

### **Supplementary material**

Mean differences in Z-scores for GMFCS level I compared with higher GMFCS levels were statistically significant for WFA (for GMFCS levels III-V), HFA (for GMFCS levels III-V), and BMIFA (for GMFCS level IV-V), but not WFH (Supplementary Figure 2). The mean differences in Z-scores for GMFCS level I compared with level V were  $-1.85$  (95% CI  $-2.41$ ,  $-1.29$ ;  $P < 0.0001$ ) for WFA,  $-1.70$  (95% CI  $-2.16$ ,  $-1.24$ ;  $P < 0.0001$ ) for HFA, and  $-1.13$  (95% CI  $-1.72$ ,  $-0.55$ ;  $P = 0.0002$ ) for BMIFA. Differences between GMFCS level II and level I did not reach statistical significance for any of the nutritional status parameters.

The adjusted model was not different from the crude model, suggesting that the variables age, sex, gestational duration, and comorbidities were not confounders (Supplementary Figure 2).

None of the potential intermediate variables (intensity of physical therapy, oro-motor dysfunction, stress/feeding problems, and long feeding times) affected the association between GMFCS level and nutritional parameters (WFA, HFA, WFH, and BMIFA), suggesting that none of them was a clear intermediate variable. Further analyses showed that country and age group were significant effect modifiers for the association between WFA and GMFCS level (Supplementary Figure 2).

Table 1 (main manuscript) shows categorical nutritional status measures for the overall population and by GMFCS level. Overall 29–36% of participants were mildly to severely malnourished, wasted or stunted based on WFA (36.3%), BMIFA (30.9%), HFA (32.9%), and WFH (28.6%), whereas 5.8% and 17.3% were overweight/obese based on WFH and BMIFA, respectively. The proportions of participants classified as malnourished, wasted, or stunted increased with higher GMFCS level.

Supplementary Figure 1B shows adjusted odds ratios for WHO categories of being malnourished (WFA  $< -2$  or BMI  $< -2$ ), stunted (HFA  $< -2$ ), wasted (WFH  $< -2$ ), and overweight/obese (BMI  $> 1$ ). Compared with GMFCS level I, higher GMFCS levels were

associated with significantly increased risks for being malnourished based on WFA (GMFCS III-V) or BMI (GMFCS IV and V), and stunted based on HFA (GMFCS III-V); however, no associations were seen for being overweight/obese or wasted.

**Supplementary Table 1.** Anthropometric measures used to evaluate the occurrence of malnutrition according to the criteria of WHO Child Growth Standards median (<https://www.who.int/childgrowth/standards/en/>)

<b>Anthropometric measures</b>	<b>Classification</b>
Weight-for-age	Severely malnourished, if Z-score < -3 Moderately malnourished, if $-3 \leq \text{Z-score} < -2$ Mildly malnourished, if $-2 \leq \text{Z-score} < -1$
Height-for-age	Severely stunted, if Z-score < -3 Moderately stunted, if $-3 \leq \text{Z-score} < -2$
BMI-for-age (children between 5 – 18 years)	Severely malnourished, if Z-score < -3 Mildly/moderately malnourished, if $-3 \leq \text{Z-score} < -2$ Normal, if $-2 \leq \text{Z-score} \leq 1$ Overweight, if $1 < \text{Z-score} \leq 2$ Obese, if Z-score > 2
Weight-for-height (children below 5 years)	Severely wasted, if Z-score < -3 Mildly/moderately wasted, if $-3 \leq \text{Z-score} < -2$ Normal, if $-2 \leq \text{Z-score} \leq 2$ Overweight, if $2 < \text{Z-score} \leq 3$ Obese, if Z-score > 3

### **Supplementary Figure legends**

**Supplementary Figure 1.** Association between nutritional parameters and GMFCS level. (A)

Continuous variables: the graph shows adjusted mean difference (Z-scores) versus GMFCS level I. (B)

Categorical variables: logistic regression analysis showing the adjusted odds ratio (OR) for

malnutrition for GMFCS level I versus levels II, III, IV, and V. The vertical lines show the 95%

confidence intervals. BMI = body mass index; BMIFA = body mass index for age; GMFCS = gross

motor function classification system; HFA = height-for-age; WFA = weight-for-age; WFH = weight-

for-height.

