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Improvement of coherence and comparability of data on children with disabilities

Understanding how responses to social and medical models differ by socio-economic characteristics: results from a comprehensive survey

Note by Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC)*

Abstract

A better understanding of how responses to social and medical models differ by socio-economic characteristics would help to identify effective strategies to improve the health and well-being of children with disabilities. It would also help to increase consistency in data collection and improve methodology in the conceptual paradigm shift from medical to social models of defining disability. In this study, we explore the associations between two different measures of disability: Self-reported functional limitations based on the Washington Group / UNICEF Child Functioning Module questions and objectively screened clinical impairments. We use a recent comprehensive survey in Türkiye that assesses both reported functional limitations and clinical impairments. The 2022 child survey contains information on 14,705 children aged 0-17 living in 9,010 households. We use the principal component analysis and logistic model to explore and test associations. We find that the disability prevalence rate is 2% when we use screened clinical impairments, but 14.1% when we use the WG / UNICEF CFM questions. Our findings suggest that the choice of disability measure strongly influences the prevalence, composition and outcomes of people identified as disabled. We also find that there are three mainly sub-populations within the 14.1%. We also show that compared to children without a medical disability report, those with a report are three times more likely to have symptoms of depression or anxiety.

*Prepared by Ahmet Ozturk

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I. Introduction

1. Disability is a complex and evolving concept that includes aspects of body function and structure, capacity, and performance (Madans, 2011; UNICEF, 2021). Historically, disability measurements have been limited to areas related to physical and sensory functioning, while psychosocial functioning in particular has often been ignored. Moreover, there has always been a need for an internationally standardized data collection methodology.
2. In this context, UNICEF and the Washington Group on Disability Statistics have developed the Child Functioning Module (CFM) for use in censuses and surveys to meet the demand for comparable data collection for children with disabilities worldwide. The module aims to provide a population-level estimate of the number and proportion of children with functional difficulties. It covers children aged 2-17 and assesses difficulties in various areas of functioning. Consistent with the biopsychosocial model of disability, the module focuses on the presence and extent of functional difficulties rather than body structure or conditions. In addition to questions on areas related to physical, sensory and cognitive functioning, the CFM also includes questions related to difficulties in psychosocial functioning, such as managing emotions, accepting changes, controlling behavior and making friends (UNICEF, 2021).
3. In March 2017, a joint statement issued by various UN agencies and Member States, disability organizations and other stakeholders recommended the CFM module as the appropriate tool for disaggregating SDG data on children (UNICEF, 2021). Accordingly, the CFM was included in Türkiye Child Survey conducted by the Turkish Statistical Institute (TURKSTAT) in collaboration with the UNICEF Türkiye between October 10 and December 16, 2022 (TURKSTAT, 2023b). The survey asked about both functional limitations using the CFM module and clinical impairments.
4. In this study, we use this unique dataset to explore associations between two different measures of disability: self-reported functional limitations based on the Washington Group / UNICEF CFM questions and objectively screened clinical impairments. The estimates are therefore robust to differences in survey methodology, as this is a source of bias in disability prevalence across measures. The 2022 child survey contains information on 14,705 children aged 0-17 living in 9,010 households. We use the principal component analysis and logistic model to explore and test associations.
5. We find that the prevalence rate of disability is only 2% when we use the screened clinical impairments, but 14.1% when we use the CFM questions. The most prevalent disability in the CFM is seen in psychosocial domains: anxiety ranks first with 7.3%, followed by depression with 4.7%. The prevalence of disability of other three domains related to psychosocial functioning - accepting change, controlling behavior and making friends – is around 2%. The prevalence of the remaining 8 domains related with physical, sensory and cognitive functioning distribute around 1%. Overall, the proportion of children with functional difficulties varies considerably by CFM domains; however, psychosocial difficulties consistently account for the largest proportion of children worldwide (UNICEF, 2021).
6. Based on prevalence rates, the distributions of socioeconomic characteristics, and logistic regression estimates, we find that the 13 domains of the CFM questions can be categorized into three disability populations. The first group consists of children with disabilities who have functional difficulty in at least one domain of seeing, hearing, walking, self-care,

communication, learning, remembering, and concentrating, referred to as physical, sensory and cognitive group. The second group consists of children with disabilities who have functional difficulty in at least one domain of accepting change, controlling behavior and making friends, referred to as social group. The third group consists of children with disabilities who have functional difficulty in domain of anxiety or depression, referred to as emotion group.

