The first 1000 days: the price of inequalities in high and middle-income countries

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Abstract

The first 1,000 days of human life start from conception until the child turns 2 years of age. This is a unique period in which the foundations of a child's lifelong health are built. Disadvantaged socioeconomic circumstances and limited access to health care services can globally affect a child's health outcomes and educational and vocational potential. This article discusses health inequalities over the first 1,000 days of life and possible mitigation programs. Governments and politicians should promote fairer health interventions and pediatric healthcare workers should be aware of the main health determinants to advocate for more equitable and child-focused resource allocation. Therefore, the main approaches to contrast health inequalities include cooperation between governments and public health professionals, removing barriers to accessing medical care and raising staff awareness about health determinants. Finally, pro-equality interventions should include providing services commensurate with the level of need, in adherence to the principle of social justice.

1. Introduction

The first 1,000 days in the life of a human, starting from conception to a child's second birthday, represent a window of opportunity to improve an individual's development throughout their lifetime [1]. The development of a child strictly depends on the conditions that occur during conception, pregnancy, and the very first period of infancy, namely the connection of genetic, environmental, socio-economical, psychological, and behavioral factors. Indeed, the foundations of optimum health, growth, and neurodevelopment across the lifespan are established during this period [2]. Unfortunately, during this period, not all children are afforded equal opportunities to thrive, leading to profound health and social inequities that can have long-lasting consequences [3–5]. The gaps widen as children grow, resulting not only in adverse adult health, educational, and vocational outcomes but also in increasing premature morbidity and mortality [1]. Moreover, according to the literature, socioeconomic position and deprivation in early childhood appear to be independent risk factors for disease in adults, even in the face of advancement up the social ladder [6,7].

Health inequities, defined as unjust and avoidable differences in health status and outcomes among different populations, have long been a pressing global concern. As stated by the United Nations Convention on the Rights of the Child (1989), every child must be recognized as having the right "to the enjoyment of the highest attainable standard of health and facilities for the treatment of illness and rehabilitation of health." [8].

The main health determinants in the first 1,000 days of life are categorized in **Figure 1**.

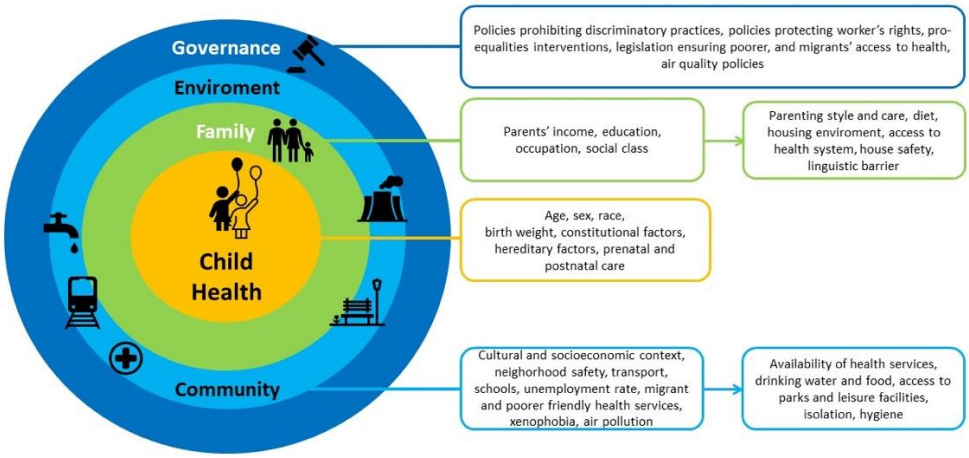

Figure 1. A conceptual framework for the main determinants of child health and pro-equality interventions.

Mortality is a key point to assess these aspects. While in the richest parts of the world child death is very rare, the infant mortality rates of some African and Asian nations are nowadays close to or even worse than those registered in the USA (36/1,000 live births), UK (35/1,000 live births), and Italy (88/1,000 live births), although there is still marked internal inequality in health in these societies [9,10] (**Figure 2**).

