

## ORIGINAL RESEARCH ARTICLE

Sustainable development and inequalities in  
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## Abstract

Although Morocco has significantly improved its overall human development index and its health indicators in particular over the last three decades, achievements remain incomplete due to persistent social inequalities, health inequities, and territorial disparities. This paper focuses on health inequities in infant mortality, nutritional status, early marriage and adolescent childbearing. With 49.6% of its population under the age of 30 years, decision makers in Morocco are challenged by high levels of unemployment among the youth population, an unacceptable territorial disparity, and socio-economic inequalities that affect the disadvantaged segments of the population, particularly women, children, and young people. The unpleasant results revealed in this article are a sincere call for urgent action to reduce the inequalities that hinder human development and ensure well-being for all, leaving no one behind.

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## 1. Introduction

According to the High Commission for Planning (HCP, 2025a), in 2022, Morocco had a population of 36.67 million, with women representing 50.2% of the population and 64.3% living in urban areas. As presented in Table 1, the age structure shows that children and youths under 30 years represented 49.6% of the population, while 12.2% were elderly over 60 years old. Among the most vulnerable young people, not in education, employment, or training individuals (NEETs) attract particular attention. Representing more than 25% (1.5 million) of young people aged 15 to 24, this group shows high differences according to sex (female [F]: 37.0% vs. male [M]: 13.5%), milieu of residence (rural [R]: 51.1% vs. urban [U]: 28.2%), region (Béni Mellal-Khénifra [BMK]: 30.6% vs. Tanger-Tetouan-Al Hoceima [TTE]: 21%) and education level (85% among young women with little or no education vs. 17.3% among young women with higher education) (HCP, 2022).

Over the last decades, Morocco has significantly improved health indicators, such as life expectancy, infant and maternal mortality, access to health care, and reproductive health, and, by developing the Basic Medical Coverage (AMO), universal health coverage increased from 16% in 2005 to 85% in 2025. However, achievements remain hindered by persistent socio-economic inequalities, health inequities, and territorial disparities (A.

Boutayeb *et al.*, 2020). Indeed, the Gini index was 40.7 over 2010–2017 and remained around 40 during 2010–2025 (A. Boutayeb *et al.*, 2020; HCP, 2025a). More generally, the Inequality-adjusted Human Development Index (IHDI) indicates that Morocco is losing nearly 30% of its overall human development due to inequality, with respective losses of 41.9%, 25.9% and 10.6% in the education, income and life expectancy components in 2023. In terms of territorial disparity, 3 Moroccan regions out of 12 account for 58.5% of the total physicians practicing in public and private hospitals or clinics, contribute 58.5% to the national gross domestic product (GDP), while they are home to a population representing 45.7% of the total population. The number of inhabitants per physician in the Drâa-Tafilalet region (3,051) is 4.25 times higher than in the Rabat-Salé-Kénitra region (717), and a newborn in the Rabat-Salé-Kénitra region (79.7 years) is expected to live 7.3 years more than a baby born in the Drâa-Tafilalet region (72.4 years) (HCP, 2025a). Maternal mortality ratio in rural areas (111 per 100,000 live births) is 2.5 times higher than in urban areas (44.6) (A. Boutayeb *et al.*, 2020; El Kadiri & El Aissaoui, 2023).

In terms of economic activity and employment, women (22%) are nearly four times less active than men (78%). Unemployment also disproportionately affects women (18.3%) compared to men (11.5%), as well as young people aged 25–34 years (20.6%) and young people with higher education (25.9%), all of which are higher than the national average (13%) (A. Boutayeb *et al.*, 2020; El Omari and Bourdin, 2025; HCP, 2025a).

Over the past three decades, numerous academic studies have examined the negative effects of socio-economic disparities and inequalities on health, education, employment, and economic activities in Morocco (Amaghouss & Ibourk, 2016; Boutayeb, 2012, 2024; Dadus & Saoudi, 2019; Loudghiri *et al.*, 2022; Mahdaoui & Kissani, 2023; Mezene *et al.*, 2021; Yaakoubd, 2009). Similarly, different international and national organisations have dedicated their reports to issues of inequality and disparity in Morocco (Economic and Social Commission for Western Asia [ESCWA], 2018; HCP, 2025b; Oxfam, 2019; World Bank, 2018).