7. A similar division is also obtained by Zia et al. (2020) for assessment of disability in Uganda. Based on an exploratory factor analysis, they find that the CFM is a two-factor structure with seeing, hearing, walking, self-care, communication, learning, remembering, concentrating, accepting change, behavior control, and making friends forming the first group (Motor and Cognition), while anxiety and depression forming the second group (Mood). Unlike them, we find that accepting change, controlling behavior, and making friends can be considered as a third factor.
8. We also find that compared to children without a medical disability report, those with a report are three times more likely to have signs of depression or anxiety. Similar findings are also obtained by de Castro et al. (2023) with nationally representative data from 26 countries and a total sample size of 123,975 adolescents aged 10-17 years. These results need to be further considered when policies are developed for the disabled population.
9. The study is structured as follows. Section 2 explains the data we use. Section 3 describes the empirical specification. Section 4 presents the results in two subsections. The first subsection provides descriptive analysis, and the second presents logistic estimates of the comparison of disability prevalence and association across the definitions. Section 5 concludes.

II. Data

10. The study relies on a unique dataset from Türkiye Child Survey asked questions both on functional limitations and clinical impairments. The estimates are therefore robust to differences in survey methodology, as this is a source of bias in disability prevalence across measures. TURKSTAT conducted the survey in cooperation with the UNICEF Türkiye between October 10 and December 16, 2022. The sample size of the survey was calculated to produce country level estimates. The sample size is 14,705 children from 9,010 households, each with at least one child in the 0-17 age group.
11. Information was obtained mainly from mothers (in cases where the mother does not live in the same household or is not alive, the primary caregiver is the father, grandmother, aunt, etc.). This survey collects information on education, living conditions, early childhood development, health, disability, quality of school life, breastfeeding and nutrition, and social and cultural participation for children aged 0-17 years. The survey also has household information such as housing characteristics, income and social transfers, places/institutions within walking distance of the household (TURKSTAT, 2023b).
12. For disability data, the survey collects information on objectively-screened clinical impairments by asking whether a child has a disability report issued by a medical board for mental, hearing, seeing, orthopedic, speech, learning, and pervasive developmental disorder. It also asks about the degree of disability. In addition to these questions, the CFM translated questions were also included in the survey. The CFM is specifically designed to collect

information on children aged 5-17 years (or aged 2-4 years), with a knowledgeable proxy respondent providing information for each child (WG, 2023). The survey has questions on all domains of the module including vision, hearing, mobility, self-care, communication, learning, remembering, concentrating, accepting change, controlling behavior, making friends, anxiety, and depression.

III. Empirical specification

13. We use binary logistic regression to compare disability prevalence and association across definitions. Robust standard errors are chosen for the hypothesis testing. The dependent variable is binary that indicates whether a person is reported to have some difficulties according to the CFM module. Age, gender, household income, and mother's years of schooling are used as control variables.
14. However, the mother's years of schooling is not directly reported. Instead, the highest level of education of the individual has ever attended is reported. Thus, in the prediction of the mean education year; not attended school or pre-school taken as 0 year, primary school as 5 years, elementary school as 8 years, high school as 11 years, 2 or 3 year higher education school as 13 years, undergraduate as 15 years, master degree as 17 years, and doctorate degree are accepted as 20 years. Similar approaches are also used in Aydemir and Kırdar (2017) and Öztürk and Tümen (2023). Both studies estimate the mean years of schooling conditional on the highest completed schooling level by using the Turkish Demographic and Health Surveys, as they contain information on both graduation and years of schooling.
15. The survey also includes variables related to items the child has at home, including whether the child has his/her own room. The 15 questions on possessions explore the following items: desk for the studying, quiet work environment, mobile phone, computer, tablet, software for education, internet connection, calculator, dictionary, additional resource books, magazine, literature books, artwork, art books, and musical instrument. Since a total of 16 questions are highly correlated and measure similar characteristics, we apply Principal Component Analysis (PCA)¹ to reduce dimensions. The main aim of the PCA is to explain the variance-covariance structure of a set of correlated variables through a few uncorrelated variables, called principal components, which contain most of the information in the original dataset (Johnson and Wichern, 2007; Bartholomew et al., 2008).
16. Figure 1 shows the scree plot of the eigenvalues versus the component number. There is an elbow at the third component. Even though, the third and fourth components meet the Kaiser's criterion (eigenvalue > 1.0), the third and subsequent components have similar eigenvalues. This means that each of them explains a similar but small proportion of the total variance. Therefore, in the regression analysis, we use two principal components instead of 16 variables on the items that the child has at home.
17. Table 1 presents the component loadings for the first two principal components. It shows the correlation coefficients between variables and components. The loadings for the first component are all fairly large and positive. The first component might therefore be