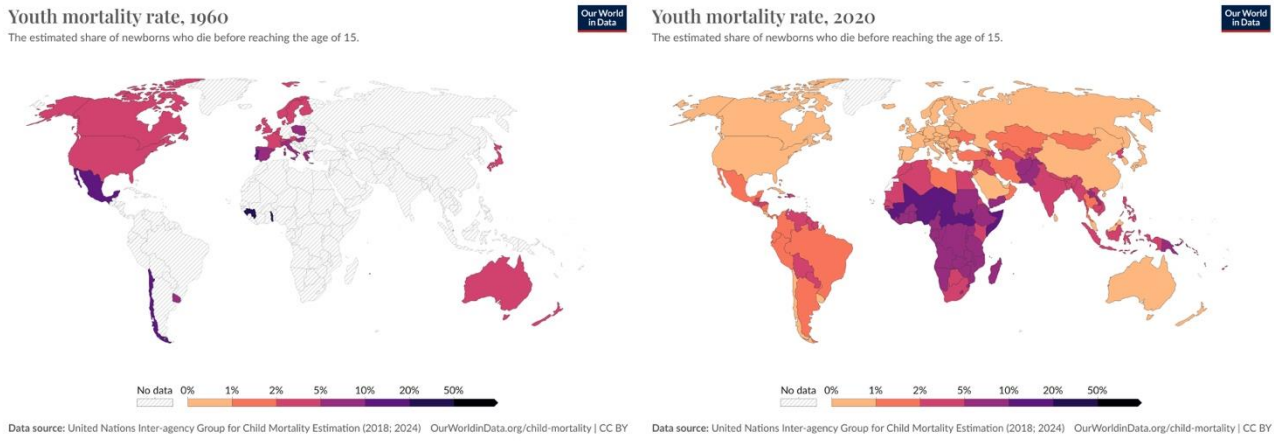

Figure 2. Infant mortality rate under 5 years of age: 1960 and 2020 [11].

OurWorldInData.org/child-mortality—Source: UN Inter-agency Group for Child Mortality Estimation

This review aims to contribute toward the ongoing dialogue on children's health during their first 1,000 days by describing some of the main disparities faced during this crucial period in countries with high- and upper-middle incomes based on a World Bank classification [11]. The classification is updated each year based on the previous year's gross national income per capita. In 2024, major high-income economies will include Japan, the United States, Canada, Europe (except for Bulgaria), New Zealand, and Australia. Upper middle-income economies will include some European countries (e.g., Bulgaria), some United Nations member states and/or EU candidate countries (e.g., Georgia, Kosovo, Bosnia and Herzegovina, Ukraine, Turkey), Middle Eastern countries, South Africa, China, Latin America, and Russia.

2. Materials and Methods

This descriptive review was conducted using PubMed as the source of research. We searched for English-language articles without setting any time limit. The following keywords were used: (1)

health inequalities; (2) maternal care; (3) inequalities in breastfeeding; (4) social health determinants; (5) disparities AND primary care; (6) strategies AND child health inequalities. Data was extracted using standard templates. Reference lists were checked to obtain additional records that comprised articles identified by other sources.

3. Childbirth, maternal and neonatal mortality: factors determining inequalities

Health inequality in antenatal is still a burning issue. In particular, according to Rauscher et al., in the USA there is a great gap in infant health inequality, with the most disadvantaged categories including single, black mothers with lower levels of education and lower salaries [12].

In the USA, Vedam et al. investigated inequity and mistreatment during pregnancy and childbirth and found that black women and those with social or economic disadvantages experience mistreatment in hospitals more frequently [13]. In 2021, Topcu et al. surveyed members of the European Board and College of Obstetrics and Gynecology and the European Association of Perinatal Medicine. They found that important differences still exist in care delivery and accessibility between European countries and between different social groups in the same region [14]. A review conducted in the UK by McKnight et al. indicated that pregnant asylum seekers face significant barriers to accessing maternity care due to their status and lack of knowledge of maternity services [15]. In the Netherlands, Baron et al. found that lower-educated women were more likely to smoke during pregnancy; women with a lower level of education and those from non-Western regions were more likely to not attend antenatal classes and take folic acid supplementation [16], which is known to prevent major brain and spine defects. Maternal deaths mostly occur in low- and lower-middle-income countries [17], but socioeconomic inequalities also have a significant impact on the maternal mortality rate in wealthier countries. In the USA, Vilda et al. found that income inequality was associated with a 14% increase in pregnancy-related mortality among black women compared to white ones [18]. Similarly, the risk of maternal mortality in Europe is two to four times greater for women of black and Asian ethnicity [19]. In the UK, Knight et al. found that black and Asian pregnant women are respectively 3.7 and 1.8 times more likely to die during childbirth than white mothers [20].

There are also significant inequalities regarding the type of birth chosen and the level of care provided because of ethnic or economic discrimination. In some upper-middle-income countries in Latin America and the Caribbean (e.g., Peru), pro-rich inequalities regarding skilled attendants during childbirth are very marked [21]. About the type of delivery chosen, the World Health Organization (WHO) recommends that the cesarean section rate should not exceed 10% to 15% [22]. In upper-middle-

income countries, richer women who have access to private healthcare facilities, as well as women with higher educational levels and decision-making power, have a higher likelihood of undergoing C-sections, according to research conducted in Indonesia by Zahroh et al. [23] and in African countries (e.g. Namibia and Guinea) by Sanni et al. [24]. Conversely, in high-income countries, ethnic minority groups had higher odds of undergoing C-sections than white women [25–27]. Likewise, in Canada, Daoud et al. observed a negative association between socioeconomic position and the timing of the first ultrasound and C-section delivery [28].