In this paper, we focus on health inequities in Morocco, specifically in relation to infant and maternal mortality, child nutritional status, early marriage, and adolescent childbearing.

In order to ensure healthy lives and promote well-being for all at all ages, as stated by Sustainable Development Goal 3, efficient strategies are needed to eliminate or at least reduce unfair, avoidable, or remediable differences among different segments of the Moroccan population by acting

on social determinants, such as milieu of residence, gender, income status, education level, ethnicity, and religion. The main objective of the present study is to highlight the persisting health inequities by income quintiles, education level, and territoriality, including disparities between rural and urban areas and between the 12 Moroccan regions. The high values of the dissimilarity index and the large gaps across the majority of the health indicators considered in this study should convince Moroccan decision-makers to adopt urgent strategies in favour of the disadvantaged segments of the population (poor, uneducated, and rural residents).

## 2. Materials and methods

### 2.1. Materials

The analyses conducted in this paper were mainly based on data from HCP (HCP, 2022, 2025a, 2025b), the Kingdom of Morocco Ministry of Health (MoH, 2018), the Centre for Economic, Social and Environmental Council (CESE, 2024), and international reports (ESCWA, 2018; Oxfam, 2019; World Bank, 2018).

### 2.2. Method

Equity analysis requires disaggregated data by different socio-economic characteristics, such as income status, education level, milieu of residence, ethnicity, religion, and gender. Such data were acquired primarily from Demographic and Health Surveys (DHS; [https://dhsprogram.com/countries/Country-Main.cfm?ctry\\_id=27&c=Morocco](https://dhsprogram.com/countries/Country-Main.cfm?ctry_id=27&c=Morocco)) and the Kingdom of Morocco MoH (2018).

When raw original data are available, different statistical methods can be used to identify clustering among individuals, correlations between variables, and the separate effects of each variable. These methods include linear or multiple regression, hierarchical or discriminant analysis, the Wagstaff decomposition method, the

**Table 1. Moroccan population by age structure in 2024**

Age group (years)	Population (in thousands)	Percentage (%)
0–14	9,264	25.3
15–29	8,905	24.3
30–59	14,021	38.2
≥60	4,481	12.2
Total	36,671	100.0

Source: High Commission for Planning (HCP, 2025a).

concentration index, the index of dissimilarity (ID), and descriptive or inferential statistics. Unfortunately, in the present study, we did not have access to the original data; consequently, our analyses were based on secondary data.

## 2.3. Statistical analysis

We used ID in the analyses because the concentration index and ID are correlated, and we could not use the Wagstaff decomposition of CI to determine the horizontal equity and the impact of each variable separately. ID is a well-known statistical method used to measure inequality between two groups of a population characterised by socio-economic factors, such as income quintiles, education level, ethnicity, milieu of residence (urban–rural), and territoriality (provinces, regions and cities). The computed value of an ID allows one to evaluate how evenly the sub-group A population is distributed compared to the sub-group B population. The statistical equation is as follows:

$$ID = \frac{1}{2} \sum_{i=1}^N \left| \frac{a_i}{A} - \frac{b_i}{B} \right| \quad (1)$$

where A denotes the sub-group A population,  $a_i$  denotes the sub-group A population in category  $i$ , and  $b_i$  denotes the sub-group B population in category  $i$ .

The ID has a value between 0 and 1 (and between 0% and 100% when expressed as a percentage). Consequently, for comparison and interpretation, a computed value of ID near 1 indicates an inequitable distribution across groups, while a value of ID approaching zero indicates no (or little) difference between the groups.

Moreover, the ID can help decision-makers to adopt a redistributive strategy to achieve equity, as indicated by the following educative example: Let us consider four regions A, B, C and D with the same proportion of population (25%) but having the following inequitable distribution of physicians: 45%, 35%, 15% and 5%. The computing ID value for this example is 30%, indicating a high level of inequity. Now, to reach an equitable distribution of the number of physicians, decision-makers should, for example, redistribute 20% of physicians from region A to region D and 10% of physicians from region B to region C to obtain an equitable distribution of physicians (25% in each region) corresponding to the same distribution of population (25% in each region).

