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Impact of Socio-demographic Factors on the Cognitive Well-being of Children with Special Needs in Low-and Middle- Income Countries: A Case of Morocco - Descriptive and Multilevel Approaches

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ABSTRACT
Using data from the 2014 General Census of Population and Housing in Morocco as an example, this paper aims to examine the socio-demographic barriers that hinder the education and literacy of children with special needs (CWSN) in low- and middle-income countries (LMICs). A combined descriptive analysis and mixed effects logistic regression was used to analyse these data. Comparative findings from international studies on this topic on CWSN in LMICs were also used. The above data provide information on the demographic, socio-economic, cultural and environmental characteristics of a representative sample of 10% of the Moroccan population and households. Both individual and contextual information on people with special needs was collected, including educational status, literacy and socio-demographic characteristics. The rate of school exclusion for CWSN is significantly higher at 0.485 compared to 0.146 for children without special needs. In addition, 34% of CWSN aged 10-17 are not literate. The likelihood of enrolment and literacy for these children is influenced by several socio-demographic factors. Moroccan CWSN have limited access to opportunities for cognitive well-being. It is therefore crucial that policymakers prioritise the cognitive well-being of these children, which is a fundamental right rather than a privilege.

ABSTRAK
Menggunakan data dari Sensus Umum Penduduk dan Perumahan di Maroko tahun 2014 sebagai contoh, makalah ini bertujuan untuk meneliti hambatan sosio-demografis yang menghambat pendidikan dan literasi anak-anak berkebutuhan khusus (CWSN) di negara-negara berpenghasilan rendah dan menengah (LMIC). Analisis deskriptif gabungan dan regresi logistik efek campuran digunakan untuk menganalisis data ini. Temuan komparatif dari studi internasional tentang topik ini pada CWSN di LMIC juga digunakan. Data di atas memberikan informasi tentang karakteristik demografi, sosial-ekonomi, budaya dan lingkungan dari sampel representatif 10% dari populasi dan rumah tangga Maroko. Baik informasi individual maupun kontekstual tentang orang-orang dengan kebutuhan khusus dikumpulkan, termasuk status pendidikan, literasi dan karakteristik sosio-demografis. Tingkat pengecualian sekolah untuk CWSN secara signifikan lebih tinggi pada 0,485 dibandingkan dengan 0,146 untuk anak-anak tanpa kebutuhan khusus. Selain itu, 34% CWSN berusia 10-17 tahun tidak melek huruf. Kemungkinan pendaftaran dan literasi bagi anak-anak ini dipengaruhi oleh beberapa faktor sosio-demografis. CWSN Maroko memiliki akses terbatas terhadap peluang untuk kesejahteraan kognitif. Oleh karena itu, sangat penting bagi para pembuat kebijakan untuk memprioritaskan

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kesejahteraan kognitif anak-anak ini, yang merupakan hak dasar dan bukan hak istimewa.

A. INTRODUCTION

Over 80% of individuals with disabilities reside in Low-and Middle- Income Countries (LMICs) (Saran et al., 2020). Despite the efforts made, many hundreds of millions of children in LMICs still face problems related to their vulnerable social situation, such as lack of access to food, sanitation, shelter, healthcare, and education. According to Kamiya (2021), it is estimated that there are 52.9 million children under the age of five with disabilities worldwide, with 95% of them living in LMICs. This group of children experiences greater challenges than their non-disabled peers. In LMICs, approximately 40% of children with disabilities do not attend primary school and 55% do not attend lower secondary school (World Bank Group, 2019).

According to the World Bank Atlas (WBA) method, economies are classified into four categories based on their Gross National Income (GNI) per capita. Low-income economies are those with a GNI per capita of $1,135 or less in 2022. Lower middle-income economies have a GNI per capita between $1,136 and $4,465. Upper middle-income economies are those with a GNI per capita between $4,466 and $13,845 (the 2024 fiscal year). Lastly, high-income economies have a GNI per capita of $13,846 or more. For the same fiscal year, the WBA considers Morocco a lower-middle-income economy (Middle East & North Africa region).

As we will explain below, this study is centered on three core concepts: disability, well-being and cognitive well-being. Disability encompasses diverse definitions. According to the 2006 convention of the United Nations on the rights of children with special needs (CWSN), individuals encompassed by the concept of "persons with disabilities" possess long-standing physical, mental, cognitive or sensory impairments that in combination with manifold obstructions could impede their complete and effective integration within society at an equal level likewise others. The World Health Organization (WHO), as outlined in its official guide to disabilities nomenclature from January 1989, identifies three distinct categories: impairment, incapacity resulting from harm, and disadvantage arising from injury.

Well-being is a concept that is becoming more prevalent in social policy, child development, international development, and empirical research. Due to its imprecision and multidimensionality, many views have been put forward, but there is no unanimously accepted definition. However, the latest definition maintains a dynamic state and process, suggesting that well-being is an ever-changing condition that betters as individuals and communities accomplish their personal and social objectives. To assess this notion, specialists consider both objective elements (such as household income, educational facilities, and health status) and subjective markers (such as happiness, perceived quality of life, and life satisfaction) (Loudghiri et al., 2021).

The notion of child well-being has expanded to cover survival and essential needs on the one hand and quality of life as well as techniques that to include positive effects of children's capacities and attitudes on the other. The domains of children's well-being are: (i) physical well-being; (ii) psychological well-being; (iii) social well-being; and (iv) educational or cognitive well-being (Loudghiri et al., 2021).

According to Pollard et al. (2003), the cognitive domain encompasses those indicators that are deemed to be intellectual or school-related in nature. Article 29 of

the International Convention on the Rights of the Child (ICRC) emphasizes the child's right to education and developing their personality and abilities to their fullest potential. Education correlates with the advancement of society's educational knowledge (Ben Arieh et al., 2014).

Cognitive well-being corresponds to a child's capacity to learn, remember, and reason in an age-appropriate manner. Its connection to the process of thinking, which encompasses memorization, problem-solving, and decision-making, originates in childhood and matures through adolescence to adulthood. Children cannot attain cognitive well-being without several prerequisites, including their level of education and ability to read and write.

Sen 1992 study's identified a small number of centrally important basic capabilities that were crucial to wellbeing, including education (in Terzi, 2007). According to this later, basic education may encompass skills in literacy and numeracy, scientific comprehension, social attitudes and dispositions and active engagement, cognitive learning, and physical exercise and play.

This refers to elementary education as outlined in the 1990 Jomtien Declaration of the World Conference on Education for All. It is determined by the percentage of children of a particular age group who are attending school compared to the total population of the same age.

Target 4.2 of the Sustainable Development Goals (SDGs) aims to ensure that by the end of 2030, all girls and boys have access to quality early childhood development, care, and pre-primary education, in order to prepare them for primary education (United Nations, 2015). In addition, Article 7 of the UN Convention on the Rights of Persons with Disabilities insists on ensuring "the full enjoyment by children with disabilities of all human rights and fundamental freedoms on an equal basis with other children". Also, the Article 24 of the same convention calls for universal quality primary education by 2030.

UNESCO's (2018) report on disability found that PWSN consistently lag behind their peers without disabilities in terms of school enrolment, school completion, average years of schooling and literacy levels. In LMICs, disabled children and their families face many challenges. Compared to children without disabilities, they are more likely to live in poverty, have limited access to health care and have limited educational opportunities (Hearst et al., 2020).

The 2021 Unicef report revealed that CWSN are 25% less likely to attend early childhood education and 42% less likely to possess foundational reading and numeracy skills compared to their peers without special needs. Moreover, 16% fewer CWSN have the opportunity to read or to be read at home. Shockingly, CWSN are 49% more likely to never attend school and 47% more likely to abandon primary education.

