Timor-Leste Population and Housing Census 2015

Analytical Report on Fertility

Volume 5

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Thematic Report Volume 5

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Foreword

The 2015 Timor-Leste Population and Housing Census with the theme **"Census from people to people: Be part of it"** was conducted in July 2015 on a *de facto* basis by the General Directorate of Statistics, Minister of Finance. The 2015 Census is the third after those conducted in 2004 and 2010 (post independent Timor-Leste) and fifth after the 1980 and 1990 Censuses, both taken in Indonesian times. This Census was undertaken within the provision of the Statistics Decree Law No. 17/2003 and the 2015 Population and Housing Census Government Resolution no. 11/2014 of 9 April 2014.

The main objective of the 2015 Census was to collect, analyze and effectively disseminate demographic and socio-economic information required for policy and programme formulation, decision making in planning and administrative processes, and research. The Census preliminary results were published in Volume 1 on 21 October 2015 and were launched by His Excellency the Prime Minister of RDTL Dr. Rui Maria de Araújo. The 2015 Census priority tables were published in three volumes: 2, 3 and 4, and launched by the Vice Minister of Finance Eng. Helder Lopes on 17 November 2016. The 'Sensus fo Fila fali' (returning back the results of the Census) was launched by His Excellency Minister of State Dr. Deonisio Babo Soares on behalf of the Prime Minister of RDTL on 2 March 2017. After that an ambitious "Sensus Fo Fila Fali" project was undertaken by the General Directorate of Statistics, Ministry of Finance that culminated in a Census report for each of the 442 sucos in the country.

This fourth phase comprises drafting of analytical reports covering Census thematic topics including fertility, marriage, mortality, migration, population projections, education, labour force, housing, agriculture, gender, youth and an atlas. The preparation of these reports was a collaborative effort between the Government of Timor-Leste, the United Nations Population Fund (UNFPA), the United Nations Children's Fund (UNICEF), the International Labour Organisation (ILO) and the Food and Agriculture Organisation (FAO). Drafting of the thematic reports involved local and international experts. The reports were authored under the supervision and guidance of the Census Technical Specialist from UNFPA. The authors were recruited on a competitive basis, ensuring that they had adequate knowledge of the topics they were to analyse.

All staff at the General Directorate of Statistics, Ministry of Finance and especially the Director General and the Director of System and Reports and his team are commended for their commitment and tireless efforts to successfully undertake all phases of the Census including the thematic analysis exercise.

The Government of Timor-Leste wishes to extend its sincere gratitude to the United Nations Population Fund (UNFPA), the United Nations Children's Fund (UNICEF), the International Labour Organisation (ILO) and the Food and Agriculture Organisation (FAO) for providing technical, financial and administrative support throughout the Census process, and in particular acknowledges the contribution of the authors of each thematic report.

Last but not least, all Timorese people deserve special praise for their patience and willingness to provide the requisite information which forms the basis of these reports and hence benchmark information for development. We in the Ministry of Finance and Government as a whole hope that the data contained in these thematic reports will be fully utilized in the national development planning process by all stakeholders for the welfare of the Timorese people.

GABINETE DA VICE MINISTRA
VICE MINISTRA

Sara Lobo Brites
Vice - Minister and Acting Minister of Finance

Executive Summary

Fertility decline

In the 2015 Census, in comparison with the 2010 Census, there was clear evidence of a sustained decline in fertility, as was also experienced between the 2004 and 2010 Censuses.

Two indirect methods were used to measure the Total Fertility Rate (TFR) for the period dating back to the mid-2000s. Both generated a linear decline. The earliest period TFR derived using the 'Own Children' method was 7.1 live births per woman for the period 2003–2005. The Own Children method generated a TFR for 2005–2007 of 6.7 live births per woman (almost identical to that derived using the back-projection method of 6.8). The back-projection method estimated a TFR of 4.6 live births per woman for the period 2013–2015. The Own Children method is considered the most reliable measure of fertility levels for the period between the 2010 and 2015 Censuses. The TFR generated using the Own Children method was **4.5 live births per woman** for the period 2013–2015, centred upon the year 2014. Reassuringly, other methods yielded consistent TFRs with the Own Children method: the Arriaga method and the Relational Gompertz method both yielded a TFR of 4.5 live births per woman.

A range of evidence is supportive of a decline in fertility between the 2010 and 2015 Censuses:

- Crude birth rates declined from 35 births per thousand population in the 2010 Census to 30.2 births per thousand population in the 2015 Census.
- Child women ratios declined from 739 children aged less than five years per 100 women of reproductive age in 2010 to 602 in 2015.
- Completed fertility fell from six live births per woman aged 45 to 49 years in 2010 to 5.7 in 2015.
- The mean number of children ever born to women aged 15 years and over decreased from 3.2 live births in 2010 to 2.8 live births in 2015.
- The percentage of women in the peak child bearing age group (25 to 29 years) who had given birth to more than one child decreased from 61.2 per cent in 2010 to 51.5 per cent in 2015.
- The percentage of women who had never had a live birth increased from 36.6 per cent in 2010 to 41.1 per cent in 2015.

Combined, this evidence proves sustained declining fertility, for Timor-Leste.

The rate of decline in fertility between 2003–2005 and 2013–2015 was -4.6 per cent per annum. To place this into context, comparing this rate of decline with average annual rates of decline in TFR data from the 2017 revision of World Population Prospects (United Nations, 2017), this rate of decline was the fastest for any country in the world between 2000–2005 and 2010–2015, just ahead of Nepal, where the rate of decline was -4.5 per cent per annum. Between 1995–2000 and 2005–2010, Saint Lucia had a faster rate of fertility decline (-4.9 per cent) and Bhutan and Taiwan had the same rate of decline (-4.6 per cent). It is necessary to go back another five years (1990–1995 to 2000–2005), to find a higher rate of decline (Vietnam: -5.2 per cent), or a similar rate of decline (Brunei Darussalam: -4.3 per cent; Laos: -4.1 per cent) in the South-east Asian region.

The TFR estimated by the U.N. in the 2017 revision of World Population Prospects was 5.9 live births per woman for 2010–2015 (United Nations, 2017). This value was the highest in Asia and the ninth highest in the world. Using the Own Children method, the estimate for 2010–2015 is 4.7, 1.4 live births per woman

lower than the U.N. estimate. Even if we compare the Own Children method estimate of 4.7 live births against U.N. estimates for 2010–2015, the TFR was only exceeded by values in Africa and Afghanistan. Therefore, despite sustained decline since the early 2000s, the TFR in Timor-Leste is still exceptionally high for an Asian country.

During the decade preceding the 2015 Census, Age Specific Fertility Rates (ASFRs) declined in all age groups. The decline was greatest for age groups between 20 and 34 years, leading to a flattening of the shape of the fertility curve between 2005–2007 and 2013–2015.

Adolescent fertility decline

According to the U.N., the adolescent ASFR for Timor-Leste declined by 14 live births per thousand women between 2005–2010 and 2010–2015, faster than the decline for the world (two live births per thousand women) or for lower middle-income countries (seven live births per thousand women). The ASFR for adolescents in Timor-Leste for 2010–2015 of 52 live births per thousand women was higher than the regional average for South-east Asia (46 per thousand), ranking below the Philippines (57 per thousand) and slightly higher than Indonesia (50 per thousand) (United Nations, 2017).

The Own Children method yielded an ASFR of 54 live births per thousand women aged between 15 and 19 years for the period 2010–2015. This compares very favourably with the U.N. estimate for 2010–2015 of 52 per thousand. The ASFR estimated by the Own Children method for 2005–2010 of 69 per thousand was also close to the U.N estimate of 66 for 2005–2010 (United Nations, 2017). The consistency between the U.N. data and the Own Children method data based on the 2015 Census confirms a decline in the adolescent fertility rate for Timor-Leste. Even although the rate is higher than in neighbouring South-east Asian countries, the trend in the adolescent ASFR was of sustained decrease, rather than stability (Indonesia) or increase (Philippines).

At the national level, the percentage of women aged 15 to 19 years recorded in the 2010 Census as having given birth was 6.3 per cent and by the 2015 Census, the percentage had fallen by 0.7 percentage points to 5.6 per cent. The percentage was lower in urban areas (3.3 per cent) than in rural areas (6.7 per cent). Compared to the 2010 Census, the percentages of 15 to 19 year old women who had already given birth decreased by 0.7 percentage points in urban areas and by 0.9 percentage points in rural areas.

Two per cent of 15 and 16-year olds were reported in the 2015 Census to have had a live birth (as compared with 2.6 per cent in the 2010 Census) and 2.7 per cent of all women aged under 18 years were reported as having already had a live birth (as compared with 3.2 per cent in 2010). Childbearing in adolescence was concentrated in ages 18 and 19 (10.5 per cent of these women had given birth as compared to only 2.6 percent of women aged 15 to 17 years).

Despite the declining adolescent ASFR at the national level, in Bobonaro, Ermera, Liquica, Manatuto, Manufahi, and Oecusse, the percentages of adolescents who had already given birth were either high and/or had increased slightly between the 2010 and 2015 Censuses. Therefore, national declines have masked higher rates in several Municipalities and Administrative Posts.

Geographical variations in fertility

In the 2015 Census, the highest TFRs were in Aileu and Ainaro (5.5 live births per woman) and the lowest TFR was in Dili (3.9 live births per woman), followed by Oecusse (4.2 live births per woman). This

constitutes a range of 1.6 live births per woman between the highest and lowest values.

Between the 2010 and 2015 Censuses, the largest declines in TFR were in Aileu and Ermera (1.5 live births per woman). These two Municipalities had the highest (Aileu: 7.0) and second highest (Ermera: 6.9) TFRs in 2010. The smallest decline was in Manufahi (0.7). Large declines from high TFRs between the 2004 and 2010 Censuses (Ainaro and Manatuto) were followed by lower rates of decline between 2010 and 2015.

Number of years taken for TFR to decline by one live birth per women between the 2004 and 2015 Censuses:

- Less than four years: Aileu, Ainaro, Dili and Ermera;
- Between four and five years: Oecusse, Lautem, Manufahi, Covalima and Baucau;
- Between five or six years: Bobonaro, Manatuto and Liquicia;
- More than six years: Viqueque.

At the level of the Administrative Post, the highest TFR was in Maubisse, Ainaro (6.0 live births per woman) and the lowest TFRs were not surprisingly found in Dili (Nain Feto: 3.5; Vera Cruz: 3.6; and Dom Aleixo: 3.7). Only in Covalima, Dili and Oecusse, were there any Administrative Posts with a TFR below 4.0 live births per woman in the 2015 Census.

When mapped, higher percentages of childbearing in adolescence can be observed in a cluster of remoter Administrative Posts within Ainaro, Bobonaro, Covalima and Ermera, in a band from Barique to Vamase and in Laclo in central Timor-Leste, and in western Oecusse. At the Municipality level, the pattern of completed fertility was the same in 2010, because completed fertility is largely a product of fertility in the past rather than the present. The geographical variation of TFR and completed fertility were also not surprisingly very similar, with higher values very clearly evident in the neighbouring mountainous Municipalities of Aileu, Ainaro and Ermera and in Lautem. At the Administrative Post level, it is notable that adjacent to Dili, TFRs transitioned immediately, and in some cases to the highest band categories. This clearly illustrates the rural-urban dichotomy in TFRs and the association between mountain topography and higher rates. Variation in Aileu, Ainaro and Ermera could be explained by differences in proximity to Municipality capitals. High TFRs were concentrated in western Lautem and eastern Viqueque and lower TFRs clearly visible across western Viqueque and eastern Manatuto. In Oecusse, the TFR increased from east to the west and south.

Fertility and background characteristics

In the 2015 Census, the TFR was higher among married women (6.2 live births, as compared to 2.6 for women who were never married), and Catholic women (4.7 live births as compared to 4.5 for Protestant women). The TFR was higher among women who were less-well educated (5.0 live births for women educated to primary level, as compared to 3.3 for women educated to university level). These patterns were generally consistent across urban and rural areas.

In the 2015 Census, childbearing was not surprisingly higher among married adolescent women (57.4 per cent of married women had given birth, as compared to 1.9 per cent of never married women), non-literate adolescent women (11.5 per cent as compared to 4.6 per cent of literate women), and adolescent women who were less-well educated. Childbearing was higher among adolescent women who reside in poorer

quality housing, and who live in rural contexts (6.7 per cent of rural adolescent women had given birth as compared to 3.3 per cent of urban adolescent women). Adolescent women who have given birth were more prevalent in agricultural households (5.7 per cent as compared to 3.9 per cent of women in non-agricultural households).

Completed fertility (parity for women aged 45 to 49) was higher for less-well educated women (6.1 live births for women educated to primary level compared to 3.8 for women educated to university level) and non-literate women (5.9 live births, compared to 5.4 live births for literate women). Catholic women had on average more live births (5.7) compared to Protestant women (5.3). Rural women had higher completed fertility (5.9 live births) than urban women (5.0). Women who were classed as inactive (not in the labour force) had higher completed fertility (5.8 live births) than employed women (5.6), and women from agricultural households had higher competed fertility (5.8) than women from non-agricultural households (4.4). The completed fertility of women from households engaged in agriculture for commercial purposes was higher (6.0 live births) than for women from households engaged in agriculture for home consumption (5.8). Patterns remained consistent between the 2010 and 2015 Censuses (despite decreasing mean numbers of children ever born).

Access to safe delivery

In the 2015 Census, new questions were added on facility of delivery for last live births, time taken to reach a health facility to give birth, the mode of travel taken to reach a health facility to give birth, and the provider of assistance during delivery of last live births.

Data on facility of delivery did not change markedly during the 2010 to 2015 period, whereas the percentage of births attended by skilled healthcare personnel increased during this period (from 39.3 per cent to 53.1). Both variables have high levels of variation across the Municipalities and Administrative posts – in short, home births, and those that took place without attendance of a skilled healthcare provider were generally higher in rural than urban areas, and particularly in the remoter and the more mountainous parts of western Timor-Leste, with pockets in north-eastern Viqueque, eastern Baucau, western Lautem, and western Oecusse. The pattern was more diffuse for skilled birth attendance than for health facility births, because home-based attendance was taking place, but not to a great enough extent to reach remoter areas. Both indicators varied by age of women such that adolescent women and women in older childbearing age groups had a greater tendency to have had home births without the attendance of skilled medical personnel. This practice places greater risk on these already more vulnerable groups of women. The infant mortality rate for last live births that took place without the assistance of a skilled birth attendant was higher (30 deaths per thousand live births), than for births assisted by a skilled birth attendant (25 deaths per thousand live births).

In the 2015 Census, there were still sizeable proportions of women outside of Dili, and especially in the mountainous parts of the country who had either walked or travelled by horse to deliver their last live birth, with no sign of any decrease in the percentages of women travelling by these means between 2010 and 2015. Aileu, Ainaro, and between eastern Manatuto and southern Lautem stood out as having higher percentages of women travelling on foot or on horseback to deliver their child. This could be explained by limited vehicular access for these locations.