**Supplementary Figure 2.** Association between nutritional parameters and GMFCS level. Box plots

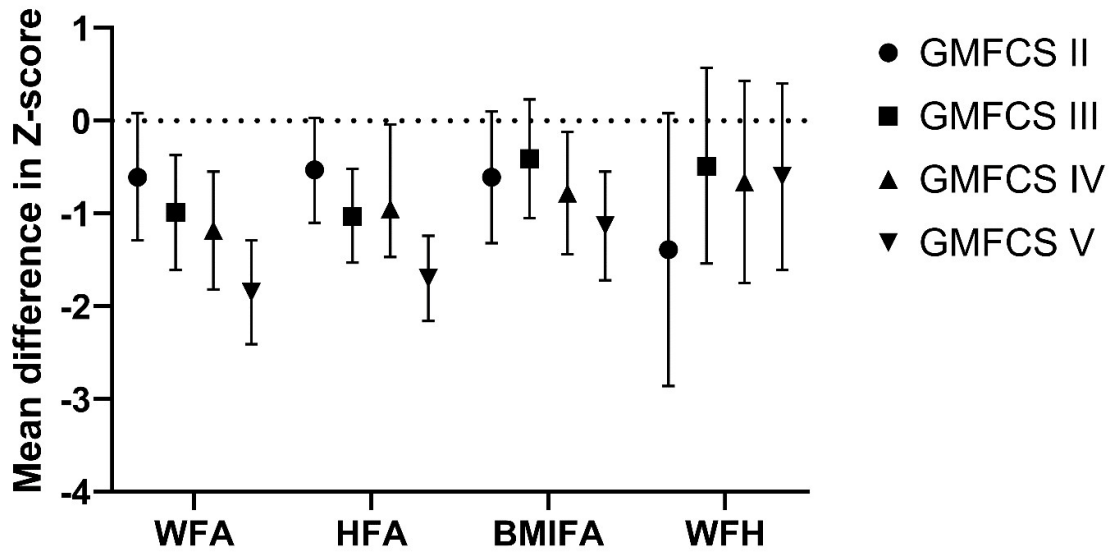
show median values with interquartile range and the whiskers show minimum and maximum values.

Statistical analyses using AN(C)OVA to compare GMFCS I with levels II, III, IV, and V.

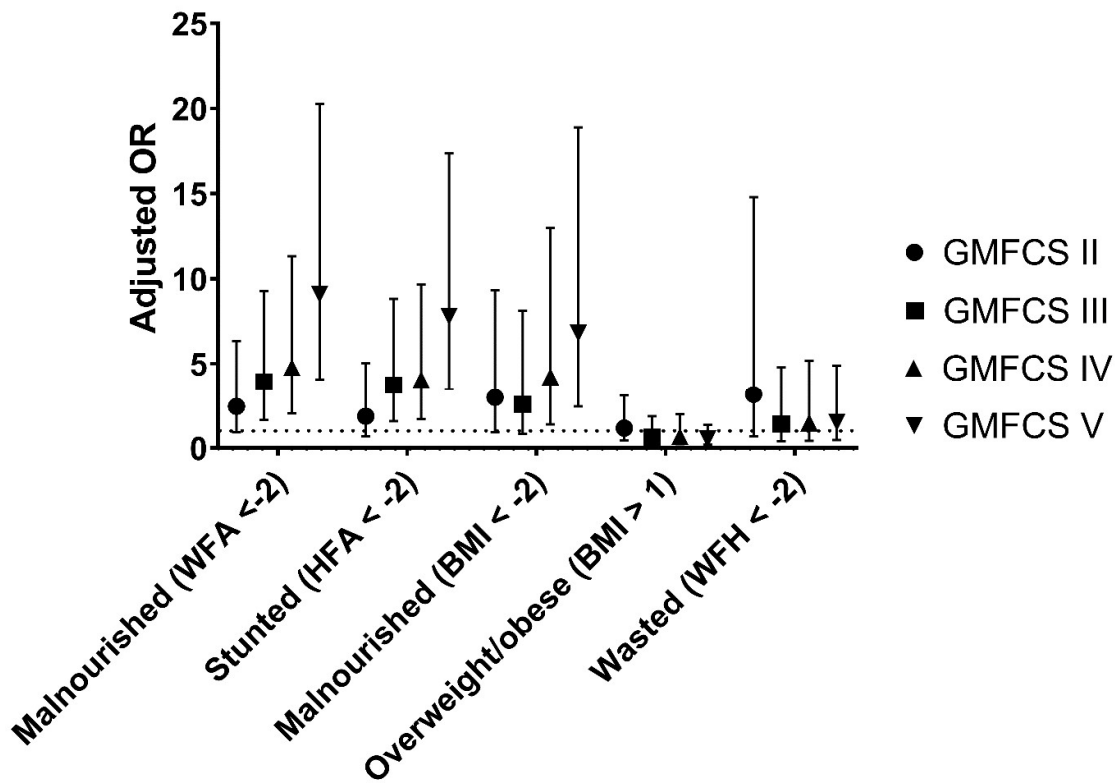
**Supplementary Figure 3.** Effect modifiers for the association between GMFCS level and WFA. A p-