In terms of neonatal mortality (the death of a baby within the first 28 days of life), unsurprisingly, upper-middle-income countries in Latin America and the Caribbean present higher rates among the poorest children [21]. The same occurs in richer countries: in the Netherlands, Ravelli et al. found that African ethnicity was a main risk factor for perinatal mortality (stillbirths plus early neonatal deaths under 7 days of life) [29]; similarly, a recent review from the UK suggests that ethnicity and socioeconomic status might be risk factors for stillbirth (death before or during birth after 28 weeks of gestation) [30]. In the same country, data from 2016 to 2020 showed an increase in stillbirth and neonatal mortality in families with socioeconomic deprivation [31]. The same authors also found a combined influence of economic deprivation and ethnicity on perinatal death rates [31]. Jardine et al. in England found that socioeconomic and ethnic inequalities are responsible for a substantial proportion of stillbirths, preterm births, and births with growth restrictions [32]. In addition to ethnicity and income, other important risk factors exacerbating stillbirth are maternal educational level and employment. This was demonstrated in Europe by Zeitlin et al., who found that the risk of stillbirth was higher for women with lower educational levels and those working manual jobs [33]. Similarly, in Norway, Eriksen et al. found a high level of perinatal mortality among low-educated and non-Western immigrant groups [34]. In Ireland, Duffy et al. found that African-born mothers have an increased risk of stillbirth in comparison to Irish-born mothers and that unemployed mothers have a higher risk of perinatal mortality than employed mothers [35]. Another significant correlation exists between the mother's educational level and the offspring's birth weight [36]. In the UK and Ireland, Tomson et al. found that women from lower socioeconomic and occupational backgrounds have significantly higher probabilities of experiencing stillbirth, neonatal mortality, perinatal mortality, preterm birth, and low birth weight [37]. Carrilero et al. in Catalonia (Spain), demonstrated that short gestation, low birth weight, fetal growth retardation, intrauterine and birth asphyxia were higher in those with the most pronounced socioeconomic disparities [38].

In conclusion, the primary determinants driving inequities in fetal and maternal health and engendering the worst outcomes, including maternal and perinatal mortality, are mothers' ethnicity, religion, income, employment, education, country and area of residence.

4. Barriers to breastfeeding: a cultural, social, and political issue

Breastfeeding is the most important source of nutrition for infants. As stated by the WHO, exclusive breastfeeding for the first 6 months of life is beneficial as it protects the child against gastrointestinal infections, necrotizing enterocolitis, sudden infant death syndrome, and reduces newborn mortality [39,40]. Later in life, it protects against the risk of obesity and chronic diseases and it improves brain development and performance; in mothers, it reduces the risk of high blood pressure, type 2 diabetes, ovarian cancer, and breast cancer [39].

Breastfeeding rates have increased over the past few decades, however worldwide more than half of all infants under six months of age are not breastfed [39]. Although formula feeding is more expensive than exclusive breastfeeding, it has been observed that older, better-educated, and more affluent women in high-income countries are more likely to breastfeed [41]. This is because younger, less-educated, and economically disadvantaged women generally receive less support and encouragement from sources such as parents, support/peer groups, voluntary organizations, or health professionals: this increases the likelihood that they will discontinue breastfeeding within the first few weeks [42].

Ethnicity also influences breastfeeding rates, with black mothers having the lowest rates compared to Asian and white mothers, as reported in the USA by the CDC in 2019 [43]. The reasons contributing to this attitude vary: black mothers are usually younger, have significantly lower incomes, are often single or divorced and have a lower level of education [44]. A further reason why black mothers may have a negative view of breastfeeding is because they were forced to breastfeed their white enslavers' babies. This approach to infant feeding was reinforced in the years that followed by the marginalization of black mothers as a result of structural racism that limited their access to breastfeeding support systems [45].

Another major barrier is maternal employment since maternity protection policies are still inadequate or even absent in many countries [46]. The most recent data from the International Labor Organization paper, for example, shows that almost half of the countries around the world (47%), including the USA, do not conform to standard maternity leave of at least 14 weeks, and in some countries, statutory paid maternity leave is only provided to certain categories of workers [47]. This lack of support leads women to prematurely discontinue breastfeeding or leave their jobs. A descriptive study on this topic

was conducted in the Netherlands on mothers employed at Dutch universities [48]. It revealed that the majority of mothers had negative experiences when attempting to balance breastfeeding with work: these challenges included inappropriate and inaccessible lactation rooms, inflexible working hours, and unmodified workloads. On the other hand, a recent review by Aronsson et al. [49] underlines this issue by pointing out that informally employed mothers have better breastfeeding outcomes because of flexible schedules.

5. Post-natal follow-up and access to primary healthcare

Post-natal follow-up is of utmost importance in children with conditions at risk of complications.