## 3. Results and discussion

### 3.1. Neonatal, infant, and child mortality

Over the past three decades, Morocco has seen significant reductions in the neonatal mortality rate (NNMR), infant

mortality rate (IMR), and under-five mortality rate (U5MR). As shown in Figure 1, NNMR, IMR, and U5MR decreased by factors of 2.3, 3.2, and 3.4, respectively, between 1992 and 2018. These important achievements were enabled by improvements in nutrition, vaccination, family planning programmes, and other sectoral strategies.

However, achievements were not shared equitably by different segments of the Moroccan population. Figure 2 shows that the three mortality rates decreased when the population's standard of living increased. For example, children born in the poorest families (27.9‰) were nearly three times more likely to die before their fifth birthday than their counterparts born in the richest families (10.9‰). These gaps are also confirmed by the computed IDs: 11.4%, 14.4%, and 17% for NNMR, IMR, and U5MR, respectively.

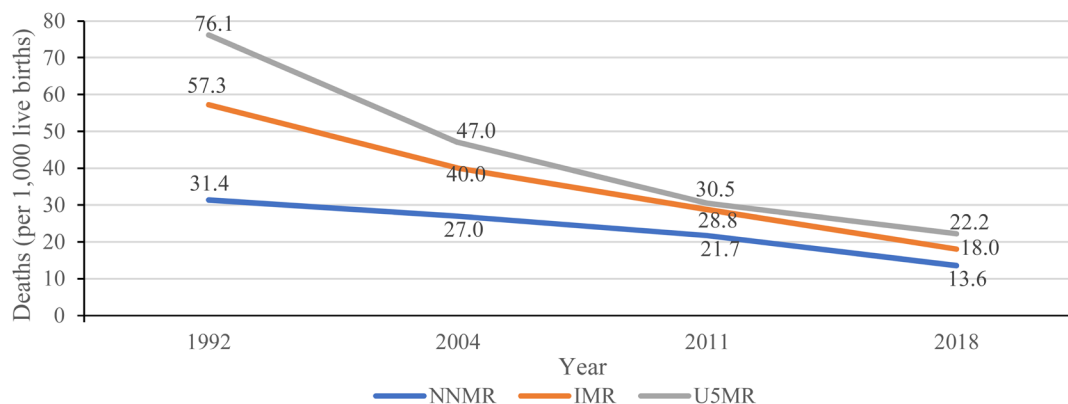
### 3.2. Nutritional status of children under five years of age

#### 3.2.1. Stunting

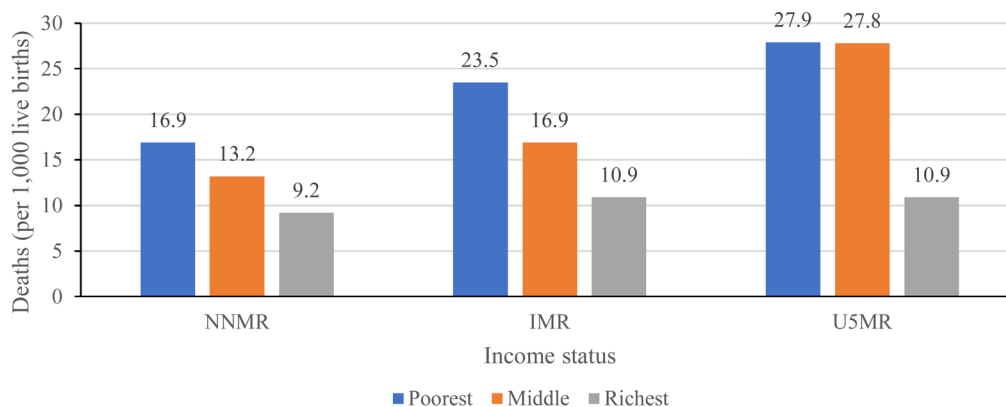
According to the results of the National Survey on Population and Family Health (ENPSF) carried out in 2018, more than 15% of children under five years of age suffer from stunting in Morocco, and this prevalence has remained virtually unchanged since 2011 (14.9%). Moreover, beyond the national average, analysis of stunting prevalence in Morocco revealed significant gaps depending on different socio-demographic characteristics, especially by region and milieu of residence (urban–rural), as shown in Figure 3. Children living in rural areas (20.5%) were twice as likely to be stunted as those living in urban areas (10.4%), and the ID was 16.7%, confirming a high degree of inequity. Similarly, stunting by region shows a high degree of territorial disparity: stunting prevalence ranged from 10.2% (Casablanca-Settat region) to 29.1% (Béni-Mellal-Khénifra region). The steepest gradient in the stunting distribution between regions is confirmed by the high ID (16.4%).