value is a signal for an effect modifier if p-value <0.10

Supplementary Figure 1A

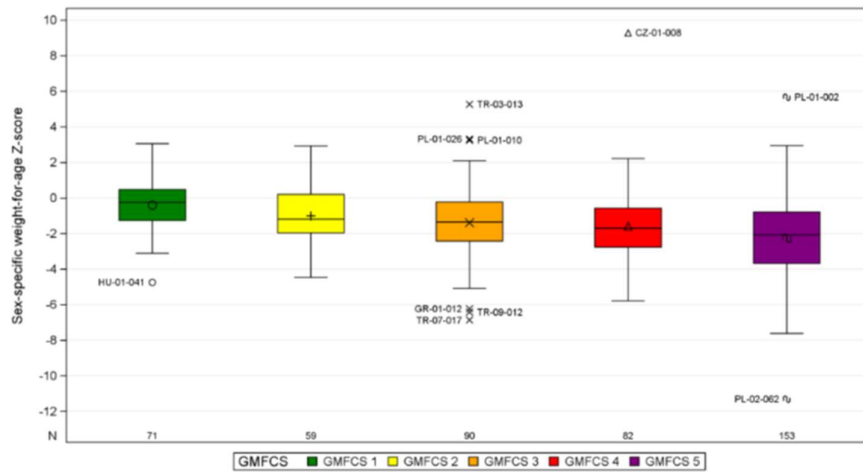


Supplementary Figure 1B



**Supplementary Figure 2.** Association between nutritional parameters and GMFCS level. Box plots show median values with interquartile range and the whiskers show minimum and maximum values. Statistical analyses using AN(C)OVA to compare GMFCS I with levels II, III, IV, and V.

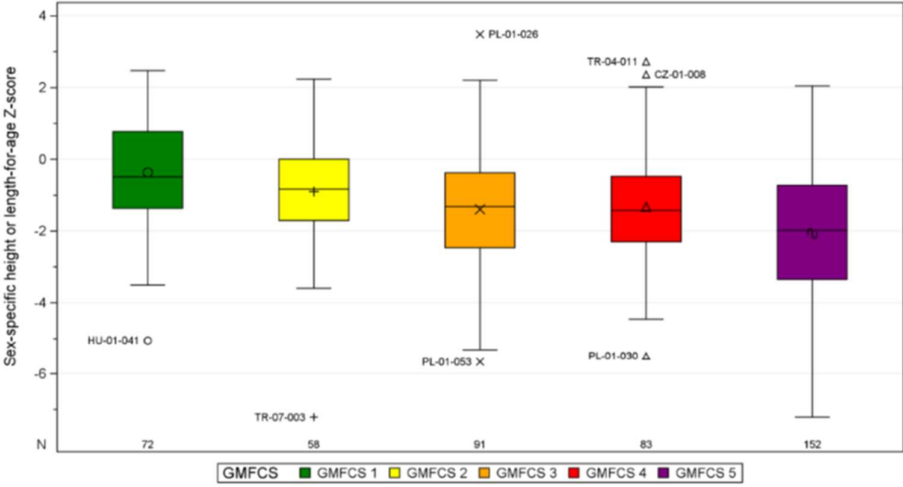
### Weight-for-age



	Crude model			Adjusted model*		
	Mean difference	95% CI	p	Mean difference	95% CI	p
GMFCS 1	reference			reference		
GMFCS 2	-0.61	-1.29; 0.08	0.08	-0.47	-1.13; 0.19	0.16
GMFCS 3	-0.99	-1.61; -0.37	0.002	-1.00	-1.60; -0.40	0.001
GMFCS 4	-1.18	-1.82; -0.55	0.0003	-1.11	-1.73; -0.49	0.0005
GMFCS 5	-1.85	-2.41; -1.29	<0.0001	-1.85	-2.43; -1.27	<0.0001

\*Adjusted for age, sex, gestational age and concomitant disease (epilepsy and recurrent/respiratory infection).  
CI=confidence interval; GMFCS=Gross Motor Function Classification System