The percentages of women who had to travel for more than two hours to give birth were generally below 10 per cent across the country. However, more than one fifth of women had to travel for one hour or more to reach a health facility for their last live birth. Above average proportions of women who travelled for longer had to either walk or travel by horse. Aileu and Ermera stood out as having higher percentages of women

travelling more than two hours to give birth, followed by Ainaro. In Administrative Posts bordering Municipality capitals or Dili, higher percentages of women were travelling for more than two hours to give birth. An explanation for this is that these women were travelling for longer durations to reach higher-order facilities (such as the hospitals in Same or Dili) to deliver their child. This suggests that women in Timor-Leste wish to receive skilled birth attendance in a higher-order healthcare facility and are willing to make arduous journeys to obtain these services, which places their health and the health of their unborn child at greater risk. The infant mortality rates for children whose mothers had travelled for a longer period were significantly higher (47 deaths per thousand live births where women travelled for more than two hours) than for women with a shorter journey time (26 deaths per thousand live births). These findings support the view that inaccessibility of healthcare facilities in remote rural and especially mountainous areas renders women and their children at greater risk of morbidity and mortality.

Recommendations

Between the 2010 and 2015 Censuses, significant progress was made in in delaying childbearing and reducing fertility. The government should aim to capitalize on the trajectory of these improvements through interventions that will sustain or even increase the pace of these changes.

As marriage is a proximate determinant of fertility, preventing early marriage reduces the risk of childbearing in adolescence. The data in this report demonstrates this. The data also shows that childbearing in adolescence is higher among women who had already entered the labour force (and who had therefore left education). Interventions should aim to encourage females to remain in education longer as a mechanism for preventing early marriage and childbearing during adolescence. A critical step is to change behavior by sharing information regarding the benefits for young women of remaining in education to fully reach their potential, the drawbacks of early marriage and the health and wellbeing risks of childbearing during adolescence. The Government must also continue to foster enabling environments so that all adolescent women are able to remain in the education system for longer.

The percentages (and absolute numbers) of adolescent women who had already given birth before age 16 or 17 were much lower than those in the older ages. However, childbearing in early adolescence represents a particular health and wellbeing risk for both mothers and their babies. Therefore, it is important that students (especially girls) aged 13 and 14 are made aware of the risks in advance and those adolescent women who fall pregnant are given necessary medical support and opportunities to continue in education.

A great deal of progress has been made in reducing the very high fertility rate in Timor-Leste, but the TFR is still among the highest in the world. The Government needs to re-double its efforts to reduce the fertility rate to levels which more closely match Timorese women's desired family size. In the 2016 TLDHS, 27.2 per cent of women of reproductive age expressed that they did not want more children, and eight-in-ten of these women had more than two children already. However, 25.3 per cent of women of reproductive age had unmet need for family planning (RDTL MoF, 2017). Therefore, interventions should aim to reduce unmet need for contraception to decrease unwanted fertility among women of reproductive age. The most appropriate way to achieve this is through universal provision of reproductive health services including modern contraception. Universal access includes provision of information and commodities to everyone, including adolescents and unmarried women.

Tackling unsafe delivery, and childbearing, and high fertility through reproductive health services, including modern contraceptive methods involves providing services and commodities everywhere, especially where fertility is higher. Targeting of high fertility should use the information in this report and the statistical annex to reach all women, including in the remoter, less-accessible mountainous areas, where the highest fertility

rates were found. In this regard, it is notable that in the 2016 TLDHS one-in-five women in Ainaro stated that they did not want more children, and nine-in-ten of these women had more than two children already. However, one-in-four women reported unmet need for family planning (RDTL MoF, 2017).

It is clearly apparent that access to safe deliveries is a major issue in remoter, mountainous parts of the country. More research is required to determine why women are travelling to higher-order facilities rather than lower-order facilities closer to home to deliver their babies. The evidence in the report suggests that increasing provision of home-based skilled birth attendance into the remotest parts of the country is required, specifically targeting adolescent and older women of reproductive age. Improving the quality of services in lower-order healthcare facilities is also necessary. Targeting of these interventions should be based on the information in this report and the data in the statistical annex.

Geographical data provides part of the picture, but it does not explain which women within Administrative Posts are the most appropriate recipients of interventions. The evidence generated in this report demonstrates that childbearing during adolescence, higher completed fertility and unsafe delivery were more common among women with less-developed circumstances at the individual, household and broader contextual levels. Therefore, information campaigns and services should, in particular, be channeled towards communities and families that exhibit these characteristics in order to be more effective in improving coverage of safe deliveries, preventing childbearing during adolescence and reducing completed family size.

The Sustainable Development Goals (SDG) framework offers a mechanism within which to implement, monitor and evaluate these interventions. The Government should focus on:

- SDG 3 (Ensure healthy lives and promote well-being for all ages and at all times)
    - Target 3.1: By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births
        - Indicator 3.1.2: Proportion of births attended by skilled health personnel.
    - Target 3.7: By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes
        - Indicator 3.7.1: The proportion of women of reproductive age who have their needs for family planning satisfied with modern methods;
        - Indicator 3.7.2: Adolescent birth rate.

- SDG 4 (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all)
    - Target 4.3: By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
        - Indicator 4.3.1: Participation rate in formal and non-formal education, by age and sex;
        - Indicator 4.5.1: Female/male parity indices for education indicators.
- SDG 5 (Achieve gender equality and empower all women and girls)
    - Target 5.3: By 2030, eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation
        - Indicator 5.3.1: Proportion of women aged 20–24 years who were married or in a union by age 15 and before age 18.

Finally, Chapter 2 of this report demonstrates that despite improvements in the quality of age reporting in the 2015 Census compared with earlier censuses, there is still room for improvement. Additionally, there were

still many other issues with the quality of data collected. Particular issues concern consistencies between enumerated data on numbers of children ever born, children living in the household, children living elsewhere, and child deaths. There were also inconsistency issues between children living in the household (questions P42 and P43 in the 2015 Census questionnaire) and the age and sex of the reported household population. Another problematic area concerns the quality and consistency of data linkages between mothers and their children.

Since Timor-Leste has one of the highest fertility rates in the world, accurate collection of data on fertility in the census is critical. It is recommended that for the 2020 Census, the data collection issues outlined in Chapter 2 of this report, and summarized here, be given much more emphasis within interviewer training, and are given higher priority in the interviewer's instruction manual. Interviewers must be instructed to check the consistency of data collected and to probe where inconsistencies are identified before leaving a household. Furthermore, supervisors need to be held to account. They need to be much more diligent in spotting errors and do so in a timely manner, then instruct interviewers to rectify these errors through return visits. Supervisors also need to check that interviewers improve their data quality in subsequent cases. It is also recommended that tablets be used to enumerate the 2020 Census, and that internal checks be written into the electronic questionnaire to automatically flag errors so that they can be rectified before enumerators leave households.

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[1] Excel versions of these tables are available in the '2015 Fertility Report Tables Annex' which can be accessed at: http://www.statistics.gov.tl/category/publications/census-publications/

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Chapter 1: Introduction

1.1 Background to the study

In July 2015, the Democratic Republic of Timor-Leste conducted its third Population and Housing Census after independence in 2002. The previous two censuses were carried out in 2004 and 2010, respectively. Like the two previous censuses, the 2015 Census was conducted by the General Directorate of Statistics (Direcção Geral de Estatística, GDE) of the Ministry of Finance. Although the census provides data on a variety of demographic and non-demographic issues, one of the most important outcomes from a demographic viewpoint is the estimation of fertility, mortality and migration levels. This thematic report will focus on fertility.

Fertility is the most important determinant of the rhythm of growth and the age structure of a population. High fertility implies a faster growth rate, a shorter doubling time of the population, a broad-based population pyramid with a large concentration of individuals in the youngest age groups, a relatively low median age, and a small percentage of people over age 60. The social and economic effects of high fertility can be both favorable and unfavorable, although most experts would agree that in the case of very high fertility (e.g. an average of more than 3 children during the life time of each woman) the unfavorable effects predominate. These include the need to maintain a high level of "demographic investments", i.e. investments necessary to continually expand the existing infrastructure in housing, education, employment, health care, etc. to accommodate an ever-increasing population. A lower level of fertility may be conducive to a higher proportion of investments in the improvement of the quality, rather than the constant numerical expansion, of these components of the country's infrastructure.

Fertility is affected by proximate determinants and in a less direct way by more remote determinants. The main proximate determinants are nuptiality (or marriage patterns - whether people marry or form couples and whether they do so at an early age or later in life), breastfeeding practices, the incidence of abortion, and contraceptive prevalence. Longer breastfeeding is associated with longer spacing between births and thereby with lower fertility. Nowadays the prevalence of contraceptive methods is one of the main mechanisms by which couples control their fertility, with the intent of spacing births or (more often) limiting the total number of children. The 2015 Census does not collect data on breastfeeding practices or prevalence of contraceptive methods, but does collect data on fertility and nuptiality, or marital status. Fertility is henceforth the focus of this thematic report and marital status is the focus of the next thematic report in the series (GDS, 2018a).

The more remote determinants of fertility, which operate through the proximate determinants, include socio-economic, cultural, environmental and other development factors. The economic activity of women may limit their possibility and motivation for having many children. Increased education will contribute to better job opportunities and in addition may raise the age at which women will get married or start having children. Women with better education may have better access to contraception and may have additional aspirations in life, besides motherhood. In societies that do not have good institutional arrangements for pensions and health care in old age, parents are motivated to have more children to ensure that they will be cared for when they get old. The influence of religion on fertility is more ambiguous. In many countries, there are major differences in fertility by religion. But it is not easy to find a causal mechanism that explains this relationship and it may change in unexpected ways. For example, while some Muslim countries still have very high fertility, such as Iraq or Pakistan, which had Total Fertility Rates (TFRs) i.e. the average number of live-born children that a woman is expected to have during her life time, of 4.6 live births per woman and 3.7 live births per woman respectively, in 2010–2015, others like Iran (1.8) or Bangladesh (2.2) had low fertility 1.8 live births per woman and 2.2 live births per woman respectively (United Nations, 2017). The same is true of

predominantly Catholic countries such as the Philippines, which had a relatively high TFR of 3.1 live births per woman and Brazil, which had a low TFR of 1.8 live births per woman in 2010–2015 (United Nations, 2017).

Countries with lower fertility generally have better indicators of socio-economic development, including higher per capita GNP, higher levels of education, lower poverty levels, and higher life expectancy. However, it is difficult to disentangle which way the causality goes. Lower fertility may be the cause of the better developmental indicators, but it may also be a consequence. Most specialists agree that both effects occur simultaneously to some extent. There are also effects at the household level. High fertility, to the extent that it implies closely spaced births, starting at a very young age and continuing up to advanced ages, undoubtedly has negative effects for the health of both the mother and the children. Moreover, to the extent that a woman has more children than she wants, this denies her the right to exercise her reproductive life in the terms that she is entitled to. Furthermore, large family sizes may limit the possibility of children to obtain a good education or otherwise have access to opportunities for social mobility.

Although this thematic report will show that fertility in Timor-Leste has come down significantly during the past decade, the TFR in 2010–2015 was still very high compared to other Asian countries like Indonesia (2.5 live births per woman), Malaysia (2.1), Thailand (1.5) or Vietnam (2.0) or indeed compared to the world average of 2.5 (United Nations, 2017). This thematic report quantifies the current level of fertility in the country and its trend since the early 2000s. In addition, it assesses the differences in fertility within the country, by age of women, geographically and in terms of particular socio-economic or cultural groups. The report also examines newly added questions for the 2015 Census on the circumstances of birth deliveries (where they took place, whether the birth was attended by medically trained staff, how women travelled to medical facilities and how long their journeys took). Finally, the report assesses one of the key proximate determinants of fertility – nuptiality data by age, sex and geography. The analysis makes full use of disaggregation and comparison with the results of the 2010 Census analysis so as to make longitudinal comparisons. Finally, the report provides the government with guidance to define priorities in terms of public policy interventions relating to fertility and nuptiality.

1.2 Levels and trends of fertility in Timor-Leste

Since around 2000, fertility in Timor-Leste has been on a downward trajectory, which was not been the case prior to 2000. According to U.N. ESCAP estimates, the TFR was in the order of 5 live births per woman during the 1980s, rising slowly toward the end of the decade. In the years leading up to Independence, however, a major increase occurred and by 2000 the TFR had exceeded 7 live births per woman. The analysis of the 2004 Census resulted in an estimate of 7.2 children per woman, one of the highest in the world at that time, exceeded only by Niger, Chad, Somalia, and Afghanistan. According to the same analysis, the Crude Birth Rate (CBR) was 42.7 LIVE births per thousand people (Neupert, 2006). The results of the 2002 Multiple Indicator Cluster Survey (MICS) and the 2003 Timor-Leste Demographic and Health Survey (TLDHS) suggested even higher TFRs, in the order of 7.4 and 7.8 live births per woman, respectively.

The analysis of the 2010 Census indicated, however, that a decline had once again begun. Amongst the wide range of estimates that were produced based on the census data, the one that was considered most plausible was the Own Children estimate, based on matching children counted during the census to their mothers, which yielded a result of 5.9 live births per woman. The 2009–10 TLDHS suggested a slightly steeper decline, to 5.7 live births per woman. As will be seen in the course of the present thematic report, the retrospective analysis carried out here using the Own Children method confirms that the TFR during 2008–

2010 was an estimated 5.6 live births per woman. The fertility analysis in this thematic report also shows that this level has now declined further, by a little more than one live birth per woman, so that the TFR was estimated at 4.5 live births per woman for the period 2013–2015 centred upon the year 2014, as generated using the Own Children method.

Particularly high fertility has been a factor to the high natural growth rate of the population, a very young age structure, and high maternal, infant and child mortality in Timor-Leste. The overall growth rate of 2.4 per cent per year between 2000 and 2010 was not among the highest in the world or in Asia due to the fact that other countries had higher migratory growth figures. But in terms of the natural growth rate (which does not include migration), Timor-Leste was the second fastest growing country in Asia (after Afghanistan) and the 11th fastest growing in the world between 2000 and 2010. The young age structure is illustrated by the low median population age, which increased slowly, from 17.7 years in 2004 to 18.2 in 2010 and 19.2 in 2015. The high TFR also contributed to high maternal mortality. According to the 2015 Census thematic report on mortality, the maternal mortality ratio for 2010–2015 was 426 maternal deaths per 100,000 live births (GDS, 2018b).

Recognizing that its fertility was among the highest in the world, the Government of Timor-Leste included family planning as among selected components of essential reproductive health in the National Strategy for Health Promotion 2004–2010 (MoH, 2004a). Public promotion of family planning was carried out within the framework of family health protection and overall reproductive health promotion. The family planning target in the National Reproductive Health Strategy 2004–2015 aimed to increase the contraceptive prevalence of married and unmarried couples to 40 per cent by the end of 2015 by increasing the knowledge of population on their right to make free and informed choices on their number of children and their timing (MoH, 2004c).

This target was only partially achieved as the contraceptive prevalence rate (modern methods) for women was estimated to have been 21.1 per cent in the 2009–10 TLDHS, and had only increased by three percentage points to 24.1 per cent by the 2016 TLDHS, although the method mix had broadened between the two DHSs (RDTL MoJ, 2010, 2017). Therefore, the decline in TFR is partly attributable to the family planning programme in the country, and is therefore also attributable to socioeconomic development and advances in the health status of the population. This evidence is supported by the fact that, according to the mortality thematic report for the 2015 Census (GDS, 2018b), life expectancy increased by more than five years and maternal mortality decreased from 570 deaths per 100,000 live births to 426 between the 2010 and 2015 Censuses.

Chapter 2: Methods and Procedures for Analysis

2.1 Definitions and methods

In the fertility analysis, measures of fertility used were the crude birth rate, child-woman ratio, age specific fertility rate, total fertility rate, and mean number of children ever born.

The **Crude Birth Rate** (CBR) is the simplest measure of fertility. It is the annual number of births per thousand mid-year population (Estee, 2004; PRB, 2011). This rate is a crude rate since the base for its calculation includes the total population, comprising of men, children, and women outside the reproductive ages. Thus, the level of the CBR depends on the number of births and also on the proportion of the population who are not exposed to having births. Accordingly, the CBR is influenced by the sex and age structure of the population. The crude birth rate (CBR) was calculated from the reported number of births in the 12 months prior to the 2015 Census obtained from questions on the month and year of last birth (July 2014 to June 2015). The formula to calculate the CBR is very simple: the number of births divided by the population and multiplied by one thousand.

The other fertility indices used in the analysis limit the measurement of births to women in reproductive ages. These are the Child-woman Ratio (CWR), Age Specific Fertility Rate (ASFR), Total Fertility Rate (TFR) and mean number of Children Ever Born (CEB).

The **Child-woman Ratio** (CWR) is the ratio of the number of children aged 0-4 years to the number of women aged 15–49 years reported in a census (Pullum, 2004). The CWR is used to measure fertility levels for small areas. The CWR has limitations since the number of births varies by age of women in reproductive ages. Thus, this measure is also affected by the age structure of women within the reproductive ages.

The **Age-Specific Fertility Rate** (ASFR) is the number of births in a year to mothers of a specific age per thousand women of the same age. ASFRs are usually computed for women aged 15–49 years in each five-year age group. The total fertility is a summary index of ASFR.

The Total Fertility Rate (TFR) is the number of children a woman would have at the end of her reproductive life if she experienced a given set of age-specific fertility rate throughout her reproductive life (Dharmalingam, 2004). The TFR is calculated by cumulating the ASFRs for all ages of women. When the rates are calculated for the seven conventional five-year age groups between 15-49, the TFR is the sum of the ASFR for each age group and then is multiplied by five (the width of the age group interval).

The mean number of Children Ever Born (CEB) is a cohort fertility measure which reflects the fertility experience of an age cohort of women. As such, it is usually tabulated by age of woman. In the 2015 Census, this measure was obtained from questions on male and female children ever born.

Fertility estimation methods and strategy

The indirect fertility estimate techniques used to estimate fertility levels at the national level (and for urban and rural contexts) were the back-projection method (Spoorenberg, 2014), Own Children method (Cho, Retherford & Choe, 1986), a refined P/F method developed by Arriaga (1983), and the Relational Gompertz approach introduced by Brass (1981) and perfected in the more recent formulation by Zaba (Moultrie et al., 2013). Indirect estimates of fertility for the Municipalities, Administrative Posts and socio-economic groups were produced using synthetic (and normalized) cohort estimation methods. Further information on these methods can be found in Chapter 3.

Almost all the standard methods that demographers customarily apply for fertility estimation methods have inherent limitations and biases. Therefore, the analysis in this thematic report pays detailed attention to issues of data quality and consistency. Assessments of the assumptions underlying each method are made. The extent those assumptions are met in the census data are assessed. Corrective action is taken to select the best variant of the method that is most likely to yield correct results. For example, the P/F methods were used with great caution and modified in a number of respects to reduce sensitivity to known violations of their underlying assumptions. Rele's (1967) method, which is easy to apply but extremely crude was not used, because it only provides accurate results under conditions of stationary fertility within a limited range of acceptable age patterns.

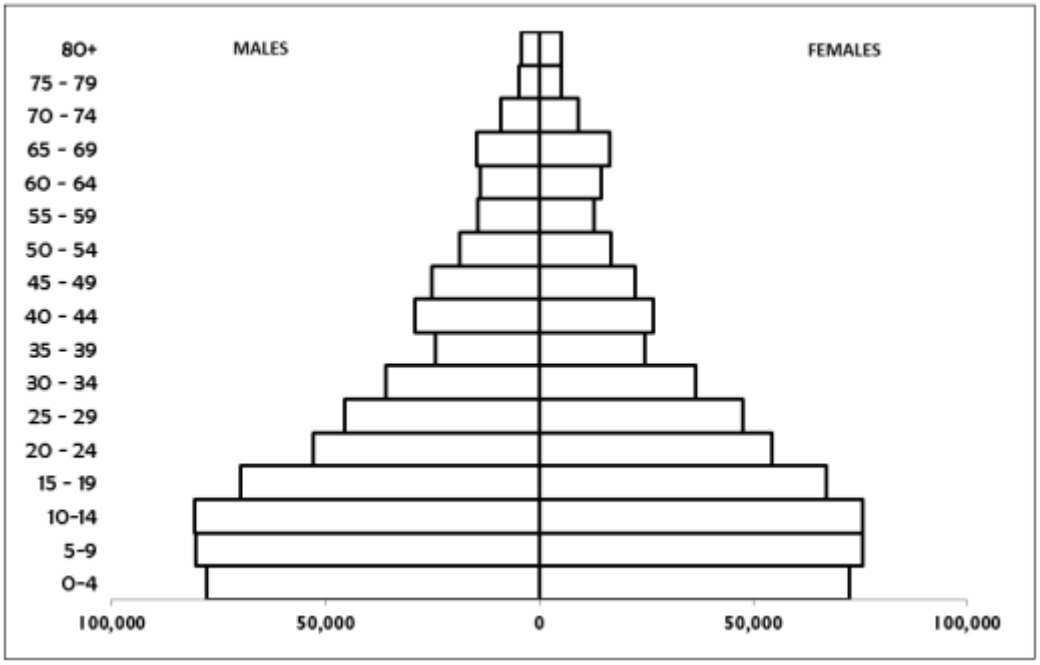
The strategic approach is supported by the fact that the 2015 Census of Timor-Leste is the third one since independence, which makes it possible to look at three censuses in conjunction and assess the consistency of the information obtained from each of them. In this regard, the fact that censuses have been conducted in intervals of 5 or 6 years is helpful because it makes the comparison of successive census data easier than if the intervals had been 10 years, as is the case in most countries.

2.2 Data quality assessment

The quality assessment of the 2015 Census shows improvements in some areas compared to the 2004 and 2010 Censuses. The quality of age declaration in the 2015 Census seemed to have improved. On the other hand, there are issues with the declaration of the date of birth of last live births.

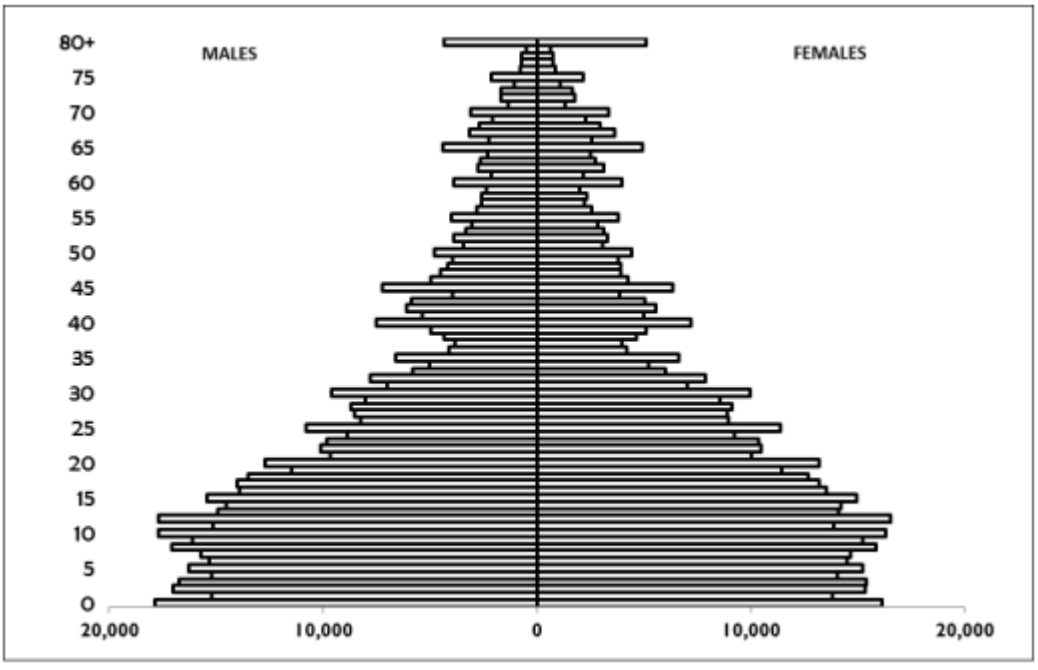
Figure 1 presents the population of Timor-Leste by five-year age group and sex. The population pyramid shape is symptomatic of a population with a high fertility rate and lower levels of life expectancy, resulting in mortality across the life course, leading to a generally linear reduction in the size of age group bars as age increases. There are signs of under-reporting of young children (0–4 years of age), and of age misreporting in some older age groups (as evidenced by a non-linear pattern of decline in the size of bars).

Figure 1: Population by five-year age group and sex, 2015 Census, Timor-Leste



Data grouped into five-year age groups can conceal more detailed inconsistencies in age reporting. Figure 2 presents the population of Timor-Leste by single year of age and sex. There are marked concentrations and deficits across the entire age profile revealing apparent tendencies for respondents to round their age.

Figure 2: Population by single year of age and sex, 2015 Census, Timor-Leste



Digit preference, or age heaping is common in many developing countries censuses, and Figure 2 shows that this is the case in the 2015 Census of Timor-Leste. People round their ages or preferred ages ending in certain digits (such as 0, 2 or 5) as opposed to other ages (such as 1, 7 or 9). Fortunately, most demographic estimates are not affected by digit preference, because they are based on five-year groupings. However, assessment of digit preference is conducted as an indicator of census data quality. The method used here, as in the 2010 fertility thematic report (NSD and UNFPA, 2012) is the Myers' Blended Index which in theory may vary between 0 and 90 although anything over 10 is considered a sign of problems in the quality of age reporting. The results are presented in Table 1 and the background calculations for the 2015 data are presented in the statistical annex (Table A.1), which is available on the General Directorate of Statistics website at: http://www.statistics.gov.tl/category/publications/census-publications/

Table 1: Myers' Blended Index of digit preference for the 2004, 2010 and 2015 Censuses

	Summary Index of age preference		
	2004	2010	2015
		Urban	
Males	15.4	5.4	4.1
Females	15.6	5.5	4.2
Total	15.5	5.4	4.1
		Rural	
Males	15.8	6.7	5.4
Females	16.2	7.4	5.6
Total	16.0	7.0	5.5

The results clearly show that the quality of age reporting (in terms of digit preference) has improved between the three censuses, with deficient reporting in 2004 but acceptable levels of digit preference in 2010 and even more so in 2015. As would be expected, the quality of the data is slightly better in urban than in rural areas (because urban residents are generally more highly educated), but the differences are relatively small. Differences by sex are also very small.

The U.S. Census Bureau Population Analysis System (PAS) spreadsheet 'SINGAGE' was used to estimate the 'Myer's index of digit preference', or age-heaping based on population data by sex and single years of age for the Municipalities and the Administrative Posts for 2015. Table 2 reinforces the point raised for Table 1 that digit preference has decreased for Timor-Leste. In Table 2 the decrease was from 12.9 for the 2010 Census to 10.0 for the 2015 Census - it should be noted that Myer's index values are twice as large as Myer's blended index values. This further demonstrates that the quality of age reporting has improved between the 2010 and 2015 Censuses.

The quality of age reporting has, in general, improved across the Municipalities, with the range between high and low Myer's indexes declining from 9.7 points in the 2010 Census to 4.5 points in the 2015 Census (and the standard deviation of values declining from 2.9 for the 2010 Census to 1.3 for the 2015 Census). Digit preference decreased in 10 Municipalities, with the greatest improvement in the worst preforming Municipalities in both 2010 and 2015 (Ermera decreased from 20.0 to 13.1 and Lautem decreased from 15.5 to 8.9). However, digit preference has increased slightly in 3 Municipalities (Liquica: by 1.2; Manufahi: by 0.5; and Oecusse: by 1.4).

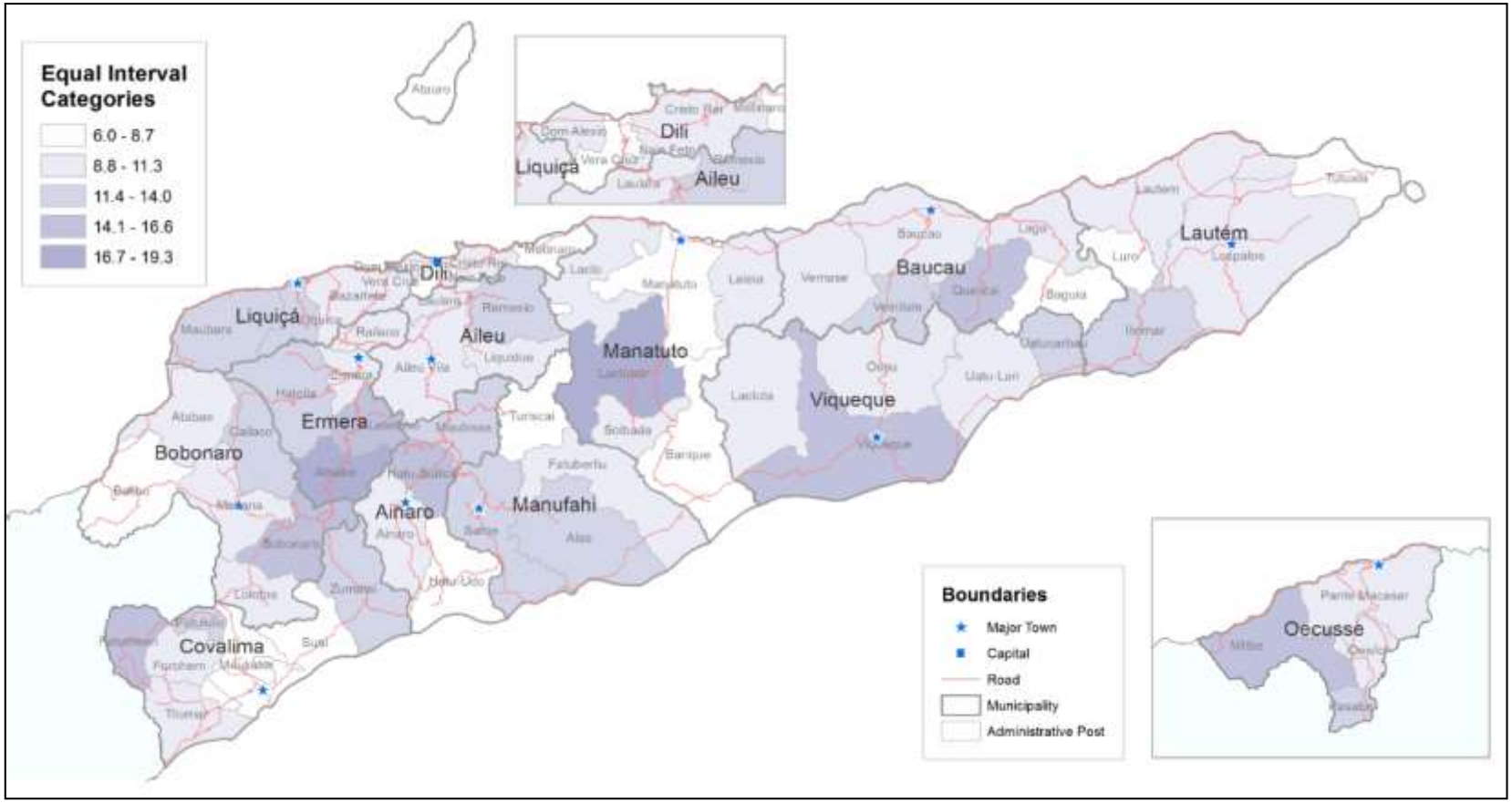
Table 2: Myers index of digit preference by Municipality and for Timor-Leste, 2010 and 2015 Censuses

Municipality	Myer's Index		2015-2010
	2010	2015	
Aileu	13.7	9.6	-4.1
Ainaro	14.1	11.0	-3.1
Baucau	13.5	10.6	-2.9
Bobonaro	12.3	10.0	-2.3
Covalima	13.1	8.8	-4.3
Dili	10.5	8.6	-1.9
Ermera	20.0	13.1	-6.9
Lautem	15.5	8.9	-6.6
Liquiça	10.2	11.4	1.2
Manatuto	12.3	11.0	-1.4
Manufahi	10.8	11.3	0.5
Oecusse	8.4	9.8	1.4
Viqueque	15.2	11.3	-3.9
Timor-Leste	12.9	10.0	-2.9

[1] Data in Tables 1 and 2 are derived using a different methodology: 'Myer's index of digit preference' values are twice as large as the 'Myer's blended index' values.

Figure 3 displays the spatial distribution of digit preference by Administrative Post for the 2015 Census. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Administrative Posts in each of the bands. The higher the Myer's Index, the darker the colour. There is a general tendency for a lower quality of age reporting in the Administrative Posts within Liquica, Ermera and Ainaro, especially the more mountainous areas and also in pockets across the south. There is some consistency with the pattern in Figure 2.4 in the 2010 thematic report (NSD and UNFPA, 2012), however the general sense is that the Administrative posts where age reporting is of poorer quality are not as contiguous as in 2010, which is consistent with improved quality of age reporting except for the pockets previously described. These data are presented in the statistical annex (Tables A.2 and A.3), which is available on the General Directorate of Statistics website at: http://www.statistics.gov.tl/category/publications/census-publications/

Figure 3: Myer's index of digit preference, Administrative Posts, 2015 Census



The accuracy of fertility estimates depend on the extent to which date of birth is correctly reported and recorded and the completeness with which child births are reported. Figure 4 presents data on reported births from the year preceding the 2010 and the 2015 Censuses. Month-by-month, the data are fairly consistent, which is reassuring, however, there is a tendency to report births during the January to May period for 2010 and 2015 more-so than the July to December period for 2009 and 2014. One explanation could be seasonality of births, but a more likely explanation concerns poorer recall over earlier births by respondents. Also, there is a drop-off in reporting after May of 2010 and 2015. This is as expected for July 2010 and 2015, since the Census was taken in the middle of this month, but should not be the case for the month of June, which is completely captured within the year preceding the census. An explanation or the lower counts in June than in May is that respondents neglect to report very young babies within the census.

Figure 4: Reported births in the 13 months preceding the 2010 and 2015 Censuses

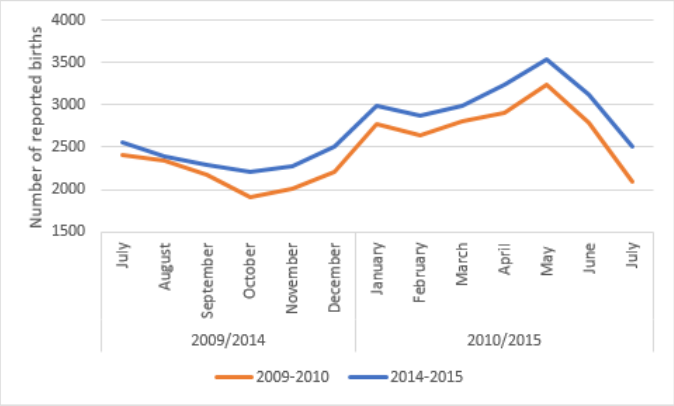


Table 3 presents data on the mean number of children ever born by age group of women from the 2004, 2010 and 2015 Censuses. It is notable that the values are generally higher in the 2010 Census as compared to the 2004 Census (except for age groups below 30 years). The explanation given in the 2010 thematic report was that fertility had declined for younger women (less than age 30) and the quality of reporting had increased for women in older age groups, which seems a logical conclusion to draw (NSD and UNFPA, 2012). For women in their child bearing years, the decline in mean number of children ever born between the 2010 and 2015 Censuses is consistent with fertility decline during this period. However, as also noted in the 2010 thematic report, the mean number of children reported for women aged 45 years and above in the 2004 Census was higher than the numbers reported for women aged 50 years and above in the 2010 Census (approximately the same cohort aged five more years). A similar effect can be observed by comparing the 2010 and 2015 Census data on the same cohorts aged precisely five years, from age 45 upwards (2010 Census), and aged 50 upwards (2015 Census). It can be observed that fewer births were reported for the same women in the 2015 Census five years after the 2010 Census. This suggests diminishing quality of recall by respondents on children who have died or moved away, reducing the mean number of children reported as born further in the past to these older women.

Table 3: Mean number of children ever born by age group of mothers, 2004, 2010 and 2015 Censuses

Age Group	Mean Number of Children Ever Born		
	2004 Census	2010 Census	2015 Census
15-19	0.1	0.1	0.1
20-24	1.0	0.9	0.7
25-29	2.6	2.3	1.9
30-34	3.9	4.0	3.4
35-39	4.9	5.0	4.7
40-44	5.4	5.8	5.4
45-49	5.3	6.0	5.7
50-54	5.0	5.9	5.6
55-59	4.8	5.6	5.3
60-64	4.3	5.2	4.8
65+	3.9	4.6	3.9
Total	3.1	3.2	2.9

Distortions in age reporting affect the quality of fertility measurement, at least in some methods. For example, there is a known tendency for children of age 0 to be under-reported. This tendency is also evident in the censuses of Timor-Leste, particularly in the 2004 Census. Table 4 presents data on births declared by women aged over 15 years as having occurred in the last year before the census (second column) and children of age 0 years found in the census population (third column). In principle, the births in the year before the census should be slightly larger than the number of children aged 0 because the former includes children that have died.

The difference between births and children aged 0 years is very large for the 2004 Census, at over 10,000, which would yield in infant mortality rate of over 270 per thousand live births, and it is known from the 2004 mortality thematic report that the infant mortality rate was 98 deaths per thousand live births in 2002 (NSD and UNFPA, 2008). For the 2015 Census, the difference is almost 4,400, which is also large as it would yield an infant mortality rate of over 120 deaths per thousand live births, and it is known from the 2015 mortality thematic report that the infant mortality rate for the 2010–2015 period was less than half this value (56 deaths per thousand live births) (GDS, 2017b). It seems likely that the number of births during the last 12 months in the 2010 Census was too low because it would be expected that this number would be higher than the number of children aged 0 and the number of children aged 5 in the 2015 Census which are both affected by mortality, but the number of births in the 2010 Census were in fact fewer than both of these values. Also, it would be expected that the number of births in the 2010 Census would be between the values for the other two censuses but it is a lower figure, which confirms the conclusion that there were too few reported births in the 2010 Census.

The fourth column shows the number of children aged 6 in the 2010 Census. This should be smaller than data on children aged zero in the 2004 Census, but there were more children aged 6 years in the 2010 Census than children aged 0 in the 2004 Census. Finally, the fifth column presents data on the number of children aged 5 in the 2015 Census which should also be slightly smaller than the number of children aged 0 in the 2010 Census, however, there were more children aged 5 in the 2015 Census than children aged 0 in the 2010 Census.

Table 4: Comparison of the data on births and children, 2004, 2010 and 2015 Censuses

Census year	Births during year before census	Children aged 0 years	Children aged 6 in 2010 Census	Children aged 5 in 2015 Census
2004	38,837	28,287		
2010	30,199	30.933	32,025	
2015	36,202 [1]	31,807		31,357

[1] This includes 3,321 births that were coded with dates of birth after July 12th, 2015, but that could plausibly be reassigned to the second semester of 2014. More information on how the number of 36,202 was arrived at will be provided below.

Although there appears to be under-enumeration of children aged zero, particularly in the 2004 and also the 2015 Censuses, the evidence is not entirely conclusive. This is because data in the second column are subject to errors in the declaration of the date of birth of the last child and data in the fourth and fifth columns are subject to age mis-declaration (in all three censuses, there is significant attraction to the digit 5 and rejection of the digit 6).

Age adjustment

Taking into account the likely biases in each of the three census population figures, it is possible to reconcile the age data of the successive censuses to come up with a more consistent result. This is particularly the case for the 2004 Census, which can be calibrated by two independent alternative estimates, from the 2010 and 2015 Censuses. This adjustment is important for the back-projection methodology for fertility estimation which is applied in Chapter 3.

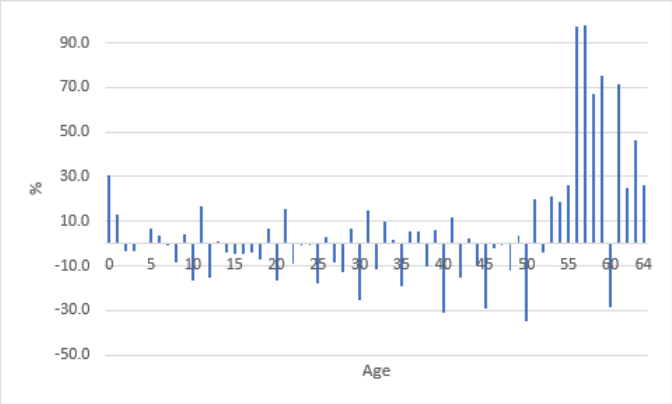
The adjusted figures for 2004 (Figure 5) are based on the following corrections:

1. Each figure by single age was adjusted by a correction factor corresponding to the final digit of the age in the original data source. So, age 10 in the 2004 Census takes a correction factor corresponding to digit 0 in the 2004 Census, a correction factor corresponding to digit 6 in the 2010 Census and a correction factor corresponding to digit 1 in the 2015 Census;
2. The Coale & Demeny East life table model was used to back-project the 2010 and 2015 figures by 6 and 11 years, respectively. The back-projection between 2004 and 2010 was based on a male life expectancy of 57.5 years and a female life expectancy of 59.5 years. The back-projection between 2010 and 2015 used a male life expectancy of 60 years and a female life expectancy of 62 years.
3. The 2004 and 2010 Censuses were adjusted by correction factors close to 1;
4. The population aged 0 from the 2004 Census was not taken into account because age 0 tends to be under-enumerated for other reasons than only digit preference;
5. The correction factors mentioned in points 1 and 3 were chosen in such a way that the estimates from the three censuses are as consistent as possible and the overall population size beyond age 0 does not change;
6. This procedure was carried out separately for males and females.

The results of the adjustments made to the 2004, 2010 Census populations by single year of age and sex can

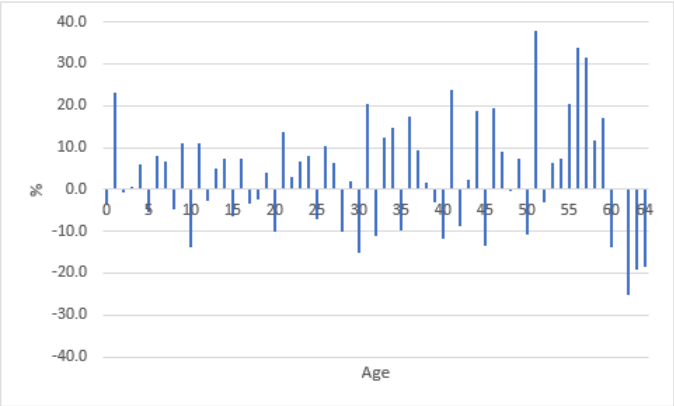
be found in the Statistical Annex (Table A.3), which is available on the General Directorate of Statistics website at: http://www.statistics.gov.tl/category/publications/census-publications/ For illustration, Figure 5 presents the percentage adjustment by age for the combined male and female population of the 2004 Census. For 2004, the procedure resulted in significant adjustments. The large adjustment to age 0 yields a result (36,942) that is more consistent with the number of births declared during the past 12 months before the census (38,837) than the unadjusted data (28,287). It seems safe to assume, therefore, that the original 2004 Census data significantly under-counted the population aged 0 and that the adjusted data provides a more reliable estimate of this population.

Figure 5: Percentage adjustment by single year of age, total population, 2004 Census



The procedure adopted for the 2010 data was the same, with the difference that only one calibration point (the 2015 Census), rather than two (the 2010 and 2015 Censuses), was available. For 2010, there was no under-declaration problem for 0 year of age category of the kind that was found in the 2004 data (Figure 6). Nevertheless, the results are consistent with the number of births during the past 12 months before the census (30,199).

Figure 6: Percentage adjustment by single year of age, total population, 2010 Census



For 2015 no adjustment could be made since there is no future calibration point to adjust against.

Births data quality issues and adjustment

Other data quality issues were detected in the course of the fertility analysis that required further data cleaning. In particular, the data on the number of children born during the past 12 months before the census, which is derived from the information on the date of birth of the last child, and is essential information for fertility analysis, were found to contain a number of errors and ambiguities that are classified in Table 5.

Table 5: Number of children born in the 12 months preceding the 2015 Census, by categories of Consistency of the information

Last Births	Woman has children of any age living in the household	Woman does not have children of any age living in the household
Born in 12 months preceding census		
1. Child of age 0 years of correct sex in household	14,794	-
2. Last child born in last 12 months but dead	1,761	472
3. No child aged 0 years in household but some absent	4,185	1,960
4. Other, inconsistent situations	6,408	3,302
Birth date after census night (11-12 July 2015)		
5. Child of age 0 years of correct sex in household	1,221	-
6. Last child has died	596	188
7. No child aged 0 years in household but some absent	605	711
8. Other, inconsistent situations	727	857
9. Child of age 1 year of correct sex in household	177	-

The data in Table 5 are separated by women who had children of any age (not only of age 0) living with them in the household and those that did not have children living with them, but who declared having had at least one child. This distinction is relevant because the Own Children method, relies mostly on the first group.

The ideal situation is 1), in which the woman declares having had a child during the past 12 months and a child of the correct sex aged 0 years was found in the household. If the last birth did not survive (Situation 2), obviously no corresponding child was present in the household. Situation 3 is one in which the child survived but was apparently not in the household and the respondent declared that indeed one or more children of the correct sex lived elsewhere.

All the other situations are inconsistent to some degree. Situation 4) is one in which no child of the correct sex and aged 0 years is found in the household and there is no satisfactory explanation as to why. A total of over 5,000 cases were found in which the declared date of birth was after July 12 2015. It is possible that some of these births took place after the 2015 Census and were erroneously included in the census record (because of the duration of census enumeration), but the vast majority must be cases of erroneous declaration

of the date of birth. The large number of such cases is a cause for concern because the same may also have happened in other years (especially 2013) where the problem cannot be easily detected.

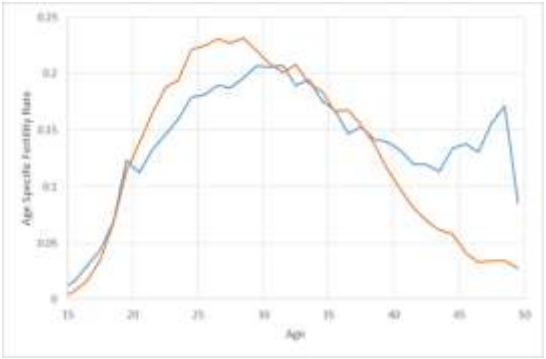
The number of surviving children among those declared as having been born during the year preceding the 2015 Census is subject to some uncertainty. Of the 36,202 children declared as having been born during the 12 months preceding the census, as many as 2,226 have code "9" for their survival status, meaning that it is unknown whether they were alive or dead, compared to only 1,192 confirmed deaths. Fertility estimates and particularly infant mortality rates will vary depending on whether these children are assumed alive or dead. These 2,226 children were assumed to be alive.

The way inconsistent dates of birth were handled was that in Situations 5 (child of age 0 years and the correct sex in the household), 6 (last child declared dead) and 7 (child possibly living elsewhere as the household did declare children of the correct sex not living in the household) were included in the births record. Whereas, situations that presented additional inconsistencies (8 and 9) were excluded. With these choices, the total number of births in the 12 months before the 2015 Census was 36,202.

Other data quality issues

Figure 7 displays data on births that occurred during the twelve months preceding the 2015 Census by age of the mother (blue line). It is evident that the age pattern is quite implausible, because of the excess fertility in older women, particularly when compared to the corresponding data from the 2010 Census (orange line). While the 2010 data by and large follow a more reasonable age pattern, with a modal age of childbearing of about 28 (although fertility in the 45–49 age group was higher than expected), the peak of the 2015 data was around age 31, after which fertility drops off slowly and even increased again between ages 44 and 49 years.

Figure 7: Unadjusted Age Specific Fertility Rates by single year of age from the 2010 Census (orange line) and the 2015 Census (blue line)



Upon closer inspection of the data, it became evident that some (but not all) of the implausibly high fertility at older ages can be explained by births declared by older women who also declared that they were not actually living with some of their children. Almost half of the women aged over 40 years who declared having had a birth during the 12 months preceding the 2015 Census also declared that some of their children lived elsewhere and additionally, did not have a child of the appropriate sex aged 0 years living in their household (i.e. Situations 3 or 7 in Table 5).

The likely conclusion from this finding is that for a lot of older women, their grandchildren were declared as if they were their own children. There may be some degree of double counting as these same children were probably also declared for the actual mothers. This conclusion is corroborated by the fact that the unadjusted

TFR of the 2015 Census (4.9 live births per woman) is higher than the unadjusted TFR from the 2010 Census (4.7) and also by the fact that the 2015 Census only counted 31,807 children of age 0 (see Table 4).

Data on children ever born and children born in the year preceding the census were investigated for women who only recently commenced their child bearing - adolescent women. Inconsistencies were found in all three censuses, but the problem appears to be less problematic in the 2015 Census than in the 2010 Census. Never-the-less, a conclusion that can be drawn is that either the age of some women is misreported (and the fertility data is correct), or the number of births in the year preceding the censuses could be under-stated relative to the reported numbers of children ever born.

The Relational Gompertz and Own Children methods used in this report appear to remove much of the implausibility from the age pattern of fertility, never-the-less, distortions in the age pattern of fertility input data were detected and this needs to be born in mind when interpreting the ASFR results.

There are also some inconsistencies between the number of children declared as living in the household and the number present in the household (i.e. counted in the household population). This may be either an error in the declaration of children ever born or, since the 2015 Census was a de facto census, it is possible that some children normally lived with the mother, but on census night they were temporarily absent. Either way, these inconsistencies constitute a problem for the application of the Own Children method and therefore this also needs to be born in mind when interpreting the results.

An assessment was made of the sex ratios of the children declared in the fertility record and in the household listing (children age 0 years). The sex ratios of children ever born, children born during the 12 months preceding the 2015 Census, last live births, and children age 0 years are presented in Table 6.

Table 6: Sex ratios (males per 100 females) of births data and children aged 0 years in the 2004, 2010 and 2015 Censuses

Census	Children Ever Born	Births during 12 months preceding the census	Last live births	Children aged 0 years
2004	108.9			106.6
2010	106.8	111.5	111.6	107.3
2015	106.6	113.0	114.5	107.8

Several of these ratios are slightly higher than usual, especially in the case of the last live birth which might indicate some degree of male sex preference implemented by sex-specific stopping behavior, i.e. parents may stop having children after they had a son. Unlike more drastic methods of sex-specific fertility control such as sex-selective abortion, this practice affects the sex ratio of last births, but not of children ever born or of children born during the 12 months preceding the 2015 Census. Therefore, it cannot explain the elevated sex ratios of children born during the 12 months preceding the 2010 and 2015 Censuses. In the 2015 Census, the sex ratio for births during the 12 months preceding the census was 113.0 males per hundred females, and for women over age 35 years, this value increased to 115.5. A explanation is sex-specific under-declaration of births of girls born during the 12 months preceding the census. The number of children aged 0 years also has a slightly elevated sex ratio, but to less of an extent than for children born during the 12 months preceding the census and last live births. No adjustment was made for these issues since the analysis did not output sex-specific fertility indicators.

In summary, digit preference in the 2015 Census was reduced compared to 2004 and 2010 Censuses. In the course of the data quality assessment exercise, other issues with the quality of reporting on fertility data were detected in the 2015 Census data. Most of these issues were addressed in data preparation, and the demographic methods that are applied in the report appear to deal with issues such as distortions in the age structure of fertility. However, the information provided in this section should serve as a caveat to readers in the interpretation of the results.

Chapter 3: Analysis of fertility in Timor-Leste

3.1 Levels of fertility based on the 2015 Census

Crude Birth Rate

The crude birth rate or CBR for the year preceding the 2015 Census was 27.7 births per thousand population using the unadjusted births count of 32,818 live births and the 2015 Census population of and 1,183,643. This CBR is only 0.3 births per thousand persons lower than the unadjusted CBR from the 2010 Census (GDS, 2018b). The 2015 population projections base population was adjusted for under-enumeration of young children and some age groups of older people. Using this population as a denominator, the CBR is 27.4 births per thousand population, which, is 7.6 births less than the CBR calculated from the 2010 Census using the 2010 projections base population as a denominator (35 births per thousand population). It can therefore be stated with confidence that the CBR has declined between the 2010 and 2015 Censuses even though the reported unadjusted birth counts increased by the 2015 Census. The CBR declined because the population increase was greater than the increase in the number of reported births.

The 2016 Timor-Leste Demographic and Health Survey (TLDHS) measured a CBR of 26.8 births per thousand population, which is close to the unadjusted births CBR using the 2015 population projections as a base population (27.4 births per thousand population) or the 2015 Census population as a base population (27.7 births per thousand population). Furthermore, the CBR measured in the DHS declined by 6.5 births between the 2009–10 TLDHS and the 2016 TLDHS. It is reassuring that the CBRs are of a similar magnitude and experienced a similar rate of decline in both the censuses and the DHSs.

It is relevant to look at the CBRs estimated by the U.N. for the 2017 round of World Population Prospects to place the situation of Timor-Leste into international context. The U.N. value for Timor-Leste in 2010–2015 of 36.8 live births per thousand population was higher than any of the census or DHS estmates. However, it can be deducted that the CBR of Timor-Leste was still very high by international standards. For example, in 2010–2015, the CBR for the world was estimated at 19.6 births per thousand population, for Lower-Middle Income Countries the CBR was 23.5 and for South-east Asia the CBR was 19.3. Neighbouring countries within the region, such as the Philippines (24.1 births per thousand population) and Indonesia (20.2 births per thousand population) also have lower CBRs than Timor-Leste.

Finally, if we use the adjusted births and the 2015 population projections base population as a denominator, we arrive at a CBR of 30.2 births per thousand population.

Child-Woman Ratio

In the 2015 Census, there were 569 children aged under five years for every thousand women aged between 15 and 49 years, which is a decrease of 80 from 649 for the 2010 Census (GRS, 2012). After adjustment (using the population projections base populations), there were 602 children aged under five years for every thousand women aged between 15 and 49 years in 2015, which represents a major decrease of 137 from 739 children aged under five years for every thousand women aged between 15 and 49 years from the 2010 population projections base population. Whichever comparisons is taken, the evidence is supportive of a decrease in fertility between the two censuses.

Child-woman ratios were calculated from the 2017 round of World Population Prospects. The child-woman ratio for Timor-Leste was estimated at 740 children per thousand women in 2010–2015, which is higher than either 2015 Census based estimate (569 or 602 children per thousand women) (United Nations, 2017).

However, it is relevant to look at this data to place the situation of Timor-Leste into international context. For example, in 2015, the child-woman ratio for the world was estimated at 361 children per thousand women, for Lower-Middle Income Countries the child-woman ratio was 418 children per thousand women and for South-east Asia the child-woman ratio was 339 children per thousand women. Neighbouring countries within the region, such as the Philippines (435 children per thousand women) and Indonesia (354 children per thousand women) also have lower child-woman ratios than Timor-Leste. Therefore, it can be deducted that the child-woman ratio of Timor-Leste was still very high by international standards in 2015.

Children Ever Born

In the 2015 Census, the mean number of children ever born to women aged 15 years and above was 2.8 live births. The corresponding value for the 2010 Census was 3.2 (NSD and UNFPA, 2012), which is further evidence that fertility has declined between the 2010 and 2015 Censuses. Indeed, as noted for Table 3, the mean number of children ever born decreased for all reproductive age groups (except age group 15–19 years), with the largest decrease of 0.6 children for age group 30–34 years, followed by 0.4 children for age group 25–29 years.

Comparison with the corresponding table in the 2010 Census clearly shows that the percentage distribution of women by the number of children ever born had altered since the 2010 Census (NSD and UNFPA, 2012). Two main points to note are that the percentage of younger women who had never had a live birth increased (for example, by 7 per cent for age group 20–24 years, and 7.9 per cent for age group 25–29 years), and the percentages of women aged between 20 and 34 who had (in particular) already had 2 or 3 children had also decreased.

To summarise, in the 2015 Census, in comparison with the 2010 Census, there is clear evidence of declining crude birth rates, declining child women ratios, and decreasing completed parity. Additionally, the percentages of women in the peak child bearing age groups who have had more than one child declined, meanwhile, the percentage of women who had not given birth increased. All this evidence points towards fertility decline between the 2010 and 2015 Censuses.

Table 7: Percentage distribution of women by the number of children ever born, total number of children ever born and mean number of children ever born by five year age group of women, Timor-Leste, 2015 Census

Age group of women	% of women in each age group by the number of children ever born													Number of women	Number of children ever born	Mean number of children ever born
	0	1	2	3	4	5	6	7	8	9	10	11	12+			
15 to 19	94.4	3.3	1.2	0.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66,378	6,326	0.1
20 to 24	65.5	14.1	10.5	5.4	2.3	0.9	1.0	0.3	0.0	0.0	0.0	0.0	0.0	53,792	39,450	0.7
25 to 29	35.7	12.7	17.1	15.1	9.3	4.4	2.9	1.1	0.8	0.8	0.0	0.0	0.0	47,199	89,728	1.9
30 to 34	17.8	6.6	11.5	16.3	16.3	12.4	8.5	4.4	2.9	1.8	0.9	0.4	0.0	36,316	124,058	3.4
35 to 39	12.4	4.4	6.5	10.5	13.9	14.0	12.9	8.9	6.4	4.3	2.6	1.3	1.9	24,549	114,951	4.7
40 to 44	10.9	3.4	5.5	7.9	10.5	12.3	12.9	10.8	9.3	6.2	4.1	2.1	4.1	26,680	145,066	5.4
45 to 49	10.5	4.1	5.5	7.7	9.4	10.9	11.7	10.3	9.0	7.1	5.1	3.3	5.5	22,181	126,076	5.7
50 to 54	12.0	4.7	6.2	7.7	8.8	9.7	10.5	10.3	8.6	7.4	5.4	3.2	5.7	16,725	93,217	5.6
55+	24.2	8.4	7.0	7.3	7.4	7.2	8.0	7.2	6.6	5.2	4.2	2.6	4.6	63,068	277,223	4.4
15+	41.1	7.6	8.0	8.0	7.3	6.3	5.9	4.5	3.7	2.8	1.9	1.1	1.9	356,888	1,016,095	2.8

3.2 Application of different fertility estimation methods

The methodological approach of this thematic report is to estimate the fertility level and trends in Timor-Leste based on a limited number of robust estimation methods that are well-suited to the demographic context of the country and to pool the information obtained from the 2004, 2010 and 2015 Censuses.

Back-projection method

Possibly one of the best methods for fertility estimation under the circumstances found in Timor-Leste, but which was not applied in previous thematic reports, is the back-projection method (Spoorenberg, 2014). The main advantage of this method is that it does not make any assumptions about past fertility trends, which is important in the case of Timor-Leste where fertility increased during the 1990s and early 2000s and then decreased again. Another advantage is that it does not require matching of children to their mothers, thereby avoiding the matching problems exposed by the data quality assessment (Chapter 2). The method does need to make assumptions about mortality levels because it needs to back-project children to their date of birth and women to the date of birth of their children, but because any errors in these two back-projections partly cancel out, it is not very sensitive to errors in the level or pattern of mortality. In this case, the life expectancies for the back-projection of the 2004 and 2010 Census data were based on the Princeton 'East' model life table and the life expectancies estimated by the mortality thematic reports for the 2004 and 2010 Censuses, whereas for 2015 life expectancies of 60.7 (men) and 63.2 (women) were used, in accordance with the mortality thematic report of the 2015 Census.

The main limitations of the method are that:

1. It is affected by migration, so it should not be applied at the local level or in countries with very strong international migration;
2. It is affected by errors in age declaration and by under-enumeration of young children;
3. The method depends on the age pattern of fertility, and as will be explained under the sub-section on the P/F method, there are reasons to assume that the observed age pattern of fertility is too old, at least in 2015. In the sub-section on the P/F method, this age pattern is be corrected. Although the correct age pattern of fertility in the 2015 Census continues to be subject to uncertainty, the best estimate is the one derived by means of the Relational Gompertz model. It is this age pattern that was also used as the basis for the application of the back-projection method;
4. Because the age pattern of fertility is imputed, rather than directly measured, the method does not provide an observation based set of ASFRs.

The first of these problems is probably not very serious in Timor-Leste, at least not when the method is applied at the national level. The second problem may be more of an obstacle. To minimize it, the method was applied first to the uncorrected population data by sex and single year of age and then to the corrected age data that are presented in statistical annex Table A.3. The third problem was also addressed.

The red, yellow and green lines in Figure 8 refer to the TFR trends derived from the uncorrected numbers of children by single year of age between 0 and 14 years in each of the three censuses. As can be seen, these estimates oscillate significantly from one year to the next due to problems in the age declarations. The blue line is based on the consolidated age structures for 2004 and 2010 which were discussed in Section 2.2. This line is considerably smoother than the uncorrected lines, but it cannot be computed for the 2010–2015 period because there is nothing to compare the lowest ages of the 2015 Census to. Therefore, the green line is the only one available for the period 2010 to 2015, but it tracks well with the consolidated line. The TFR fell

from 6.3 live births per woman in 2005–2010 (the average of the last five points of the blue line) to 4.8 in 2013 (the average of the last five points of the green line).

Figure 8: Estimated TFRs based on back-projection, Timor-Leste, 2004, 2010 and 2015 Censuses

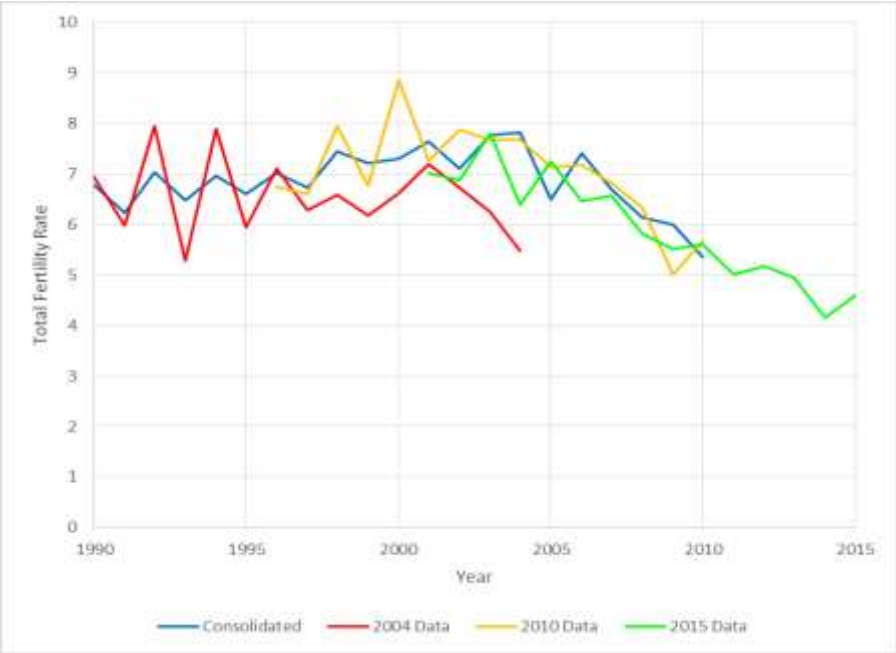


Figure 9 disaggregates the analysis based on the 2015 data (green line in Figure 8) by urban and rural residence. The analysis was carried out by using a uniform fertility pattern and differentiating between the urban and rural patterns found in the fertility analysis with the Relational Gompertz curve (see Figure 17). The rural TFR was higher than the total TFR, and the urban TFR was lower than the total TFR for every year between 2003 and 2015. This is as would be expected and is therefore reassuring as to the applicability of the methodology in the context of Timor-Leste. The range between the urban and rural TFRs was narrower for 2003 and 2004 than for later years and the differences were inconsistent for 2001 and 2002. One explanation for the inconsistencies between the 2001 to 2004 period and the 2005 to 2015 period could be poorer quality of reporting on events that took place further in the past. Readers should note that the TFRs derived for the urban and rural populations should be interpreted with some degree of caution because rural to urban migration took place across the 2001 to 2015 period.

Figure 9: Estimated TFRs for 2000-2015 based on back-projection, Timor-Leste and urban and rural areas of residence

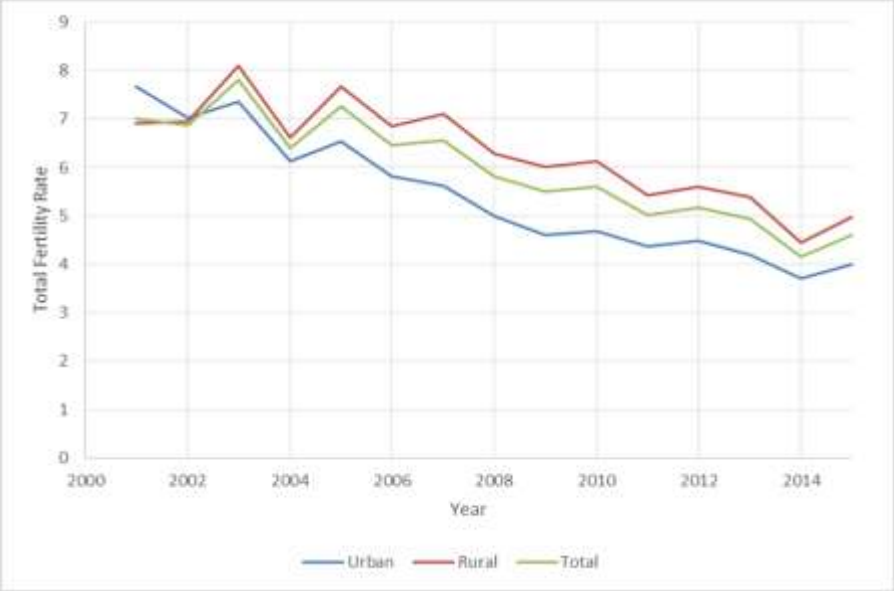
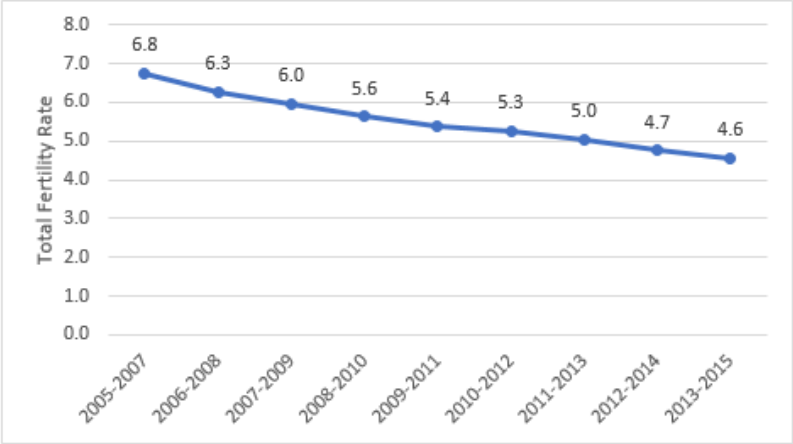


Table 8 presents TFRs averaged across three-year periods for the total population of Timor-Leste for the time-frame 2005 to 2015. Figure 10 displays these TFRs graphically, illustrating a uniform decline in TFR from 6.8 for the period 2005–2007 to 4.6 for the period 2013–2015. These data are not presented for the period 2001 to 2004 because of the inconsistencies found in Figure 9.

Table 8

Period	TFR
2005-2007	6.8
2006-2008	6.3
2007-2009	6.0
2008-2010	5.6
2009-2011	5.4
2010-2012	5.3
2011-2013	5.0
2012-2014	4.7
2013-2015	4.6

Figure 10



Own Children method

The Own Children method (Cho, Retherford & Choe, 1986) is very similar to the back-projection method and shares the same limitations in that it assumes a population closed to migration and depends on the correctness of the mortality assumptions used in projecting children back to their date of birth and women back to the date when they had their children. The major difference between the two methods is that the back-projection method relies on an assumed age pattern of fertility, which may be problematic in cases such as the 2015 Census of Timor-Leste where there are doubts about what the correct age pattern is. The benefit of the Own Children method is that it constructs the age pattern of fertility by matching the ages of surviving children to those of their mothers and then projects both back in time to the date of birth of each child.

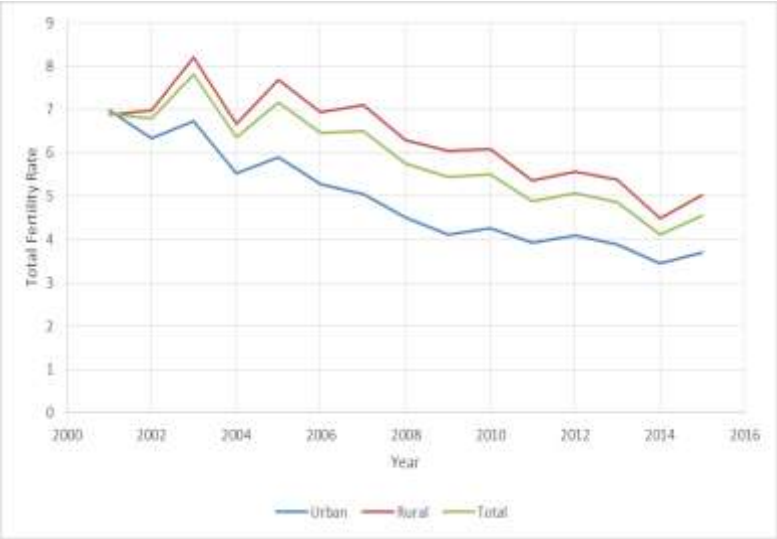
This works well provided that the ages of both women and children are reasonably well declared and that most children live with their biological mothers, so that they can be matched. In the case of Timor-Leste almost 16 per cent of children could not be matched, either because they did not live with their mothers or because there were several eligible women in the household and the census questionnaire failed to identify the line number of the child's mother. These problems usually increase with the age of the children as older children are more likely to live elsewhere, possibly because of reasons of study or because of marital instability in the family. Because these children were born longer ago, their absence is less important because it only affects fertility estimates further in the past. However, in the case of the Timor-Leste 2015 Census, the incidence of unmatched children aged between 0 and 9 years ranges from 13 per cent to 16 per cent. The method assumes that the ages of the mothers of these children are distributed in the same way as those of the mothers of matched children of the same age.

The other vulnerability of the method has to do with the age distribution of children under age 10 years. This problem affects the back-projection method as much as it affects the Own Children method. As was shown in section 2.2, these data tend to contain systematic errors, particularly the under-enumeration of the very youngest children, which may lead to an under-statement of the most recent fertility estimates. In the case of the 2004 and 2010 Censuses, these errors may be corrected to some extent by comparing the information with that of children 5 or 6 years older in the subsequent census, but the Own Children method was only applied to the 2015 Census which does not have any standard for comparison. Consequently, it must be borne in mind that the method has a tendency for under-estimating the most recent fertility levels.

Princeton 'East' model life tables were used to carry out the back-projection of mothers and children as part of the Own Children method. This was the same family used in the 2010 Census mortality thematic report and it was also found to provide satisfactory results in the mortality analysis of the 2015 Census, so it was decided to follow the previous practice. Constant life expectancies were used for 2000–2015, namely 63.5 years (men) and 65.9 years (women) in urban areas, 59.8 years (men) and 62.3 years (women) in rural areas. These were the averages that were found in the analysis of infant and child mortality described in the mortality thematic report (GDS, 2018b).

Figure 11 shows that the TFRs based on the Own Children method were very similar to those found in the back-projection method. The rural TFR was higher than the total TFR, and the urban TFR was lower than the total TFR for every year between 2003 and 2015. This is as would be expected and is therefore reassuring as to the applicability of the methodology in the context of Timor-Leste. Note that overall Figure 11 is very similar to Figure 9, but the difference between urban and rural fertility in Figure 11 is slightly bigger due to the lower urban fertility estimates from the Own Children method as compared to the back-projection method.

Figure 11: Estimated TFRs for 2000-2015 based on the own children method, Timor-Leste and urban and rural areas of residence, 2015 Census

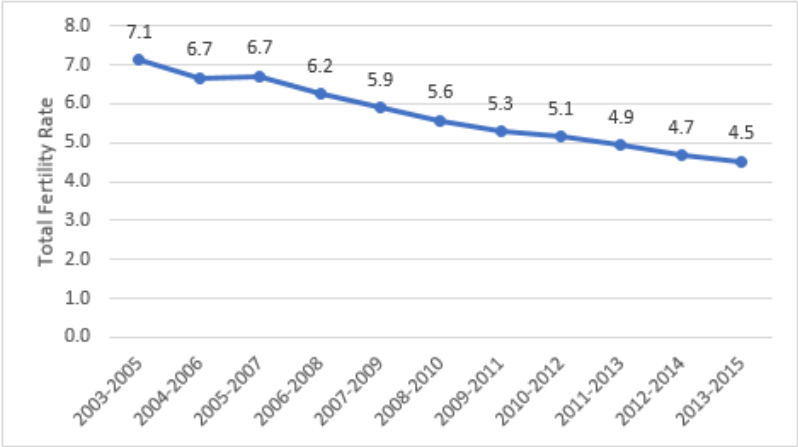


Taking the average between the fertility rates for the last three years (as was done for the back-projection method), the estimated TFR for 2013–2015 was 4.5 live births per woman (Table 9 and Figure 12), almost identical to the back-projection estimate of 4.6. The Own Children method also generated a linear decline, and the value for 2005–2007 of 6.7 live births per woman was almost identical to that derived using the back-projection method of 6.8 live births per woman. The Own Children method appears to generate higher quality of data than the back-projection method for the years 2003 and 2004, and the earliest period TFR derived is 7.1 live births per woman for the period 2003–2005.

Table 9

Period	TFR
2003-2005	7.1
2004-2006	6.7
2005-2007	6.7
2006-2008	6.2
2007-2009	5.9
2008-2010	5.6
2009-2011	5.3
2010-2012	5.1
2011-2013	4.9
2012-2014	4.7
2013-2015	4.5

Figure 12



The rate of decline in TFR between 2003–2005 and 2013–2015 was -4.6 per cent per annum. To place this into context, comparing this rate of decline with average annual rates of decline in TFR data from the 2017

revision of World Population Prospects, this rate of decline was the fastest for any country in the world between 2000–2005 and 2010–2015, just ahead of Nepal, where the rate of decline was -4.5 per cent per annum (United Nations, 2017). Between 1995–2000 and 2005–2010, Saint Lucia (-4.9 per cent) had a faster rate of fertility decline and Bhutan and Taiwan had the same rate of decline (-4.6 per cent). It is necessary to go back another five years (1990–1995 to 2000–2005), to find a higher rate of decline (Vietnam: -5.2 per cent), or a similar rate of decline (Brunei Darussalam: -4.3 per cent; Laos: -4.1 per cent) in the South-east Asian region.

A comparison with the three-year period TFR derived from the 2016 TLDHS is possible. The DHS obtained a Figure of 4.2 live births per woman for 2014–2016 for Timor-Leste, and 3.5 for urban areas and 4.6 for rural areas. The 2015 Census figures for 2013–2015 of 4.5 live births per woman for Timor-Leste, 3.7 for urban areas and 5.0 for rural areas were therefore very similar to those derived from the DHS.

Table 10 presents a set of ASFRs derived from the Own Children method for the period 2013–2015. This fertility pattern is also presented in Figure 13 and compared to the pattern obtained using information on children born during the past 12 months, as analyzed in Figure 7 (unadjusted ASFR), presented in five-year age groups. Figure 13 shows a striking difference in the age pattern, which was much younger in the case of the Own Children estimates. This confirms the spurious nature of the elevated ASFRs among older women in the case of the children born during the 12 months preceding the 2015 Census.

Table 10

Age Group	Age Specific Fertility
15-19	0.052
20-24	0.170
25-29	0.226
30-34	0.209
35-39	0.141
40-44	0.071
45-49	0.032
TFR	4.5

Figure 13

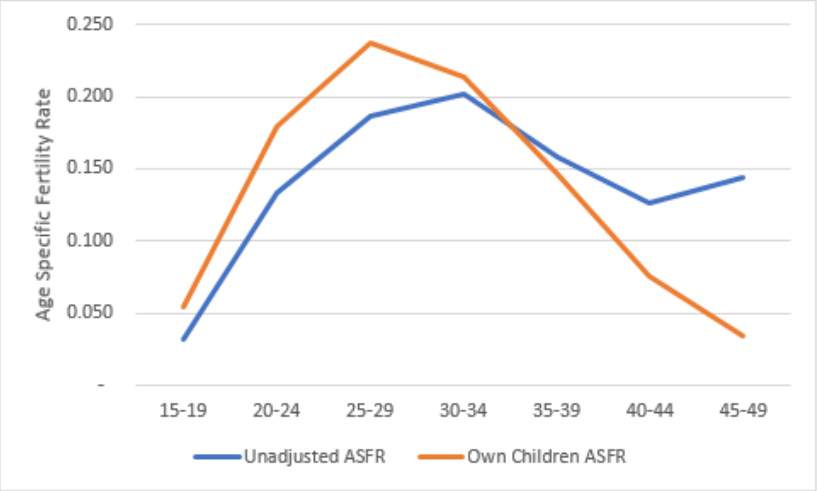
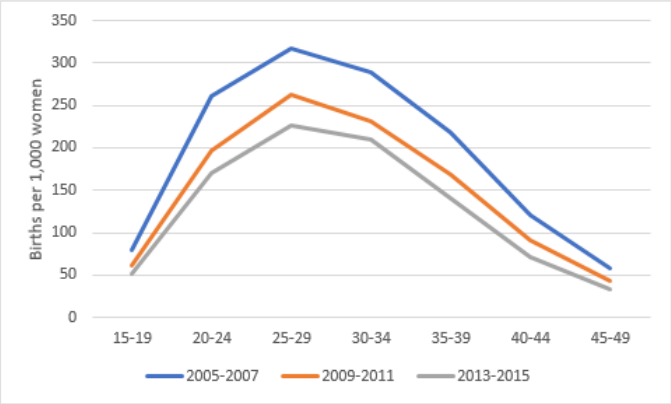


Figure 14 presents average annual ASFRs derived using the Own Children method with 2015 Census data for the periods 2005–2007, 2009–2011 and 2013–2015. In Figure 14, the ASFRs have fallen in all age groups, with a slightly larger decline evident between 2005–2007 and 2009–2011. The decline was greatest for age groups between 20 and 34 years leading to a flattening of the shape of the fertility curve, but fertility decreased across all age groups between 2005–2007 and 2013–2015.

Figure 14: Three-year Average Age Specific Fertility Rates based on the own children method, 2015 Census



P/F method and its variants

The third major approach to the estimation of aggregate fertility levels and trends is through Brass's P/F ratio method. However, even though it is maybe the most widely applied fertility estimation method, it depends on three rather strong assumptions:

1. The original formulation of the technique requires fertility levels to have been constant during several decades preceding the census;
2. The tendency for older women to omit children ever born from their birth histories should be relatively small, at least up to age 35;
3. The errors in the date of birth of the last child, particularly the error in the number of children born during the past 12 months, should not be age-dependent.

Neither the first nor the third of these three assumptions are satisfied in the case of the 2015 Census. It is known that fertility increased during the 1990s and then started to decline again in the early 2000s, and the analysis in Section 2.2 demonstrated errors in age reporting. Therefore, Brass's P/F ratio method was not applied.

A refined method developed by Arriaga (1983) derives a series of P (accumulated fertility) values by age of the woman based on the evolution of fertility between two censuses, rather than directly taking the P-values calculated from a single census and assuming that these represent a constant fertility pattern in the past. This approach significantly reduces sensitivity to the first assumption and is also fairly robust with respect to the second. However, even Arriaga's method does not resolve the third problem, which is due to the age pattern of current fertility observed in Figure 7, which causes strong variations in the P/F ratio between age 20 and age 35. This is clearly incompatible with a time reference error that is presumably constant by age, as the method requires.

An alternative and more modern approach to the logic of the P/F methodology is the Relational Gompertz approach introduced by Brass (1981) and perfected in the more recent formulation by Zaba (Moultrie et al., 2013). The advantage of this method is that it is more flexible in the way the age pattern of current fertility is determined, by a combination of choices of P (age-specific parity) and F (age-specific accumulated current fertility), rather than using only current observed fertility as the standard for the age pattern of fertility. The

method can be applied either with one or with two censuses. In the latter case it explicitly makes provisions for possible changes in fertility levels. In this sense, the one census and two census variants of the Relational Gompertz approach parallel the earlier Brass and Arriaga variants of the P/F method. Like these earlier methods, the two variants of the Gompertz methodology require that "errors in the pre-adjustment fertility rates are proportionally the same for women in the central age groups (20-39), so that the age pattern of current fertility described by reported births in the past year is reasonably accurate" (Moultrie et al., 2013: 56, 97).

Even if the current fertility rates of women aged over 40 years are not used in the estimation, the third assumption is in doubt in the case of the 2015 current fertility data. Fertility rates over age 30 seem too high and it is uncertain whether these exaggerated fertility rates are or are not compensated by fertility rates at lower ages that may be too low. If births were declared for grandmothers and already declared for the actual mothers, only fertility at older ages is affected. If births were declared for grandmothers instead of the actual mothers, fertility at younger ages will also be affected. As was noted in Section 2.2 that there is some supporting evidence for the first hypothesis. Another issue is whether the possible declaration of children by grandmothers also affects the number of children ever born. If the hypothesis of double counting is correct, this would only affect the P-values at higher ages, where its impact on the final estimates is less important, but if births were declared for grandmothers instead of the actual mothers, the P-values at younger ages and consequently the estimates of the TFR could also be affected.

There are a number of ways to deal with the problem of an implausible age structure of current fertility and the resulting instability of the P/F ratios (in the case of Arriaga's method) or discrepancies between the P(x)/P(x+5) and F(x)/F(x+5) ratios (in the case of the two census Relational Gompertz method):

1. In Section 2.2, it was suggested that part of the problem is accounted for by births being declared for older women and these children not living in the same household (codes 3 and 7 in the typology of Table 4). By eliminating these categories from the current fertility data, a more plausible age pattern is obtained. Omitting these births will result in a fertility level that is too low, but as long as the age pattern is correct, this can be adjusted. However, even though eliminating these births improves the situation, the resulting age pattern is still older than the age pattern of fertility in the 2010 Census;
2. Another option is to base the analysis on the P-values of the 2015 Census and the age pattern of current fertility found in the 2010 Census. Given that the time between the two censuses was only 5 years, it may not be too far-fetched to presume that the age pattern has remained more or less the same, even though the level of fertility has declined. This option was applied in conjunction with the Relational Gompertz method, but the results were rather inconsistent;
3. Prior to executing Arriaga's method or the two census Relational Gompertz method, a rejuvenation of the age pattern of current fertility was carried out, to stabilize the P/F ratios (in the case of Arriaga's method) or minimize the discrepancies between the P(x)/P(x+5) and F(x)/F(x+5) ratios (in the case of the two census Relational Gompertz method).

The third of these three strategies was followed, both with Arriaga's method and with the two census Relational Gompertz method. The Arriaga and Relational Gompertz methods were chosen because they allow for changes in fertility, rather than requiring fertility to be constant. Table 11 shows the input data for these two methods, with the adjustments that were made to the 2015 current fertility data.

Table 11: Input data for Arriaga's method and the two census Relational Gompertz method of fertility estimation based on the 2010 and 2015 Censuses

Age Group	Life-time Fertility	Unadjusted	Current Fertility (births in the 12 months preceding the 2015 Census)	
			Adjusted for Arriaga	Adjusted for Relational Gompertz
2010				
15-19	0.112	0.024		
20-24	0.916	0.156		
25-29	0.233	0.227		
30-34	3.964	0.207		
35-39	5.024	0.164		
40-44	5.758	0.090		
45-49	5.998	0.042		
2015				
15-19	0.100	0.032	0.054	0.050
20-24	0.744	0.134	0.156	0.162
25-29	1.912	0.186	0.184	0.199
30-34	3.428	0.202	0.183	0.186
35-39	4.690	0.158	0.135	0.139
40-44	5.443	0.126	0.104	0.092
45-49	5.690	0.144	0.117	0.080

The adjustments of the age patterns for current fertility were done in the following manner:

1. A Gompertz Relational fertility curve, based on the Booth standard also used by Moultrie et al., was fitted on the unadjusted fertility data, so that it preserved the unadjusted fertility for the 20–24, 25–29 and 30–34 age groups;
2. An (initially unknown) age shift parameter Δ was introduced to be summed to the standard location parameter A of the Relational Gompertz model;
3. The numbers of births by single year of age were then adjusted by multiplying them by the ratio between the shifted and the original Relational Gompertz curve;
4. A final adjustment was made to reach the correct number of total births;
5. The shift parameter Δ was then chosen in a way that guaranteed the greatest consistency between the P and F series. In the case of the Arriaga method, this was the value that resulted in the most stable P/F ratios between age 20 and age 34. In the case of the Relational Gompertz method, this was the value that resulted in the smallest Root-Mean-Square-Error for the final regression line of the linearized P(x)/P(x+5) and F(x)/F(x+5) ratios.

In both cases, the adjustments were made primarily to make it possible to apply the respective methods, but they do not definitively resolve the distortions in the age pattern of current fertility, particularly in the case of Arriaga's method. Even with this adjustment, it is easy to see that fertility rates for women aged over 40 years were still much too high. It would be possible to remedy this problem by using the Relational Gompertz curve itself, rather than using the shifted and unshifted Gompertz curves to adjust the original numbers of births, at least at higher ages. It was decided, however, not to over-fit and leave the further details to the methods themselves.

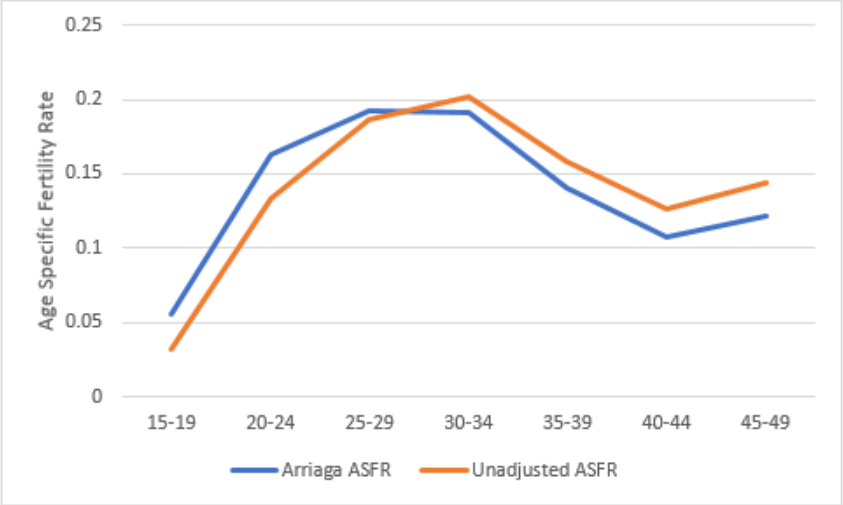
a. Arriaga's method

The usual solution in the face of strong variations of the P/F ratios is to use the unadjusted current fertility rates and pick a P/F ratio somewhere in the middle from among the wide range of possibilities, e.g. P3/F3 (the P/F ratio of the 25–29 age group), which in this case was 1.204. After applying the correction described above, the P/F ratios for the rejuvenated fertility pattern acquired a much more regular appearance and their average over the 20–34 age range became 1.051. The adjustment factor P3/F3 was now quite close to this average (1.041). With this correction factor, the estimate for the TFR was 4.9 live births per wman. The ASFRs at the national level are presented in Table 12 and Figure 15.

Table 12

Age Group	Age Specific Fertility Rates
15-19	0.056
20-24	0.163
25-29	0.192
30-34	0.191
35-39	0.141
40-44	0.108
45-49	0.122
TFR	4.9

Figure 15



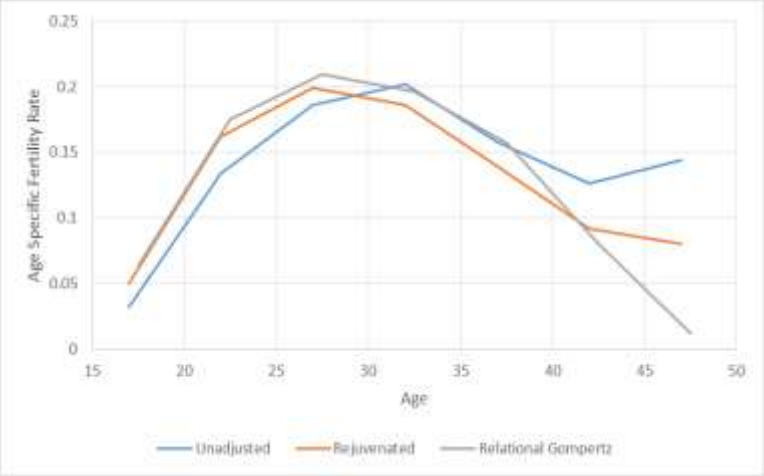
The TFR of 4.9 live births per woman yielded by the Arriaga method is acceptable (Table 12), and the age pattern of fertility an improvement on the pattern for the unadjusted ASFR. However, the age pattern of fertility is still implausible, particularly for age groups 40—44 and 45–49. As was mentioned above, it is possible to remedy this problem by using the Relational Gompertz curve itself to adjust the original numbers of births beyond age 35, rather than using the shifted and unshifted Gompertz curves. This alternative approach estimated TFR at 4.5 live births per woman.

b. Relational Gompertz model

The variant of the Relational Gompertz model that was used is the two census variant, in which the P series is based on the increments of P between the successive age groups in the five-year period between the two censuses and the F-series is a weighted average between the 2010 and 2015 Censuses. The results of this procedure refer to the period between the two censuses. i.e. the reference date is January 1st of 2013. Unlike Arriaga's method, the Relational Gompertz method also changes the age pattern of fertility by considering the P-series as well as the F-series and calibrating all of these data points against the theoretical age pattern implied by the Relational Gompertz fertility curve. In the process, some deviant data points can be dropped. In this case P(40)/P(45), F(40)/F(45) and F(45)/F(50) of the rejuvenated F-series were dropped. The resulting pattern of F(x)/F(x+5) and P(x)/P(x+5) was quite consistent although still suspiciously old (on the border of the Alpha = -0.3 limit admitted by the model).