#### 3.2.2. Underweight

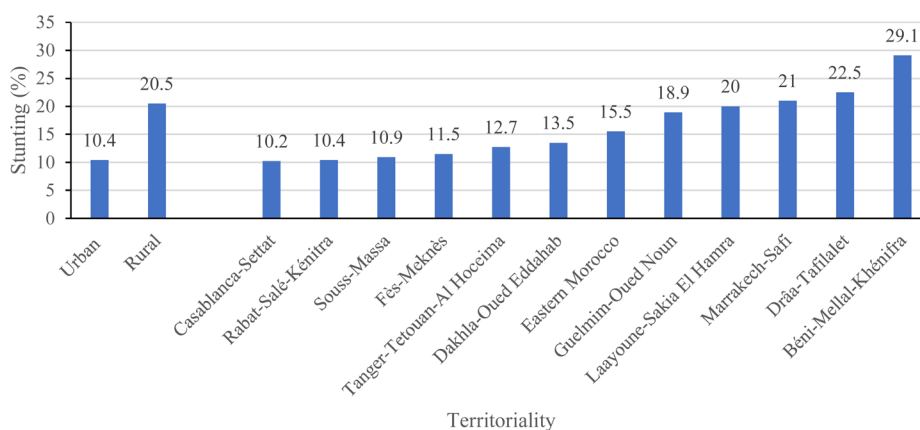
The weight-for-age indicator recorded a significant decline in Morocco during the period 2004–2018. The prevalence of underweight fell from 10.2% in 2004 to 2.9% in 2018, a 72% decrease. However, the average prevalence of underweight masked disparities by certain characteristics (milieu of residence, age group, region). Although the prevalence of underweight was relatively low, significant differences appeared across socio-demographic factors (Figure 4): Depending on the area of residence, the inequity analysis showed that rural children (3.8%) suffered from underweight almost twice as much as urban children (2%),



**Figure 1.** Evolution of neonatal (NNMR), infant (IMR), and under-five mortality rates (U5MR)  
Data source: Kingdom of Morocco Ministry of Health (2018).



**Figure 2.** Neonatal (NNMR), infant (IMR), and under-five mortality rates (U5MR) by household's income level  
Data source: Kingdom of Morocco Ministry of Health (2018).



**Figure 3.** Stunting by the milieu of residence, including urban-rural and regions  
Data source: Kingdom of Morocco Ministry of Health (2018).

and the ID (15.8%) confirms this high degree of inequity. Territorial disparity showed that children in the Eddakhla-Oued Ed-Dahab region (5.8%) were almost three times more likely to be underweight than children living in Casablanca-Settat (2%), and overall, the distribution of underweight showed a significant regional disparity, illustrated by a steep gradient and characterised by an ID slightly greater than 10%.

### 3.2.3. Wasting

Wasting varies greatly by region. Children living in the Eastern region (6.1%) were more than three times as likely to be wasted as those living in the Casablanca-Settat (1.9%), Marrakech-Safi (1.9%), or Souss-Massa (1.9%) regions. The high degree of inequity is confirmed by the 16% ID.

### 3.2.4. Overweight/Obesity

Globally, obesity has become a critical problem that challenges both developed and less-developed countries. Moreover, being overweight is not limited to adults; it also affects children and adolescents. According to a 2025 study, the combined prevalence of overweight and obesity doubled between 1990 and 2021, while that of obesity alone tripled over the same period (GBD 2021 Adolescent BMI Collaborators, 2025). By 2021, it was estimated that obesity affected 93.1 million individuals aged 5–14 years and 80.6 million aged 15–24 years.

