions were linear for each GMFCS level. The estimated population value (95% CI) at 12 years of age was lowest for children at GMFCS Level I and increased across the GMFCS levels; however, there was an overlap in 95% CIs between Level I and III and between Level II and IV, indicating some support that development is different by functional ability classification. Due to the linear nature of development, we could not calculate a Time-90 parameter. Children at Level I and IV essentially remain the same through the age range. Children at Level II and V continue to increase slightly, and those at Level III decrease slightly through 12 years of age. The percent change in mean scores from 2-5 years of age represented a smaller percent change (33%-50%) as compared with 5-12 years of age, indicating that younger children with CP do not increase the impact of health conditions at a greater rate than older children with CP.

Participation

Child Engagement in Family/Recreation Activities (CEDL Part 1)

The estimated population value (95% CI) at age 12 years does gradually decrease from GMFCS Level I to V; however, there is a large overlap of the 95% CI between children at Levels II and III and a very small overlap between Levels II and IV, indicating some support that development is different by functional ability classification. The Time-90 parameter varied from 14 to 23 months and was not related to the children's functional ability (GMFCS level). Children at GMFCS Level II showed a slight decrease in development over time; this does not support that the rate of development is associated with functional ability. The percent change in mean scores occurring at 2-5 years of age represented a

larger percent change (95%-97%) as compared with 5-12 years of age in all GMFCS levels, except for Level II, for which the mean score change occurring between 2 and 5 years of age was 30%. The mean change score for Level II, however, represents a smaller decrement in score from 2-5 years of age as compared with 5- 12 years of age. This supports that younger children develop participation in family/recreation activities at a greater rate than older children.

Child Performance in Self-Care Activities (CEDL Part 2)

The estimated population value (95% CI) at 12 years of age was the largest for children at GMFCS Level I and decreased for each GMFCS level, with no overlap of 95% CIs, indicating that development is different by functional ability classification. The Time-90 parameter varied from 20 to 107 months with children who had the most functional ability (GMFCS Levels I-III), developing their maximum across a mean of 80 to 107 months and those with less functional ability meeting their Time-90 parameter more quickly (20-40 months). This supports that functional ability is associated with the development of children's performance in self-care activities. The percent change in mean scores occurring at 2-5 years of age represented a larger percent change (59%-90%) as compared with 5-12 years of age in all GMFCS levels. This supports that younger children develop performance in self-care at a greater rate than older children.

Physical Activity Substudy *Amount of Walking (StepWatch)*

The estimated population value (95% CI) at 12 years of age decreases from GMFCS Level I to III, but there are overlaps in the 95% CIs between consecutive levels, indicating some support that development is different by functional ability classification. Due to the linear nature of development, we could not calculate a Time-90 parameter. Scores for

children at Level I decrease slightly and children at Level II and III increase slightly from 1.5 to 12 years of age. The percent change in mean scores occurring at 2-5 years of age represented a small percent change (30%) as compared with 5-12 years of age in all GMFCS levels; however, for Level I this represented a smaller decrease at 2-5 years as compared with 5-12 years. This does not support that younger children develop their amount of walking at a greater rate than older children.

Intensity of Walking (StepWatch)

The estimated population value (95% CI) at age 12 years decreases from GMFCS Level I to III, but there are overlaps in the 95% CIs between consecutive levels, indicating some support that development is different by functional ability classification. Due to the linear nature of development, we could not calculate a Time-90 parameter. Scores for children at Level I show a gradual decrease from 1.5 to 12 years of age. For children at Level II and III, they increase slightly through 12 years of age.

The percent change in mean scores occurring at 2-5 years of age represented a small percent change (30%) as compared with 5-12 years of age in all GMFCS levels; however, for Level I this represented a smaller decrease at 2-5 years of age as compared with 5-12 years of age. This does not support that younger children develop their intensity of walking at a greater rate than older children.

Amount of Activity (ActiGraph)

The estimated population value (95% CI) at 12 years of age was highest for children at GMFCS Level II, but the 95% CIs overlapped between Levels I and II. Children at Level III to V (combined due to small sample size) had the smallest values, and their CI did not overlap with Levels I or II. This

indicates some support that development is different by functional ability

classification. Due to the linear nature of development, we could not calculate a Time-90 parameter. Children in all GMFCS levels showed a decrease in activity counts per minute from
1.5 to 12 years of age. The percent change in mean scores occurring at 2-5 years of age represented a small percent change (30%) as compared with 5-12 years of age in all GMFCS levels. This does not support that younger children develop their amount of activity at a greater rate than older children.

Intensity of Activity (ActiGraph)

The estimated population value (95% CI) at 12 years of age was highest for children at GMFCS Level II, but the 95% CIs overlapped between Levels I and II. Children at Level III to V (combined due to small sample size) had the smallest values and their CI did not overlap with Levels I or II. This indicates some support that development is different by functional ability classification. Due to the linear nature of development, we could not calculate a Time-90 parameter. Children in all GMFCS levels showed a decrease in activity counts per minute from
1.5 to 12 years of age. The percent change in mean scores occurring at 2-5 years of age represented a small percent change (30%) as compared with 5-12 years of age in all GMFCS levels. This does not support that younger children develop their intensity of activity at a greater rate than older children.