B. LITERATURE REVIEW

Several international studies have been undertaken in this area to establish the factors that impact the cognitive welfare of CWSN and impede their educational attainment as well as reading and writing abilities in LMICs. However, few studies have examined the relationship between the contexts of interactions in the household and cognition of CWSN. According to Saran et al. (2020), there is a gap between the framing of disability research in LMICs, which is mostly based on the medical model rather than the social model.

As an alternative to the medical model, Ndeezi (2004) argues that economic, cultural, attitudinal, physical, environmental and social barriers prevent people with disabilities from contributing entirely in society.

According to Richard (2014), numerous studies have demonstrated that the family context, specifically the "domestic sphere," has an impact on the well-being of CWSN in the United States. Richard's research in India revealed that a responsible family member providing care and creating a stable, inclusive home environment was crucial to achieving positive outcomes for these children.

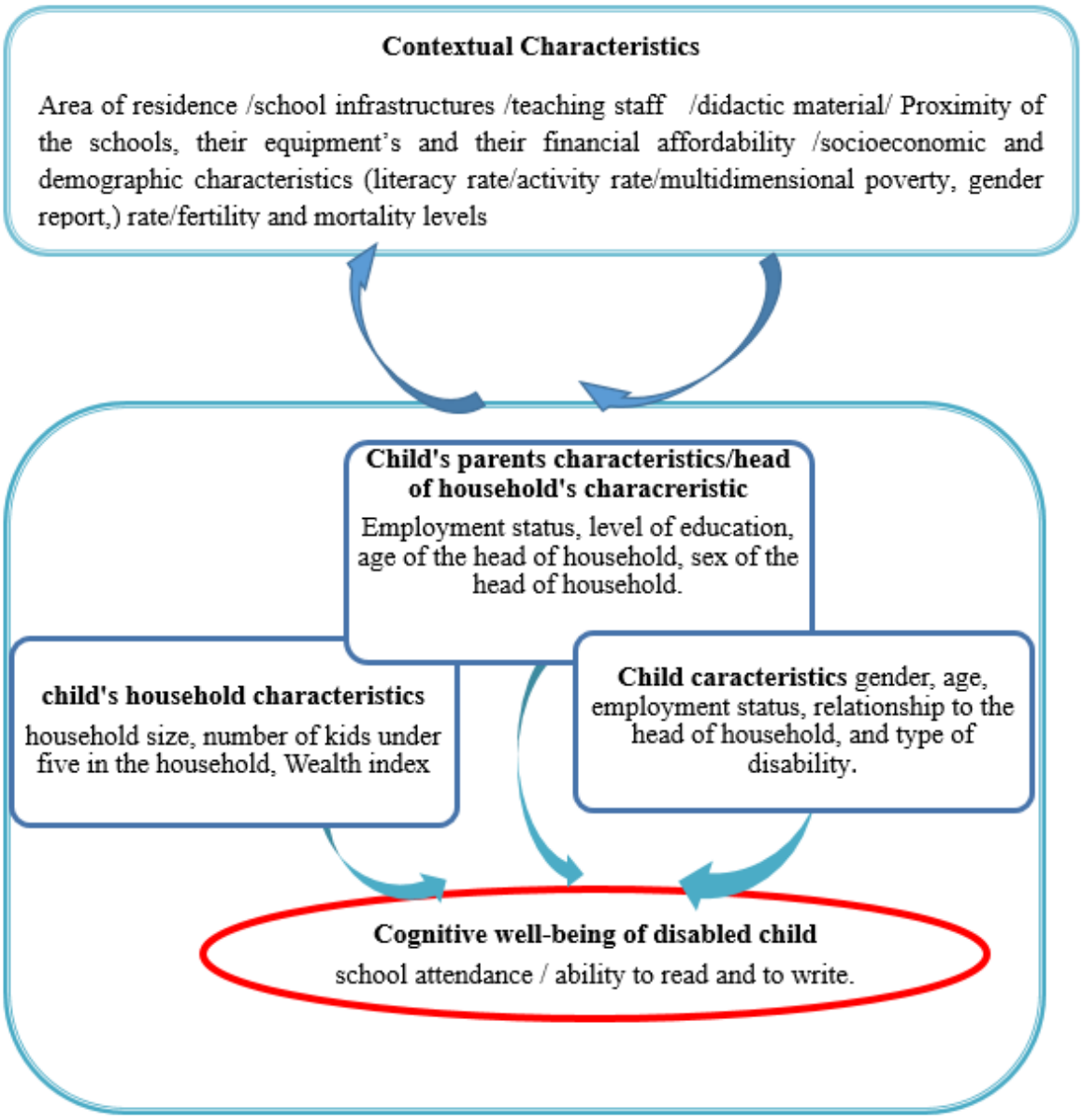


Figure 1. Theoretical Framework of factors that affect cognitive well-being of CWSN

Source: developed by the authors considering the literature review

A lack of education or training within a family member to meet the requirements for CWSN, combined with society's attitude of these needs being different and shameful in comparison to other needs, and the shortage and inaccessibility of further supportive services to meet these needs, can have a significant impact on the

intimate relationships between people with disabilities and those without (Wasserman et al., 2016).

In Nepal (India), Banks et al. (2019b) mentioned, among the factors affecting CWSN attendance and participation in school, some socio-economic and attitudinal factors (motivation for education, parents' perceptions, child with disability behaviour, stigma, and parents' financial shortfall to accompany their children to school).

Barriers to accessing and benefitting from education for CWSN in various countries especially in LMICs continue to exist. Institutional difficulties including school costs, distance to school, insufficient teacher training, inaccessible facilities, inadequate adaptations, lack of professional resources, large class sizes, and negative attitudes of teachers and peers without special needs are among them. However, additional factors are also taken into account at the community and household levels, such as poverty, inadequate transportation, affordability, parental perceptions of disabilities, level of parents' education, traditional attitudes and practices, religious beliefs, and caregivers' attitudes towards CWSN' learning ability and education's significance. Other factors relating to the child also exist, such as gender, the severity of their disability, poor health, no one available to drop him off at school, or a girl's first menstruation (Rousso, 2015; Soni et al., 2022; Aruldas et al., 2023).

Saran et al (2020) found significant geographic differences, particularly for LMICs. They noted also that although disability research in LMICs has grown, several important questions remain unanswered. In order to improve outcomes and inclusion for people with disabilities, what type of evidence is needed? What are realistic expectations? This is why our study aims to help reduce this gap by examining the situation in Morocco, one of the countries in this category.

Based on the literature review, numerous factors impede CWSN from attending school and meeting educational requirements. These factors are diverse in nature and manifest at various levels. Figure 1 provides a summary of these factors.

C. RESEARCH METHOD

Thus, in an attempt to fill the above gap, the purpose of this study is to fill the knowledge gap regarding socio-demographic factors that may affect the cognitive well-being of CWSN in LMICs. We used national data on Morocco as an example. To test the hypothesis that cognitive well-being of CWSN in Morocco is or is not affected by socio-demographic factors, we used the data and methods described below.

1. Data

The aim of this unprecedented paper in Morocco is to examine the socio-demographic barriers that can prevent CWSN from obtaining an education and literacy by utilizing national data from a subset of the 2014 General Census of Population and Housing (RGPH-2014).

2. Census and participants

The High Commission for Planning (HCP) has published the micro-data file for the RGPH-2014 Census on its institutional website in 2018 (www.rgph2014.hcp.ma).The census was conducted over a period of around two years, during which data on the demographic, economic, and social characteristics relating to the entire resident population of the country were extensively collected. This information pertains to every level of administrative division in the Kingdom,

including regions, prefectures, provinces, circles, and municipalities, as well as even more localized geographic areas such as neighborhoods and census districts. The census was carried out in roughly 48,000 census districts across the country and covered some six million households. It is worth mentioning that the census covers not only typical or traditional households, but also encompasses those who are homeless, have a nomadic lifestyle, and reside in hotels or similar accommodations.