In Morocco, according to data from the 2018 ENPSF, the prevalence of obesity or overweight in children under five years of age was 10.8% nationwide. This rate masks disparities by residential area, child's gender, child's age group, and region. Figure 5 shows that the prevalence of overweight/obesity was relatively higher in urban areas (11.7%) than in rural areas (9.7%). This distribution generated an ID of 4.6%. Similarly, a significant disparity was seen in the distribution of overweight/obesity by regions. Children living in Laâyoune-Sakia-El Hamra (19%) were three times more likely to be overweight than their neighbours living in Eddakhla-Oued Ed Dahab (6.1%). The ID (10.1%) indicates a high degree of inequality.

By gender, boys (12.3%) were relatively more overweight than girls (9.2%), resulting in an ID of 7.2%. Finally, by age group, the analysis showed a significant variation in the prevalence of overweight, ranging from 4.6% in children aged 48–59 months to 17% in the 12–23 months age group. The high ID (19.1%) confirms the significant disparity in overweight prevalence across age groups.

It is also interesting to note that the prevalence of overweight/obesity was relatively high (16.4%) in the under-six-month age group, implying that this age group suffers from the double burden of overweight and wasting/

underweight. Therefore, special emphasis on strategies to reduce inequities should be placed on children (and parents) in this age group. This crucial issue affecting infants in their early life may be explained by different factors, such as the low breast feeding rate (35%); the inadequate nutritional supplements (55.1%); the low post-natal care (22%), especially in rural areas (15.6%) and among the poorest mothers (13.9%); and finally, a relatively high proportion of adolescents who have begun childbearing (5.1%), especially in rural areas (8.2%) and among uneducated girls (15.2%).

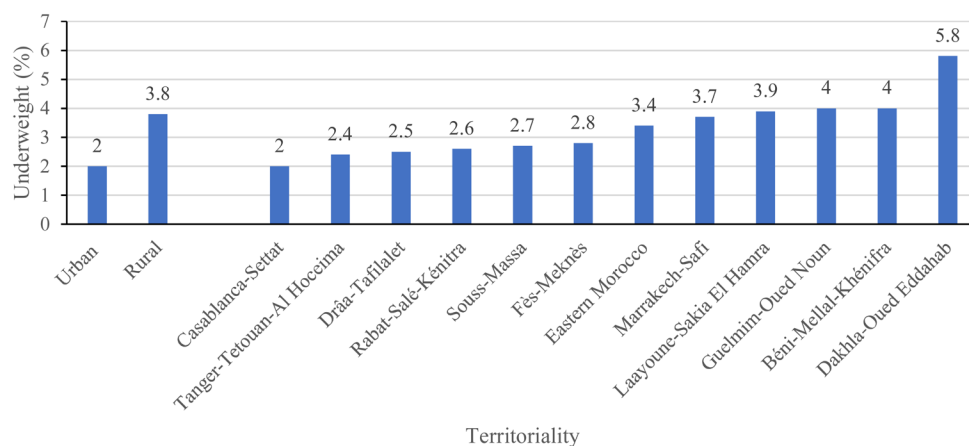
### 3.3. Early marriage

The analysis of data on early marriage (also known as child or minor marriage) is interesting for at least two reasons: (i) early marriage has repercussions on the health of mothers and children due to the close relationship between childbearing at a young age and the associated risks for both mother and child (more than 32% of married underage girls already have at least one child); and (ii) the family code (Moudawana) adopted in 2004 prohibits the marriage of girls under the age of 18, except with the authorisation of a judge for special cases (Boutayeb, 2025). However, in practice, these “special cases” number in the tens of thousands, as, according to the Ministry of Justice, approximately 85% of marriage applications resulted in authorisation during the period 2011–2018. Recent data indicate that in 2023 and 2024, the judges authorised 62.5% (12,629 out of 20,192 marriage requests) and 63% (10,691 out of 16,985 marriage requests), respectively, of which 98% are for girls. Over the last two decades, since the launch of the Moudawana in 2004, more than 520,000 girls were married before age 18, representing an average of more than 26,000 early marriages per year (Figure 6) (Boutayeb, 2022, 2025).