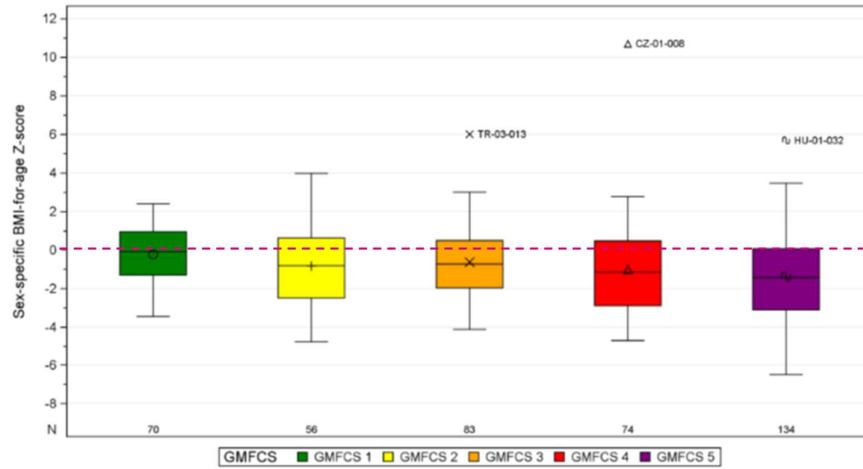
### Height-for-age



	Crude model			Adjusted model*		
	Mean difference	95% CI	p	Mean difference	95% CI	p
GMFCS 1	reference			reference		
GMFCS 2	-0.53	-1.10; 0.03	0.07	-0.42	-0.98; 0.13	0.14
GMFCS 3	-1.03	-1.53; -0.52	<0.0001	-1.01	-1.51; -0.50	<0.0001
GMFCS 4	-0.95	-1.47; -0.44	0.0003	-0.93	-1.46; -0.41	0.0005
GMFCS 5	-1.70	-2.16; -1.24	<0.0001	-1.68	-2.17; -1.19	<0.0001

\*Adjusted for age, sex, gestational age and concomitant disease (epilepsy and recurrent/respiratory infection).  
CI=confidence interval; GMFCS=Gross Motor Function Classification System

## BMI-for-age

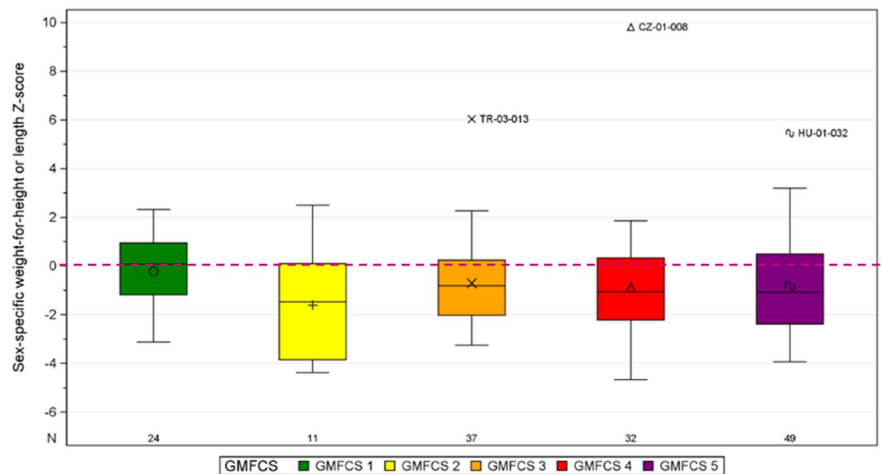


	Crude model			Adjusted model*		
	Mean difference	95% CI	p	Mean difference	95% CI	p
GMFCS 1	reference			reference		
GMFCS 2	-0.61	-1.32; 0.10	0.09	-0.52	-1.24; 0.19	0.15
GMFCS 3	-0.41	-1.05; 0.23	0.21	-0.47	-1.11; 0.18	0.16
GMFCS 4	-0.78	-1.44; -0.12	0.02	-0.74	-1.42; -0.06	0.03
GMFCS 5	-1.13	-1.72; -0.55	0.0002	-1.14	-1.77; -0.50	0.0005

\*Adjusted for age, sex, gestational age and concomitant disease (epilepsy and recurrent/respiratory infection).  
CI=confidence interval; GMFCS=Gross Motor Function Classification System