¹ We choose a linear PCA model for computational efficiency. We also repeat our estimates with one-factor logit model. Our results are robust to using a latent trait model for dimension reduction.

interpreted as an overall measure of the economic strength of households. A child who scores highly on each variable also scores high on this component. The coefficients for the second component have a bipolar structure. Artwork and art books have relatively high positive loadings, while desk for studying, quiet work environment, mobile phone, internet connection, and dictionary have relatively high negative loadings. Therefore, the second component can be interpreted as a personal attitude towards the preference of art and creativity over the traditional and technology-oriented approach.

Figure 1
Screen plot of eigenvalue versus number of component

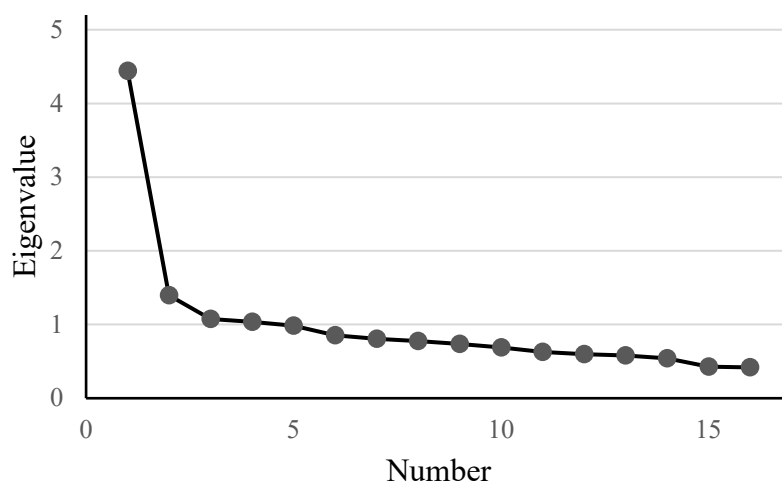


Table 1
Component loadings for the first two principal components

Variable	PC1	PC2
Own room	0.50	0.00
Desk for the studying	0.66	-0.24
Quiet work environment	0.61	-0.26
Mobile phone	0.44	-0.25
Computer	0.61	-0.08
Tablet	0.43	0.10
Software for education	0.35	0.39
Internet connection	0.66	-0.26
Calculator	0.50	-0.10
Dictionary	0.58	-0.21
Additional resource books	0.58	-0.06
Magazine	0.45	0.35
Literature books	0.60	-0.08
Artwork	0.39	0.62
Art books	0.40	0.62
Musical instrument	0.53	0.14

