

Fertility Transition among Major Ethnic Groups in Sarawak, Malaysia: Historical Trends, Socioeconomic Drivers and Future Implications

See Too Kay Leng¹, Poline Bala*¹, Michael King¹, Lam Chee Kheung¹

¹Institute of Borneo Studies, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

***Corresponding Author**

Poline Bala

Institute of Borneo Studies, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

Email ID: bpoline@unimas.my

ABSTRACT

Fertility decline is reshaping population growth, age structure, and social reproduction across Malaysia, yet long-term ethnic comparisons for Sarawak remain limited. This study examines historical birth-rate transition among the Iban, Chinese, Malay, Bidayuh, Orang Ulu, and Melanau populations using annual civil-registration series from the Sarawak Yearbook of Statistics and population-census reports for 1949–2009. The analysis combines descriptive trend comparison, proportional decline in crude birth rates, decadal slopes, cross-group dispersion statistics, and changes in natural increase. Because early civil registration was incomplete for several rural populations, the main comparison emphasizes the 1980s–2000s, when registration was substantially more complete. Across this period, all six groups recorded lower crude birth rates. The Malay population experienced the largest proportional reduction, from 34.0 to 21.8 births per 1,000 population (35.9%), followed by the Bidayuh (32.7%), Chinese (29.7%), Melanau (24.2%), Iban (23.7%), and Orang Ulu (21.2%). Cross-group differences narrowed, while natural increase declined in every group. These patterns are linked to education, urbanization, delayed marriage, women's employment, healthcare improvement, family planning, rising child-rearing costs, and changing family aspirations. Sarawak's fertility decline has continued into a below-replacement context, with implications for ageing, labor-force replacement, rural continuity, and family-support policy and long-term demographic sustainability across diverse ethnic communities.

Keywords: crude birth rate; ethnic fertility; demographic transition; population ageing; Sarawak

INTRODUCTION

Fertility is a central component of population change because it determines the size of successive birth cohorts and, over time, the balance between children, working-age adults and older persons. Persistent fertility decline can create short-term opportunities through a lower child-dependency burden, but it can also produce long-term challenges when smaller cohorts enter the labour market and larger cohorts reach old age. These effects are increasingly visible across Asia, where rapid socioeconomic development has compressed demographic transitions that took much longer in Europe. Global analyses now project that fertility will remain below replacement level in a growing number of countries, with major implications for labour supply, healthcare demand, intergenerational support and regional population distribution (GBD 2021 Fertility and Forecasting Collaborators, 2024; United Nations, 2024; Vollset et al., 2020).

Malaysia is a particularly important setting for fertility research because its demographic transition has unfolded within a plural society. National fertility decline has never been ethnically uniform. Historical research in Peninsular Malaysia showed that Chinese fertility fell earlier and more rapidly, while Malay fertility declined more gradually and displayed temporary plateaus associated with changes in marriage timing and parity progression (DaVanzo & Haaga, 1982; Hirschman, 1986; Lim et al., 1987; Leete & Tan Boon Ann, 1993). More recent Malaysian studies continue to identify female education, female employment, medical development and income change as important correlates of fertility decline (Kamaruddin & Khalili, 2015; Tang & Tey, 2017). These findings demonstrate that national averages conceal differences in the timing, pace and social mechanisms of fertility transition. Sarawak provides an even more diverse demographic context. Its major ethnic communities include the Iban, Chinese, Malay, Bidayuh, Orang Ulu and Melanau, each with distinctive histories of settlement, religion, livelihoods, migration, and exposure to urban development. Historically, the Iban, Bidayuh, Orang Ulu and Melanau included large rural populations living in longhouses, villages and riverine settlements, whereas the Chinese population was more concentrated in commercial and urban centres. Malay communities were distributed across both urban and rural areas, with family formation shaped by Islamic marriage norms and local socioeconomic conditions. These differences make Sarawak a valuable case for investigating whether fertility decline followed separate ethnic pathways or gradually converged as education, healthcare, transportation and urban employment expanded.

The historical evidence is contained in civil-registration records and census compilations assembled by Lam (2014a, 2014b). The annual series cover crude birth rates (CBR), crude death rates (CDR) and natural increase rates (NIR) by ethnicity from 1949 to 2009. The records are unusually valuable because they permit six-group comparison over approximately six decades. At the same time, the data demand careful interpretation. Early birth registration was incomplete, particularly among geographically dispersed rural populations. Lam's comparison of registered and indirectly adjusted birth rates showed severe under-registration among the Iban, Bidayuh, Orang Ulu and Melanau in the early decades. Consequently, the low registered rates observed for some groups in the 1950s and 1960s cannot be interpreted as genuinely low fertility. They partly reflect unequal administrative reach and registration completeness.

Despite these limitations, the later series provide clear evidence of transition. By the 1980s, registration systems were more established, and by the 1990s and 2000s the ethnic series display broad declines. This later period is analytically important because it coincided with rapid educational expansion, road development, urbanisation and occupational change in Sarawak. The spread of secondary and tertiary education increased the time young adults spent outside marriage and raised the opportunity costs of early childbearing. Urban employment and higher housing and childcare costs encouraged smaller families, while improved healthcare and lower child mortality reduced the perceived need for large numbers of births. Migration also exposed rural-origin households to urban norms concerning marriage, work and family size.

The contemporary relevance of the historical series has become more pronounced. Vital Statistics, Malaysia, 2024 recorded a national crude birth rate of 13.6 births per 1,000 population in 2023, while the subsequent release reported that the national total fertility rate declined to 1.6 children per woman in 2024; the Chinese rate was 0.9 and the Malay rate 1.9 (Department of Statistics Malaysia [DOSM], 2024, 2025). Public discussion in Sarawak has similarly intensified. State-level reporting has highlighted a decline in Sarawak's total fertility rate from 2.76 children per woman in 2001 to 1.69 in 2023, alongside concern about ageing, marriage decline and future socioeconomic sustainability (Malay Mail, 2025; Sarawak Tribune, 2024). These recent developments suggest that the historical fall in birth rates documented up to 2009 was not temporary; it formed the foundation of a continuing low-fertility regime.

This study therefore undertakes a comparative historical analysis of birth-rate transition among the six major ethnic groups in Sarawak. It has three objectives. First, it describes and compares long-term trends in registered crude birth rates and natural increase rates. Second, it identifies the demographic, socioeconomic and cultural mechanisms that plausibly shaped the different transition paths, drawing on historical evidence and the wider fertility literature. Third, it discusses future implications for ageing, labour-force replacement, rural continuity, family support and population policy. The study does not claim to establish individual-level causal effects because the available data are aggregate historical statistics. Instead, it combines quantitative trend assessment with theoretically grounded interpretation to provide a comprehensive account of ethnic fertility transition in Sarawak.

2. LITERATURE REVIEW

2.1 Demographic and fertility transition

Demographic transition theory explains the movement from high fertility and mortality to low fertility and mortality as societies experience improvements in health, education, income and urban development (Notestein, 1945; Thompson, 1929). In the early transition, mortality tends to decline before fertility, producing rapid natural increase. In the later transition, fertility falls as child survival improves, family production systems change, education expands and parents increasingly favour greater investment in fewer children. Lee (2003) emphasised that the transition transforms not only population growth but also age structure and intergenerational transfers. Bongaarts (2009) similarly showed that even after fertility begins to decline, population momentum can sustain growth because large young cohorts continue to enter reproductive ages.

Classical transition theory is useful, but it does not by itself explain why fertility decline begins at different times across social groups. Caldwell's (1982) theory of intergenerational wealth flows proposed that fertility falls when the direction of net resource transfers changes: children move from being contributors to household production to becoming long-term recipients of parental investment. Education is crucial in this process because schooling delays children's economic contribution while increasing the cost and expected duration of parental support. In urban and service economies, the economic value of child labour declines, while expenditure on education, housing, transport and childcare rises.

The proximate-determinants approach adds an important behavioural layer. Fertility is directly shaped by exposure to sexual union, contraception, postpartum infecundability and abortion, while socioeconomic variables operate through these proximate mechanisms. Malaysian research has demonstrated the importance of marriage timing, birth spacing, breastfeeding and contraceptive use. DaVanzo and Haaga (1982) found that fertility decline in Peninsular Malaysia reflected later marriage and longer menstruating intervals associated with modern

contraceptive use, with especially rapid changes among Chinese women. Hirschman (1986) showed that a temporary rise in Malay period fertility could partly reflect the recuperation of births postponed by rising age at marriage rather than a reversal of cohort fertility decline.

2.2 Ethnic differentials in Malaysian fertility

Ethnic differences have therefore been a persistent feature of Malaysian fertility transition. Lim et al. (1987) concluded that all major groups in Peninsular Malaysia participated in fertility decline, but that the Chinese and Indian transitions were more rapid than the Malay transition. Leete and Tan Boon Ann (1993) placed these differences within broader variations in marriage, education, employment, residence and family preferences. Such work cautions against treating ethnicity as an isolated cultural variable. Ethnic differentials often reflect unequal distributions of socioeconomic opportunities, settlement patterns and institutional access, together with culturally specific expectations concerning marriage and children.

Female education is among the most consistent correlates of lower fertility. Education delays marriage, increases knowledge of reproductive health, raises aspirations for women's employment and strengthens the preference for investing more resources in each child. At the household level, Kamaruddin and Khalili (2015) found a negative association between education and fertility decisions in Malaysia. At the macro level, Tang and Tey (2017) reported that Malaysian fertility was inversely related to female education, female employment and medical quality over 1980–2012. The relationship is not mechanical, however. Education can affect fertility through marriage timing, employment opportunities, desired family size and contraceptive use, and the magnitude of each pathway varies by community.

2.3 Education, employment, urbanisation and healthcare

Women's employment also has context-dependent effects. Mason and Palan (1981) found that the relationship between women's work and fertility in Peninsular Malaysia was shaped by the compatibility of employment with maternal roles and by household opportunity structures. Employment that can be combined with family labour may not strongly reduce fertility, whereas formal wage employment with fixed hours, commuting and career progression can increase the cost of childbearing. This distinction is relevant in Sarawak, where shifts from agriculture and family enterprises to salaried work, education, healthcare, public administration and industry changed the organisation of both work and care. Urbanisation intensifies these pressures. Urban households generally face smaller living spaces, higher direct costs, weaker reliance on child labour and more competition between employment and caregiving. Urban migration can also accelerate ideational change by exposing migrants to new models of marriage, gender roles and family size. In Sarawak, migration to Kuching, Sibü, Miri and Bintulu expanded access to education and wage employment, while rural–urban mobility linked longhouses and villages to urban labour markets. Fertility behaviour may therefore converge across groups even when cultural identities remain distinct.

Healthcare improvement can reduce fertility through two related mechanisms. First, lower infant and child mortality increases the probability that births survive to adulthood, reducing the number of births needed to achieve a desired number of surviving children. Second, improved maternal and reproductive healthcare increases access to information, contraception and birth-spacing services. Tang and Tey (2017) identified medical quality as a significant long-run correlate of Malaysian fertility. At the global level, recent fertility forecasting models similarly incorporate female education, contraceptive met need and under-five mortality as key predictors of completed fertility (GBD 2021 Fertility and Forecasting Collaborators, 2024).

2.4 Low fertility and the research gap

Low fertility creates a different policy environment from the one that shaped earlier family-planning programmes. When fertility falls below replacement level, governments must balance reproductive autonomy with measures that reduce unwanted barriers to family formation. Tey (2020) argued that Malaysia must prepare for persistent low fertility rather than assume automatic recovery. International evidence suggests that cash incentives alone have limited effects when housing costs, insecure employment, work–family conflict and inadequate childcare remain unresolved. A comprehensive response requires affordable childcare, family-friendly workplaces, reproductive healthcare, housing support and gender-equitable caregiving.

For Sarawak, a further concern is spatial and community sustainability. Fertility decline interacts with youth migration, producing sharper ageing in some rural areas than state-level averages imply. Smaller birth cohorts may lead to declining school enrolments, reduced local labour supply and weaker intergenerational transmission of language and customary knowledge. At the same time, the transition can improve maternal health, educational investment and household welfare. The policy objective should therefore not be to restore historically high fertility, but to support desired fertility, reduce involuntary childlessness and ensure that family formation is compatible with education, employment and community continuity.

The literature reveals a clear gap. Malaysian studies have concentrated mainly on Peninsular ethnic groups or national indicators, while Sarawak research has often examined one community at a time. Few studies compare six major Sarawak ethnic populations across the same historical period, explicitly account for early under-registration, quantify later convergence and connect the historical transition to the present low-fertility debate. This study addresses that gap by distinguishing observed registration patterns from the more comparable post-1980 transition and by combining ethnic trend analysis with a forward-looking policy discussion.

3. MATERIALS AND METHODS

3.1 Research design and data sources

This study used a comparative historical-demographic design based on secondary aggregate data. The unit of analysis was the ethnic population-period rather than the individual woman or household. The six populations were the Iban, Chinese, Malay, Bidayuh, Orang Ulu and Melanau. Annual registered crude birth rates, crude death rates and natural increase rates were obtained from appendices and summary chapters in Lam's two demographic monographs, which compiled Sarawak civil-registration records, Yearbook of Statistics series and population-census reports, including the 2010 census publication (DOSM, 2011; Lam, 2014a, 2014b). The annual records cover 1949–2009, with slight differences in the first and final averaging periods across ethnic groups.

The crude birth rate is defined as registered live births during a year divided by the mid-year population, multiplied by 1,000. The crude natural increase rate is the crude birth rate minus the crude death rate. CBR is not identical to the total fertility rate because it is influenced by the age and sex composition of the population. As populations age, a smaller share of the total population may be in the reproductive ages; CBR can therefore decline even when age-specific fertility behaviour is unchanged. Part of the late-period decline may consequently be compositional. Nevertheless, CBR is the only consistently available ethnic-specific annual indicator across the full historical period and is used as a proxy for the population-level intensity of childbearing. Contemporary TFR statistics are used only in the discussion of recent developments and are not merged numerically with the historical CBR series.

3.2 Measurement and data quality

Data quality was treated as a central methodological issue. Civil registration was incomplete in the early post-war decades, especially for rural populations living far from administrative centres. Lam's indirect demographic assessments indicated that registered early CBRs substantially understated actual levels among the Iban, Bidayuh, Orang Ulu and Melanau. For example, adjusted estimates for the earliest intercensal period were approximately 44.0 births per 1,000 for the Iban, 58.5 for the Bidayuh, 48.1 for the Orang Ulu and 46.8 for the Melanau — well above their registered averages. Leete (1996) similarly noted that registration completeness improved as administrative systems expanded and birth certificates became more important for proof of citizenship. Accordingly, the 1950s–1970s series are presented as observed registration patterns and interpreted with caution. The principal cross-ethnic transition analysis focuses on the 1980s, 1990s and 2000s, when administrative coverage and awareness of birth registration were substantially better.

The analysis proceeded in five stages. First, annual observations were summarised into decadal or near-decadal averages as reported in the source monographs. Second, line graphs were used to compare observed CBR trajectories across all periods and within the more comparable 1980s–2000s window. Third, the proportional decline in CBR was calculated for each ethnic group as $[(\text{CBR}_{1980s} - \text{CBR}_{2000s}) / \text{CBR}_{1980s}] \times 100$. The absolute decline and a simple linear slope across the three later periods were also calculated. The slope is expressed as the average change in CBR points per decade and is descriptive rather than inferential.

3.3 Analytical procedures

Fourth, cross-group convergence was evaluated using the mean, standard deviation, coefficient of variation and range of the six CBRs in each of the three later periods. A declining range and coefficient of variation were interpreted as evidence that ethnic differences were narrowing. Fifth, changes in the natural increase rate were compared between the 1980s and 2000s. These calculations indicate whether lower birth rates translated into slower natural population growth after accounting for mortality.

The study did not apply significance testing or causal regression. The number of decadal observations is small, the series are aggregate, and early measurement error is non-random across ethnic groups. Inferential models would therefore risk overstating precision. Drivers of fertility decline were interpreted through triangulation with historical descriptions and peer-reviewed Malaysian fertility research. The resulting claims are framed as plausible mechanisms consistent with the observed timing and existing evidence, not as causal estimates derived from the Sarawak series alone.

All calculations were performed using standard spreadsheet and statistical procedures. Values were retained to one decimal place because the source CBR and NIR data were reported at that precision. Ethical approval was not required because the study used published aggregate statistics and contained no identifiable individual-level information.

Table 1. Decadal Average Registered Crude Birth Rates by Ethnic Group (per 1,000 population)

Period	Iban	Chinese	Malay	Bidayuh	Orang Ulu	Melanau
1950–1959	10.7	33.5	34.1	30.3	21.6	24.8
1960–1969	15.3	37.0	38.7	40.9	25.6	24.7
1970–1979	19.8	33.5	38.4	36.3	28.0	30.0
1980–1989	24.9	26.6	34.0	29.7	29.7	29.7
1990s	24.7	22.6	29.6	27.0	23.4	27.7
2000s	19.0	18.7	21.8	20.0	23.4	22.5

Source: Adapted from Lam (2014a, 2014b)

4. RESEARCH FINDINGS

4.1 Observed historical trajectories and registration effects

The full registered series shows substantial ethnic variation, but the early pattern is strongly affected by registration completeness. In the first averaging period, the observed CBR ranged from only 10.7 births per 1,000 among the Iban to 34.1 among the Malay population. The Chinese and Bidayuh recorded 33.5 and 30.3, respectively, while the Melanau and Orang Ulu recorded 24.8 and 21.6. Taken literally, these figures would suggest exceptionally low Iban fertility during a period when the population was still characterised by large families and rapid intercensal growth. The indirect estimates reported by Lam show that this interpretation would be incorrect. Low early registered values among several rural populations primarily reflect under-registration rather than a true low-fertility regime. The observed rates for the Iban, Bidayuh, Orang Ulu and Melanau generally rose between the 1950s and the 1970s or 1980s as registration improved. The Iban registered average increased from 10.7 in the 1950s to 24.9 in the 1980s. The Bidayuh rate rose from 30.3 to 40.9 in the 1960s before declining. Orang Ulu increased from 21.6 in the 1950s to 29.7 in the 1980s, while the Melanau rate rose from 24.8 to around 30.0 in the 1970s. These increases should not be read as simple fertility rises. They combine changes in actual childbearing with the progressive inclusion of births previously missed by the registration system.

The Chinese and Malay series are more plausible in the early decades because registration was relatively more complete. Chinese CBR increased from 33.5 in the 1950s to 37.0 in the 1960s, then declined to 33.5 in the 1970s and 26.6 in the 1980s. Malay CBR rose from 34.1 in the 1950s to 38.7 in the 1960s and remained high at 38.4 in the 1970s before declining to 34.0 in the 1980s. The timing resembles earlier findings from Peninsular Malaysia, where Chinese fertility declined earlier and Malay fertility remained higher for longer.

By the 1980s, all six series had reached a range that is more credible for cross-group comparison: 24.9 for Iban, 26.6 for Chinese, 34.0 for Malay, and 29.7 for each of Bidayuh, Orang Ulu and Melanau. From this point onward, the direction of change was overwhelmingly downward. This later period provides the clearest evidence of a shared fertility transition.

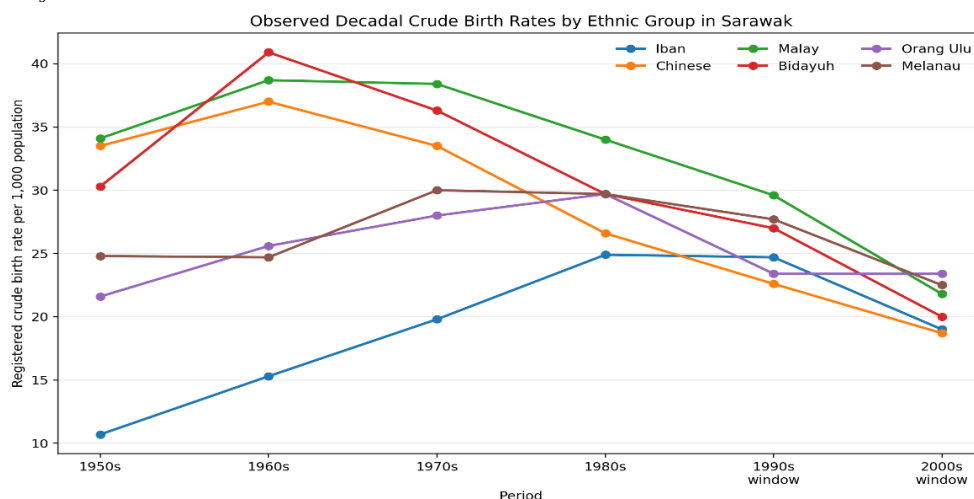


Figure 1. Observed decadal crude birth rates by ethnic group. Early increases among several rural populations partly reflect improved registration completeness.

4.2 Fertility decline in the comparable 1980s–2000s window

Between the 1980s and the 2000s, every ethnic group experienced a decline in registered CBR. The six-group mean fell from 29.1 to 20.9 births per 1,000 population, a reduction of 8.2 points or 28.2%. The decline was

therefore not restricted to one religious, linguistic or settlement group; it was a state-wide transformation that reached communities with different initial conditions.

The Malay population recorded the largest absolute reduction, declining by 12.2 births per 1,000, from 34.0 to 21.8. Its proportional decline was 35.9%, and its estimated linear slope was -6.1 CBR points per decade. The Bidayuh experienced the second-largest relative decline, from 29.7 to 20.0, representing a proportional decline of 32.7% and a slope of -4.85 points per decade. Chinese CBR fell from 26.6 to 18.7, equivalent to a 29.7% decline. By the 2000s, the Chinese population had the lowest CBR among the six groups, consistent with the long-standing pattern of earlier Chinese fertility transition in Malaysia.

The Melanau rate declined from 29.7 to 22.5, or 24.2%, while the Iban rate fell from 24.9 to 19.0, or 23.7%. Orang Ulu recorded the smallest proportional reduction, but the decline was still substantial: from 29.7 to 23.4, or 21.2%. The apparent stability of Orang Ulu CBR between the 1990s and 2000s should be treated cautiously because the category covers several culturally and geographically diverse populations and because the relatively small population produces greater sensitivity to annual fluctuations.

The 2000s ranking was Chinese (18.7), Iban (19.0), Bidayuh (20.0), Malay (21.8), Melanau (22.5) and Orang Ulu (23.4). The ordering is important but should not obscure the broader convergence: all six groups had moved into a relatively narrow band between 18.7 and 23.4 births per 1,000. The results indicate that socioeconomic transformation reduced historical ethnic differences even though distinct family patterns remained.

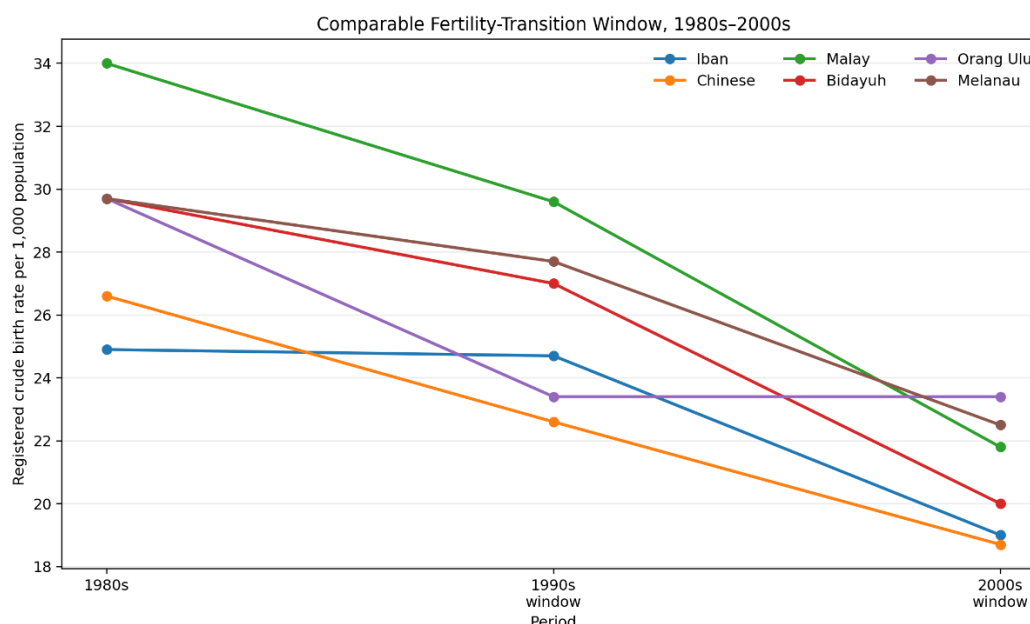


Figure 2. Comparable crude birth-rate transition from the 1980s to the 2000s.

Table 2. Magnitude and Pace of Crude Birth-Rate Decline, 1980s–2000s

Ethnic group	1980s CBR	2000s CBR	Absolute decline	Proportional decline (%)	Slope per decade
Iban	24.9	19.0	5.9	23.7	-2.95
Chinese	26.6	18.7	7.9	29.7	-3.95
Malay	34.0	21.8	12.2	35.9	-6.10
Bidayuh	29.7	20.0	9.7	32.7	-4.85
Orang Ulu	29.7	23.4	6.3	21.2	-3.15
Melanau	29.7	22.5	7.2	24.2	-3.60

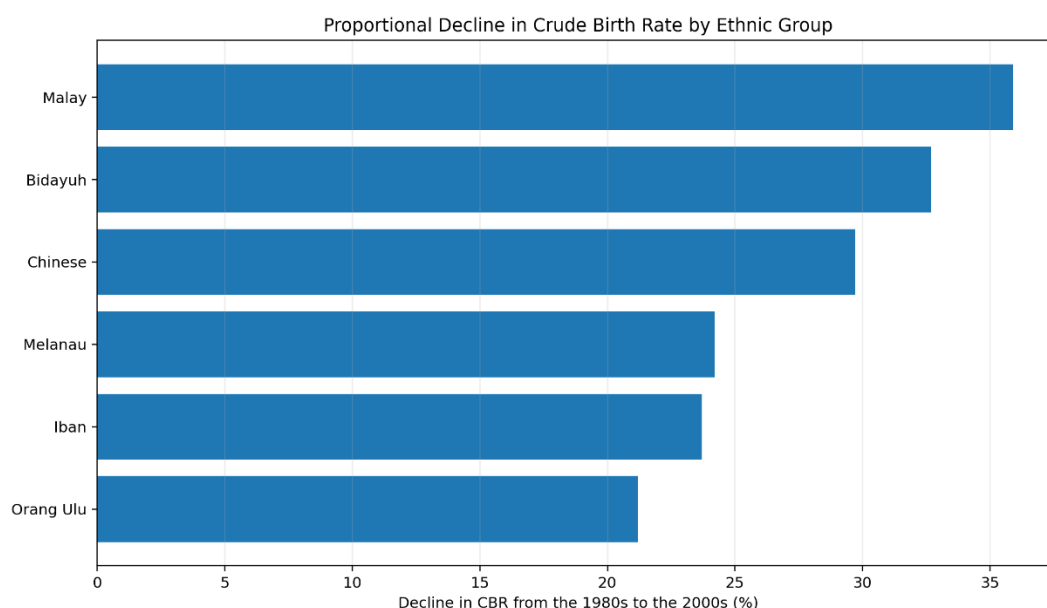


Figure 3. Proportional decline in crude birth rate from the 1980s to the 2000s, by ethnic group.

4.3 Interethnic convergence and declining natural increase

Cross-group dispersion decreased over the comparable period. In the 1980s, the difference between the highest and lowest CBR was 9.1 births per 1,000, and the coefficient of variation was 9.82%. The range narrowed to 7.0 in the 1990s and 4.7 in the 2000s. The coefficient of variation changed non-linearly but declined overall, from 9.82% in the 1980s to 9.57% in the 1990s and 8.49% in the 2000s. The standard deviation fell from 2.86 to 2.47 and then to 1.77, despite differences in population size and settlement history.

This convergence has two interpretations. First, the structural forces associated with lower fertility such as education, urbanization, healthcare access, delayed marriage and rising child-rearing costs became increasingly widespread across Sarawak. Second, convergence does not mean the disappearance of culture. Ethnic institutions continued to shape marriage, residence and kinship, but they operated within a shared economic and institutional environment that increasingly favored smaller families.

The natural increase rate also declined for all six groups. Between the 1980s and 2000s, Iban NIR fell from 21.5 to 14.6 per 1,000; Chinese from 22.7 to 14.5; Malay from 30.1 to 18.0; Bidayuh from 26.0 to 16.2; Orang Ulu from 27.0 to 17.4; and Melanau from 24.6 to 17.5. Relative reductions ranged from 28.9% among the Melanau to 40.2% among the Malay population. Mortality was already comparatively low in the later decades, so most of the decline in natural increase reflected lower birth rates. The combination of lower CBR and lower NIR indicates a transition toward slower population growth and the eventual ageing of ethnic populations.

Table 3. Cross-Group Convergence in Crude Birth Rates

Period	Mean CBR	SD	CV (%)	Range	Minimum	Maximum
1980s	29.10	2.86	9.82	9.1	24.9	34.0
1990s	25.83	2.47	9.57	7.0	22.6	29.6
2000s	20.90	1.77	8.49	4.7	18.7	23.4

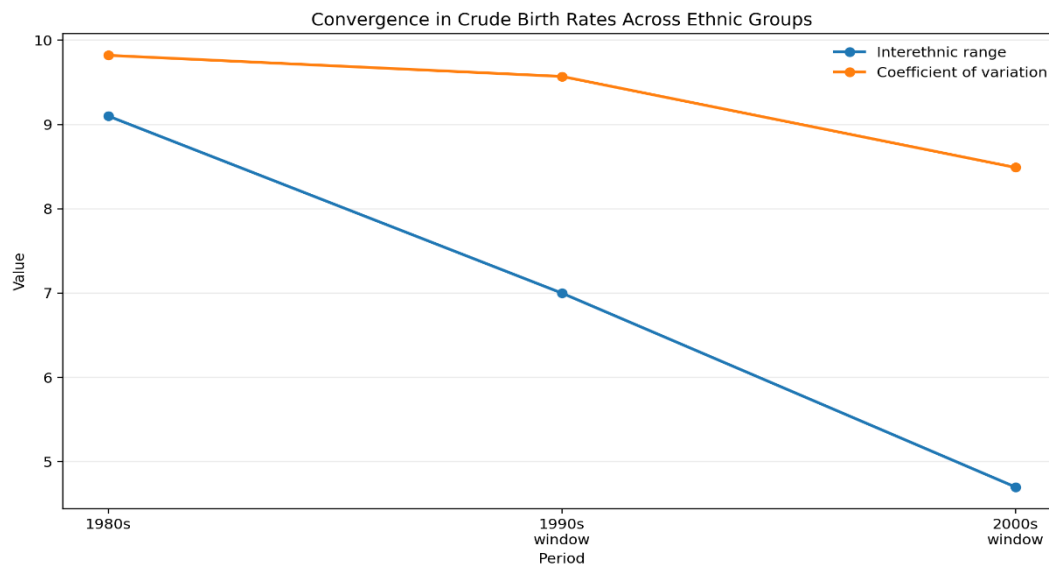


Figure 4. Declining interethnic range and coefficient of variation in crude birth rates.

Table 4. Decline in Natural Increase Rates, 1980s–2000s

Ethnic group	1980s NIR	2000s NIR	Absolute decline	Decline (%)
Iban	21.5	14.6	6.9	32.1
Chinese	22.7	14.5	8.2	36.1
Malay	30.1	18.0	12.1	40.2
Bidayuh	26.0	16.2	9.8	37.7
Orang Ulu	27.0	17.4	9.6	35.6
Melanau	24.6	17.5	7.1	28.9

5. DISCUSSION

5.1 Ethnic pathways through fertility transition

The central finding is that fertility transition became common across all six major ethnic groups in Sarawak, but its timing and pace were differentiated. The Chinese population entered sustained decline earlier, while the Malay, Bidayuh and several other Bumiputera groups retained higher rates into the 1980s. The later decline among Malay and Bidayuh populations was sufficiently rapid that their CBRs moved much closer to the other groups by the 2000s. This pattern resembles the plural fertility transition documented in Peninsular Malaysia: ethnic differences persisted, yet all groups eventually responded to common socioeconomic changes (Lim et al., 1987; Leete & Tan Boon Ann, 1993).

The Malay series deserves particular attention. Its high rates through the 1970s and 1980s and subsequent steep reduction resemble the delayed but substantial transition identified in earlier Malaysian studies. Hirschman (1986) showed that period fluctuations in Malay fertility could partly result from postponed births associated with later marriage. In Sarawak, the fall from 34.0 in the 1980s to 21.8 in the 2000s suggests that any temporary postponement effect was eventually accompanied by lower completed or desired fertility. Expansion of women's education, salaried employment and urban living likely increased the costs of early and high-parity childbearing, while improved reproductive healthcare increased the capacity to regulate births.

The Chinese population's earlier decline is consistent with its longer exposure to urban commerce, formal education and non-agricultural employment. Chinese CBR was already below the Malay rate in the 1980s and became the lowest by the 2000s. Earlier Malaysian research linked the rapid Chinese transition to delayed marriage and stronger adoption of modern contraception (DaVanzo & Haaga, 1982). The Sarawak evidence is compatible with this explanation, although the aggregate data do not permit direct measurement of contraceptive use or parity progression.

Bidayuh decline was especially pronounced after the 1980s. The population's proximity to Kuching and increasing access to education and wage employment may have accelerated behavioural change. Road development and commuting enabled households to maintain ties to rural villages while participating in urban labour markets, creating a hybrid setting in which the economic function of large families diminished. The Bidayuh transition illustrates why a simple rural–urban dichotomy is inadequate: fertility can decline rapidly in communities that remain culturally rural but are deeply integrated into urban education and employment systems.

The Iban trend also reflects changing rural–urban relations. Early registration problems make the initial trajectory difficult to quantify, but the decline from 24.9 in the 1980s to 19.0 in the 2000s is clear. Migration from longhouses and rural settlements to towns and cities changed living arrangements, occupational opportunities and expectations concerning children's education. Smaller families may be better suited to households that combine urban employment with continuing obligations to rural kin. At the same time, out-migration can amplify local ageing because young adults and children are increasingly concentrated away from ancestral communities.

The Orang Ulu and Melanau maintained the highest rates in the 2000s, although both were far below their 1980s levels. Interpretation requires caution because “Orang Ulu” is an umbrella category covering multiple communities with different settlement and migration patterns. Geographic remoteness, uneven access to secondary schooling and the continued importance of extended-family systems may have slowed the transition in some localities. For the Melanau, the decline was more continuous from the 1980s onward. Both groups nevertheless converged toward the state-wide low-birth-rate range.

5.2 Common socioeconomic and demographic mechanisms

Education is likely the most general driver across all groups. Sarawak's expansion of primary, secondary and tertiary education delayed entry into full-time work and marriage, while increasing the expected cost of children's schooling. The quantity–quality trade-off became more salient as parents sought to finance higher education and urban mobility. Malaysian empirical studies consistently report negative associations between female education and fertility (Kamaruddin & Khalili, 2015; Tang & Tey, 2017). Education also expands women's bargaining power and knowledge of reproductive health, though the strength of these mechanisms varies across households.

Employment and household opportunity structures form a second mechanism. The historical transition from agriculture and family enterprises to public-sector, professional, industrial and service employment changed the compatibility between work and large families. Mason and Palan (1981) argued that the employment–fertility relationship depends on whether work and childcare roles can be combined. In agricultural or family-based work, children may be integrated into household production, and care can be shared across kin. In formal employment, fixed schedules, commuting and career costs make repeated childbearing more difficult. These constraints are particularly strong when childcare services are limited or when domestic work remains unequally distributed.

Urbanisation reinforces the change. Housing is generally smaller and more expensive in urban centres, children contribute less to household production, and education-related expenses are higher. Migration also spreads new family ideals through social networks linking urban residents with rural relatives. The decline in cross-group dispersion suggests that these structural influences crossed ethnic boundaries. Differences in religion and custom remained important, but they increasingly operated within the same educational, labor-market and housing environment.

Healthcare improvement and lower child mortality also reduced fertility incentives. When survival is uncertain, parents may have more births to ensure that a desired number of children reaches adulthood. As immunisation, maternal care, sanitation and transport improved, fewer births were required to achieve family-size goals. Better healthcare also increased access to contraception and fertility regulation. Tang and Tey (2017) found medical quality to be inversely associated with fertility in Malaysia, supporting the view that health transition and fertility transition are interconnected.

The convergence observed in this study should not be interpreted as cultural homogenisation. Fertility behaviour can become numerically similar while the meanings attached to marriage, children, lineage and residence remain different. Chinese, Malay, Iban, Bidayuh, Melanau and Orang Ulu families may arrive at smaller family sizes through different combinations of delayed marriage, migration, education, religious norms and economic constraints. A comparative demographic approach should therefore distinguish convergence in outcomes from uniformity in social processes.

5.3 Measurement as substantive evidence

The data-quality findings are themselves substantive. Early registration systems reached ethnic populations unevenly, and administrative inclusion improved over time. Apparent rises in registered CBR among the Iban, Bidayuh, Orang Ulu and Melanau partly document state-building and improved civil registration rather than rising fertility. Historical demographic studies that ignore this process may misclassify the timing of transition. The

decision to emphasise the post-1980 window is therefore not merely technical; it recognises that measurement systems are socially and geographically structured.

6. Future Demographic and Policy Implications

The historical decline has continued into the contemporary period. Sarawak's reported total fertility rate fell from 2.76 children per woman in 2001 to 1.69 in 2023, and state leaders have publicly warned that falling births, fewer marriages and population ageing may affect future economic and social sustainability (Malay Mail, 2025; Sarawak Tribune, 2024). Nationally, DOSM's 2024 vital-statistics release recorded a CBR of 13.6 in 2023, and the 2025 release reported that TFR fell to 1.6 in 2024; the Malay TFR was 1.9 and the Chinese TFR 0.9 (DOSM, 2024, 2025). These contemporary figures use TFR rather than CBR, but they confirm that the low-birth-rate direction identified in the historical series has persisted.

A first implication is population ageing. Smaller birth cohorts reduce the number of future workers relative to older people. Sarawak already records a comparatively high crude death rate and a growing older population, and the demographic effect will intensify as the large cohorts born during earlier high-fertility decades age. Demand will rise for chronic-disease management, long-term care, accessible transport and age-friendly housing. The burden will not be distributed evenly: rural communities with high youth out-migration may age faster than urban centres.

A second implication is labour-force replacement. Low fertility does not immediately reduce the workforce because of population momentum and labour-force participation changes, but sustained low fertility eventually produces smaller entry cohorts. Sarawak's development ambitions in infrastructure, renewable energy, digital industries, healthcare and education may face recruitment constraints unless productivity, women's employment, later-life employment and managed migration compensate for smaller cohorts. Rural agriculture and community-based enterprises may be especially affected because they already experience youth migration.

A third implication concerns the continuity of rural settlements and cultural transmission. Smaller families and urban migration may reduce enrolment in rural schools and weaken the everyday use of ethnic languages. Longhouses and villages may retain ceremonial importance while losing year-round residents. Cultural knowledge is not determined by fertility alone, but demographic scale and age structure affect the number of children who learn local languages, participate in customary institutions and inherit community responsibilities. Policies for cultural sustainability therefore need to support both families and viable local economies.

A fourth implication is unequal access to family formation. Low fertility may reflect chosen smaller families, but it may also reflect postponed marriage, housing constraints, insecure employment, infertility and difficulty reconciling work with care. Policy should not treat all low fertility as a behavioural problem or pressure individuals to have children. A rights-based response should enable people to realise their desired family size. This includes affordable reproductive and infertility care, maternal healthcare, childcare, parental leave, flexible work, secure employment and housing.

The policy response should be tailored rather than ethnically deterministic. The historical data show different rates of decline, but contemporary needs vary more by age, income, residence, employment and access to services than by ethnicity alone. Remote communities may need transport, reproductive-health outreach and local childcare, while urban families may prioritise housing affordability and work-life balance. Community organisations and religious institutions can help design culturally appropriate services, but policy evaluation should focus on outcomes such as unmet fertility intentions, maternal health, childcare access and economic security.

Finally, the state should improve demographic monitoring. Contemporary ethnic-specific TFR estimates for Sarawak's six groups are not routinely available in the same historical detail. Linking high-quality civil registration with census denominators and maternal-age information would permit age-specific fertility rates, parity analysis and district-level projections. Such data would distinguish tempo effects (births postponed to later ages) from permanent declines in completed family size. This distinction is essential for effective policy.

7. CONCLUSION

Sarawak experienced a broad but differentiated fertility transition across the Iban, Chinese, Malay, Bidayuh, Orang Ulu and Melanau populations. Early registered rates are distorted by severe under-registration in several rural groups, but the more comparable evidence from the 1980s to the 2000s is unambiguous: crude birth rates declined in every group, natural increase slowed and interethnic differences narrowed. The Malay and Bidayuh populations recorded the largest proportional declines, while Chinese CBR reached the lowest level in the 2000s. The range across all six groups contracted by almost half, indicating convergence toward a shared low-birth-rate regime.

The transition was associated with educational expansion, delayed marriage, improved child survival, urbanisation, women's employment, family planning and the rising economic cost of raising children. These forces operated across ethnic boundaries, although each community experienced them through distinct settlement systems, religious norms and migration histories. The findings therefore support an interpretation of convergence without cultural uniformity.

Recent evidence that Sarawak's TFR reached 1.69 in 2023 shows that the historical decline has continued into a below-replacement context. The future challenge is not simply population size. Sustained low fertility will reshape ageing, labour supply, rural settlement, caregiving and cultural transmission. Policy should support reproductive autonomy and desired family formation through childcare, housing, secure work, family-friendly employment and accessible reproductive healthcare, while strengthening rural economies and demographic data systems. A historically informed response can help Sarawak manage low fertility without romanticising the high fertility past or reducing diverse families to demographic targets.

References

1. Bongaarts, J. (2009). Human population growth and the demographic transition. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1532), 2985–2990. <https://doi.org/10.1098/rstb.2009.0137>
2. Caldwell, J. C. (1982). *Theory of fertility decline*. Academic Press.
3. DaVanzo, J., & Haaga, J. (1982). Anatomy of a fertility decline: Peninsular Malaysia, 1950–1976. *Population Studies*, 36(3), 373–393. <https://doi.org/10.1080/00324728.1982.10405593>
4. Department of Statistics Malaysia. (2011). *Population distribution and basic demographic characteristics 2010*. Department of Statistics Malaysia.
5. Department of Statistics Malaysia. (2024). *Vital statistics, Malaysia, 2024*. Department of Statistics Malaysia. <https://www.dosm.gov.my/portal-main/release-content/vital-statistics-malaysia-2024>
6. Department of Statistics Malaysia. (2025). *Vital statistics, Malaysia, 2025*. Department of Statistics Malaysia. <https://www.dosm.gov.my/portal-main/release-content/vital-statistics-malaysia-2025>
7. GBD 2021 Fertility and Forecasting Collaborators. (2024). Global fertility in 204 countries and territories, 1950–2021, with forecasts to 2100: A comprehensive demographic analysis for the Global Burden of Disease Study 2021. *The Lancet*, 403, 2057–2099. [https://doi.org/10.1016/S0140-6736\(24\)00550-6](https://doi.org/10.1016/S0140-6736(24)00550-6)
8. Hirschman, C. (1986). The recent rise in Malay fertility: A new trend or a temporary lull in a fertility transition? *Demography*, 23, 161–184. <https://doi.org/10.2307/2061614>
9. Kamaruddin, R., & Khalili, J. M. (2015). The determinants of household fertility decision in Malaysia: An econometric analysis. *Procedia Economics and Finance*, 23, 1308–1313. [https://doi.org/10.1016/S2212-5671\(15\)00472-4](https://doi.org/10.1016/S2212-5671(15)00472-4)
10. Lam, C. K. (2014a). Pattern and trends of the Iban, Chinese and Malay population of Sarawak, 1947–2010. *Universiti Malaysia Sarawak*.
11. Lam, C. K. (2014b). Pattern and trends of the Bidayuh, Orang Ulu and Melanau population of Sarawak, 1947–2010. *Universiti Malaysia Sarawak*.
12. Lee, R. (2003). The demographic transition: Three centuries of fundamental change. *Journal of Economic Perspectives*, 17(4), 167–190. <https://doi.org/10.1257/089533003772034943>
13. Leete, R. (1996). *Malaysia's demographic transition: Rapid development, culture and politics*. Oxford University Press.
14. Leete, R., & Tan Boon Ann. (1993). Contrasting fertility trends among ethnic groups in Malaysia. In R. Leete & I. Alam (Eds.), *The revolution in Asian fertility: Dimensions, causes and implications* (pp. 128–147). Clarendon Press.
15. Lim, L. L., Jones, G. W., & Hirschman, C. (1987). Continuing fertility transitions in a plural society: Ethnic trends and differentials in Peninsular Malaysia. *Journal of Biosocial Science*, 19(4), 405–425. <https://doi.org/10.1017/S0021932000017065>
16. Malay Mail. (2025, October 25). Declining birth rates in Sarawak raise alarm on social and economic future, Fatimah warns. <https://www.malaymail.com/news/malaysia/2025/10/25/declining-birth-rates-in-sarawak-raise-alarm-on-social-and-economic-future-fatimah-warns/195838>
17. Mason, K. O., & Palan, V. T. (1981). Female employment and fertility in Peninsular Malaysia: The maternal role incompatibility hypothesis reconsidered. *Demography*, 18, 549–575. <https://doi.org/10.2307/2060947>
18. Notestein, F. W. (1945). Population: The long view. In T. W. Schultz (Ed.), *Food for the world* (pp. 36–57). University of Chicago Press.
19. Sarawak Tribune. (2024, November 28). Sarawak's fertility rate drops significantly to 1.69 in 2023. <https://www.sarawaktribune.com/sarawaks-fertility-rate-drops-significantly-to-1-69-in-2023/>
20. Tang, C. F., & Tey, N. P. (2017). Low fertility in Malaysia: Can it be explained? *Journal of Population Research*, 34, 101–118. <https://doi.org/10.1007/s12546-017-9187-2>

21. Tey, N. P. (2020). Bracing for low fertility in Malaysia. *ISEAS Perspective*, 2020(28), 1–11.
22. Thompson, W. S. (1929). Population. *American Journal of Sociology*, 34(6), 959–975.
23. United Nations, Department of Economic and Social Affairs, Population Division. (2024). *World population prospects 2024: Summary of results*. United Nations.
24. Vollset, S. E., Goren, E., Yuan, C. W., Cao, J., Smith, A. E., Hsiao, T., Bisignano, C., Azhar, G. S., Castro, E., Chalek, J., Dolgert, A. J., Frank, T., Fukutaki, K., Hay, S. I., Lozano, R., Mokdad, A. H., Nandakumar, V., Pierce, M., Pletcher, M., ... Murray, C. J. L. (2020). Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100. *The Lancet*, 396(10258), 1285–1306. [https://doi.org/10.1016/S0140-6736\(20\)30677-2](https://doi.org/10.1016/S0140-6736(20)30677-2).