### Weight-for-height (children <5 years)



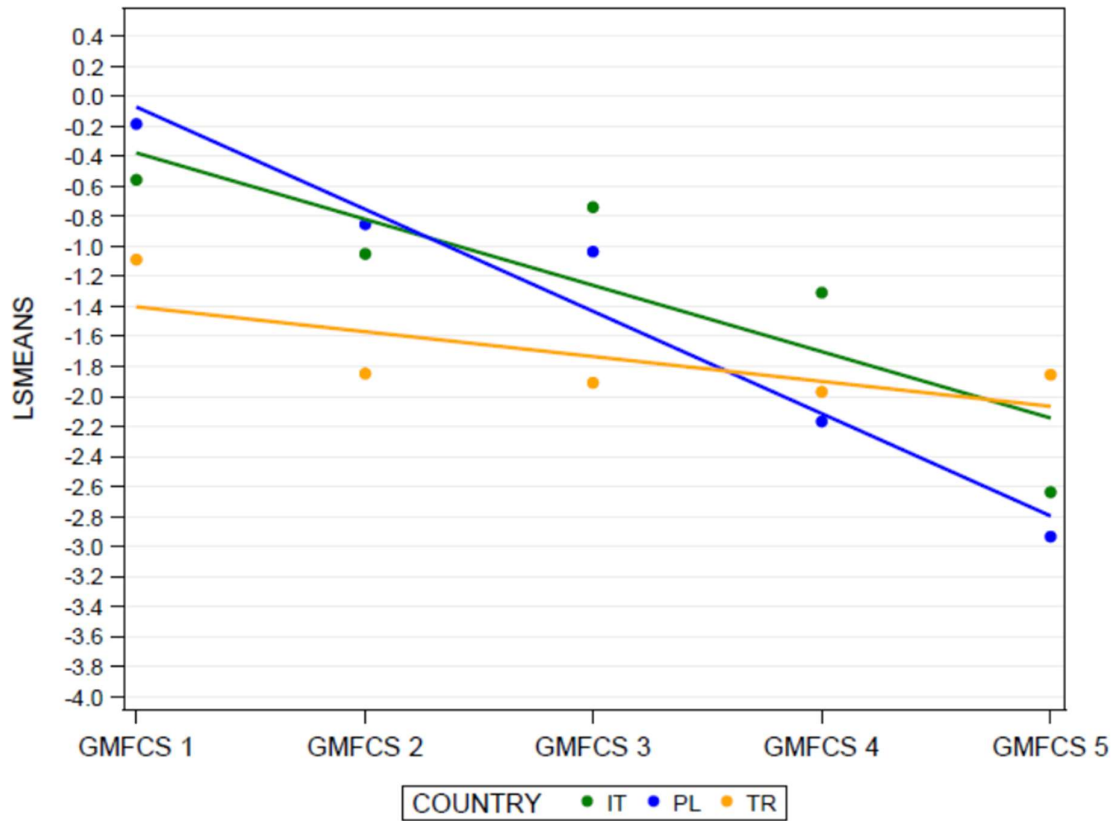
	Crude model			Adjusted model*		
	Mean difference	95% CI	p	Mean difference	95% CI	p
<b>GMFCS 1</b>	reference			reference		
<b>GMFCS 2</b>	-1.39	-2.86; 0.08	0.06	-1.25	-2.76; 0.25	0.10
<b>GMFCS 3</b>	-0.49	-1.54; 0.57	0.36	-0.31	-1.37; 0.75	0.56
<b>GMFCS 4</b>	-0.66	-1.75; 0.43	0.23	-0.51	-1.63; 0.61	0.37
<b>GMFCS 5</b>	-0.60	-1.61; 0.40	0.24	-0.35	-1.45; 0.75	0.53

\*Adjusted for age, sex, gestational age and concomitant disease (epilepsy and recurrent/respiratory infection).  
CI=confidence interval; GMFCS=Gross Motor Function Classification System

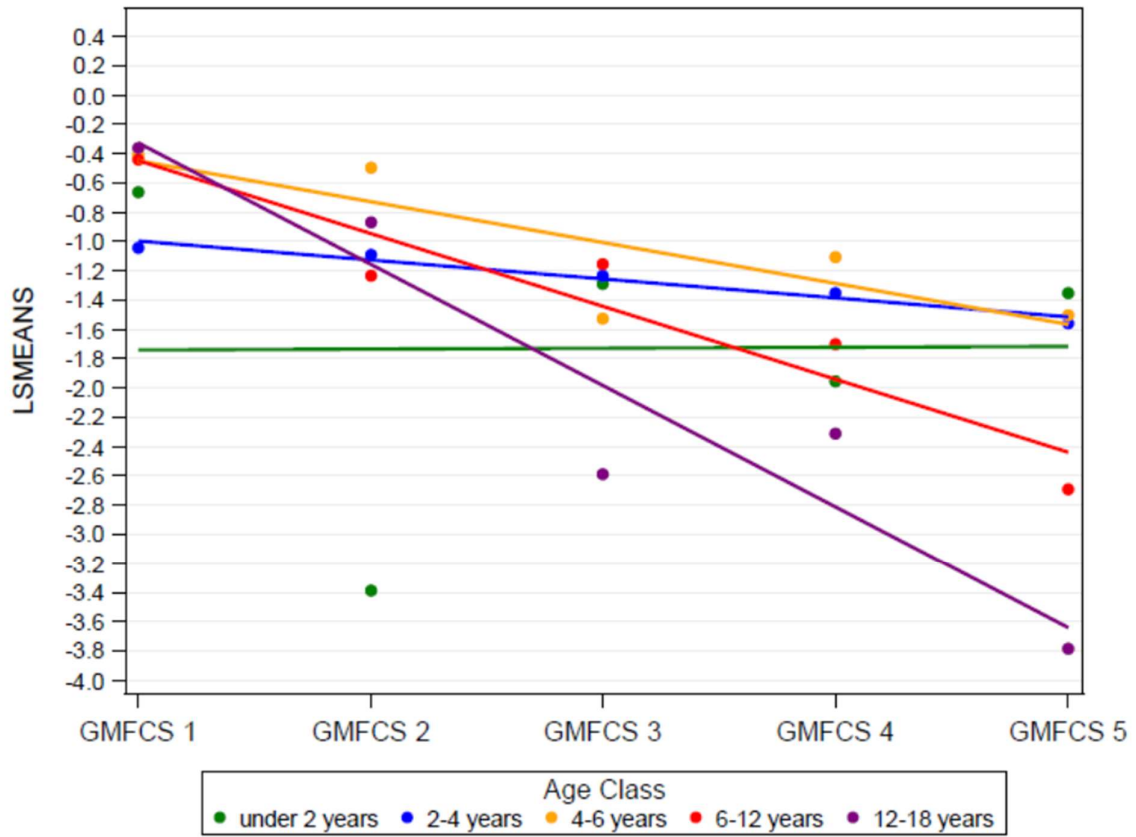
**Supplementary Figure 3.** Effect modifiers for the association between GMFCS and WFA. A