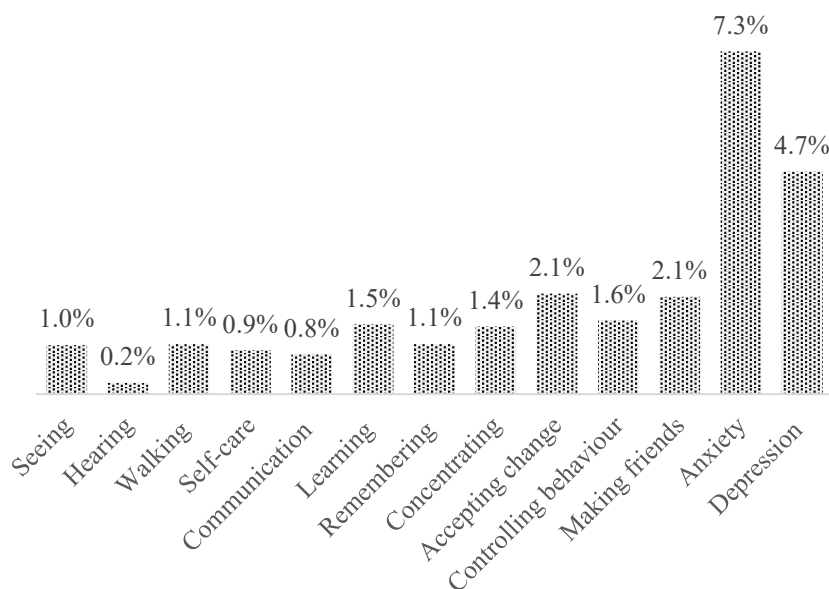
IV. Result

A. Descriptive analysis

18. Table 2 presents the percentage of children aged 5-17 years with functional difficulty for the WG/UNICEF CFM domains. Overall, the most common prevalent disability is seen in psychosocial domains: anxiety ranks first with 7.3%, followed by depression with 4.7% (Figure 2). The prevalence of disability in other three domains of psychosocial functioning - accepting change, controlling behavior and making friends - is around 2%. The prevalence of remaining 8 domains related to physical, sensory and cognitive functioning distribute around 1%.

Figure 2

Percentage distribution of overall disability by CFM domains



Source: TURKSTAT, 2023a

19. Similar to the prevalence rates, socio-economic characteristic of children also differ across domains. The percentage of 10-17 age group is highest in anxiety and depression domains, followed by other three domains related to psychosocial functioning. Similarly, while the rate of attendance to education is over 90% in the anxiety and depression domains, close to 90% in other three domains of psychosocial functioning, and around 80% in the physical, sensory and cognitive domains. Similar distributions are also observed for percentage of higher education for the mother's schooling level and the percentage of richest group for household income level. Among parents of children with disabilities, parents of children with anxiety and depression domains appear to have the highest income and are more educated. This is followed by parents in the areas of accepting change, controlling behavior and making friends, and lastly, parents in the physical, sensory and cognitive domains.

Table 2: Socio-demographic characteristics by disability status for children aged 5-17

	Percentage of children aged 5-17 years with functional difficulty										Percentage of children with functional difficulty in at least one domain			
	Seeing	Hearing	Walking	Self-care	Comm.	Learning	Remem.	Concent.	Accep. change	Controlling behaviour		Making friends	Anxiety	Depression
Total	1.0	0.2	1.1	0.9	0.8	1.5	1.1	1.4	2.1	1.6	2.1	7.3	4.7	14.1
Gender														
Male	44.1	54.9	52.6	55.1	58.5	62.0	58.8	66.1	57.0	64.1	51.0	51.4	48.1	51.4
Female	55.9	45.1	47.4	44.9	41.5	38.0	41.3	33.9	43.0	35.9	49.0	48.6	51.9	48.6
Age														
5-9 years	22.1	50.5	49.3	68.4	61.7	52.2	53.3	50.6	41.7	52.2	43.8	34.8	38.6	37.7
10-14 years	45.9	37.3	30.5	25.7	28.2	32.0	32.6	35.2	38.1	27.9	36.0	37.1	35.5	37.5
15-17 years	32.0	12.2	20.2	6.0	10.1	15.8	14.0	14.2	20.1	19.9	20.2	28.1	25.9	24.8
Attendance to education														
Attending	93.3	85.4	77.6	70.3	73.2	78.1	81.3	81.2	87.2	79.9	86.5	93.2	91.3	92.4
Not attending	6.8	14.6	22.4	29.7	26.8	21.9	18.7	18.8	12.8	20.1	13.6	6.8	8.7	7.6
Mother's education														
Pre-primary or none	12.8	32.0	22.4	29.3	16.2	24.9	28.7	23.0	15.5	18.8	14.9	14.4	15.1	15.7
Primary	53.7	41.1	47.7	44.4	51.7	48.4	43.0	45.4	43.4	50.5	50.2	50.7	49.4	50.4
Secondary	19.0	23.6	20.3	14.7	19.2	16.0	16.3	17.3	22.9	17.6	21.3	18.8	21.0	19.4
Higher	14.6	3.4	9.6	11.6	12.9	10.7	12.0	14.4	18.2	13.2	13.7	16.1	14.5	14.5
Wealth index quintile														
Poorest	14.1	4.8	17.4	14.9	13.3	16.5	15.4	15.7	15.2	13.8	12.3	10.9	12.4	12.9
Second	33.9	31.0	31.8	38.1	32.1	37.1	34.5	28.3	25.4	30.7	30.9	25.2	29.5	27.4
Middle	20.7	14.5	19.8	16.8	21.5	17.8	20.2	21.8	19.0	16.5	17.2	17.7	15.1	18.6
Fourth	16.7	15.0	21.9	19.5	17.7	17.6	18.4	20.2	19.0	22.1	22.8	21.7	21.3	20.9
Richest	14.7	34.8	9.2	10.7	15.4	11.1	11.5	14.0	21.5	16.8	16.8	24.6	21.7	20.2