3. Procedures

The HCP has established a clear conceptual, methodological and technical framework for preparing and conducting a census. The HCP has developed questionnaires directed towards various population groups, such as households, non-household populations, and transient populations. These questionnaires have comprehensively identified individuals whose daily functions are impeded by a physical or mental impairment. A detailed section on housing and its various components is also incorporated to provide a more comprehensive census. The household well-being sections have received enhancement through the solicitation of accurate data on the commuting circumstances of citizens between their home and workplace or educational institution. The aforementioned holds true for the acquisition of conveyance means or electronic devices, furniture, or any other household equipment.

The census districts were delimited with ground and cartographic support. This was achieved through the use of Geospatial Information Systems (GIS) and satellite imagery with high resolution. The data collected during the census was processed using automatic document reading (LAD).

The dataset encompasses demographic, socioeconomic, cultural, and environmental attributes of a representative 10% sample of the populace and households in Morocco. Researchers and analysts may integrate variables in diverse arrangements to fit their particular demands and inclinations.

The 2014 census in Morocco gathered data to evaluate disability by assessing the extent of difficulty in performing everyday activities. The database holds information regarding the state, types, and severity of disabilities in their respective forms. These included seeing (even when wearing corrective glasses), hearing (even when using hearing aids), walking or climbing stairs, remembering or concentrating, taking care of oneself, and communicating in one's primary language. The census proposed four levels of difficulty for each of these six activities: "no difficulty"; "small difficulty"; "high difficulty" and "incapacity". Thus, an individual is classified as having special needs if they experience "high difficulty" or "total incapacity" in any one of the six specified daily living domains mentioned earlier. Additionally, the database provides information on the educational status of all children between the ages of 6 to 17 years during the 2013/2014 school year, as well as the reading and writing proficiency of each child aged 10 and older.

Methods

1. Measures

In this study, the definition of persons with special needs (PWSN) as presented by the Washington Group on Disability Statistics (WG) was utilized. The WG follows an approach grounded on the classification system of functioning, disability, and health (ICF) and observes the principles and practices of national statistical agencies, as determined by the United Nations Statistical Commission. Thus, the WG employed a questionnaire encompassing six fundamental functions mentioned above (Madans

et al., 2011). Therefore, evaluating disabilities is a personalized process which gauges the severity of impairment across three dimensions: (i) impairment, which denotes the loss of substance or alteration of psychological, physiological, or anatomical structure or function; (ii) partial or complete decrease (as a result of impairment) in the ability to carry out an activity in a manner or within the constraints deemed normal for a human being; (iii) disadvantage refers to the restrictions or inability to fulfill a typical social function due to factors such as age, gender, social, and cultural influences.

Table 1. Description of the indicators used for multilevel analysis

Level		variable	Label	Categories			
Dependant variable		child _cog_wellbeing	Ability to read and to write for children aged 10 years and over	Yes	No		
		schooling_status	Schooling status during the reference year (2013/2014)	In school	Not in school		
Explanatory variable	Level_1 child	residence_area	Place of residence	Urban	Rural		
		head_houss_link	Relationship to head of household	Son / Daughter	Grandson / Granddaughter	Brother / Sister	Other
		gender	Gender of the child	Male	Female		
		age_group	Child's age group	6 to 11 years old	12 to 14 years old	15 to 17 years old	
				Nodifficulties	Little difficulty		
				Nodifficulty	Little difficulty		
				Nodifficulty	Little difficulty		
				Nodifficulty	Little difficulty		
				Nodifficulty	Little difficulty		
				Nodifficulty	Little difficulty		
				Nodifficulty	Little difficulty		
				Private	Shared		
				Private	Shared		
				Private	Shared		
				Yes	No		
				Yes	No		
				Yes	No		
				Yes	No		
				Yes	No		
				Yes	No		
				Yes	No		
				Household	Less than 200		

				with a connection to the water supply system low nuclear <2 yes yes yes Yes <1Km less than 2 <3,5% less than 10	m average complex [2;3[no no no No [1Km;2Km[[2;3| |3,5%;5,5%[|10%;15%|		
		visual_disbility	Visual impairment	Nodifficulty	Little difficulty	A lot of difficulty	full disability
		hearing_disability	Hearing disability	Nodifficulty	Little difficulty	A lot of difficulty	full disability
		Mobility_disability	Mobility disability	Nodifficulty	Little difficulty	A lot of difficulty	full disability
		Memory_disability	Memory disability	Nodifficulty	Little difficulty	A lot of difficulty	full disability
		Maintenance_disability	Maintenance disability	Nodifficulty	Little difficulty	A lot of difficulty	full disability
		Communication_disability	Communication disability	Nodifficulty	Little difficulty	A lot of difficulty	full disability
	Level_2 housshold	Kitchen	Kitchen - Availability	Private	Shared		
		Toilet	Toilet - Availability	Private	Shared		
		Batht / Shower	Bathtub / Shower - Availability	Private	Shared		
		Time _reach _water	Time required to reach water point (in minutes)	time ranges from 0 to 700 (mean : 21.3 mn ; standard deviation : 32.12 mn)			
		Television	Television - Possession	Yes	No		
		Radio	Radio - Possession	Yes	No		
		Cell_phone	Cell phone - Possession	Yes	No		
		Landline phone	Landline phone - Possession	Yes	No		
		Internet	Internet - Possession	Yes	No		
		Computer	Computer - Ownership	Yes	No		
		Satellite dish	Satellite dish - Ownership	Yes	No		
		distance_water	Distance to drinking water	In the Household	Less than 200 m	[200 m ;1 km|	1 km &+

		household_size	Average household size	low < 5	Average [5 ; 10[	high: 10 & +	
		family_structure	Family structure	Nuclear	Complex	Other	
		density/room	Number of people per room	< 2 persons	[2 ; 3[	3 persons &+	
		drinking_water	Drinking water	Yes	No		
		electricity	Electricity	Yes	No		
		sanitation	housing hooked to a public sewage network	Yes	No		
		Refrigerator	Refrigerator - Ownership	Yes	No		
		Trucks	Trucks - Number	No truck	one truck	2 trucks and more	
		Cars	Cars - Number	No car	one care	2 cars and more	
		Tractors	Tractors - Number	No tractor	one tractor	two tractors and +	
		Motorcycles	Motorcycles - Number	No motorcycle	one motorcycle	Not available	
	Level_3 province	first marriage (years)	Average age at first marriage (years)	The average age at first marriage range from 25 to 33 years old			
		Disability_prevalence	Disability prevalence rate (%)	The disability prevalence rate range from 2,7% to 9,3%			
		parity_women	Average parity of women 45-49 (children per woman)	The average parity for women aged 45-49 ranges from 1.75 to 7.22 children per woman.			
		Illiteracy_rate	Illiteracy rate of the population aged 10 years and over	The Illiteracy rate of the population aged 10 years and over range from 15,5% to 67,5%			
		Net_activity_rate	Net activity rate (%)	The proportion range fron 25,5% to 98,7%			
		Unemployment	Unemployment rate (%)	The proportion range fron 0,38% to 45,5%			
		Household_size	Average household size by province (effective)	The average householde size range from 2,87 to 8,53 persons			
		distance_paved road	Distance to the nearest paved road	<1Km	[1Km;2Km[	[2Km;5Km[	5 Km &+
		fertility_level	Total fertility rate (children per woman)	Less than 2	[2 ; 3[	3 children &+	
		infant_mortality	The proportion of the 2014 birth cohort that died in 2014.	Less than 3,5%	[3,5% ; 5,5%[	5,5% and more	
		poverty	Overall poverty prevalence according to the multidimensional or monetary appaches	Less than 10%	[10% ; 15%[	15% and more	

Source: developed by the authors based on the 2014 census data

Therefore, a comprehensive analysis was conducted on the data of 713,897 children aged between 6 and 17 years old. From this sample, 10,499 CWSN were selected for further in-depth analysis. The obtained data file was improved through macro-level indicators measured at the provincial level and indicators of area of residence - urban and rural. All the indicators that seem to affect the CWSN's cognitive well-being that are available in the database are reproduced in Table 1.