p-value is a signal for an effect modifier if p-value < 0.10

**Interaction term with country (p-value=0.03)**



Interaction term with age group (p-value= 0.08)



## Survey used in the PURPLE N study

This is the paper version. In the PURPLE N study this survey was build into a secured, electronic environment.

Question	Answer possibilities
<b>General participant characteristics</b>	
Date of birth	Month - year
Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female
Informed consent signed	<input type="checkbox"/> Yes <input type="checkbox"/> No
Country	<i>Free text</i>
What is your profession?	<input type="checkbox"/> Paediatric neurologist <input type="checkbox"/> Rehabilitation physician <input type="checkbox"/> Paediatrician <input type="checkbox"/> Other, specify...
What type of cerebral palsy does the child have?	<input type="checkbox"/> Spastic <input type="checkbox"/> Ataxic <input type="checkbox"/> Dyskinetic/Athetoid <input type="checkbox"/> Mixed
What is the topographical type of cerebral palsy?	<input type="checkbox"/> Hemiplegia <input type="checkbox"/> Diplegia <input type="checkbox"/> Triplegia <input type="checkbox"/> Quadriplegia
What was the child's gestational age at birth?	<input type="checkbox"/> ... weeks ... days <input type="checkbox"/> Unknown
What was the child's weight at birth?	<input type="checkbox"/> ... gr / kg <input type="checkbox"/> Unknown
What was the child's head circumference at birth?	<input type="checkbox"/> ... cm <input type="checkbox"/> Unknown
At what age was the child diagnosed with cerebral palsy?	<input type="checkbox"/> ... months <input type="checkbox"/> Unknown
What is the GMFCS level of this child?	<input type="checkbox"/> GMFCS 1 <input type="checkbox"/> GMFCS 2 <input type="checkbox"/> GMFCS 3 <input type="checkbox"/> GMFCS 4 <input type="checkbox"/> GMFCS 5
Does the child use a walking aid or wheelchair?	<input type="checkbox"/> No <input type="checkbox"/> Walking aid only <input type="checkbox"/> Wheelchair only <input type="checkbox"/> Both <input type="checkbox"/> Unknown
What is the most recent GMFM score of the child?	<i>Free text</i>
Was this GMFM score measured with the GMFM-88 or GMFM-66?	<input type="checkbox"/> GMFM-66 <input type="checkbox"/> GMFM-88
When was this assessed?	Day – Month – Year
<b>Comorbidities</b>	