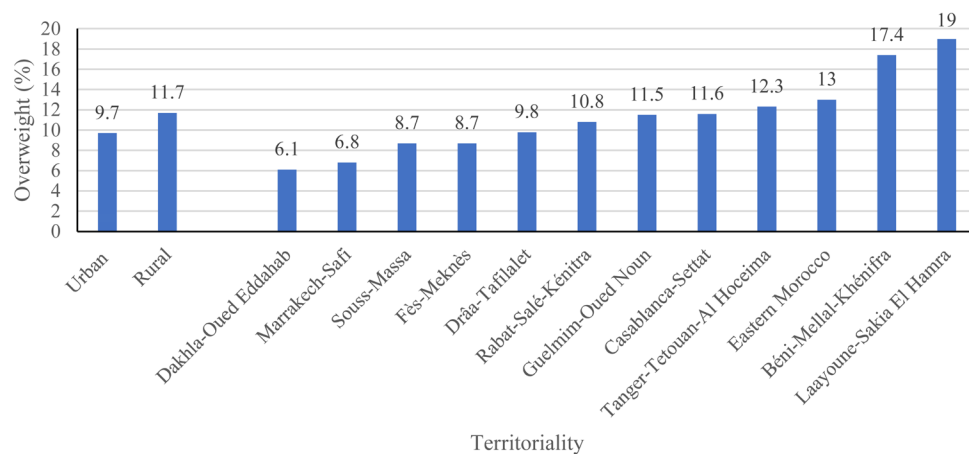
Figure 7 shows that early marriage is highly affected by social determinants such as the milieu of residence, education level, and income status (Boutayeb, 2024, 2025; Kingdom of Morocco MoH, 2018). Girls without a certificate (22.8%) were 19 times more likely to be married before age 18 than girls with at least secondary education (1.2%). In comparison, girls from the poorest quintile (21.5%) were more than twice as likely to be exposed to early marriage before age 18 than girls from the richest quintile (10.8%). Similarly, rural girls were more likely to be exposed to early marriage (ages < 15 and < 18) than urban girls.

The distribution of early marriages by region also showed a significant disparity. For example, girls living in the regions of Béni Mellal-Khénifra (23.8%), Draa-Tafilalt (21.8%), Marrakech-Safi (21.5%), and Ed Dakhla-Oued Ed