The examined database for multilevel analysis comprises solely children, aged from 6 to 17 years, who have special needs. The number of children included in this analysis amounts to approximately 10,499, constituting 1.47% of the total number of children within this age range. Urban areas are the place of residence for 56% of these children, while rural areas are home to the remaining 44%. Boys make up 57% of the included children, whereas girls constitute 43%. For comparison, data on children without special needs or adults with special needs was occasionally utilized. Data from RGPH-2014 and National Survey on Disability-2014 (ENH-2014) were sometimes compared as well.

2. Statistical analysis

Various techniques were utilized to examine the social and demographic aspects that could impact the cognitive wellness of CWSN, alongside an assessment of its effects, if any.

Descriptive analysis:

A descriptive analysis of the prevalence of disabilities among Moroccan children was conducted, taking into account their age, gender, and area of residence. The prevalence of out-of-school children and illiteracy among CWSN and those without has been quantified, followed by comparisons across time and space. The odds ratios were calculated to evaluate the likelihood of being out of school or illiterate among CWSN and those without. By utilizing correlation analysis and independence tests, this descriptive analysis allowed us to examine the potential factors that could impact the attendance of CWSN in school.

Multi-level analysis:

As previously explained, the database includes specific information on all CWSN aged between 6 and 17 years. These children were selected randomly from households, which were stratified based on administrative and geographical subdivisions (regions, provinces, municipalities, and urban centers) and housing categories. Both children residing in the same dwelling and households within the same region have shared contexts, rendering them interdependent. Therefore, given the hierarchical nature of this data and the correlation of observations (i.e. children in the same household sharing the same characteristics), a multilevel model was employed.

The model estimation is a two-level logistic regression model in which the binary response variable (yij) denotes the attendance of CWSN aged between 6 and 17 in the academic year of 2013/14. Additionally, another model, with 'literacy skills' as a dependent variable (yij), is estimated for children aged 10 to 17.

$Yij = \beta 0j + x'ij\beta + \varepsilon ij$ with $\beta 0j = \beta 00 + uj$

Each child is assigned an identifier (i) ranging from 1 to (nj), where (nj) denotes the number of children in province (j) varying between 1 and 72. The fixed part of the model is represented by (x'ijβ), where (xij) is the explanatory variable vector concerning the child, their household, and their province, and β is the vector of regression coefficients. The variability in the model {uj + εij} is analyzed by breaking it down into the sum of residuals where (uj) indicates the unseen differences

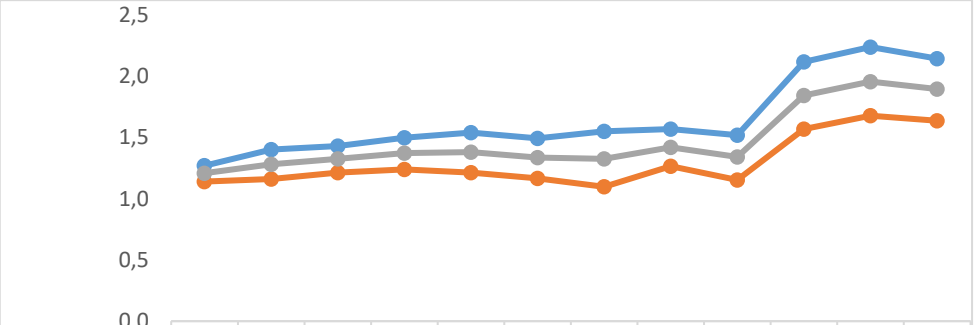
between provinces while (εij) is the residual error term for child (i) in province (j). This is a random constant model in which β00 corresponds to the average value, and (uj) indicates the deviation from the provincial mean. The error terms (εij) are assumed to be mutually independent and independent of the explanatory variables.

This methodology was selected to account for all latent variables affecting the likelihood of attending school or being literate, and to investigate the underlying causes of this unexplained variance. In fact, other than the effects of commonly acknowledged and quantifiable factors such as gender, age, household size, and socio-economic status, a significant portion of the decision to attend school or not is inexplicable. This could arise from discriminatory effects between siblings, stemming from their health or learning abilities, as well as effects that are specific to select families, like parental aspirations. In addition, proximity to schools, availability of transport, boarding, catering, and infrastructure tailored to the particular requirements of CWSN can also have an impact. These analyses were carried out using Stata and Mlwin software and led to the results listed in the following section.

D. RESULTS AND DISCUSSION

According to the 2014 census in Morocco, approximately 15 in every 1,000 children (168,660 in total) are CWSN. There are about 93,470 males and 75,190 females. The sex ratio is approximately 124 percent. The distribution by area of residence indicates a higher prevalence in urban areas (93,170 cases in urban areas versus 75,240 cases in rural areas). Furthermore, there is a higher prevalence of disability amongst boys (16.4 per thousand) compared to girls (13.7 per thousand), as well as in rural areas (15.4 per thousand) compared to urban areas (around 14.9 per thousand). Males are more likely to have disabilities at any age (figure 2).

The prevalence of disability in Moroccan children mentioned above is similar to that found in some LMICs. They are consistent with the findings of Kuper et al.'s 2014 study of data from 30 LMICs. They also agree with those found by Mizunoya et al. (2018). In fact, among children of primary school age, it did not exceed 1.5% in 12 of the 15 countries surveyed by these authors.



	6 years	7 years	8 years	9 years	10 years	11 years	12 years	13 years	14 years	15 years	16 years	17 years
male	1,3	1,4	1,4	1,5	1,5	1,5	1,5	1,6	1,5	2,1	2,2	2,1
female	1,1	1,2	1,2	1,2	1,2	1,2	1,1	1,3	1,2	1,6	1,7	1,6
total	1,2	1,3	1,3	1,4	1,4	1,3	1,3	1,4	1,3	1,8	2,0	1,9

Figure 2. Age and sex-specific prevalence of disability among children, Morocco, RGPH-2014

Source: developed by the authors using the 2014 Census database.

With regards to the education of CWSN, the likelihood of missing school is four times higher than children without special needs within the age range of 6 to 14, with the risk being two times higher for CWSN aged 15 to 17 (figure 3). This issue affects both genders and both urban and rural areas, with rural girls being particularly impacted (figure 4). Nationally, 48.5% of children aged 6 to 17 are affected (with children without special needs having an odds ratio of 5.76).

The findings on the likelihood of missing school in Morocco are close to those of UNESCO (2018), which concluded that 'the out-of-school rate for children with disabilities is two to three times higher than for children without disabilities in Colombia, the Maldives, Uganda and Yemen' (p. 20). Also, the percentages described in Figure 3 about out-of-school CWSN are similar to those in relation to specific LMICs mentioned by Gottlieb et al. (2009) and Mizunoya et al. (2018). According to the first, the proportion of children who screened positive for disability to the ten questions in the 2005-06 Multiple Indicator Cluster Survey (MICS3) who are out of school varies in 18 LMICs from 2% (Uzbekistan) to 83% (Belize). According to the second, for children with disabilities, the rates of out-of-school children (OOSC) range from a low of 7.0% in South Africa to a high of 72.4% in Albania. Median OOSC rates also differ by 25.9 and 23.8 percentage points in primary and secondary education respectively in these LMICs.