Active epilepsy?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If yes, is the medication that is currently used effective to control the seizures?	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No Medication given <input type="checkbox"/> Unknown
Cognitive problems?	<input type="checkbox"/> Yes <input type="checkbox"/> No
How would you describe the cognitive function of this child?	<input type="checkbox"/> Mild impairment <input type="checkbox"/> Moderate impairment <input type="checkbox"/> Severe impairment
Gastrointestinal problems?	<input type="checkbox"/> Yes <input type="checkbox"/> No
What kind of gastrointestinal problems is the child suffering from (please select all that apply)?	<input type="checkbox"/> Gastroesophageal Reflux <input type="checkbox"/> Vomiting <input type="checkbox"/> Abdominal pain for unknown reasons <input type="checkbox"/> Constipation <input type="checkbox"/> Diarrhoea <input type="checkbox"/> Retching/gagging <input type="checkbox"/> Other, specify...
Behavioral problems?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Hearing abnormalities?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Oropharyngeal dysphagia?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Pain?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Respiratory problems	<input type="checkbox"/> Yes <input type="checkbox"/> No
Sialorrhea (drooling)	<input type="checkbox"/> Yes <input type="checkbox"/> No
Sleep problems	<input type="checkbox"/> Yes <input type="checkbox"/> No
Visual abnormalities	<input type="checkbox"/> Yes <input type="checkbox"/> No
Cardiological problems	<input type="checkbox"/> Yes <input type="checkbox"/> No
What kind of medication is the child currently using (please select all that apply)?	<input type="checkbox"/> Anticonvulsant <input type="checkbox"/> Antispasticity medication (baclofen, tizanidine, dantrolen, diazepam) <input type="checkbox"/> Botulinum toxin <input type="checkbox"/> Laxative <input type="checkbox"/> Motility stimulation medication <input type="checkbox"/> Ritalin <input type="checkbox"/> Antibiotics (in the past 6 months) <input type="checkbox"/> Other, specify...
<b>Therapies</b>	
Does the child receive physical therapy?	<input type="checkbox"/> Yes

	<input type="checkbox"/> No <input type="checkbox"/> Unknown
What kind of physical therapy does the child currently receive?	<input type="checkbox"/> Constraint-induced movement therapy <input type="checkbox"/> Bimanual therapy <input type="checkbox"/> Context-focused therapy <input type="checkbox"/> Strength training <input type="checkbox"/> Hippotherapy <input type="checkbox"/> Walking training <input type="checkbox"/> Hydrotherapy <input type="checkbox"/> Neurodevelopmental therapy (Bobath) <input type="checkbox"/> Vojta therapy <input type="checkbox"/> Biofeedback therapy <input type="checkbox"/> Fitness training <input type="checkbox"/> Stretching <input type="checkbox"/> Other, specify...
Where does the child receive xx therapy? *for each type of therapy the child receives this question was asked*	<input type="checkbox"/> At home <input type="checkbox"/> In a rehabilitation centre <input type="checkbox"/> At a physical therapy practice
How often does the child receive xx therapy? *for each type of therapy the child receives this question was asked*	... times / week or ... times/month
How long does one xx therapy session take (minutes/session)	... minutes
Does the child receive occupational therapy?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
How often does the child receive occupational therapy?	... times / week or ... times/month
How long does one therapy session take?	... minutes
On what level are you monitoring outcomes of the (physical/occupational) therapy? (please select all that apply)	<input type="checkbox"/> Spasticity management <input type="checkbox"/> Contracture management <input type="checkbox"/> Muscle strength <input type="checkbox"/> Bone density <input type="checkbox"/> Motor activities <input type="checkbox"/> Function and self-care <input type="checkbox"/> Participation in society <input type="checkbox"/> Other, specify...
Does the child receive speech- and language therapy?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
How often does the child receive speech- and language therapy?	... times / week or ... times/month
How long does one therapy session take?	... minutes
What is the purpose of the speech- and language therapy (please select all that apply)?	<input type="checkbox"/> Manage communication and/or speech related issues <input type="checkbox"/> Manage eating, drinking or swallowing related issues <input type="checkbox"/> Manage saliva related issues <input type="checkbox"/> Other, specify...

Which other health care professionals are currently involved in the treatment of the child (please select all that apply)?	<input type="checkbox"/> Neurologist <input type="checkbox"/> Orthopaedic surgeon <input type="checkbox"/> Paediatrician <input type="checkbox"/> Rehabilitation physician <input type="checkbox"/> Psychologist/Psychiatrist <input type="checkbox"/> Physical therapist <input type="checkbox"/> Occupation therapist <input type="checkbox"/> Dietician <input type="checkbox"/> Speech-language therapist <input type="checkbox"/> Gastroenterologist <input type="checkbox"/> Other, specify...
<b>Anthropometry</b>	
Weight	<input type="checkbox"/> ... g or kg <input type="checkbox"/> not done
Date of weight measurement	Day – Month - Year
Are there problems with unintentional weight loss or lack of weight gain in the past year?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Are there problems with unintentional weight gain in the past year?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Height	<input type="checkbox"/> ... cm or m <input type="checkbox"/> not done
Date of height measurement	
Body Mass Index	... kg/m <sup>2</sup>
Tibial length left side	<input type="checkbox"/> ... cm <input type="checkbox"/> not done
Tibial length right side	<input type="checkbox"/> ... cm <input type="checkbox"/> not done
Knee height left side	<input type="checkbox"/> ... cm <input type="checkbox"/> not done
Knee height right side	<input type="checkbox"/> ... cm <input type="checkbox"/> not done
Is the left arm considered impaired or less-impaired?	<input type="checkbox"/> Impaired <input type="checkbox"/> Less-impaired <input type="checkbox"/> Arm not used for measurements
Is the right arm considered impaired or less-impaired?	<input type="checkbox"/> Impaired <input type="checkbox"/> Less-impaired <input type="checkbox"/> Arm not used for measurements
Upper arm length left side	<input type="checkbox"/> ... cm <input type="checkbox"/> not done
Upper arm length right side	<input type="checkbox"/> ... cm <input type="checkbox"/> not done
Mid upper arm circumference left side	<input type="checkbox"/> ... cm <input type="checkbox"/> not done
Date of measurement mid upper arm circumference left	Day – Month – Year
Mid upper arm circumference right side	<input type="checkbox"/> ... cm <input type="checkbox"/> not done
Date of measurement mid upper arm circumference right	Day – Month – Year