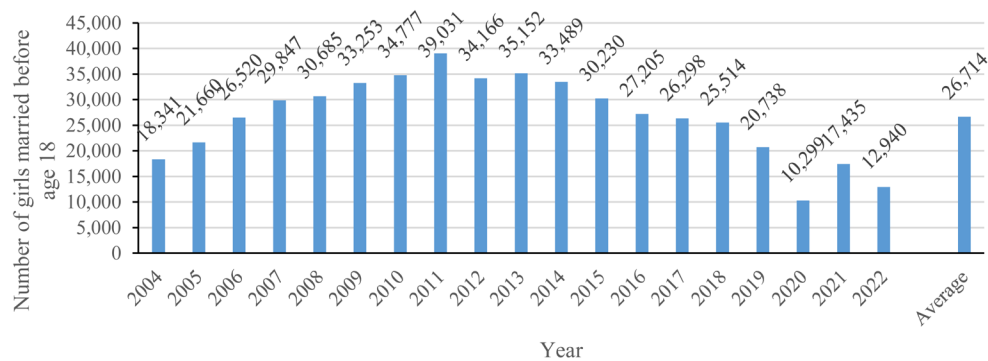




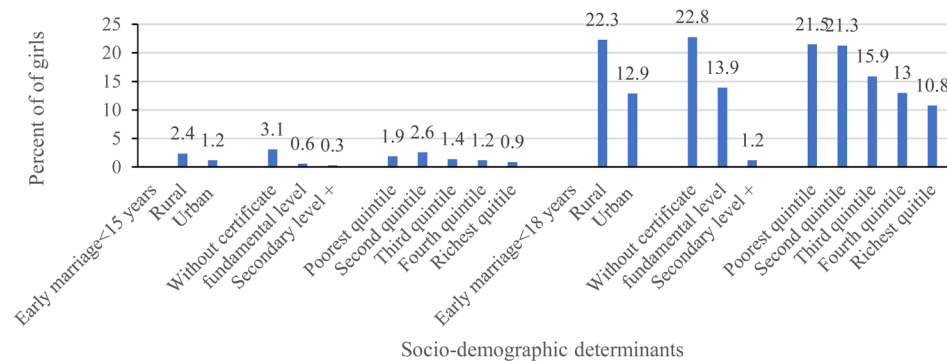
**Figure 4.** Underweight by milieu of residence, including urban–rural and regions  
Data source: Kingdom of Morocco Ministry of Health (2018).



**Figure 5.** Proportion of children under five years old suffering from overweight/obesity by regions and urban–rural areas  
Data source: Kingdom of Morocco Ministry of Health (2018).



**Figure 6.** The number of girls married before age 18 per year in Morocco  
Data source: Boutayeb (2025).



**Figure 7.** Proportions of girls married before ages 15 and 18 in Morocco  
Data source: Boutayeb (2024) and Kingdom of Morocco Ministry of Health (2018).

Dahab (20.3%) were significantly more at risk of early marriage before age 18 than girls in other regions such as Casablanca-Settat (12.8%), Guelmim-Oued Noun (12.4%), and Tanger-Tétouan-El Hocima (12.4%). The IDs were 9% for marriage under 18 years and 11.3% for marriage under 15 years.

The National Office for Human Development (ONDH) study on “Intersectional Discrimination of Women in Morocco” analysed the accumulation of deprivations among women who had experienced early marriage, considering, in addition to the effect of each socio-demographic factor (place of residence, standard of living, and region), the combined effects of two or three of these factors (A. Boutayeb *et al.*, 2020). The result is shown in Figure 8, revealing that a rural girl, belonging to the poorest quintile and residing in the most disadvantaged region, accumulated 3 deprivations and was therefore 3.5 times more likely to be early married (38.2%) than an urban girl, belonging to the richest quintile and residing in the most advantaged region (10.9%).

### 3.4. Adolescent childbearing

The distribution of percentages of adolescent girls aged 15–19 who have begun childbearing shows intolerable inequities across all considered factors (Figure 9) (Boutayeb, 2023). The inequitable distribution patterns are confirmed by high IDs, indicating that action to reduce inequity in adolescent fertility is a top priority requiring urgent and efficient action from decision-makers.

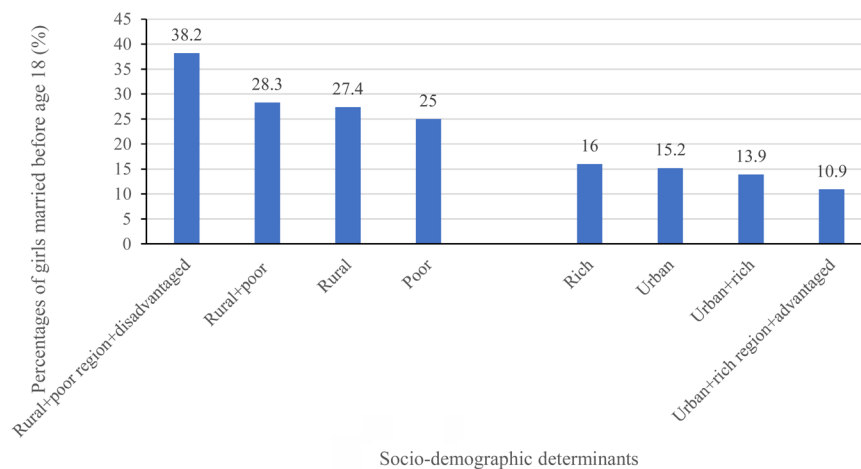
By area of residence, adolescent girls living in rural areas (8.2%) were 2.6 times more likely to have begun childbearing than their counterparts living in urban areas (3.2%). The ID was 23.1%, confirming the high level of inequity between urban and rural areas.