Note: Observations are weighted using the sampling weights so that the results are nationally representative.

20. According to these prevalence rates and the distributions of socioeconomic characteristics, three different disability groups in CFM are observed in Türkiye. Domains related to physical, sensory and cognitive functioning form a group. Domains related to psychosocial functioning form two groups, one is accepting change, controlling behavior and making friends, and the other is anxiety and depression. Based on these observations, we will define three groups for testing procedures. The first group consists of disabled children who have functional difficulty in at least one domain of seeing, hearing, walking, self-care, communication, learning, remembering, or concentrating, we will refer to as physical, sensory and cognitive group. The second group consists of disabled who have functional difficulty in at least one domain of accepting change, controlling behavior or making friends, we will refer to as social group. The third group consists of disabled children who have functional difficulty in at least one domain of anxiety or depression, we will refer to as emotion group.

B. Comparison of disability prevalence and association across definitions

21. Table 3 presents odds ratios of the logistic regression to explore the association between different disability populations. We find that the group of physical, sensory and cognitive is highly associated with the group of children with a medical disability report, which we will refer to medical disability group (column 1). When gender, age, years of mother's education and income are controlled, the odds ratio of this relationship is around 43. The odds ratio of this group can be interpreted as that if a child has a medical report of disability, he or she is 43 times more likely to have difficulties in one of the 8 domains of the physical, sensory and cognitive group than a child without a medical report.
22. When we look at the association between social domains and the medical disability group, we find that the odds ratio declined by almost half compared the association between physical, sensory and cognitive and the medical groups (column 3). We run the same regression for the third comparison, where we look the association between the emotion and medical disability groups (column 5). Even though, we still get a highly significant association, the odds ratio drops rapidly to levels 2-3. However, this also reveals the fact that, compared to children without disability medical report, those with a disability report are three times more likely to have signs of depression or anxiety. Similar findings are also obtained by de Castro et al. (2023) with nationally representative data from 26 countries, with a total sample size of 123,975 adolescents aged 10-17. These results need to be further considered when policies are developed for the disabled population.
23. We provide the same estimates when additionally control for two principal components of the 16 variables regarding items a child has in his or her room. Because the sample of observations varies due to missing values in possession indicators, we present separate estimates in the column 2, column 4, and column 6 of the Table 3. However, our estimates are robust to additional control variables and in different subpopulations.
24. We conclude that the physical, sensory and cognitive domains group and the medical disability group are highly similar groups when the effect of socio-economic characteristic of children and households are controlled. The association between social domains and the medical group weaken by half, and the association between the emotion and the medical group is much weaker than the other two associations. A similar division is also reported in Zia et al. (2020) for assessing disability in Uganda. Based on an exploratory factor analysis, they find that the CFM is a two-factor structure that seeing, hearing, walking, self-care,

communication, learning, remembering, concentrating, accepting change, controlling behavior, and making friends constitute the first group (Motor and Cognition), while anxiety and depression constitute the second group (Mood).