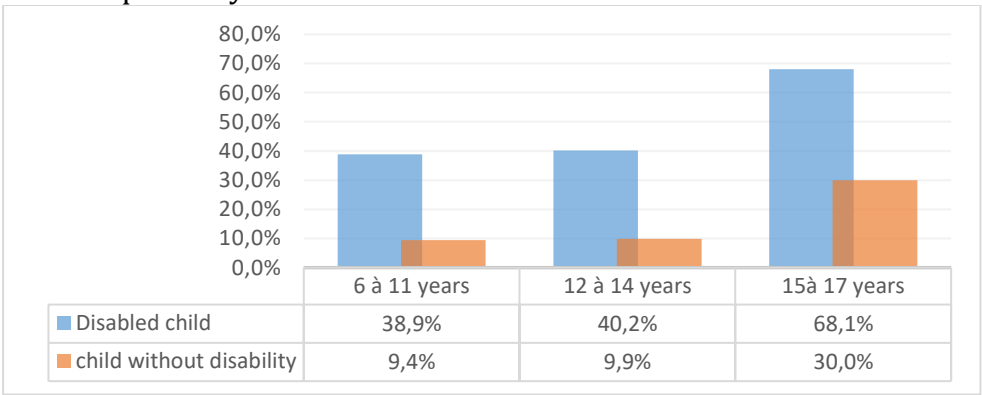


Figure 3. Percentage of out-of-school children by disability status and age group, Morocco, 2014
Source: developed by the authors using the 2014 Census database.

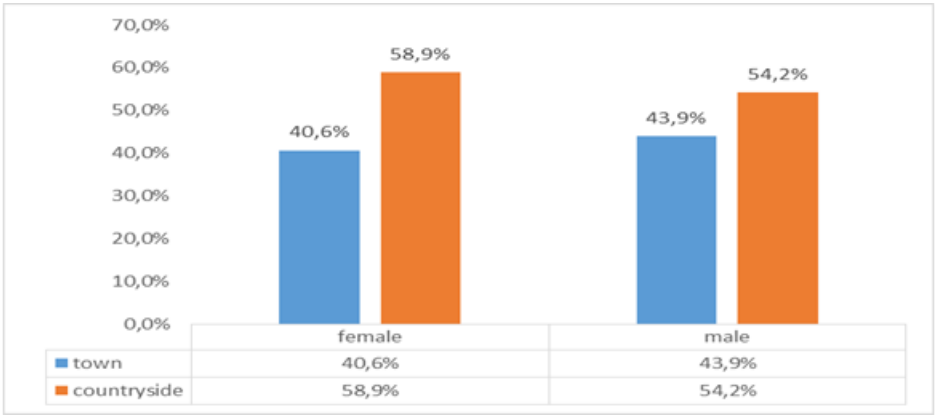


Figure 4. Percentage of CWSN not in school according to their sex and area of residence, Morocco 2014

Source: developed by the authors using the 2014 Census database.

In rural areas, literacy rates among girls and boys stand at 57% and 61%, respectively. Conversely, urban areas have marginally improved literacy rates for

CWSN; nonetheless, their rates are still below the expected level (65% and 67% for boys and girls, respectively) (Figure 5).

These results on literacy rates among CWSN by gender are similar to those of Rousso (2015), who found that girls with disabilities in rural areas have even less access to education than their urban counterparts due to cultural stigma against them.

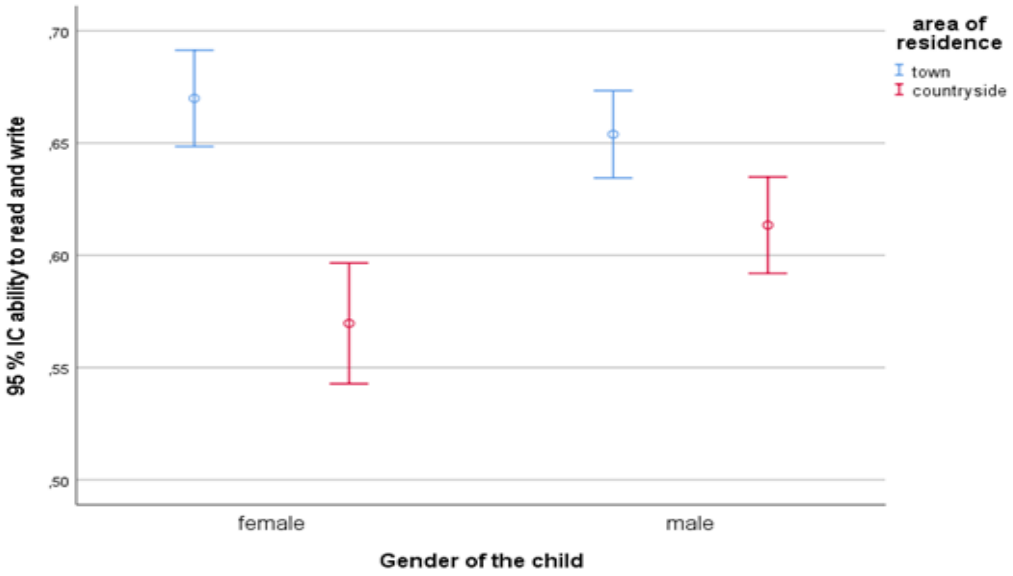
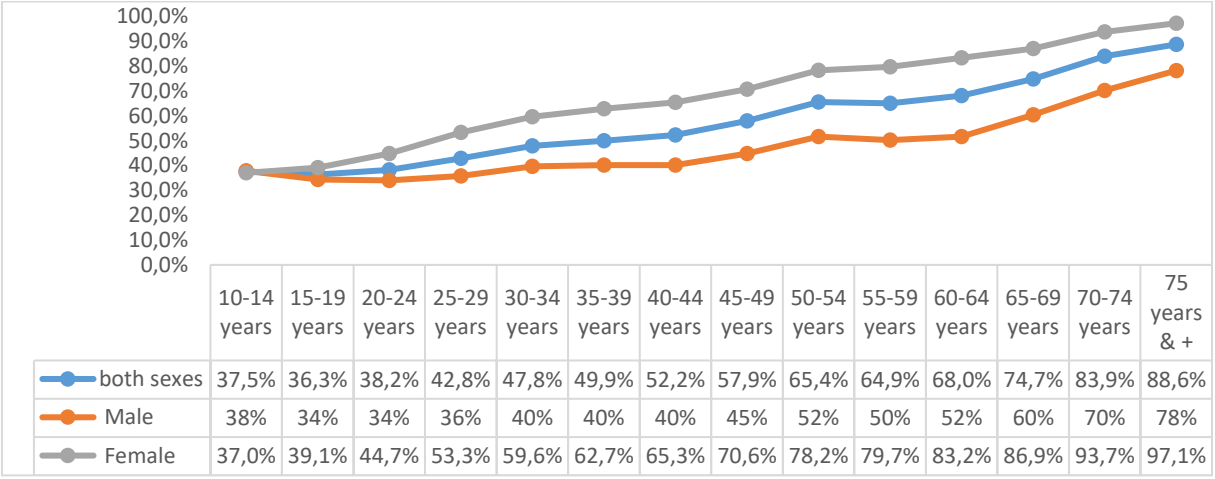


Figure 5. Percentage of literate CWSN aged 10 to 17, according to their sex and area of residence, Morocco 2014

Source: developed by the authors using the 2014 Census database.

When compared to their peers without special needs, the 2014 RGPH data revealed a higher incidence of illiteracy among Moroccan CWSN. In urban areas, the odds ratios for illiteracy are 43:1 for boys and 32:1 for girls. These odds ratios drop to approximately 11:1 and 6:1 for males and females, respectively, in rural areas.

The analysis of the prevalence of illiteracy amongst People with Special Needs (PWSN) from various generations indicates a rise in the occurrence with advancing age, across both genders (figure 6). The prevalence rate amongst children and young people is roughly 40%; however, it surges to 90% amongst PWSN over the age of 75.