Prematurity is one of the riskiest conditions for sequelae. In particular, preterm children born at 22 to 34 weeks gestation or under 1500 grams [50,51] need specific, long-term high-risk infant follow-up programs after discharge from the neonatal intensive care unit, including multidisciplinary evaluations that provide specific neurodevelopmental and functional screening, assessment, and diagnosis, along with routine evaluations by a general practitioner [52,53]. However, many patients still do not complete this follow-up. The main factors influencing this trend are ethnicity, non-native speaker parents, maternal smoking, young maternal age, distance from the clinic, and high gestational age at birth [54].

A pattern of discontinuing clinical follow-up was also observed among children afflicted with chronic diseases, with social factors continuing to be the main determinants [55]. For example, non-white ethnicity has been identified as a predictor of clinic non-attendance for patients with congenital heart disease (CHD) [55]; thus, notable racial and ethnic disparities were recorded in post-operative mortality after CHD surgery [56]. Similarly, a retrospective study published by Jackson et al. in 2018 revealed that non-white children with CHD had a significantly greater risk of experiencing a lapse in follow-up. Inequitable access to care has been suggested as a factor contributing to differences in mortality after surgery [57].

Loss to follow-up is also an issue in the field of congenital infections. A retrospective study conducted in Brazil from 2000 to 2017 on a cohort of children exposed to HIV infection during pregnancy demonstrated that mothers of children classified as “lost to follow-up” have higher chances of being younger, non-white, with lower grade schooling, and addicted to intravenous drugs [58].

In terms of access to primary care, several European countries, including Italy, the United Kingdom, Spain, Norway, and Ireland, provide children with free access to hospitals and primary healthcare. In

other European and non-European countries, however, healthcare is not fully subsidized by governments, leading to disparities in access to healthcare, particularly among minority groups and migrants who have often lower incomes and can't afford extended insurance nor have other financial resources to pay for their children's medical care [59]. In New Zealand, for instance, government funding is limited, and general practitioners may charge a fee for their services; for this reason, cost seems to be a persistent barrier to care among minorities. A study by Mona Jeffreys et al. [60] on accessibility to primary pediatric care demonstrated that barriers were more often reported by younger mothers and included household overcrowding, area-level deprivation, household income, and sufficiency of income, especially for minorities (Pacific and Maori ethnic groups in comparison to New Zealand European groups).

Language seems to be the primary barrier for migrants, as they find it difficult to understand healthcare providers, and interpreters are frequently not available [61]. Language barriers can lead to misdiagnosis and inappropriate treatment, causing immigrants and refugees to mistrust their physicians [62]. A Canadian descriptive study revealed that the challenges faced by migrant parents are mostly due to a lack of interpreting services, which limits their ability to communicate their children's health issues and schedule visits as needed [59].

6. Inequalities in vaccination programs and adherence issues

It is widely acknowledged that childhood immunization is the most cost-effective method of primary prevention [63,64]. Vaccination coverage is a good indicator of health, and among all vaccines, the one against diphtheria, tetanus, and pertussis (DTP) signifies access to primary care and continuity of care, as it requires three doses.

It is a long-standing practice among all European Union Member States to administer vaccination programs. Nevertheless, vaccination coverage is not uniform across Europe and vaccination programs differ considerably across different European states, depending on the vaccines included in the program, vaccine type, total number of doses administered and timing [65]. There are also substantial variations regarding whether vaccinations are recommended or mandatory and vaccination costs coverage [66]. According to the Vaccine European New Integrated Collaboration Effort (VENICE) network, a total of 16 countries lack mandatory vaccination policies [65,66]. The minimum DTP immunization level recommended by the WHO was not met in Romania and Austria and DTP

immunization rates dropped in 2021, during the SARS-CoV-2 pandemic, in more than half of the EU Member States with the most significant decline in Latvia, Spain, and the Czech Republic [67].

Limited access to vaccinations is also a main issue in disadvantaged and isolated communities in high-income countries [68]. For instance, Perry et al. found that although Wales (UK) promoted a nationwide immunization policy among migrants, the vaccination coverage of asylum-seeking children is not comparable to that of the local population [69]. A few years later, the same Authors found that the factors most strongly associated with unvaccinated children were birth order, being born outside of the UK, living in a deprived area, low maternal education and mother-tongue language other than English or Welsh [70]. Access to vaccinations, but also adherence to vaccination programs, are pressing concerns, with salary, level of education, and geographic location influencing adherence [71]. The number of parents who choose to delay or refuse vaccines has recently risen in Western countries. In Italy, Bertoncello et al. found that economic hardship was a determinant of hesitancy while lower education was a predictor of refusal [72]. Giambi et al. identified four main factors associated with hesitancy: (1) absence of a pediatrician's recommendation; (2) getting discordant opinions; (3) meeting children who experienced serious adverse reactions; and (4) use of non-traditional medical treatments [73]. Similarly, a study conducted in Quebec by Guay et al. found strong associations between vaccine hesitancy and the beliefs that: (1) children receive too many vaccines; (2) a healthy lifestyle and use of alternative medicine can eliminate the need for vaccination [74].

In upper-middle-income countries, Ali et al. found a heterogeneous picture of inequality in vaccination coverage and access based on sex, birth order, maternal age, number of family members, access to transport, parental education, religion, and ethnicity [71]. In China, higher parental education contributes to improved coverage outcomes, while a negative association between educational attainment and vaccination coverage was surprisingly found in Thailand. [75]. In South Asian countries, Acharya et al. found that vaccination inequality influenced by maternal education was more profound than inequality attributable to affluence, supporting the benefits of maternal education [76]. As regards African countries, studies show low vaccination rates in all African countries, with the highest coverage in South Africa with inequalities in on-time and complete immunization [77,78]. However, the New United Nations Children's Fund (UNICEF) recently reported a 30% decline in confidence regarding childhood vaccines in this Country, probably due to growing access to misleading information, declining trust and inappropriate policies.[79].

Immunization coverage rates are also threatened in Latin America and the Caribbean, where the New United Nations Children's Fund (UNICEF) reported a significant drop in childhood vaccination over

the past decade [80]. The percentage of children under the age of one who received the third dose of the DTP vaccine dropped from 93% in 2012 to 75% in 2021 [80]. Fortunately, this rate increased to 79% in 2022 [8182]. Unsurprisingly, immunization coverage among the Ukrainian pediatric population has declined since the onset of the conflict. Even before the war, between 2017 and 2020, Ukraine experienced over 115,000 cases of measles and 40 deaths [83]; these numbers are likely to have risen due to the conflict [84]. Therefore, the European Centre for Disease Prevention and Control recommends that all Ukrainian refugees should be offered vaccinations under the host country's immunization schedule [85].

In conclusion, vaccination programs differ considerably between countries and socioeconomically deprived children still have limited access to vaccines in both wealthier and poorer countries. Family income, level of education, and geographic location can not only affect individuals' access to vaccinations but can also result in their outright refusal to be vaccinated.

7. Maternal mental health

The first 1000 days are a transitional phase that can lead to anxiety and stress in women. The WHO reported in 2019 that 10% of pregnant women and 13% of those who had recently given birth experienced mental health disorders, with depression being the most common [86]. The percentage was estimated to increase in 2022 [87]. Poor mental health during the perinatal period may result in lower engagement with antenatal and postnatal care services, insufficient nutritional intake, a higher risk of pre-eclampsia, a greater likelihood of breastfeeding challenges, and suboptimal parenting practices [88].

An interesting review on the topic identified three different reproductive risks: periconceptional, obstetric, and fetal-neonatal complication [89]. In this paper, the most robust evidence correlates preterm birth and low birth weight with common mental disorders that develop during pregnancy. It has been suggested that the earlier depressive symptoms arise during pregnancy, the more pronounced their impact may be on fetal development, affecting parameters such as fetal head growth, as well as birth weight and head circumference relative to age [9091]. Other studies have looked at other health outcomes after birth, and parental behavior during the early nurturing phase plays a crucial role in shaping the child's overall health, including their mental well-being [92]. Research from Indonesia indicates a strong link between maternal depression during pregnancy and stunting in children, with 33.8% (24 children) affected by stunting among those born to mothers with a history of depression

[93]. Children of mothers with symptoms more associated with depression had a higher risk of developing dental caries within 48 months [94].

Prioritizing women's mental health is essential, given its protective role in achieving positive outcomes for both mothers and newborns. We believe this risk factor would be modified if specialists and institutions contributed by investing time and resources. Both prevention and treatment must be strengthened to ensure early management of these conditions [95]. Counseling should encompass mental health screening: mental health evaluations should be conducted for pregnant women in the first and third trimesters, with follow-up as needed to address secondary manifestations of mental health conditions. Routine screening and psychosocial support from qualified healthcare providers are vital to helping women manage mental health concerns for the entire 1,000-day period, providing accessible psychological support modalities that can be much less costly than late interventions [96–98].

8. Social determinants of child health (SDOH)

The presence of health inequalities across the lifespan is substantiated by an expanding body of extensive evidence [99]. Children's well-being depends on the socioeconomic status of their parents, which itself consists of a broader spectrum of social determinants of health factors (SDOH) [100] as represented in **Figure 3**.

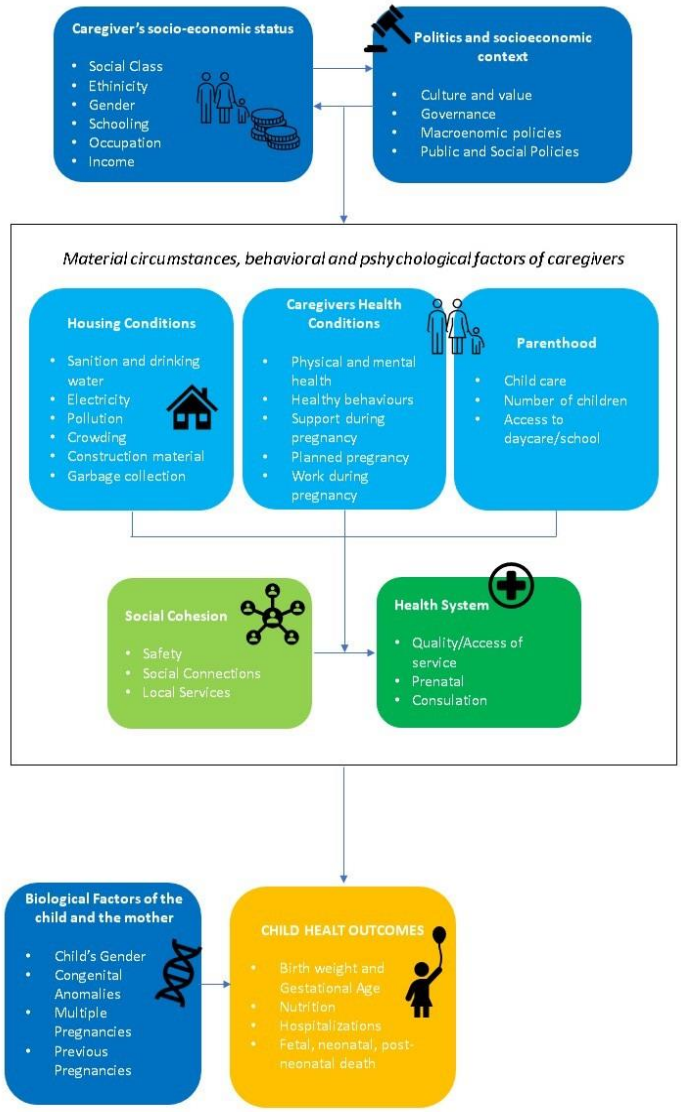

Figure 3. Social determinants of child health model (adapted from Mosley & Chen, 1984 [102], [103]).

A recent systematic review and meta-analysis by Balaj et al. showed how lower maternal and paternal levels of education are both risk factors for child mortality [101]. Specifically, each additional year of maternal or parental education resulted in a reduction in mortality so that, in the end, a child born to a mother with 12 years of education, compared with one from a mother with no education, has a 16.4% reduced risk of dying in the first month of life, a 36.3% reduced risk of dying between 1 and 11 months, and a 41.5% reduced risk of dying between 12 and 59 months.

A European-wide systematic review conducted in 2014 sought to identify the key social factors that drive inequalities in early childhood development. The results provided solid evidence that educational achievement, neighborhood deprivation, lower parental income or unemployment, lack of housing tenure, strenuous physical occupational demands and material deprivation in the household were independently related to a wide range of adverse health and developmental outcomes in the first years of life [102].

One of the most important social determinants of health that contributes to generating inequalities is the family's socioeconomic position (SEP) before birth. In low- and middle-income countries, the chance of dying in infancy is strongly related to parental SEP due to basic needs such as food availability, accommodation, or drug supply [103]. However, the same process is also observed in high- and upper-middle-income countries, even though the specific pathways remain more difficult to define. In 2013, a UK study demonstrated how the prevalence of diseases, as well as the way children cope with them, are related to parental income: infants from low-income households showed a higher probability of developing a chronic health condition, particularly respiratory diseases [104]. These findings were consistent with previous research conducted in the UK and USA [105].

A recent scoping review explored which family characteristics mediate the association between SEP and young children's health. It reveals specific mediating effects of family processes: the presence of rules and descriptive norms, parent-rated stress in parent-child relationships, parental screen time, and the presence of a TV in the bedroom [106].

The foundations for preventing obesity are also established in the first thousand days of life: a balanced maternal diet, breastfeeding, and proper weaning prevent obesity [107–109]. In Sweden, White et al. found a social gradient between the risk of childhood obesity and maternal education and income, especially in non-Swedish mothers [110].

Height is another widely used indicator of child health and a predictor of lifelong well-being. Unsurprisingly, Bird et al. found that children from more egalitarian countries (Sweden and the Netherlands) were taller across all levels of parental education and household income than those from less egalitarian countries (the USA, UK, and Australia), especially among less-educated parents and families with the lowest household incomes [106].

Finally, although results from high-income countries varied, they mostly indicated that health status inequalities persist or widen as children age [111].

9. Strategies to tackle health inequalities

The collection of data on health inequalities can reveal the contrasting health experiences of people with different economic statuses, educational levels, places of residence, sex, and ethnicities. Nevertheless, even in Europe, only a few countries have an adequate strategy for monitoring health inequalities [112]. Despite this apparent lack of data, global interest in these issues seems to be growing, so that on April 20, 2023, the WHO released the largest global collection of inequality data with the launch of the Health Inequality Data Repository, which contains about 11 million points of disaggregated data [113]. These data are a central requirement for monitoring inequalities between social groups and identifying situations of injustice.

On this matter, the European Child Guarantee, established in 2021, seeks to break the cycle of poverty and social exclusion by ensuring that children in need have free access to health, education, and other key services [114]. It is widely recognized that several European countries are attempting to develop comprehensive policy programs to stop health inequalities; however, different countries are in considerably varying stages of awareness and commitment [115]. In 2014, Wickham et al. proposed policies to reduce child poverty by providing income support and employment, affordable housing and public transport, high-quality services during pregnancy and supporting parents through parenting programs [116]. Going deeper, Lee et al. provide a pragmatic framework for both health professionals and healthcare institutions to address problems related to child poverty and health inequalities [5]. They recommend that institutions consider the following advice during the development of interventions: (1) a detailed investigation and comprehension of the underlying mechanisms of equalities before planning an intervention; (2) interventions should be co-developed with governments, community services, health care professionals and families; and (3) system-wide changes are more likely to reduce inequalities than small changes that can only offer temporary relief to a few families.

In addition to governments and politicians, community doctors can actively help reduce health inequalities. In 2023, Lee and colleagues provided health professionals with a small guide regarding how to destigmatize poverty and raise questions about finances: (1) identifying families struggling with poverty by address or appearances can be counterintuitive; (2) choosing the correct time for the discussion, preferring to ask these questions on routine growth monitoring check-ups and not during examination for acute illness; (3) pediatricians should ask everyone the same suite of questions and tell every parent that they ask these questions routinely; (4) ask questions about housing and income openly and empathetically, explaining parents why they are being asked those questions [5]. Finally, Lee et al. encourage healthcare workers to advocate firmly for structural and high-level policy change.

In 2021 Singh et al provided frontline practitioners with straightforward and evidence-based advice to tackle child poverty, including the adapted "HEADSS" tool for poverty, which is a screening questionnaire for poverty including questions about housing, employment, education, activities, diet, social support and safeguarding [117]. Similarly, De Rose et al. [118] propose that racial and sex discrimination should be routinely assessed during clinical examination and should be considered as a potential cause or trigger of disease. To support their statement, De Rose and colleagues shared a case of a 13-year-old Nigerian girl with sleepiness and seizures, suspected of Trypanosomiasis, but later revealed as a functional disorder due to a traumatic experience.

Another important role is played by pediatric community services and recently, in 2024, Buckley et al. specifically emphasized the role of community pediatric clinics in supporting children living in disadvantaged communities, through a family-centered model of care[119]. Maharaj et al. concretely demonstrated that Derbyshire County (UK) Community Pediatricians have effectively contributed to mitigating health inequalities by granting preferential access to services to deprived children [120]. Their pediatric community service was completely re-engineered in the 1990s creating a service based on a multidisciplinary approach, staff awareness, accessibility and acceptability. In particular, in Derbyshire County Pediatric Community, staff is periodically trained about child health inequalities; children are seen in local community clinics close to their houses, the booking process is easy with flexible schedule and telephone reminders are provided; active management of non-attendance is used to avoid lost to follow-up.

Figure 4 summarizes the prevention strategy against child health inequality in the first thousand days of life.

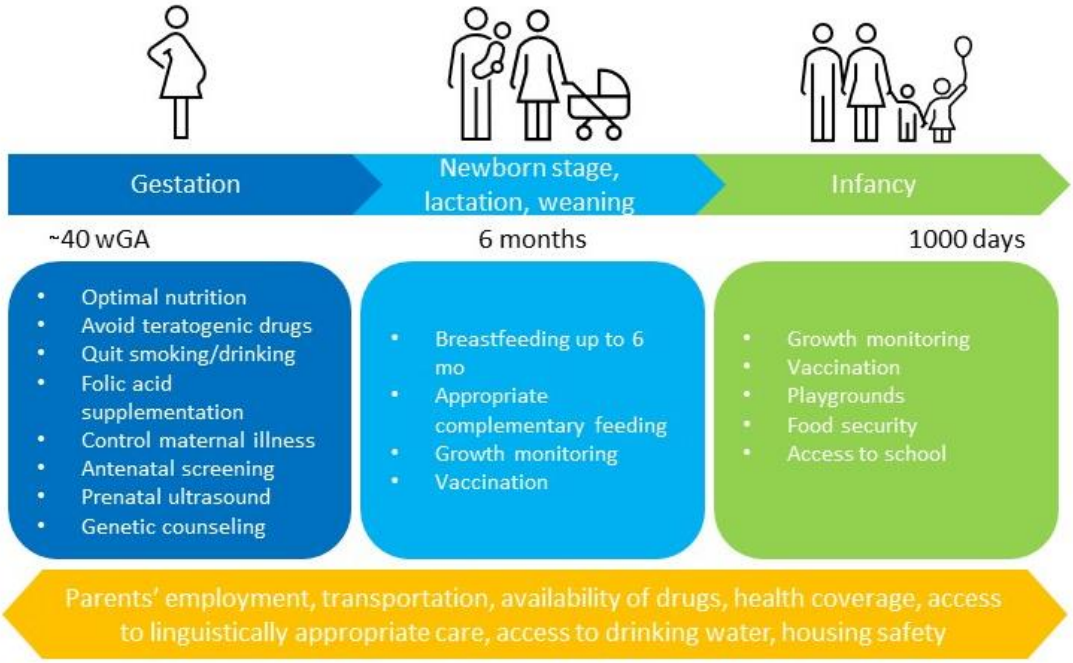

Figure 4. Main prevention policies and practices against child health inequality in the first thousand days of life. Abbreviation: wGA, weeks gestational age; mo, months.

Specifically regarding inequities in prenatal care services, we report tangible strategies adopted within our ecosystem, based on the cooperation of obstetrics and neonatal units, and early pediatric care facilities. In our country (Italy) several services are provided to support maternal and neonatal health, according to the National Prevention Plan 2020-2025 which promotes health and equity in the first 1000 days of life [121]. A recent National Maternity Experience Survey conducted among 3642 women, has shown that most of the women had a positive experience with maternity care services [98]. For example in many Italian regions, there are free clinics where obstetricians and gynecologists follow low-risk pregnancies referring high-risk pregnancies to higher specialized centers, home midwifery services and obstetric services concerning breastfeeding and home management of the newborn[122]. Other pro-equality services provided are interpreter services, classes to raise awareness among health professionals about female genital mutilation - that might hinder delivery - and specific programs to handle violence against women or children. In some regions in Italy, free birth courses for parents-to-be are regularly taught by midwives, gynecologists and neonatologists. However, surveys indicate that these courses are less attended by those who would most need them, such as immigrants and parents with lower levels of education [123]. In Italy, hospitals with birth centers and obstetric units are divided into high-specialized centers where high-risk pregnancies are monitored closely and smaller

hospitals with less specialized staff where low-risk women are followed through pregnancy until delivery [124]. The first hospitals are inevitably fewer in number, located in big cities and difficult to reach, whereas the latter are more spread throughout the territory and easy to reach by citizens. This organization might create some inequalities, due to the difficulty of reaching specialized centers. However, access to both centers is free or requires a minimum contribution, according to our National Health Care System, based on universalism and equality. Finally, the current Italian medical system includes free access to primary care pediatricians in the first 14 years of life. In some Italian regions, this service is offered free of charge also to foreign families without a residence permit. Undoubtedly, our current healthcare delivery model could be optimized to offer better medical care in the first 1000 days. For instance, interpreter services could be available 24 hours a day, especially in the emergency room to help doctors collect patients' history; similarly, home midwifery services and obstetric services concerning breastfeeding could be open 7 days a week. Moreover, inequality awareness among health professionals should be raised through periodical classes and doctors should routinely assess racial, poverty and sex discrimination and start considering them as potential causes or triggers of organic and functional diseases. Some of these improvements have already been implemented by some communities, but different cities and regions are in considerably varying stages of awareness and commitment, with marked differences between Northern and Southern Italy[125].

In conclusion, significant measures to address health disparities require cooperation between governments and public health professionals, augmented data collection, and enhanced awareness among healthcare personnel regarding SDOH. Although many studies emphasize the economic benefits of applying prevention in health rather than consequence care, especially in the early years of life and mental health, there is no clear data on the economic impact of health disparities in the first 1000 days [126127128]. Studies on this topic are undoubtedly desirable in supporting policies of change and innovation more robustly. Pro-equality interventions should encompass health services that are not only available to all mothers and children but, more specifically, are also tailored to meet the varying levels of need among individuals. This model has been described as proportionate universalism, according to which services should be developed based on population needs and supported by principles of social justice [129,130]. This strategy seems to be the right strategy for real equality.

Declaration of interests:

All the authors declare no competing interests.

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Impact

This review aims to elicit a detailed understanding of how inequalities affect early childhood development in different socio-economic contexts, focusing on both the short and long-term consequences. The greatest impact comes precisely from providing valuable tools for both clinicians and public health practitioners to understand and read, in daily practice, the effects produced by health determinants and health inequalities.

Author contributions:

All authors contributed to the study's conception and design. Egidio Candela, Arianna Dondi, and Marcello Lanari had the first idea for the article. Chiara Del Bono, Lorenza Parini, and Egidio Candela performed the literature search. Chiara Del Bono, Lorenza Parini, Egidio Candela, and Arianna Dondi wrote the first draft of the manuscript. Daniele Zama, Chiara Francesca Bodini, and Luca Pierantoni performed the review and editing. All authors commented on previous versions of the manuscript. Marcello Lanari supervised and administered the project. All authors read and approved the final manuscript.

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