Table 3
Odds of reporting a functional limitation amongst children with medical disability report

	Dependent variable: Children aged 5-17 years with functional difficulty					
	Physical, sensory and cognitive		Social		Emotion	
	(1)	(2)	(3)	(4)	(5)	(6)
Children aged 5-17 years with a medical disability report	42.8 (7.2)***	36.2 (7.1)***	14.5 (2.3)***	10.7 (2.1)***	3.0 (0.5)***	2.3 (0.5)***
Control variable:						
Gender	Yes	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes	Yes
Years of mother education	Yes	Yes	Yes	Yes	Yes	Yes
Income	Yes	Yes	Yes	Yes	Yes	Yes
PC1	No	Yes	No	Yes	No	Yes
PC2	No	Yes	No	Yes	No	Yes
# of observations	10,698	9,545	10,698	9,545	10,698	9,545

Note: Observations are weighted using the sampling weights so that the results are nationally representative. Robust standard errors are in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

25. Finally, in Table 4, we compare the socio-economic characteristics of four disability groups and the overall population. Among four disabled populations, children with the medical report are farthest away from the overall population in terms socioeconomic characteristics. The percentage of small children are highest, the percentage of those attending to schools is lowest at close to 80%, the percentage of mother's education with higher education is lower, the share of richest group is also lower in this group. Among the CFM disability groups, the medical group is closest to the physical, sensory and cognitive domains. This close relationship is also confirmed in Table 3. The emotion domains are however close to the distribution of the overall population. The association between social domains and the medical group is moderate compared to the association between the medical and the physical, sensory and cognitive group.

Table 4
Socio-demographic characteristics by disability status for children aged 5-17

	Overall Population	Medical	Physical, sensory and cognitive	Social	Emotion
Total	100.0	2.0	4.6	4.2	8.5
Gender					
Male	51.3	66.6	55.2	55.7	50.9
Female	48.7	33.4	44.8	44.3	49.1
Age					
5-9 years	39.4	44.0	42.9	41.2	35.3
10-14 years	38.0	37.0	35.4	36.9	38.0
15-17 years	22.6	19.0	21.6	22.0	26.7
Attendance to education					
Attending	94.6	82.0	88.2	89.5	93.3
Not attending	5.4	18.0	11.8	10.5	6.7
Mother's education					
Pre-primary or none	16.9	21.5	20.7	15.5	14.8
Primary	51.3	49.8	49.6	48.3	50.3
Secondary	17.8	16.5	18.0	21.7	20.1
Higher	14.1	12.1	11.7	14.6	14.9
Wealth index quintile					
Poorest	11.8	15.4	16.6	13.7	12.0
Second	26.6	28.6	32.0	27.9	25.3
Middle	17.7	17.2	18.8	18.3	17.6
Fourth	21.7	20.3	18.5	20.5	22.1
Richest	22.3	18.5	14.2	19.6	23.1

Note: Observations are weighted using the sampling weights so that the results are nationally representative.

V. Conclusion

26. A recent comprehensive survey in Türkiye assesses both reported functional limitations and clinical impairments. We use this unique dataset and investigate the associations between two different disability populations: self-reported functional limitations based on the CFM questions and objectively screened clinical impairments. Our findings suggest that the choice of disability measure strongly influences the prevalence, composition and outcomes of people identified as disabled.
27. We find that there are three mainly sub-populations within the 14.1%. Among these CFM group, the physical, sensory and cognitive domains has a similar distribution of socioeconomic characteristics as the medical disability group. The other two CFM populations have weaker relationships with the medical group. In particular, the emotion group describes groups of people with different socioeconomic characteristics.

28. Even though past estimates on disability have mostly been based on medical concepts of disability, which emphasize clinical conditions and the presence of specific impairments, countries continue to produce them as they are still referenced in legislation. However, the Washington Group/UNICEF Child Functioning Module would be a good complement to the medical model. The main benefit of the CFM module is that it provides comparable global and regional estimates. The main role of this comparable disability prevalence should be to raise public awareness, much like the OECD's Program for International Student Assessment (PISA) scores. This impact could be further enhanced if three prevalence rates are disclosed for the 13 domains instead of one. This is important for understanding the functional profile of the population, particularly for formulation of disability inclusive policies. Furthermore, with a clear understanding of the types of disabilities encountered, resources and programs can be adapted accordingly.
29. In concluding this research, it is important to acknowledge the limitations of this study and recognize the constantly evolving nature of socio-economic dynamics. Future research should continue to explore the differences between self-reported functional limitations based on the Washington Group / UNICEF CFM questions and objectively screened clinical impairments with different country data, especially to strengthen the role of the CFM model.

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