	10-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years	75 years & +
both sexes	37,5%	36,3%	38,2%	42,8%	47,8%	49,9%	52,2%	57,9%	65,4%	64,9%	68,0%	74,7%	83,9%	88,6%
Male	38%	34%	34%	36%	40%	40%	40%	45%	52%	50%	52%	60%	70%	78%
Female	37,0%	39,1%	44,7%	53,3%	59,6%	62,7%	65,3%	70,6%	78,2%	79,7%	83,2%	86,9%	93,7%	97,1%

Figure 6. Illiteracy prevalence among PWSN according to age and sex, Morocco, 2014

Source: developed by the authors using the 2014 Census database.

This improvement, nevertheless, conceals significant discrepancies between PWSN and those without. The Odds Ratios are particularly elevated in children and young adults, with no discernible gender impact. Figure 7 demonstrates that the Odds Ratios range from 22 (registered within the 10-14 age group) to 1.67 (registered within the 75+ age group) for males, and from 17 to 1.61 for females.

However, our findings of decreasing odds ratios with age, indicating that illiteracy is more prevalent among older generations regardless of disability status, join those of Unesco (2018).

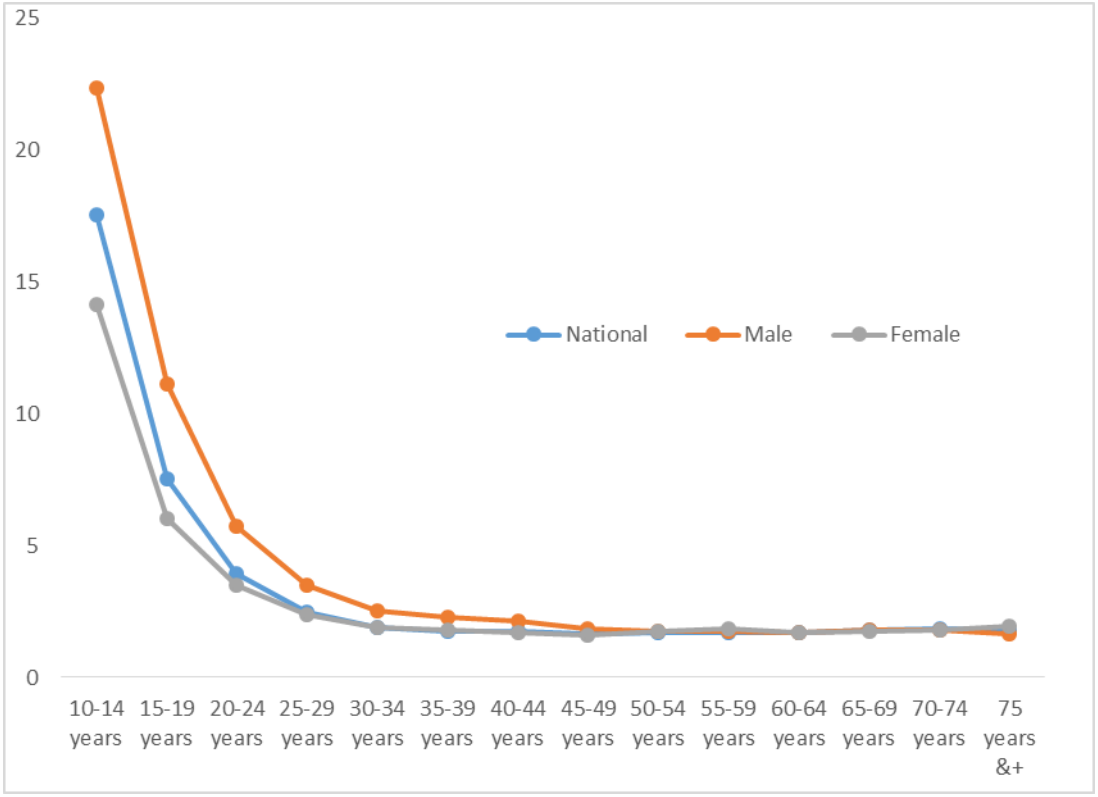


Figure 7. Trends in the odds ratios ("literacy inability" among PWSN versus children without) according to age and sex, Morocco, 2014

Source: developed by the authors using the 2014 Census database.

After conducting a descriptive analysis on all 6 to 17-year-old children, we were able to identify the varying levels of cognitive well-being in CWSN and those without. We present below the findings of the subsequent explanatory analysis which aims to investigate the factors hindering the cognitive well-being of CWSN. The analysis focuses, as previously stated, on socio-demographic factors. However, it is important to consider the numerous variables that can influence the cognitive well-being of CWSN. Additionally, the issue of multi-collinearity must be taken into account.

We began by examining the correlations between the variables accessible in our database that concerned our research question. As a result, we identified the most highly correlated variables with the dependent variables and the ones that displayed inter-collinearity. These variables are listed in Table 1 of the methodological section. The correlation matrix for the chosen variables is featured in the appendix.

Table 2 presents the findings of two multi-level analysis models of 'Mixed-effects logistic regression'. Each model includes an indicator measuring the cognitive well-being of CWSN, specifically their education status and attitude towards reading

and writing. The data indicates that various factors, such as gender and the nature and severity of disability, affect the likelihood of schooling for CWSN. Boys have a higher likelihood of attending school compared to girls (odds ratio = 1.15, $p < 0.05$). Further, the nature and intensity of disability reduce school enrollment for CWSN. For instance, children facing major mobility disabilities (total disability) have significantly lower chances of attending school (odds ratio = 0.37). In other words, a CWSN that doesn't include a complete mobility disability is three times more likely to attend school. This holds true for all other categories of disabilities, with an increased risk for disabilities related to communication. An odds ratio of 0.13 (Pvalue = 0.000) indicates that a child with a severe communication disability has a very low probability of attending school (one in eight chances), compared to other CWSN.

The child's chances of receiving an education are influenced not only by their gender, type of disability, and severity, but also by their age group. CWSN aged 6 to 11 years have a higher likelihood of being in school than those in older age groups. The estimated odds for children in the age brackets "12-14 years" and "15-17 years" are 0.86 and 0.22 respectively, compared to those in the "6-11 years" group. Additionally, it has been observed that CWSN who live within a complex family structure were less likely to attend school than those living in a nuclear family (with an odds ratio of 0.888). This later result is consistent with the studies of Wang (2008) and Kuper et al. (2018).

According to our findings, a number of factors affect the likelihood of CWSN attending school. These include gender, disability type and severity, age group, and family structure. These results are in line with the findings of Kuper et al. (2014) and UNESCO (2018) in some LMICs.

Other contextual factors may influence access to education, such as the distance between a CWSN's home and the closest tarmacked road. Additionally, rates of infant mortality and disability prevalence within the province can have an effect on attending school.

In contrast, numerous other factors appeared to have little impact on the educational prospects of CWSN. These include the location of their residence, the size of their household, and their relationship with the household head. Additionally, we note the same thing about the level of poverty in the province, fertility rates, and housing amenities.

The child's relationship with the head of the household is also very imperative. This relationship encompasses several elements, such as awareness of disability issues, understanding the rights of people with disabilities, and attitudes towards the abilities of people with disabilities. CWSN parents' attitudes towards the above factors are positively correlated with their children's average educational years, based on Lamichhane's 2013 study. Also, in some LMICs, where certain cultural norms and values prevail, having a disabled child is the mother's responsibility. Such beliefs are bound to have serious consequences for the involvement of the fathers of CWSNs in their upbringing, or even disown them (Crabtree, 2007). On this relationship, there is a significant influence on the CWSN in Morocco. This finding is in agreement with the observation reported by Fakhr El-Islam (2008) and (Al-Zyoud, 2011), who noted the neglect and absence of some fathers in participating in their child's education.

As Wall (2010) points out, parents of CWSN often experience blame and shame and sometimes keep their disabled children at home (Al-Zyoud, 2011). For this reason, this author highlights the importance of political, cultural and social factors in Jordanian parents' decisions to disclose their child's disability and live with its consequences. Also, Cunningham (1985) found that registration, failure, regular attendance and better results for CWSN are influenced by parents' education, their socio-economic status, their beliefs, ethics, conjugal relations and single parent status. This category of children with harmonious parents, cultivated and higher socio-economic status often fare better (Einfeld et al., 2012).

Moroccan CWSN are denied the chance to achieve optimum cognitive well-being compared to their peers without special needs. This goal cannot be fulfilled given the fact that almost half of CWSN do not attend school (48.5%), and approximately a third of CWSN aged between 10 and 17 are unable to read or write (34%). These findings are in line with those reported in the National Survey on Disability-2014 (ENH-2014). This survey confirms that CWSN have considerably lower rates of school enrolment than children without special needs. 85.7% of all children who are out of school in Morocco are CWSN, with 87.1% in urban areas and 83.9% in rural areas. A detailed analysis of the situation of CWSN indicates that their type of disability and its severity determine whether or not they attend school. In a similar vein, female CWSN are the least likely to enroll in school, as well as the oldest children (15-17 years old). These findings are consistent with those discovered in other settings and through utilizing diverse methodologies (Hassanein et al., 2021; Kobiané, 2009; G.T. Kpadonou et al., 2013; Limaye, 2016, UNESCO, 2018).

This result was replicated in a second "Mixed-effects logistic regression" model that estimated the CWSN's ability to read and write as the dependent variable. The variables that influenced the educational status of CWSN also had a significant impact on their reading and writing abilities, as evidenced by Odds Ratios with similar values and significance levels (table 2).

Some other factors appear to have a correlation with the literacy skills of CWSN, rather than their current schooling situation. For instance, having access to and being in close proximity to a drinking water source have a statistically significant Odds Ratio. Specifically, CWSN residing in housing with access to drinking water are nearly twice as likely to possess literacy skills compared to other children in the study (Odds Ratio = 1.93). An augmented proximity to the nearest potable water source seems to diminish the likelihood of literacy in CWSN (Odds Ratio of 0.4155574 when the distance surpasses one kilometer).

In Morocco, especially in rural areas, most houses are informal and made of wood or mud, which increases the suffering of CWSN. These homes lack these above vital elements. Water often comes from wells, springs or rivers. It is often transported by cattle from long distances. Some villages have communal fountains or water tanks outside the houses. And even if these later have toilets, such as pit latrines, they are inaccessible to CWSN. In addition, these toilets were usually built outside the house and did not have electric lighting. Rural houses don't have bathrooms either. In urban areas, cities are still surrounded by shantytowns, where squalid dwellings remain. In other districts, having flush toilets or bathrooms at home doesn't make things any easier. They remain also unsuitable for CWSN. In this regard, our findings are consistent with some other international research on the great importance of water, sanitation and hygiene (WASH) in the daily lives of PWSN (White et al., 2016; Banks et al., 2019a).

Table 2. Results of the Mixed-effects logistic regression analysis

	model1: Child's school status during reference year (2013/2014)				**Model 2:** Ability of child aged 10 and over to read and write			
	Odds Ratio	**Pvalue**	**Confidence interval 95%**		**Odds Ratio**	**Pvalue**	**Confidence interval 95%**	
Sex								
Male	1,16	0,01	1,05	1,28	1,23	0,00	1,10	1,39
Visual_disability								
Little difficulty	1,33	0,02	1,05	1,67	1,07	0,59	0,83	1,38
Lot of difficulty	1,56	0,00	1,38	1,77	2,01	0,00	1,71	2,35
Unable	0,70	0,04	0,50	0,98	1,21	0,30	0,84	1,76
Hearing_disability								
Little difficulty	1,16	0,29	0,88	1,53	1,48	0,01	1,10	2,00
lot of difficulty	1,07	0,34	0,93	1,24	1,14	0,13	0,96	1,35
Unable	0,78	0,07	0,60	1,02	0,91	0,48	0,69	1,19
Mobility_disability								
Little difficulty	0,75	0,03	0,59	0,97	0,89	0,40	0,68	1,17
Lot of difficulty	0,71	0,00	0,63	0,81	0,86	0,06	0,74	1,01
Unable	0,38	0,00	0,30	0,47	0,53	0,00	0,42	0,67
Memory_disability								
Little difficulty	0,67	0,00	0,53	0,85	0,44	0,00	0,33	0,58
Lot of difficulty	0,42	0,00	0,36	0,47	0,38	0,00	0,32	0,44
Unable	0,38	0,00	0,30	0,49	0,42	0,00	0,33	0,53
Child's age group								
[12 years ; 15 years [	0,86	0,02	0,76	0,98	0,90	0,21	0,77	1,06
[15 years ; 18 years[	0,23	0,00	0,20	0,26	1,52	0,00	1,30	1,78
Communication_disability								
Little difficulty	0,48	0,00	0,38	0,60	0,31	0,00	0,24	0,41
Lot of difficulty	0,24	0,00	0,21	0,28	0,22	0,00	0,19	0,26
Unable	0,13	0,00	0,11	0,16	0,17	0,00	0,14	0,22
Maintenance_disability								
Little difficulty	0,75	0,03	0,58	0,96	0,63	0,00	0,47	0,83
Lot of difficulty	0,51	0,00	0,44	0,59	0,57	0,00	0,48	0,67
Unable	0,50	0,00	0,42	0,60	0,55	0,00	0,44	0,69
Television possession								
No	0,84	0,17	0,65	1,08	1,14	0,40	0,84	1,53
Radio possession								
No	0,93	0,18	0,84	1,03	1,02	0,71	0,91	1,16
Cell_phone possession								
No	0,98	0,83	0,79	1,21	0,88	0,30	0,69	1,12
Landline_phone possession								
No	1,02	0,87	0,81	1,28	1,18	0,23	0,90	1,56
Internet possession								
No	1,13	0,32	0,89	1,43	1,06	0,71	0,79	1,41

Computer possession								
No	0,59	0,00	0,48	0,72	0,73	0,01	0,58	0,93
Satellite_dish possession								
No	0,90	0,22	0,76	1,06	0,87	0,15	0,72	1,05
Refrigerator possession								
No	0,89	0,22	0,75	1,07	0,90	0,88	0,23	3,49
Trucks - Number	0,97	0,22	0,92	1,02	0,99	0,70	0,93	1,05
Cars - Number	1,00	0,95	0,96	1,04	1,01	0,80	0,96	1,05
Tractors - Number	1,04	0,09	0,99	1,10	1,00	0,90	0,94	1,05
Motorcycles - Number	0,97	0,36	0,91	1,03	0,97	0,34	0,90	1,04
	model1: Child's school status during reference year (2013/2014)				**Model 2:** Ability of child aged 10 and over to read and write			
	Odds Ratio	**Pvalue**	**Confidence interval 95%**		**Odds Ratio**	**Pvalue**	**Confidence interval 95%**	
Distance to drinking water								
Less than 200 m	1,04	0,88	0,61	1,78	0,57	0,11	0,29	1,13
[200 m ;1 km[	1,13	0,65	0,66	1,96	0,54	0,08	0,27	1,07
1 KM &+	1,07	0,83	0,61	1,87	0,41	0,01	0,20	0,84
child's relationship to head of household								
Grandson/granddaughter	0,94	0,56	0,75	1,17	1,27	0,09	0,96	1,67
Brother/sister	0,76	0,25	0,48	1,21	0,78	0,31	0,49	1,25
Other	0,86	0,34	0,63	1,17	0,86	0,39	0,60	1,22
Family structure								
Complex	0,89	0,11	0,78	1,03	0,95	0,56	0,81	1,12
Others	0,97	0,88	0,63	1,49	0,80	0,37	0,50	1,30
Number of people per room								
[2;3[	0,98	0,68	0,86	1,10	1,07	0,36	0,93	1,23
3 &+	0,91	0,16	0,79	1,04	1,15	0,10	0,97	1,35
Housing hooked up to the drinking water network								
No	0,83	0,50	0,49	1,41	1,93	0,05	0,99	3,78
Housing connected to the Public Electricity distribution network								
No	1,00	0,99	0,81	1,23	1,05	0,72	0,82	1,34
Housing hooked to a public sewage network								
No	0,88	0,19	0,73	1,07	0,84	0,14	0,67	1,06
Place of residence								
Countryside	1,07	0,70	0,77	1,48	1,37	0,12	0,92	2,04
first_mariage_age	0,99	0,79	0,93	1,06	1,00	0,92	0,92	1,08
Disability prevalence rate (%)	1,09	0,07	0,99	1,20	1,10	0,09	0,98	1,22
School_enrollment	1,02	0,09	1,00	1,05	1,03	0,03	1,00	1,06
Provincial Illiteracy rate	0,99	0,16	0,97	1,00	1,00	0,96	0,98	1,02
Distance to the nearest paved road								
[1Km ; 2Km[	0,98	0,82	0,80	1,19	1,01	0,94	0,80	1,26
[2Km ; 5Km[	0,86	0,22	0,68	1,09	0,81	0,13	0,61	1,07
5 KM & +	0,68	0,00	0,56	0,84	0,91	0,45	0,72	1,16
Total fertility rate (children per woman)								

[2;3[	0,91	0,19	0,78	1,05	0,96	0,67	0,81	1,15
3 enfants &+	1,26	0,16	0,91	1,73	1,23	0,29	0,84	1,79
The proportion of the 2014 birth cohort that died in 2014.								
|10% ; 15%|	1,01	0,84	0,90	1,14	1,04	0,55	0,91	1,20
15% and more	1,24	0,01	1,05	1,47	1,31	0,01	1,08	1,60
Overall poverty prevalence (multidimensional /monetary)								
[10% ; 15%[	1,14	0,38	0,86	1,51	0,82	0,26	0,58	1,16
15% & +	1,11	0,50	0,82	1,49	0,75	0,11	0,53	1,07
Unemployment rate (%)	1,00	0,80	0,98	1,01	0,99	0,60	0,98	1,01
Household size by province	0,99	0,87	0,89	1,10	0,99	0,85	0,87	1,12
Constant	1,72	0,76	0,05	55,25	0,23	0,47	0,00	12,41

Source: developed by the authors using the 2014 Census database.

We have also shown in this research that some leisure activities (television, hardline, cellular, internet, computer, reading, etc.) have a small impact on the cognitive well-being of Moroccan CWSN. There are no national social programmes to adapt homes for disabled people. Or, it is important for self-fulfillment of child to have some media organs in the home. According to the study of Li et al. (2017), CWSN watched electronic media at home for about 56% of the time.

In addition, according to Arakelyan et al. (2019), some family socio-demographic factors such as lower parental education, lower socioeconomic status, single-parent family, lower parental health and well-being, negative parental behaviors, beliefs, perceptions and attitudes, and ethnicity were consistently associated with lower CWSN participation in leisure and community activities. Also, Biggs et al. (2023) reviewed a number of studies looking at aspects of the home literacy environment for some children with CWSN. The study shows that those whose parents share reading at home are more likely to have better intervention and positive outcomes.

The environment of CWSNs outside their homes also faces many barriers (lack of roads and pavements, inaccessibility of public buildings, inaccessibility of transport, air pollution, and so on). With regard to these barriers in the home and its environment, our study has shown that they have a certain influence on the education of CWSN. We therefore agree to some extent with the findings of Coulson et al. (2006) in South Africa. Also, this finding is consistent with the findings of Gottlieb et al. (2009) and Anaby et al. (2013). The first concluded that "children who have the most parental interaction or the most stimulating home environment have the best developmental outcomes (especially cognitive)" (p. 8). The second, across the review literature provides evidence of the impact of the environment on CWSN participation.

Further investigation is necessary to explore the apparent correlation between the degree of infant mortality measured at the macro level (province) and the cognitive well-being of CWSN. Both estimated models reveal that the probability of schooling or literacy for a CWSN is elevated in areas with higher infant mortality rates. Consequently, the corresponding Odds ratios are 1.234574 (pvalue = 0.012) and 1.305478 (pvalue = 0.008).

Therefore, when examining the conditions of education for CWSN, we must acknowledge that even in supposedly inclusive schools, the specific requirements of

this group are often overlooked, such as the distance of schools, the availability of transport, boarding and catering, and facilities tailored to their needs. CWSN require special care that is not typically available in mainstream schools with high student-to-teacher ratios. Due to financial constraints, parents are unable to hire attendants for their CWSN and therefore choose to keep them at home. Financial accessibility undoubtedly impedes the education of CWSN, as some households, despite their willingness to send their children to school, lack the financial resources to cover tuition fees and additional expenses associated with their disabilities (Hassanein et al., 2021; Limaye, 2016; Pilon and Yaro, 2001). Furthermore, the quality of the school and its ability to accommodate CWSN heighten families' concerns regarding physical and moral aggression (Bourdon, 1999; Gardou, 1999; Hassanein et al., 2021; Limaye, 2016).

Indeed, Banks & Zuurman (2015) found that poverty in Malawi was a significant factor in not attending school, missing lessons and experiencing learning difficulties. In the same way, Malungo et al. (2018) concluded that poverty is one of the barriers to education for CWSN in Zambia (inability of parents to pay for transport to and from school, buy compulsory uniforms, pay food allowances for boarding students, buy assistive devices, afford education costs, etc). Also, UNESCO (2018) has indicated that "the observed disadvantage of people with disabilities is likely to intensify in combination with other exclusion factors related to location, poverty and other individual and household characteristics" (p. 5).

CWSN may face economic, social, attitudinal, and physical barriers to accessing education, according to Lamichhane (2013). Disabilities, as well as socio-economic factors like gender, rural residence, economic status and rural location, have a profound impact on a child's access to education (Lamichhane, 2013). It is even less likely that children with disabilities will be able to attend school when other sources of inequality exist, such as economic disadvantage or living in a rural area (Lamichhane & Kawakatsu, 2015). Also, being a girl or coming from a very poor family, as example, are additional risk factors that have a negative impact on CWSN's access to education and their ability to perform well (Rousso, 2015).

In terms of limitations, we acknowledge that while our analysis yielded robust findings regarding the methods and representativeness of the data, it remains incomplete due to a lack of information in the database. The issue of CWSN's lack of schooling is multifaceted and can be approached through various means, each with its own merits and contributions. But the combination of these approaches offers the most all-encompassing perspective on the situation. The inaccessibility of 2018 data is another limitation of this study. Otherwise, more recent data would have been more useful.

E. CONCLUSION

The findings of this study highlight that children with special needs (CWSN) in low- and middle-income countries (LMICs) face significant challenges in achieving cognitive well-being due to barriers in education, school and classroom environments, and socio-demographic factors. Despite numerous social policies and programs, CWSN, one of the most vulnerable groups, have not equitably benefitted from interventions aimed at improving their conditions, particularly regarding cognitive well-being. Their education is also influenced by external factors such as economic, social, demographic, and cultural approaches. Socio-demographic analyses reveal multiple reasons for school enrollment failures, including household

size, family structure, head of household characteristics, geographical location, economic status, and parental attitudes. These findings align with previous international research addressing similar challenges faced by CWSN in LMICs. To address these issues, it is crucial to shape national policies and programs for disabilities, focusing on eliminating barriers and enhancing access to optimal cognitive well-being for CWSN, which should be considered a basic entitlement rather than a privilege. Policymakers and stakeholders must address the lack of robust quantitative and qualitative research in LMICs to identify effective strategies for improving educational accessibility. Additionally, support programs for CWSN and their families, both in and out of school, are essential to combat public stigma and promote equitable opportunities for these children.

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