Almost one in six adolescent girls without an educational certificate has begun childbearing and is pregnant or already has at least one child, while none of the adolescent girls with a secondary education or higher have begun childbearing. The high ID (15.7%) confirms inequity by education level.

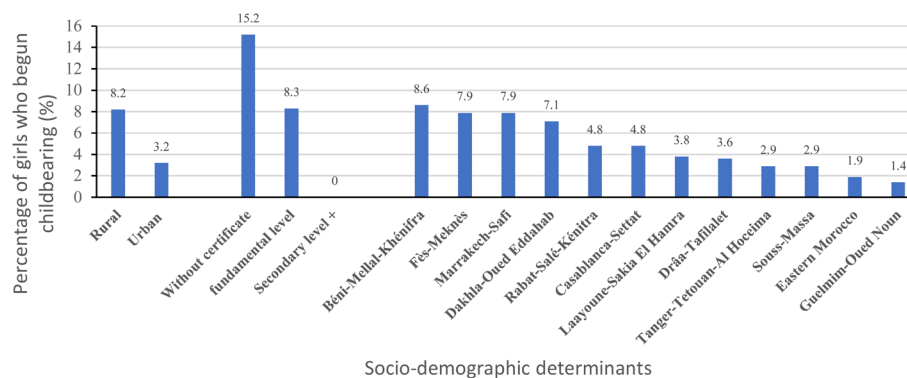
Regional disparities showed significant gaps: regions with adolescent girls’ childbearing rates exceeding 7% and those with rates below 2%. The ratio between the highest (8.6%) and lowest (1.4%) percentages reached 6.1, and the ID was 17.5% (Figure 9).

### 3.5. Present study and global context

Despite its limitations, the present study addressed the crucial issue of health inequity among children and adolescents in Morocco. The importance of this theme can be better understood by relating it to global studies, such as those published in 2025 by GBD 2021 Adolescent BMI Collaborators (2025), GBD 2023 Disease and Injury and Risk Factor Collaborators (2025), GBD 2023 Causes of Death Collaborators (2025), GBD 2023 Demographics Collaborators (2025), and the State of the World’s Children 2025 Statistical Compendium by UNICEF (2025). These global studies show how the health and death of children affect vital health indicators at the global, regional, and local levels, including life expectancy, healthy life expectancy at birth, the global burden of disease, mortality, multi-morbidity patterns, and well-being at advanced age. For example, it is estimated that 60.1 million deaths globally were registered in 2023; of these, 4.67 million occurred among children younger than five years (GBD 2023 Demographics Collaborators, 2025). According to UNICEF, neonatal deaths in Morocco (6,413) represented 61% of under-five deaths (10,483) in 2023, while the global proportion was 48% (2.28/4.77 million deaths; UNICEF, 2025).



**Figure 8.** Proportions of girls married before age 18 in Morocco  
Data source: A. Boutayeb et al. (2020).



**Figure 9.** Proportion of girls aged 15-19 who have begun childbearing in Morocco  
Data source: Kingdom of Morocco Ministry of Health (2018) and Boutayeb (2024, 2025).

## 4. Conclusion

This study revealed that persisting health inequities and territorial disparities in Morocco are seriously hindering the country's sustainable development. Although the country has made undeniable progress and all health indicators were improved "on average," achievements remain incomplete due to appalling inequalities affecting vital sectors, such as health, education, and employment. Moreover, women and children are among the segments of the Moroccan population that suffer the most from inequality (W. Boutayeb *et al.*, 2016). Consequently, beyond its scientific contribution, the publication of this study will be a sincere appeal to policymakers to act swiftly against the scourge of inequality in Morocco.

The analysis carried out in this study had some limitations, mainly due to the type of data available (secondary data). For example, we could not use multivariate analysis or Wagstaff decomposition of the concentration index to identify the contribution of each factor to health inequity. Moreover, the data used were from the ENPSF survey conducted in 2018, and the next survey with disaggregated data is expected to be published by UNICEF in 2026 (MICS 7).

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## Conflict of interest

The author declares he has no competing interests.

## Author contributions

This is a single-authored article.

## Ethics approval and consent to participate

Not applicable.

## Consent for publication

Not applicable.

## Availability of data

Data are available from the corresponding author upon reasonable request.

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