Triceps skinfold thickness left side	<input type="checkbox"/> ... mm <input type="checkbox"/> not done
Triceps skinfold thickness right side	<input type="checkbox"/> ... mm <input type="checkbox"/> not done
Do you use growth charts for this child?	<input type="checkbox"/> Yes <input type="checkbox"/> No
What kind of growth charts do you use?	<input type="checkbox"/> CP specific growth charts <input type="checkbox"/> General national growth charts <input type="checkbox"/> General international growth charts
Are you, based on the growth charts, concerned about the child's growth	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Feeding and Nutrition</b>	
<input type="checkbox"/> Is the child currently fed orally or by tube?	<input type="checkbox"/> Oral - self feeding <input type="checkbox"/> Oral - assisted feeding <input type="checkbox"/> Oral - self feeding and Tube <input type="checkbox"/> Oral - parent feeding and Tube <input type="checkbox"/> Tube only <input type="checkbox"/> Unknown
If tube, what kind of tube feeding is being used for this child (please select all that apply)?	<input type="checkbox"/> Commercial tube feeding <input type="checkbox"/> Homebrew <input type="checkbox"/> Unknown
What type of commercial tube feeding does this child receive (please select all that apply)?	<input type="checkbox"/> Low energy <input type="checkbox"/> Standard energy <input type="checkbox"/> High energy <input type="checkbox"/> Peptide-based/hydrolysed protein <input type="checkbox"/> With fibre <input type="checkbox"/> For paediatric use <input type="checkbox"/> For adult use <input type="checkbox"/> Unknown
What kind of tube does the child have (please select all that apply)?	<input type="checkbox"/> Nasogastric tube <input type="checkbox"/> Percutaneous Endoscopic Gastrostomy (PEG) <input type="checkbox"/> Jejunostomy (PEJ) <input type="checkbox"/> Unknown
How is the tube feeding presented to the child?	<input type="checkbox"/> Bolus <input type="checkbox"/> Continuous <input type="checkbox"/> Unknown
Are there problems with the tube feeding?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
If yes, what problems does the child experience (please select all that apply)?	<input type="checkbox"/> Reflux <input type="checkbox"/> Vomiting <input type="checkbox"/> Infection of the PEG/PEJ <input type="checkbox"/> Obstruction of the tube <input type="checkbox"/> Unknown
Does the child currently use oral nutritional support	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown



<p>Is there any other dietary adaptation needed for this child (please select all that apply)?</p>	<input type="checkbox"/> No <input type="checkbox"/> Yes, thickening of foods <input type="checkbox"/> Yes, vitamin/mineral supplement <input type="checkbox"/> Yes, positioning during feeding <input type="checkbox"/> Yes, oral appliances and equipment <input type="checkbox"/> Yes, chopping/mashing <input type="checkbox"/> Yes, other <input type="checkbox"/> Unknown
<p>Are you aware of any problems related to feeding stress or long feeding times for this child?</p>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
<p>If yes, what are these problems (please select all that apply)?</p>	<input type="checkbox"/> Mealtimes take (too) long <input type="checkbox"/> Mealtime is stressful for child <input type="checkbox"/> Mealtime is stressful for parent(s)/caregiver(s)
<p>How do you perceive the nutritional status of this child?</p>	<input type="checkbox"/> Severely undernourished/underweight <input type="checkbox"/> Mildly undernourished/underweight <input type="checkbox"/> Normal <input type="checkbox"/> Mildly overweight <input type="checkbox"/> Severely overweight
<p>Are you concerned about the child's nutritional status</p>	<input type="checkbox"/> Yes <input type="checkbox"/> No
<p>Is this concern addressed by you or another health care professional?</p>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure