

DEMOGRAPHIC DETERMINANTS OF INFANT AND UNDER-FIVE MORTALITY IN PAKISTAN: AN INTERPROVINCIAL COMPARATIVE ANALYSIS USING MULTIPLE INDICATOR CLUSTER SURVEY (MICS) DATA

Dr. Syed Ghulam Haider Kazmi^{*1}, M. Tayyab Ilyas², Hina Kazmi³, Khuram Hussain Shah⁴,
Dr. Ali Abbas⁵, Mohammad Aun⁶

¹Ex Chief Economist & Development Specialist/Consultant, P&DD /UNDP/UNICEF

²Chief Statistical Officer, AJ&K Bureau of Statistics (AJ&KBoS),

³Lecturer Computer Science Dept. of Education, Govt. AJ&K,

⁴Research Scholar, Mirpur Azad Jammu and Kashmir and

^{5,6}Research Scholars, Islamabad Capital Territory (ICT) Pakistan

DOI: <https://doi.org/10.5281/zenodo.22194397>

Keywords

Infant mortality rate, under-five mortality rate, demographic determinants, birth interval, maternal age, birth order, Pakistan, MICS

Article History

Received: 15 January 2026

Accepted: 13 March 2026

Published: 31 March 2026

Copyright @Author

Corresponding Author: *

Dr. Syed Ghulam Haider
Kazmi

Abstract

Two of the most important indicators for child survival - Infant mortality rate (IMR) and Under 5 mortality rate (UFMR) - show the combined effect of biological, demographic, maternal and health system related factors. Despite efforts to improve indicators of child mortality, large variations exist between and within provinces and population groups in Pakistan. This study is based on Multiple Indicator Cluster Surveys (MICS6) data that is available from the MICS6 recent surveys conducted in Punjab, Sindh, Khyber Pakhtunkhwa (KP), Balochistan, Azad Jammu and Kashmir (AJ&K) and in Gilgit-Baltistan (GB). The analysis of mortality differentials was done using a comparative and descriptive approach, which was based on child sex, maternal age at birth, birth order, and previous birth interval. The results show that the levels of infant and child deaths are significantly different across different groups. The overall mortality burden in Punjab is the highest with IMR 60 and UFMR 69, followed by AJ&K (IMR 51 and UFMR 59), Balochistan (IMR 48 and UFMR 53), GB (IMR 43 and UFMR 50), Sindh (IMR 39 and UFMR 46) and KP (IMR 35 and UFMR 39). The analysis showed that children born from mothers who were less than twenty years experienced of having higher mortality risk. The greatest mortality rates are seen in Punjab, AJ&K and GB. Also, there is a consistent association where higher birth order, particularly seventh or later births and short birth intervals less than two years, are associated with high IMR and UFMR in most regions. The results indicate that the demographic factors are still significant factors in child survival in Pakistan. The study concludes that the reproductive health services need to be strengthened, optimum birth spacing should be encouraged, early childbearing should be delayed, fertility rate should be curtailed, and maternal and newborn health care interventions in high risk areas should be improved.

1. INTRODUCTION

Infant mortality rate (IMR) and under-five mortality rate (UFMR) are among the most widely used health indicators for assessing child health, population well-being, and the effectiveness of healthcare systems. The IMR refers to a probability of death in the first year of life, while UFMR represents the risk of death over the first 5 years of childhood. These indicators reflect the effect of a number of factors, such as maternal health, pregnancy status, newborn care, nutrition, disease exposure and access to health and health care services (WHO - World Health Organization, 2023). While the death of children has significantly dropped in recent decades due to the progress made in immunization, maternal health care, neonatal care, and disease prevention initiatives, millions of children still perish from preventable causes, especially in low and middle-income countries (LMICs) (UNICEF, 2023).

Factors beyond just the availability of health care affect infant and child mortality, and include demographic factors which affect biological vulnerability and the capacity of the mother to provide adequate care. Demographic characteristics of the mother, such as her age at childbirth, birth order, birth spacing, and the sex of the child have always been known to be important factors in the prediction of infant and under-five survival. These factors affect pregnancy outcomes, maternal health, vulnerability of the newborn, and allocation of household resources. Mosley and Chen (1984) explain how demographic and socioeconomic factors influence child survival by acting through intermediate pathways, such as maternal factors, nutrition, environment, and health practices.

Pregnancy and childbirth conditions have a special impact on infant mortality. The first six months of life is a critical period of early childhood development when complications due to low birth weight, birth asphyxia and inadequate newborn care are significant causes of infant deaths (Black et al., 2017). Maternal age is one of the demographic determinants since very young mothers may be exposed to additional risks because of their biological immaturity, limited knowledge and understanding about reproductive

health, low utilization of antenatal care, and socioeconomic disadvantages. Adolescent pregnancies are linked to premature delivery, low birth weight, and neonatal complications, all of which raise the infant/child mortality risks (WHO, 2022). The risk of pregnancy complications, hypertension, and other maternal and child health issues, however, also may raise the mortality risk and may be linked to advanced maternal age.

Other demographic variables that are highly correlated with child survival are birth order and birth interval. High birth order children likely face a higher risk of death as a result of maternal depletion, less parental attention, competition for family resources and greater nutrition challenges.

In like manner also, short birth intervals can have a negative impact on child survival since the mothers might not be able to recuperate physically between pregnancies, hence leading to low birth weight, too soon delivery and inadequate length of breastfeeding. Literature also found high fertility ratio responsible for high rate of children loss. Kazmi (1995) study '*Foreign Aid and Health in Pakistan*' explored strong positive association between fertility ratio and infant mortality.

Evidence from the developing countries also suggests that optimal child survival occurs with a birth interval of about 2-3 years, rather than close spacing of children (Cleland and Sathar, 1984; Kazmi, 1995; Cleland & Jejeebhoy, 1996; Rutstein, 2005; Khan and Raza, 2014; Zaidi, 2024). Mortality studies have also been explored in detail for sex differences in children. At the global level, male infants are at slightly higher risk of dying than female infants related to biological vulnerability, a higher risk of premature birth and the increased risk of some neonatal complications (WHO, 2023). Gender differences can, however, vary depending on social and cultural influences, and healthcare related factors (Kazmi, 1995; Agha, 2000; Rutstein, 2005; Khan and Raza, 2014; Memon et al., 2023; Kazmi et al., 2024; Zaidi, 2024; Kazmi et al., 2026 e&f. It is crucial to be aware of these demographical patterns to design interventions targeted at vulnerable groups.

Despite the achievement of higher health coverage and better child health programs, Pakistan still

faces huge problems in reducing infant and under-five deaths. Child mortality rates have been higher in the country than in some of the neighbouring countries in South Asia, and this is due to some persisting issues with maternal healthcare, nutrition, reproductive health practices and unequal access to healthcare services (Hashmi, 1979; WHO/UN, 1979; Hobcraft, et al., 1984; Jinabhai et al., 1986; Irfan, 1986; Cleland & Jejeebhoy, 1996; WEF, 2022; UNICEF, 2023). The earlier studies on Pakistan have revealed that maternal age, birth spacing, fertility pattern and utilization of health services are all significant factors affecting child survival in Pakistan (Cleland & Sathar, 1984; Sathar, 1987 & 1992; Irfan, 1986; Kazmi, 1995; Agha, 2000; Memon et al., 2023; Zaidi, 2024). Results from the segregated MICS6 data indicate that the country's provinces and administrative regions have quite a diversity in their child mortality pattern as well. The population characteristics, coverage of health services, reproductive behavior, and socioeconomic conditions are quite different across Punjab, Sindh, KP, Balochistan, AJK, and Gilgit-Baltistan (Kazmi et al., 2025, 2026a-f). Geographical barriers and lack of access to specialized maternal and newborn health and social services are adding further burden in remote and mountainous areas like A&K and GB, whereas in Balochistan, challenges have been observed due to the dispersion of population and lack of healthcare infrastructure (Kazmi et al., 2026 e&f).

Multiple Indicator Cluster Survey (MICS6) offers a valuable source of standardized demographic and health data to analyse child mortality trends in Pakistan. However, negligible work has been done at provincial level as well as in the context of provincial comparison. This study fills this gap and gives a full picture of how demographic differences relate to early childhood mortality. It looks at the difference of the IMR and UFMR amongst the provinces in Pakistan. In particular, it examines the incidence of deaths by child sex, birth order, interval between births, and maternal age at birth. The results can inform the process of evidence-based policy development and help guide the focus of maternal and child health interventions on

specific population groups and areas. Hence in this study, the interprovincial variations in infant and under five mortality rates and the relationship between demographic characteristics and infant and child survival outcomes have been studied across Pakistan. Addressing the demographic determinants of IMR and UFMR, it helps to understand child mortality's contributing factors in addition to socioeconomic factors, and emphasizes the need for reproductive health interventions, birth spacing interventions and maternal health interventions.

2. Literature Review

2.1 Global Patterns of Infant and Under-Five Mortality

Infant mortality rate (IMR) and under-five mortality rate (UFMR) are important indicators of child survival and provide insight into the health status, socio-economic development and effectiveness of health services. IMR reflects the risk of mortality in the first year of life and is closely related to maternal health, pregnancy outcomes, birth conditions, and neonatal care. UFMR incorporates risk factors in the first five years of life and is a composite measure of neonatal factors, infectious diseases, nutrition status, immunization coverage, environmental factors, and access to healthcare (WHO, 2023). All of these indicators are key to tracking progress towards Sustainable Development Goal (SDG) 3.2 to reduce preventable newborn and child mortality around the world by 2030 (United Nations, 2023).

The efforts have been successful globally in reducing child mortality - IMR and UFMR, which are due to improvement in maternal services, skilled birth attendance, immunization, nutrition programs, growing breastfeeding and management of childhood infection but it has not happened evenly across the regions (UNICEF, 2023). In low and middle-income countries, child deaths are disproportionately high and are caused by poverty, lack of access to health services, poor nutrition and geographical barriers (Knowles, 1976; Flege, 1982; Moseley, 1984; Jinabhai et al., 1986; Sogaard, 1993; Kazmi, 1995 & 2009; Agha, 2000; Memon et al., 2023' Kazmi et al., 2026e-f). Neonatal causes

such as prematurity, low birth weight, birth asphyxia, and neonatal infections remain a significant contributor to infant mortality, while pneumonia, diarrhea, malnutrition and preventable infections continue to be a large driver of under-five mortality. Thus, the health system factors as well as demographic and socioeconomic conditions continue to affect child mortality rates (Hashmi, 1979; WHO/UN, 1979; Rusicka & Hansliwks, 1982; Mosley & Chen, 1984; Hobcraft, et al., 1984; Nag, 1985; Rutstein, 2005; Kazmi, 1995 & 2009; Khan & Raza, 2014; Black et al., 2017; Memon et al., 2023; Zaidi, 2024; Kazmi et al., 2026e&f). Demographic factors are important determinants of child survival outcomes. Biological vulnerability, pregnancy outcomes, caregiving capacity, and household resource allocation are shaped by maternal age, birth order, birth spacing and child sex. Young maternal age is associated with the higher likelihood of premature birth and low birth weight, whereas short birth intervals may be associated with a higher likelihood of mortality due to maternal nutritional depletion and inadequate recovery between pregnancies. Similarly, high birth order is likely to be associated with higher mortality because of less parental attention, competition for parents' resources, and greater challenges of the extra parenting responsibilities (Mosley & Chen, 1984; Kazmi, 1995; Rutstein, 2005).

2.2 Infant Mortality and Child Sex Differences

Child sex is recognized as an important demographic determinant influencing infant and under-five mortality patterns. Globally, male infants generally experience slightly higher mortality risks than females, particularly during the neonatal and early infancy periods. This difference is primarily attributed to biological factors, including lower physiological maturity at birth, higher probability of premature delivery, greater vulnerability to respiratory complications, and increased susceptibility to infections among male infants (WHO, 2023'). Biological differences in immune response and developmental maturity contribute to increased risks of adverse neonatal outcomes among male children (Black et al., 2017;

Memon et al 2023; Zaidi, 2024; Kazmi et al., 2026e&f). However, gender differentials in child mortality cannot be explained exclusively through biological mechanisms. Social, cultural, and healthcare-related factors may also influence survival differences between male and female children, particularly in settings where household decisions affect healthcare utilization, nutrition, and treatment-seeking behavior. In some developing countries, gender norms may influence the allocation of household resources and access to healthcare services, potentially increasing mortality risks among specific groups of children (Preston, 1980; Sathar, 1987; Cleland & Jejeebhoy, 1996; Kazmi et al., 2024). Conversely, improvements in maternal education, healthcare access, and preventive child health services can reduce gender-based mortality differences by ensuring equitable care for all children (Sathar, 1987; Kazmi, 1995 & 2009; Memon et al., 2023; Zaidi, 2024). Evidence from South Asian countries suggests that while biological disadvantages among male infants are commonly observed, the magnitude of sex differentials varies according to socioeconomic conditions, healthcare systems, and cultural practices (United Nations 1979; Hashmi, 1979; Hobcraft, 1984; Nag, 1985; Kuly et al., 1993; Kazmi, 1995, 1998 & 2009; Agha, 2000; WHO, 2023; Memon et al., 2023; Zaidi, 2024). Therefore, analysis of child mortality requires consideration of both biological vulnerability and the broader social environment in which children are born and raised. In the context of Pakistan, where maternal healthcare access and socioeconomic inequalities vary considerably across provinces and administrative regions – Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, AJ&K, and Gilgit-Baltistan – understanding gender-related mortality patterns provides important insights for improving equitable child survival interventions (Agha, 2000; Khan & Raza 2014; Kazmi et al., 2026e-f).

2.3 Maternal Age and Child Mortality

Maternal age demonstrates a significant relationship with infant survival. Adolescent mothers (< 20 years) experience elevated mortality risks. It [Maternal age] is considered because

adolescent pregnancies are associated with premature birth, low birth weight, and pregnancy complications. Besides, young maternal age is also associated with biological immaturity, premature delivery, low birth weight, and inadequate antenatal care utilization whereas advanced maternal age may increase delivery-related risks (WHO, 2022). Confirming the importance of reproductive health services targeting both adolescent and older mothers, this study examines the relationship of mother age with IMR and UFMAR across the provinces/areas in Pakistan

2.4 Birth Order and Child Mortality

The birth order is an important socio-demographic variable affecting the survival of infants and under-fives and it is seen as an indicator of both the biological and socio-economic conditions surrounding child survival. High birth order children might also have a higher risk of death associated with low nutrition, less attention from parents, competition for food, water and other resources, lacking mother education, and greater demands for care by parents in large families (Kazmi et al., 2023a&b, 2024, 2025 and 2026b&c-e-f). Maternal factors, reproductive behavior and household conditions are important pathways by which demographic characteristics affect child survival as per the Mosley and Chen (1984) framework. Higher fertility rates is positively associated with child mortality and can also be linked to shorter birth intervals, less time for mothers to recover and a strain on family resources. Having more children can be a problem for parents to ensure a nutritionally sound diet, medical care, and individualized attention for every child (Kazmi, 1995). In South Asian studies, children in higher order of birth have been found to have greater risk of mortality, especially in situations of poverty, lack of access to medical services and low levels of maternal education (Scrimshaw, 1978; WHO/UN, 1979; Rusicka and Hansliwks, 1982; Nag, 1985; Kuliy et al., 1993; Agha, 2000; Memon et al., 2023). But the pattern of birth order and mortality is moderated by social and economic conditions in general. The negative effects of high birth order could be less severe in well-resourced

families with good health care. Hence, the birth order needs to be taken into account with other determinants such as household wealth, maternal education, utilisation of healthcare services, birth spacing, etc. (Khan & Sirajeldin 1979; Sathar, 1984, 1987 & 1992; Desai & Alva 1998; Agha 2000; Memon et al., 2023; Zaidi 2024; Kazmi et al., 2026e&f). The understanding of birth-order effects is crucial for reproductive health and family planning interventions, particularly in Pakistan, where fertility trends and health services differ depending on the area (Kazmi, 1995).

2.5 Birth Interval and Child Mortality

The relationship between birth interval and child survival is well established. The interval between births affects the recovery of the mother, her nutrition, breastfeeding, and health of the newborn. Short birth intervals, especially < 2 years have been associated with higher risk of preterm birth, low birth weight, maternal nutritional depletion along with reduced duration of breast feeding, and greater intra-household competition for resource use (Cleland & Sathar, 1984; Kazmi, 1995; Rutstein, 2005; Zaidi, 2024; Kazmi et al., 2026e&f). Biological explanation for the link between birth spacing and child death is mainly about maternal depletion. The short interval between pregnancies may mean that the mother does not have sufficient nutritional reserves and that she is not able to recover physically after a pregnancy, putting her at risk for future pregnancies. Moreover, short interval may decrease the duration of breastfeeding in older children, increase nutrition competition between younger children which may have effect on their poor growth and increased susceptibility to illness (Kazmi, 1995). Studies in developing countries show that birth intervals around 2 to 4 years are associated with better child survival rates than birth intervals of less than two years (Preston, 1980; Rutstein, 2005). Those longer birth intervals give mothers more time to attend to children during pregnancy, to have better breastfeeding habits, and to devote more time and resources to each child. Thus, family planning activities and reproductive health education are regarded as a key intervention for decreasing

infant and under-five mortality. Optimal birth spacing is of particular importance in Pakistan as there are regional disparities in fertility patterns, maternal health and knowledge and availability of family planning services. Expanding reproductive health programs, enhancing contraceptive availability, encouraging breastfeeding, and raising awareness around birth spacing can make a significant impact in the reduction of preventable child deaths (Cleland and Sathar, 1984; Irfan, 1986; Kazmi, 1995&2009; Memon et al., 2023).

2.6 Research Gap in Existing Literature and Contribution of This Study

Widespread research on child mortality (IMR) and under five mortality (UFMR) in Pakistan is mainly, in the national context. However, there is a scanty evidence on regional/areas' disparities in IMR & UFMR using recent standardized datasets while integrating demographic factors. Previous work on IMR & UFMR widely focuses on the national trends or individual determinants, providing limited understanding of how different factors interact across diverse provincial contexts. This research effort fill this study gap by undertaking a comparative analysis of IMR and UFMR across 4 regions and 2 administrative units using MICS6 provincial/area data. This study adds to existing literature by concentrating exclusively on IMR and UFMR, integrating demographic determinants, and explaining mortality variances within broader health system and development perspectives. The findings offer evidence for targeted regional/area policies designed for reducing preventable infant and Under Five deaths in Pakistan.

3. Methodology

The present study is of comparative descriptive research type which aims to find out the demographic factors affecting IMR and UFMR in various provinces and administrative regions of Pakistan (Kazmi et al., 2023a&b, 2024, 2025, 2026e&f). The choice of comparative descriptive approach was chosen because the main goal of the study is to detect differences and patterns in child survival and not to draw cause/effect conclusions. This approach is suitable for examining the population level health inequalities and

determining which populations have a higher risk of dying from a standardized survey-based data set (Mosley & Chen, 1984). The study is based on secondary data collected from the latest available Multiple Indicator Cluster Survey (MICS6) carried out in the six administrative regions of Pakistan: Punjab (2017-18), Sindh (2018), Khyber Pakhtunkhwa (2022), Balochistan (2022), Azad Jammu and Kashmir (2020-21), and Gilgit-Baltistan (2024-25). Supported by the United Nations Children's Fund (UNICEF), the MICS program generates household survey data that is comparable across countries and represents key areas of maternal and child health, demographic characteristics, nutrition, education and socioeconomic conditions (UNICEF, 2020, 2022). The justification of using MICS data is based on the fact that the surveys use a standardized sampling procedure, accepted international definitions and information is collected in a consistent way, making it possible to compare child mortality indicators across a range of geographic contexts (UNICEF, 2022). The present study is based on data provided in Provincial/Areas' Infant & Under-5 Mortality Rates by Demographic Characteristics which it uses to assess the differences across demographic groups in child survival results.

In this study the dependent variables are infant mortality rate (IMR) and under-five mortality rate (UFMR). IMR is the number of deaths that occur before a child's first birthday per 1,000 live births. The UFMR is the chance of death before 5 years of age and is also expressed per 1,000 live births. These are commonly used as health outcome measures as these incorporate the impact of maternal health, pregnancy, newborn care, childhood diseases, nutrition, and health service delivery (WHO, 2023). This study concentrates on four important demographic factors that influence child mortality. The first determinant is that of sex and is used to determine the differences in mortality risk of the child. Studies have shown that male infants are marginally more susceptible to mortality (due to biological vulnerability), preterm delivery and neonatal complications (Black et al., 2017; Kazmi et al., 2026e&f). The second determinant is maternal age at birth grouped into

age categories to assess the effect of maternal young and older age on child survival. Maternal age is an important predictor as adolescent pregnancies have been linked to poorer rates of maternal health care utilization, low birth weight and premature birth, and older maternal age with pregnancy-related complications (WHO, 2022). The third demographic variable is birth order, which looks at the variation in mortality risks based on the number of previous births. Mosley and Chen (1984) attributed the higher mortality rates of children with higher birth order to depletion of the mother, less parental attention, competition for family resources and greater difficulty in childcare. They hypothesized that the higher mortality rates among children with higher birth order were the result of a number of factors including the depletion of the mother, reduction in parental attention, competition for family resources and increased difficulty in childcare. In Kazmi (1995) study, fertility is also emerged as a strong positive contributor towards infant mortality. Previous birth interval is the fourth variable that is of interest, and investigates how the spacing between births affects child survival. Short birth intervals can raise mortality risks due to a drop in nutritional status, risk of not having recovered fully between births, risk of premature birth, and shorter breastfeeding duration (Kazmi, 1995; Rutstein, 2005).

The analytical approach includes comparative evaluation of IMR and UFMR within and between provinces and population categories. For the purpose of making comparisons, provincial/areas comparisons are made between Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Azad Jammu and Kashmir and Gilgit-Baltistan to identify different situations in each province/areas in terms of child survival. The mortality pattern by sex of the child, maternal age at childbirth, birth order and birth interval is further studied to identify the demographic groups at higher risk. Because the study is based on secondary cross sectional survey data, its conclusions are described as associations between the demographics and patterns of the population but not necessarily causal. However, it offers useful information on understanding the inequalities in early childhood

mortality and is useful for designing targeted maternal and child health interventions in Pakistan. The study however, has methodological limitations. The use of MICS6 datasets from different survey periods (MICS6 held provinces/areas at different point of time from 2016 to 2025) may reflect variations in socioeconomic conditions, health policies, and service availability over time, and may have implications for direct comparability of findings. The use of cross-sectional data limits the ability to establish causal relationships between IMR-UFMR and socio-economic factors. The current analysis relies only on demographic factors and ignore socioeconomic factors, having implications for the overall results. Some regional indicators and disaggregated statistics, particularly for remote and rural areas, were either unavailable or incomplete, restricting deeper comparative analysis. Furthermore, geographic differences, population characteristics, and healthcare accessibility may also influence provincial comparisons. However, the standardized MICS methodology and indicators provide a reliable basis for comparative assessment despite these limitations (UNICEF, 2020 & 2022).

4. Results and Discussion

Demographic determinant of Infant Mortality Rate (IMR) and Under-Five Mortality Rate (UFMR) shows significant differences among provinces and administrative units in Pakistan. The results of the study showed that child sex, maternal age at birth, birth order, and birth spacing are the determinant factors in the assessment of early childhood mortality beyond the regional variations. Biological vulnerability, reproductive behavior, and household care practices are important channels of influence on child survival outcomes that are mediated through these demographic factors. There is great variation in general and gender segregated mortality levels across the six areas in the provincial comparison shown in Table 4.1 and subsequently illustrated in Figure 4.1. Punjab has the most significant mortality burden with 60 deaths from IMR/1000 live births and 69 deaths from UFMR/1000 live births. Though the healthcare facilities in terms of

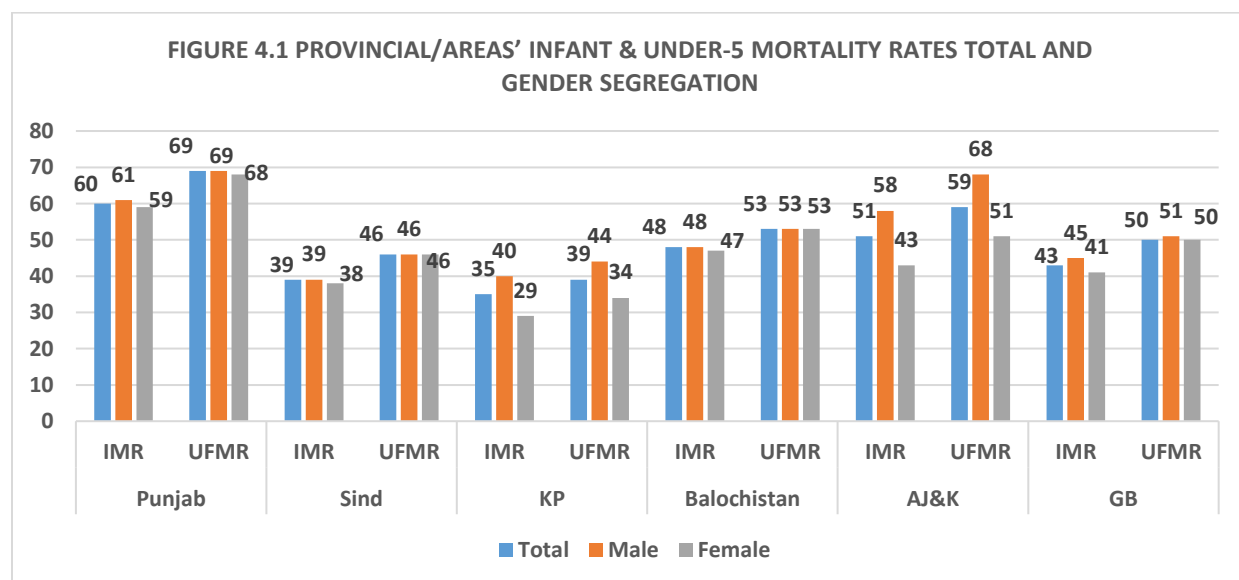
provision and quality of service are relatively better as compared to several other regions but Punjab faces significant challenges to child mortality, several other regions are also facing it, highlighting population pressure, differences in utilization of

maternal health services and inequities in access to quality health services. The second-highest mortality rates are recorded in Azad Jammu and Kashmir (AJ&K) where IMR is 51, while UFMR is 59 per 1000 live births.

Table 4.1: Provincial/Areas' Infant & Under-5 Mortality Rates by Demographic Characteristics												
Areas	Punjab		Sind		KP		Balochistan		AJ&K		GB	
IMR/UFMR	IMR	UFMR	IMR	UFMR	IMR	UFMR	IMR	UFMR	IMR	UFMR	IMR	UFMR
Total	60	69	39	46	35	39	48	53	51	59	43	50
Male	61	69	39	46	40	44	48	53	58	68	45	51
Female	59	68	38	46	29	34	47	53	43	51	41	50
Mother's age at birth												
Less than 20	85	97	50	56	40	43	36	38	83	90	63	70
20-34	58	66	37	44	34	38	47	53	45	53	38	45
35-49	61	68	39	46	35	42	56	63	70	81	60	67
Birth order												
01	58	66	39	44	40	43	32	34	54	62	47	56
2-3	52	60	35	43	32	35	39	44	48	56	34	39
4-6	67	75	35	42	32	47	56	63	42	50	45	54
7+	95	112	67	75	45	55	85	97	102	113	58	65
Previous birth interval												
First Birth	60	68	30	45	43	45	33	35	54	63	-	-
< 2 years	89	102	61	72	49	56	73	79	69	78	67	73
2 years	45	52	33	40	27	31	42	50	36	45	33	41
3 years	40	45	19	25	28	31	26	31	38	45	28	39
4+ years	39	0	21	26	19	2	32	36	49	57	24	49
Sources: Provincial/Areas' MICS6 (BoS Punjab and UNICEF 2017-18; BoS Sindh and UNICEF 2018 ; BoS KP and UNICEF 2022.; BoS Baluchistan and UNICEF 2022; BoS AJ&K and UNICEF 2020-21; P&DDGB and UNICEF 2024-25)												

The geographical constraints, the lack of specialization in maternal and newborn healthcare services and difficulties in accessing them in remote mountainous areas are evident in the high

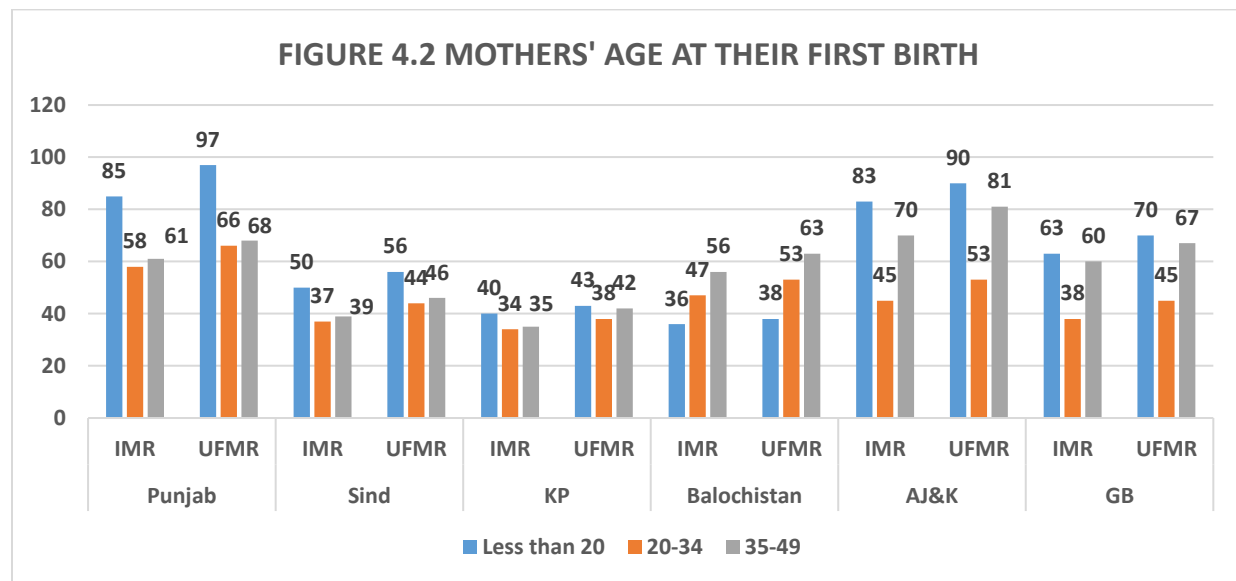
mortality burden in AJ&K despite better education and WASH indicators (Kazmi et al., 2023a, 2024, 2025, and 2026a-d). Balochistan observed the third highest mortality figures with



IMR being 48 and UFMR 53. This mortality pattern in the province might be linked to its size, the spread of its population, insufficient healthcare facilities, and shortage of skilled healthcare providers. It is also noted that there are also high mortality rates in Gilgit-Baltistan (GB) as IMR is 43 and UFMR is 50 indicating the difficulties of the geographically isolated communities. The IMR in Sindh (39) is relatively less than in Punjab, AJ&K, Balochistan and GB as reflected in diagram 4.1. UFMR in Sindh (46) is below Punjab (69), Balochistan (51), AJ&K (58) and GB (48). But there is still a concern with demographic and healthcare inequalities that continue to exist in rural areas. The mortality levels in Khyber Pakhtunkhwa (KP) are the lowest of the surveyed regions, with an IMR of 35 and UFMR of 39, indicating relatively good child survival situation. However, ongoing effort is needed to maintain progress and reach out to remaining vulnerable groups. The regional variation highlights how early childhood survival outcomes are influenced by regional factors, healthcare access and demographic factors. Overall the analysis of gender difference shows that mortality risks are slightly higher for children who are male than children who are female in several regions, clearly mirrored in Table 4.1 and Figure 4.1. This reflects the global evidence that male infants are more biologically vulnerable, as they are more likely to be premature, less physiologically mature and suffer from neonatal complications (Black et al., 2017; WHO, 2023). In Punjab, male children have an IMR of 61 and UFMR of 69 while female have IMR of 59 and UFMR of 68. Likewise, a gender disparity exists at AJ&K with male children having an IMR of 58 and UFMR of 68 against female children with an IMR of 43 and UFMR of 51. GB male children also have an IMR of 45 and UFMR of 51 against

girls having IMR 41 and UFMR 50. KP male children have an IMR of 40 and UFMR of 44 while girls have IMR 29 and UFMR 40. Sindh has little gap in IMR male 39 and girls 38 while boys and girls have similar UFMR of 46, indicating very little or no disparities. The results suggest that there is a biological component to the risk of death in early life; however, differences in provinces show that the gender patterns are also driven by access to health care, as well as maternal factors and social circumstances. Thus, the improvement of the maternal and newborn health care services is important in reducing the rate of mortality among children, both male and female.

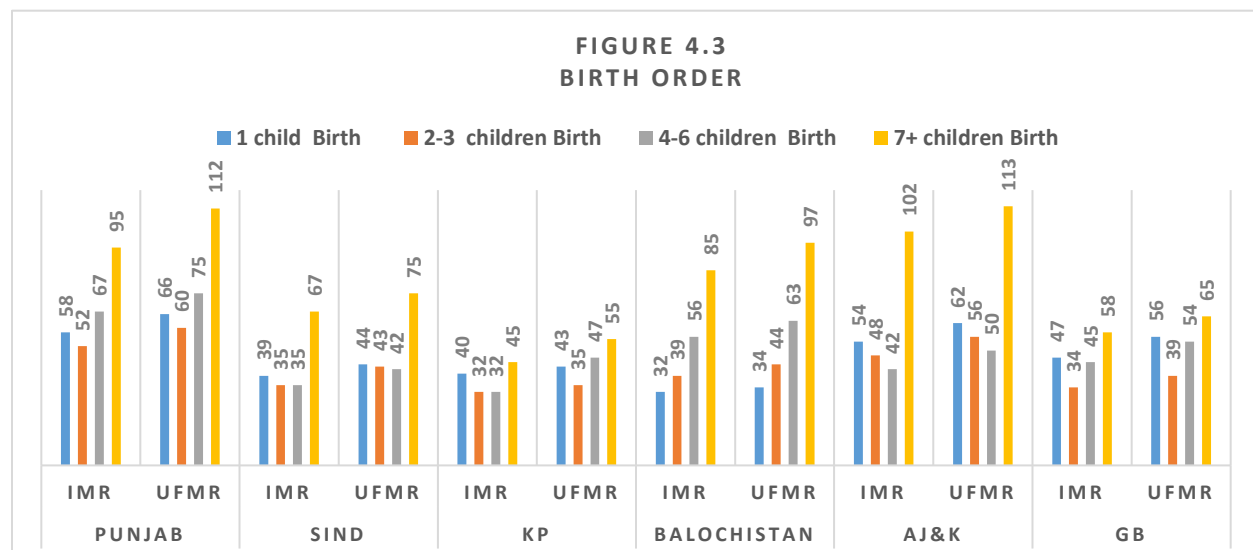
Maternal age at birth is strongly associated with child mortality outcomes. Very young mothers, especially those under 20, have significantly higher risks of death for their children than mothers aged 20-34. Adolescent pregnancy can be characterised with physical and social vulnerabilities such as insufficient physical development, higher likelihood of pregnancy complications, premature birth, low weight birth, and inadequate access to adequate antenatal care (WHO, 2022). Table 4.1 and Figure 4.2 show that mortality for children born to mothers under 20 years is particularly high in a few regions. In Punjab, 85 babies died within one year out of every 1,000 are born, and 97 died out of every 1,000 within their first 5 year of life, demonstrating IMR and UFMR rate 85 and 97 respectively. In AJ&K, 83 babies out of every 1,000 die within one year after their birth while 90 out of every 1,000 die within their first 5 year of life, endorsing IMR 83 and UFMR 90. GB also has higher rates of deaths of young mothers (IMR of 63 and UFMR 70). These rates are much higher than the provincial mortality rates overall, emphasising the significance of teenage pregnancy as a risk factor.



Another indicator of increased mortality risks is the advanced maternal age. Older mothers (ages 35-49) might be at greater risk because of complications during pregnancy, chronic health issues, and delivery concerns. Children born to mothers in this age group are more vulnerable in AJ&K with IMR 70 and UFMR 81 while Punjab (IMR 61 and UFMR 68) is next to it followed by GB (IMR 61 and UFMR 68), Balochistan (IMR 56 and UFMR 63), Sindh (IMR 39 and UFMR 46) and KP (IMR 35 and UFMR 42). The results indicate that maternal age is not linearly associated with child mortality; both adolescent and

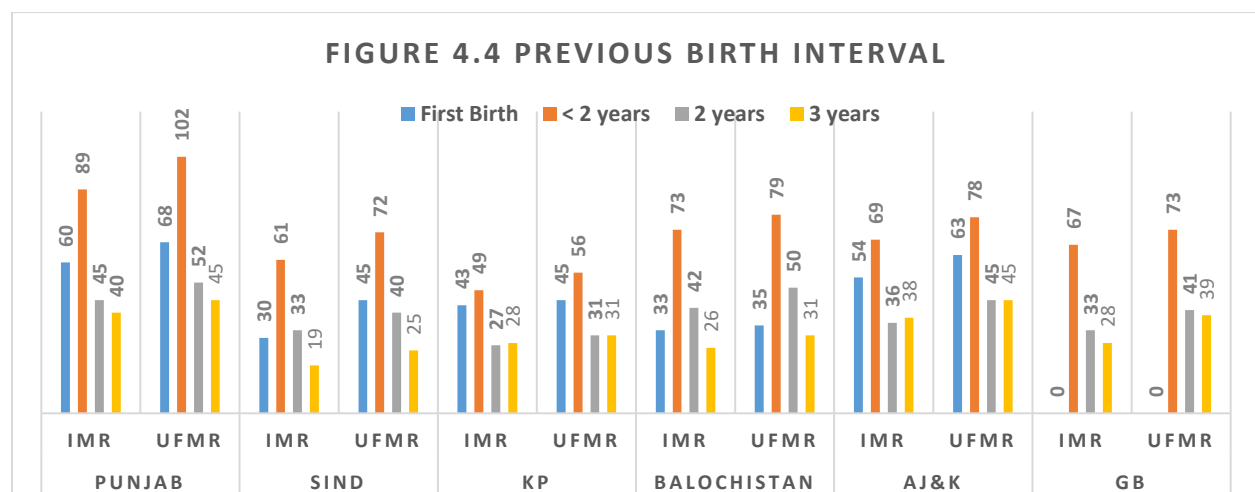
advanced maternal ages need to be supported and monitored by reproductive health care.

Birth order analysis shows a definite association between higher birth order and higher mortality risk. Compared to children of lower birth order, the children with a high birth order (7 or more) have significantly higher IMR and UFMR portrayed in Figure 4.3. In Punjab, the IMR and UFMR for 7+th children are 95 and 112, respectively, whereas in AJ&K, the IMR and UFMR for 7+th children are 102 and 113, respectively. As for the High-birth-order children, their mortality rates are also found higher in Balochistan with IMR of 85 and UFMR of 97.



These results suggest that high birth order may be linked to mortality rates in multiple ways such as nutrition deprivation of the mother, less attention towards the child, competition for family resources, and economic stress. Excessive fertility has been noted to be correlated with unwanted high child mortality as the families may become unable to feed their children, provide medical care, and give individual care to each child (Mosley & Chen, 1984; Sathar, 1992; Kazmi, 1995; Agha, 2000; Zaidi, 2024).

Birth interval analysis also shows a good demographic association with child survival. The increased mortality risks are seen with short births, especially < 2 years witnesses the highest mortality rate (IMR & UFMR in Figure 4.4) in all 6 regions/areas of Pakistan. Due to close pregnancies, mothers might not be able to recover physically and nutritionally which may lead to premature birth, low weight and poor breastfeeding habits (Cleland & Sathar, 1984; Kazmi, 1995 and 2009; Rutstein, 2005; Khan & Raza, 2014; Memon et al., 2023).



In Punjab, children born after an interval of less than two years' experience an IMR of 89 and UFMR of 102, whereas children with birth intervals of 3 or more years have an IMR of 40 and UFMR 45. Similarly, AJ&K reports an IMR of 69 and UFMR of 78 among children born after intervals shorter than two years compared with an IMR of 38 and UFMR of 45 among children with a three-year interval. The information given in Table 4.2 and portrayed in Figure 4.4 displays a similar trend for Sindh, Balochistan, KP and GB with reference to birth interval. These findings highlight the protective role of adequate birth spacing in improving child survival outcomes. Overall, the results demonstrate that demographic characteristics significantly influence infant and under-five mortality patterns in Pakistan. While provincial differences reflect variations in healthcare systems and geographical conditions, demographic factors such as maternal age, birth

order, and birth spacing represent important determinants of mortality risk. The findings emphasize the need for integrated reproductive health strategies, including delayed childbearing, family planning services, optimal birth spacing, and improved maternal and newborn healthcare to reduce preventable child deaths.

5. Key Findings

Demographic determinants of infant mortality rate (IMR) and under-five mortality rate (UFMR) by province and administrative area show wide disparities by child sex, maternal age, birth order and birth spacing. The results suggest a slightly higher mortality risk for boys than for girls, consistent with international findings that boys' mortality risk is higher than girls' because they are more likely to be born too early or have a complication at birth or to be born with lower physiological maturity (Black et al., 2017; WHO,

2023). The results of Table 4.1 also support the fact that children in some areas of Pakistan have slightly higher mortality rates for males than for females. According to the data from Punjab, IMR for the male child is 61 while for females is 59 and the UFM for males is 69 while the UFM for females is 68. Likewise, AJ&K records higher mortality rates for male is IMR 58 and UFM 68 whereas score for female is IMR 43 and UFM 51. While not all of these differences are observed in all provinces, the results imply that the biological vulnerability of male children leads to higher mortality risk. But different figures from provinces suggest that there are also differences in healthcare access, maternal conditions and socioeconomic factors that affect gender-related mortality patterns.

Maternal age is also significant in shaping the risk of child deaths, as children born to mothers aged under 20 years have significantly higher mortality risks because they are more likely to experience complications during pregnancy, premature birth, low birth weight and less likely to access mothers' health services (WHO, 2022). Likewise, women of advanced maternal age have been found to have a higher mortality risk due to higher risk of pregnancy-related complications and adverse pregnancy outcomes. The statistics in Table 4.1 clearly demonstrate a strong association between young maternal age and child mortality. In Punjab, children of mothers less than 20 years experienced an IMR of 85 and UFM of 97, which is much higher than the provincial average. Likewise, AJ&K has an IMR of 83 and UFM of 90 while GB has IMR as 63 and UFM as 70 for children born by adolescent mothers. The results underline the importance of adolescent pregnancy as a significant risk factor and a need for specific reproductive health interventions. Advanced maternal age (35-49 years) is also associated with higher maternal mortality risk associated with pregnancy, chronic diseases, hypertension, and delivery complications. In AJ&K, mothers aged 35-49 years give birth to children with IMR of 70 and UFM of 81 which shows increased vulnerability compared to mothers of younger age groups. Hence maternal age exhibits a non-linear relationship with child mortality, with very young

and old mothers needing extra health care support. The findings also indicate that in certain regions, high birth order (seventh or greater) is highly associated with higher IMR and UFM. Such a relationship is thought to be due to maternal nutritional depletion, parental inattention, intra-family competition for resources, and greater demands on parental care in larger families (Mosley & Chen, 1984). Short inter-birth intervals (IBI) particularly those of less than 2 years have also been found to be associated with significantly higher mortality risks from inadequate recovery of the mother, greater risks of premature delivery, low birth weight, and shorter duration of breastfeeding (Cleland & Sathar, 1984; Kazmi 1995 and 2009; Rutstein 2005). Contrary to this, a three- to four-year birth interval is protective as better maternal health status and more time to invest in child nutrition and care. As seen from the data in Table 4.1, a strong association is identified between short birth interval and increased mortality. The results of this study verify the beneficial effects of good birth spacing. Longer birth intervals limit the depletion of maternal nutrition, enhance breastfeeding practices, decrease premature births and enable families to devote more emphasis and resources to each child. Enhancing Family Planning services, creating awareness regarding reproductive health and promotion of optimum birth spacing are therefore crucial interventions for reducing infant and under-five mortality in Pakistan (Cleland & Sathar, 1984; Sathar, 1984 & 1992; Kazmi, 1995, 1998 & 2009; Black, et al., 2017; Memon et al., 2023; Kazmi et al., 2026e&f). In summary, there are significant provincial differences in the level of demographic risk and a need for region-specific reproductive health strategies, family planning services, enhanced maternal and newborn health services, and specialized interventions for high-risk groups. The results support the need to focus on demographic vulnerability alongside access to health services and other social determinants of health (SDOH) to reduce child mortality (UNICEF, 2023).

6. Conclusion and Recommendations

The results of this study show that the demographic characteristics have an impact on the infant mortality rate (IMR) and under-five mortality rate (UFMR) in all the provinces and administrative regions of Pakistan. A series of analysis points out that healthcare availability and socioeconomic factors are not the only factors that affect child survival but that reproductive and demographic factors also play a role, such as the sex of the child, the mother's age at birth, the birth order, and the interval between births. Children of young mothers were found to have a greater risk of death as they were more likely to be born prematurely, weigh less than 5.5 pounds at birth, experience pregnancy complications, and receive less maternal care. Likewise, women in their older reproductive ages have higher rates of mortality, where greater monitoring of mothers is needed throughout this reproductive period. The following risk factors were found to be significant: death rates for children born after short birth intervals and for seventh and higher-order births were significantly higher. The results of this study corroborate the results of other studies on how reproductive health behaviors and demographic trends affect survival during the early childhood period (Mosley & Chen, 1984; Cleland & Sathar, 1984; Sathar, 1987 & 1992; Agha, 2000; Rutstein, 2005; Khan and Raza, 2014; Black et al., 2017; Memon et al., 2017; Zaidi, 2024; Kazmi et al., 2026e&f).

The study concludes that for a substantial reduction in infant and under-five mortality rates in Pakistan, a multi-sectoral approach involving demographic, healthcare, and socioeconomic measures is needed. Although enhancement of the health infrastructure, nutrition and poverty alleviation are crucial, reproductive health strategies that emphasize the promotion of optimal birth spacing, the delay of early childbearing, and the improvement of family planning services are also important (Cleland, & Sathar, 1984; Kazmi, 1995; Agha 2000; Memon et al., 2023; Kazmi et al., 2026e&f). The wide range of values seen across the provinces shows that it is important to tailor interventions to meet the needs of each province given the differences in

demographic and health service delivery challenges.

The results indicate that policy actions need to focus on improving maternal and reproductive health services, including those for adolescent mothers and women with high-risk pregnancies. The birth spacing should be encouraged to 2-3 years and the risks from close pregnancies should be reduced by expanding family planning programs. The awareness program should be based on the community level and emphasise the need to educate the families with regard to the importance of maternal age, birth spacing and proper care of children, especially with respect to breastfeeding (Cleland and Sathar, 1984; Kazmi, 1995 & 2009). Accessibility to skilled birth attendance, ANTENATAL CARE - ANC, neonatal services and emergency referral systems should be prioritized in high-risk areas like Punjab, AJ&K, Balochistan and Gilgit-Baltistan. Further investments in education and socio-economic development of girls are also recommended given that demographic risks are frequently compounded by other social inequalities, which affect child survival (WHO, 2023; UNICEF, 2023).

REFERENCES

- Agha, S. (2000). The determinants of infant mortality in Pakistan. *Social Science & Medicine*, 51(2), 199–208.
- Black, R. E., Levin, C., Walker, N., Chou, D., Liu, L., & Temmerman, M. (2017). Reproductive, maternal, newborn, and child health: Key messages from disease control priorities. *The Lancet*, 389(10079), 115–124.
- BoS AJ&K and UNICEF (2021) *Multiple Indicator Cluster Survey 2020–21*. Islamabad: UNICEF Pakistan.
- BoS Balochistan and UNICEF (2022) *Balochistan MICS 2019–20: Key Findings*. Quetta: BoS P&DD Balochistan.
- BoS KP and UNICEF (2022) *Sindh MICS 2018–19*. Karachi: Bureau of Statistics, Government of Sindh.

- BoS Punjab and UNICEF (2018) *Multiple Indicator Cluster Survey 2017–18*. Lahore: Bureau of Statistics, Government of Punjab.
- BoS Sindh and UNICEF (2019) *Sindh MICS 2018–19*. Karachi: Bureau of Statistics, Government of Sindh.
- Cleland, J., & Jejeebhoy, S. (1996). Maternal schooling and fertility decline. In R. Jeffery & A. M. Basu (Eds.), *Girls' schooling, women's autonomy and fertility change in South Asia*. Sage Publications.
- Desai, S., & Alva, S. (1998). Maternal education and child health: Is there a strong causal relationship? *Demography*, 35(1), 71–81.
- Cleland, J.G. and Sathar, Z.A., 1984. The effect of birth spacing on childhood mortality in Pakistan. *Population Studies*, 38(3), pp.401–418.
- Flege, A. T. (1982), “Inequality Income Illiteracy and Medical Care as Determinant of Infant Mortality in Underdeveloped Countries”, *Journal of Population*, Vol. 36, No., pp. 441-458.
- Hashmi, S. S. (1979), “Socio-Economic Determinant of Mortality Levels in Asia and the Pacific”, *Proceeding of the Meeting on Socio-Economic Determinant and Consequences of Mortality Mexico City 19-25, June Mexico WHO/UN, Geneva/New York*.
- Hobcraft, J. N., McDonald, J. W., and Rutstein, S. O. (1984) “Socio-Economic Factors in Infant and Child Mortality: A Cross-National Comparison”, *Journal of Population Studies*, Vol. 38, pp. 193-223.
- Irfan, M (1986), “Mortality Trends and Patterns in Pakistan”, Bangkok, ESCAPE (Asian Population Studies Services No.75).
- Jinabhai, C. C., Coovadia, M. M., and Abdool Karim, S. S. (1986), “Soico Medical Indicators in South Asia”, *Journal of Health Services*, Vol. 16, No. 1, pp. 163-176
- Kazmi, S. (1995). Determinants of infant mortality in Pakistan: Evidence from demographic and health survey data. *Pakistan Development Review*, 34(4), 783–798.
- Kazmi, S.G.H. (1995) ‘*Foreign Aid and Health in Pakistan*’. Unpublished PhD thesis. University of Bradford, UK.
- Kazmi, S.G.H. (1998) ‘Foreign Aid as a Determinant of Social Sector Expenditure in Pakistan’, paper presented at *Business Leadership Seminar: Setting Agenda for Change*, ILM Lahore, 29 –30 July 1998.
- Kazmi, S.G. Haider (2005), “Foreign Aid as Determinant of Health Expenditure in Pakistan” Paper presented at the International Conference, Lahore University of Management Sciences LUMS, Lahore, 2005
- Kazmi, S.G.H. (2009) ‘Role of Kind of Foreign Aid in Determining Health Status in developing countries: A case study of Pakistan’, paper presented at the *5th International Conference of Mahdism Doctrine*, Tehran, Iran, 5–6 August.
- Kazmi SGH (2010); “Structure Loan are determinant for Health Expenditure in Pakistan: An Evidence from Time Series data, Kashmir Development Review 2010, General of Kashmir Studies University of Azad Jammu and Kashmir Muzaffarabad Azad Kashmir
- Kazmi, SGH and others (2023a), “Azad Jammu And Kashmir Distinctly Moves for Gender Parity at Primary School Level: A Historical Comparison From Mics Data”, *International Journal of Contemporary Social Sciences*, Volume 2 Issue 3, p 38-52
- Kazmi, SGH and others (2023b), “Azad Jammu And Kashmir Outstrips in Gender Parity: An Evidence From MICS Data”, *International Journal of Contemporary Social Sciences*, Volume 2 Issue 4, p 707-722

- Kazmi, S.G.H., Ilyas, M.T. and Kazmi, Hina. (2024) 'Azad Jammu and Kashmir outperforms Pakistan's regions/areas in gender parity at the primary school level: An empirical evidence from MICS data', *Web of Semantic: Universal Journal on Innovative Education*, 3(6), pp. 49-70.
- Kazmi, S.G.H., Ilyas, M.T., Kazmi, H. and Shah, K.H., (2025). Comparative Study of Gender Parity in Education Among Regions/Areas of Pakistan: An Analysis of MICS Historical Data, *International Journal of Social Sciences Bulletin*, 3(7), pp.198-216. <https://theijssb.com>
- Kazmi, S.G.H., Ilyas, M.T., Kazmi, H., Shah, K. H. (2026a), "Reimagining Education in Pakistan: Lessons From AJK's Success and A Blueprint for National Reform", *International Journal of Social Sciences Bulletin*, Vol. 2 No.2 (2026) pp. 1-15
- Kazmi, S.G.H., Ilyas, M.T., Kazmi, Hina., Shah, K. Hussain, (2026b), "Out-Of-School Children in Pakistan's Regions/Areas: A Comparative Analysis Based on Regional MICS6 Data Focusing Azad Jammu & Kashmir" *Policy Research Journal*" Volum4, Issue 3, (2026)
- Kazmi, S.G. Haider., Ilyas, M.Tayaab., Kazmi, Hina., Hussain, Khuram., (2026c) "Assessing Disparities in Wash Indicators: A Provincial Comparison Using Multiple Indicator Cluster Surveys (MICS6) Regional/Area Data", Vol. 4 No. 3 (2026b): *International Journal of Social Sciences Bulletin* p. 304-321
- Kazmi, S.G.H., Ilyas, M.T., Kazmi, H. and Shah, K.H., 2026d. Out-Of-School Children in Islamabad Capital Territory (ICT): Trends, Determinants And Policy Implications. *International Journal of Advanced Research*, 3(2), pp.344-365.
- Kazmi, S. G.Haider., Ilyas, M. T., Hina., K, Shah, K. H., Ali, A., Aun, M., (2026e), "Socioeconomic Determinants Of Infant and Under-Five Mortality Rates in Pakistan: A Provincial/Area Comparison Using Multiple Indicator Cluster Survey (Mics6) Data", *Research Journal of Neurological & Medical Science Review* , Volume 4, Issue 3, 2026 p. 1-16
- Kazmi, S. G. Haider., Ilyas, M. Tayaab., Hina, Kazmi., Shah, Khuraam Hussaun., Ali, Abbas., Aun, Muhmmad., (2026f), "Unequal Beginnings: Interprovincial Inequalities and Socioeconomic and Demographic Determinants of Infant Mortality in Pakistan", *Frontier in Medical & Health Research* Volume 4, Issue 3, 2026, p. 1-18
- Khan, R. E. A., & Raza, M. A. (2014). Maternal health-care utilization and child mortality in Pakistan. *Asian Social Science*, 10(12), 157-164.
- Knowles, J. C. (1979), "The Determinants of Mortality in a Low Income Areas of Karachi", Discussion Paper No. 35, Applied Economics Research Centre, University of Karachi, Pakistan.
- Kully, V.R. Thankappan, K.P., Kannan. K.P. and Arvindan, K.P. (1993), "How Socio-economic Status Affects Birth and Death Rates in Rural Kerala, India: Results of a Health Study". *International Journal of Health Services*, Vol. 23. No. 1, pp. 373-386.
- Mosley, W. H., & Chen, L. C. (1984). An analytical framework for the study of child survival in developing countries. *Population and Development Review*, 10(Supplement), 25-45.

- Memon, Z., Fridman, D., Soofi, S., Ahmed, W., Bhutta, Z. A., & others. (2023). *Predictors and disparities in neonatal and under-5 mortality in rural Pakistan: Cross-sectional analysis*. The Lancet Regional Health – Southeast Asia, 15, 100231. <https://doi.org/10.1016/j.lansea.2023.100231>
- Nag, M. (1985), “The Impact of Social and Economic Development on Mortality: Comparative Study of Karala and West Bengal”, in Good health at Low Cost eds., Rockefeller Foundation, New York.
- P&DDGB (Gilgit-Baltistan) and UNICEF (2024-25), “Gilgit-Baltistan Multiple Indicator Cluster Survey 2024–25: Key Findings Report”, Statistical Cell P&DD Government of Gilgit-Baltistan Gilgit
- Preston, S. H. (1980), “Causes and Consequences of Mortality Declines in Less Developed Countries During the Twentieth Century”, in Population and Economic Change in Developing Countries, Eastern, R. A. (ed.), Conference Report No. 30, Universities - national Bureau Committee for Economic Research. University of Chicago Press, Chicago pp. 289-342.
- Rana, M.S., Mazumder, S., Khan, M.T.F., Khan, M.M.H. and Rahman, M.M., 2024. Trends and determinants of caesarean section in South Asian countries: Bangladesh, Nepal, and Pakistan. *Plos one*, 19(12), p.e0311082.
- Rusicka, L. T., Hansliwks, H. (1982), “Mortality in South and East Asia: Technology Confronts Poverty”, Population Development Review.
- Rutstein, S. O. (2005). Effects of preceding birth intervals on neonatal, infant and under-five years mortality and nutritional status in developing countries. *International Journal of Gynecology & Obstetrics*, 89 (Supplement 1), S7–S24.
- Sathar Z. A. (1984), “Does Female Education Affect Fertility Behaviour in Pakistan”, The Pakistan Development Review (PDR), Vol. 23, No. 4, pp. 573 -589.
- Sathar, Z. A. (1987), “Sex Differential in Mortality: A Corollary of Son Preference”
- Sathar, Z. A. (1992), “Child Survival and Changing Fertility Pattern in Pakistan”, The PDR Vol. 31, No. 4 pp. 699-713.
- Sogaard, J. (1993), “Econometric Analysis of Child Mortality in 28 African Countries 1984 and 1987, Mino Centre for Health and Social Policy, Odense University, Denmark.
- UNICEF (2020), *Multiple Indicator Cluster Survey (MICS) Pakistan*.
- UNICEF (2022) *Multiple Indicator Cluster Surveys (MICS): Methodology and Tools*. New York: UNICEF.
- UNICEF [United Nations Children’s Fund] (2023). *Levels and trends in child mortality: Report 2023*. United Nations Inter-agency Group for Child Mortality Estimation.
- United Nations (1979), “Some Aspects of Socio-Economic Determinants of Mortality in Tropical Africa”, in Proceedings of the Meeting on Socio-Economic Determinants and Consequences of Mortality, New York.
- United Nations (2023). *The Sustainable Development Goals Report 2023*. United Nations.
- WHO/UN (1979), “Socio-Economic Determinant of Mortality Levels in Asia and the Pacific”, in Proceeding of the Meeting on Socio-Economic Determinant and Consequences of Mortality”, Mexico City 19-25 June Mexico WHO/UN, Geneva/New York.
- WHO [World Health Organization]. (2022). *Adolescent pregnancy*. World Health Organization.
- WHO [World Health Organization]. (2023). *Child mortality: Levels and trends*. World Health Organization.
- Zaidi, B. (2024). *Losing the female survival advantage: Sex differentials in infant and child mortality in Pakistan*. *Demographic Research*, 50, 411–442. <https://doi.org/10.4054/DemRes.2024.50.15>