Figure 16 presents the final estimates of the Relational Gompertz ASFRs alongside the unadjusted and rejuvenated ASFR from Table 11.

Figure 16: Age Specific Fertility Rates according to the unadjusted data on births during the 12 months preceding the 2015 Census, the rejuvenated fertility pattern and the Relational Gompertz method



The TFR yielded by the model was 4.5 live births per woman for Timor-Leste and 3.2 for urban areas and 5.1 for rural areas. Thus, the Relational Gompertz method yielded a rural TFR 0.6 births higher and an urban TFR 1.3 births lower than for the total population TFR.

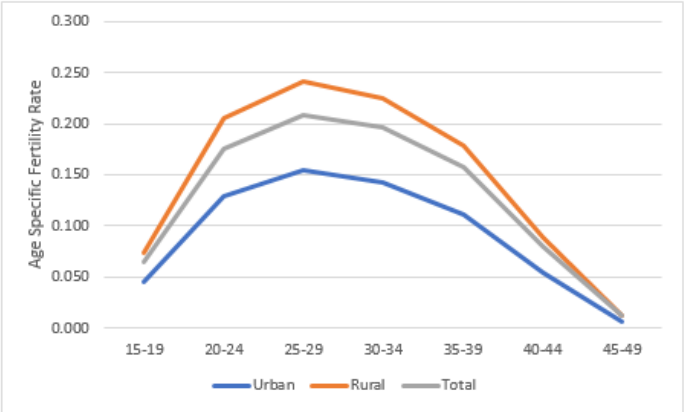
In comparison, the results of the 2016 TLDHS were 4.2 for the total population, 4.6 for the rural population and 3.5 for the urban population for the three year period 2014-2016 (RDTL MoF, 2017). Thus, the DHS yielded a rural TFR 0.4 births higher and an urban TFR 0.7 births lower than the total population TFR.

The ASFRs based on the Relational Gompertz method are presented in Table 13 and Figure 17.

Table 13

Age Group	Age Specific Fertility Rates		
	Urban	Rural	Total
15-19	0.045	0.074	0.064
20-24	0.129	0.206	0.175
25-29	0.155	0.242	0.209
30-34	0.143	0.225	0.196
35-39	0.111	0.178	0.157
40-44	0.054	0.089	0.080
45-49	0.007	0.013	0.012
TFR	3.2	5.1	4.5

Figure 17



The total ASFR pattern lies beneath the rural ASFR curve and above the urban ASFR curve, and is closer to the rural curve than the urban curve which is as would be expected.

The Arriaga and Relational Gompertz methods yielded a TFR that is consistent with the back-casting and Own Children methods. As was the case in the 2010 analysis, the Own Children method is the best measure of fertility levels for the period between the 2010 and 2015 Censuses. Therefore, it is heartening that the P/F methods (Arriaga and Relational Gompertz) confirm the results of the Own Children analysis.

Final Results

Table 14 presents a selection of TFR estimates from different sources, including the Multiple Indicator Cluster Survey of 2002 (RDTL MoF, 2003), The Demographic and Health Surveys of 2003, 2009-10 and 2016 (MoH, 2004b; RDTL MoF, 2010, 2017), The United Nations Population Division World Population Prospects 2017 round of estimates (United Nations, 2017), the unadjusted Census Estimates, and the estimates calculated using the back projection, Own Children, Arriaga and Relational Gompertz methods from this report, and estimates from the reports of the 2004 Census (Neupert, 2006) and the 2010 Census (NSD and UNFPA, 2012).

Figure 18 presents a selection of these estimates graphically. The United Nations estimates do not have such a steep decline as is evident in the other range of estimates, but overall there is clear trend of fertility decline in the range of estimates presented.

A TFR of 4.5 live births per woman for the period 2013–2015 centred upon the year 2014, generated using the Own Children method is the official estimate of TFR for Timor-Leste from the 2015 Census.

Table 14: Estimates of TFR by different methods and sources, Timor-Leste, 2002 to 2015

Period	Year [1]	MICS 2002	United Nations			Unadjusted Census			DHS 2003	DHS 2009-10	DHS 2016
						2004 Census	2010 Census	2015 Census			
2001-2002	2002	7.4									
2001-2003	2002								7.8		
2000-2005	2003		7.0								
2003-2004	2004					6.7					
2005-2007	2006										
2004-2010	2007										
2005-2010	2007			6.5							
2007-2008	2008										
2007-2009	2008									5.7	
2008-2010	2009										
2009-2010	2010						4.5				
2010-2012	2011										
2010-2015	2013				5.9						
2013-2015	2014										
2014-2015	2015							4.9			
2014-2016	2015										4.2

[1] Corresponds to the middle of the period for which TFR was estimated.

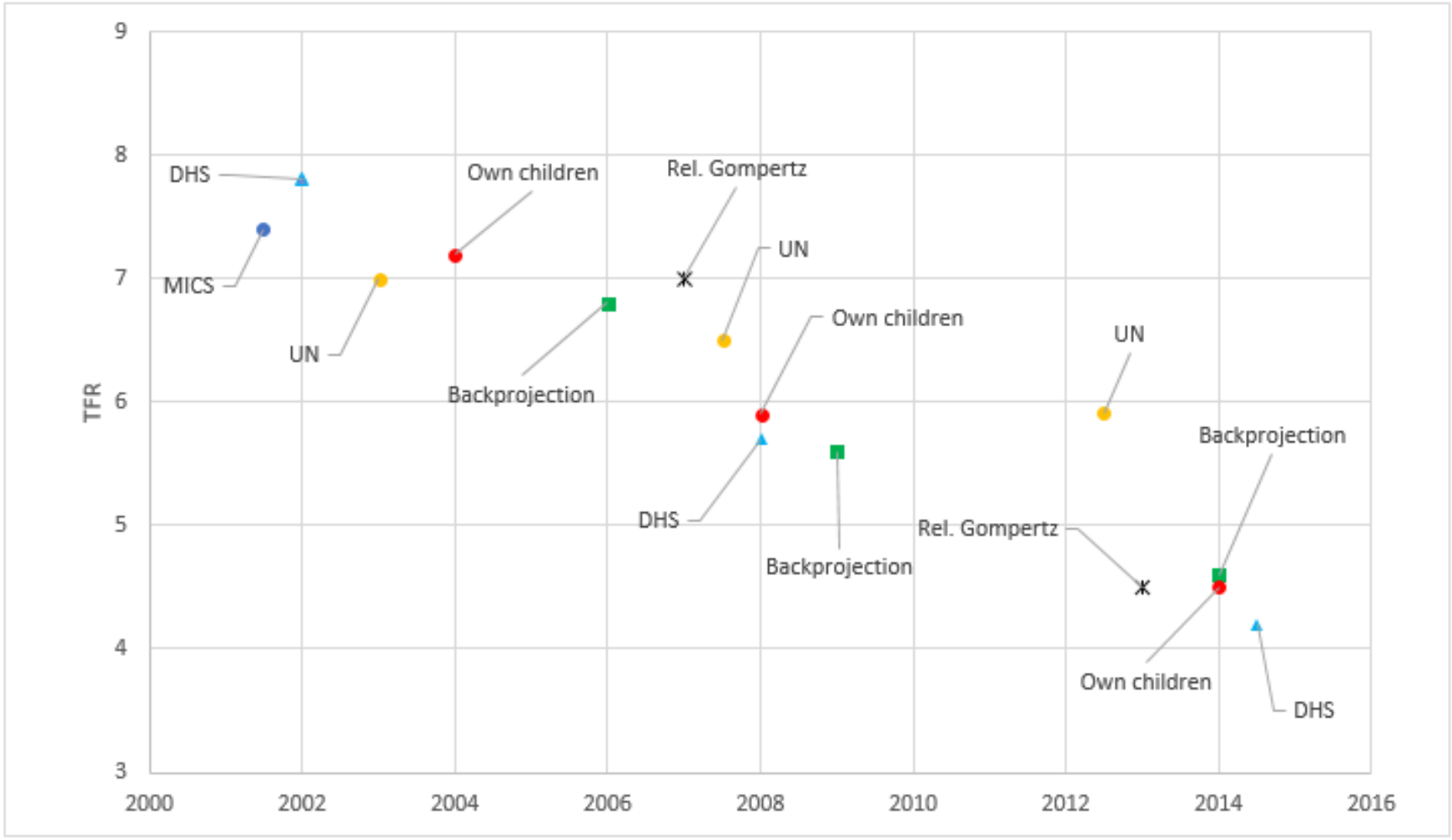
Continued…

Table 14: Estimates of TFR by different methods and sources, Timor-Leste, 2002 to 2015

Period	Year [1]	Back-projection method		Own children method			Arriaga Method		Relational Gompertz Method	
		2010 and 2015 Censuses	2015 Census	Census 2004	Census 2010	Census 2015	2004 and 2010	2010 and 2015	2004 and 2010	2010 and 2015
2001-2002	2002									
2001-2003	2002									
2000-2005	2003									
2003-2004	2004			7.2						
2005-2007	2006	6.8								
2004-2010	2007								7.0	
2005-2010	2007									
2007-2008	2008				5.9					
2007-2009	2008									
2008-2010	2009	5.6				5.6				
2009-2010	2010						6.4			
2010-2012	2011	5.3				5.1				
2010-2015	2013									4.5
2013-2015	2014		4.6			4.5				
2014-2015	2015							4.5		
2014-2016	2015									

[1] Corresponds to the middile of the period for which TFR was estimated.

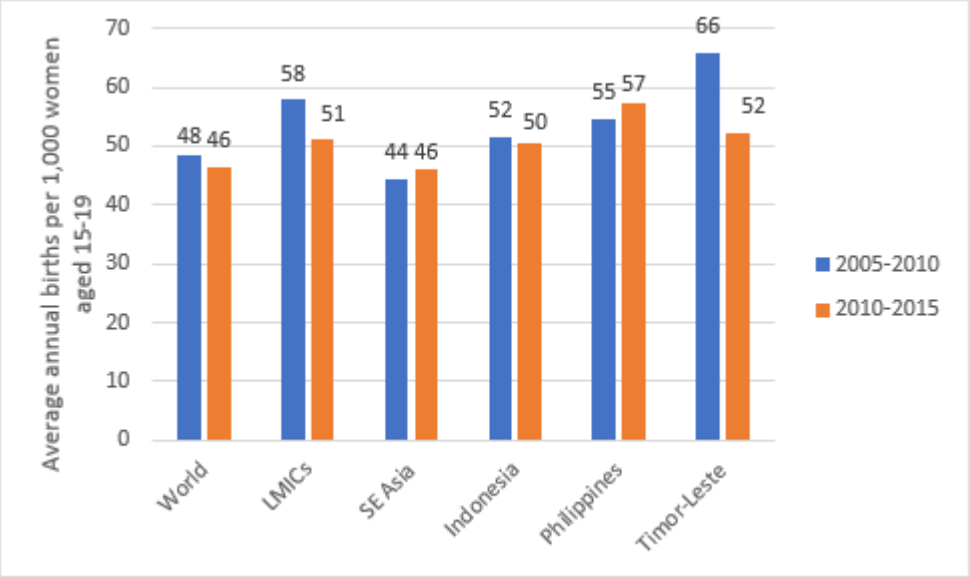
Figure 18: Estimates of TFR by different methods and sources, Timor-Leste, 2002 to 2015



3.3 Adolescent Fertility

According to the U.N. Population Division's World Population Prospects, 2017 Revision, the ASFR for Timor-Leste was 52 live births per thousand women aged between 15–19 years for the period 2010–2015, this ASFR is quite close to the world average (46 per thousand) and similar to the average for all lower middle-income countries (51 per thousand) (see Figure 19) (United Nations, 2017). The ASFR for adolescents in Timor-Leste was higher than the regional average for South-east Asia (46 per thousand), ranking below the Philippines (57.0 per thousand) and slightly higher than Indonesia (50 per thousand). According to the U.N., the adolescent ASFR for Timor-Leste declined by 14 live births per thousand women in five years, faster than the decline for the world (two live births per thousand women) or for lower middle-income countries (seven live births per thousand women). The adolescent ASFR for South-east Asia and the Philippines was estimated to have increased across the same five year period. Whilst for Indonesia, the ASFR was estimated to have declined by two live births per thousand women. In five years, the adolescent fertility in Timor-Leste was estimated to have declined to almost match the Indonesian rate by 2010–2015.

Figure 19: Selected adolescent fertility rates, U.N. World Population Prospects, 2005–2010 and 2010–2015



The Own Children method yielded an ASFR of 54 live births per thousand women aged between 15–19 years for the period 2010–2015 which compares very favourably with the U.N. estimate for 2010–2015 of 52 per thousand. The ASFR estimated by the Own Children method for 2005–2010 of 69 per thousand was also close to the U.N estimate of 66 for 2005–2010. Therefore, the consistency between the U.N. data and the Own Children method data based on the 2015 Census confirms a decline in the adolescent fertility rate for Timor-Leste. Even although the rates were higher than in neighbouring South-east Asian countries, the trend in the adolescent ASFR was of sustained decrease, rather than stability (Indonesia) or increase (Philippines).

The results of the 2016 TLDHS were less consistent with the 2015 Census results based on the Own Children method (RDTL MoF, 2017). The DHS yielded an ASFR of 42 live births per thousand women for Timor-Leste's adolescent population for the 3 years preceding the survey (centred upon 2015), which was 9.9 live

births per thousand women fewer than the value from the 2015 Census of 51.9 live births per thousand women for the three years preceding the census (centred on 2014). For the 2009–10 TLDHS, the ASFR for Timor-Leste's adolescent population for the three years preceding the survey (centred upon 2008) was 51 live births per thousand women, which was 17.9 live births fewer than the value of 68.9 live births per thousand women obtained for 2007–2009 using Own Children data from the 2015 Census (RDTL MoF, 2010). The inconsistencies between the DHS and census estimates can be explained by the fact that the DHS is a sample survey and that adolescent fertility is a relatively uncommon enough event for the ASFR to be affected. From this perspective it is actually reassuring that the difference between the census and DHS rates discussed here decreased by eight live births over the period, suggesting improvements in census and DHS consistency. It is also reassuring that both census and DHS data on adolescent fertility were tracking downwards, further evidence that adolescent fertility is in decline in Timor-Leste.

Figure 20 examines the average annual adolescent ASFRs in more detail. The total, rural and urban ASFRs all declined linearly between 2005–2010 and 2010–2015. Across the period, rural rates were higher than total rates and urban rates were significantly lower than total rates, which is as would be expected.

Figure 20: Adolescent fertility rates based on the own children method, Timor-Leste and urban and rural areas of residence, 2015 Census

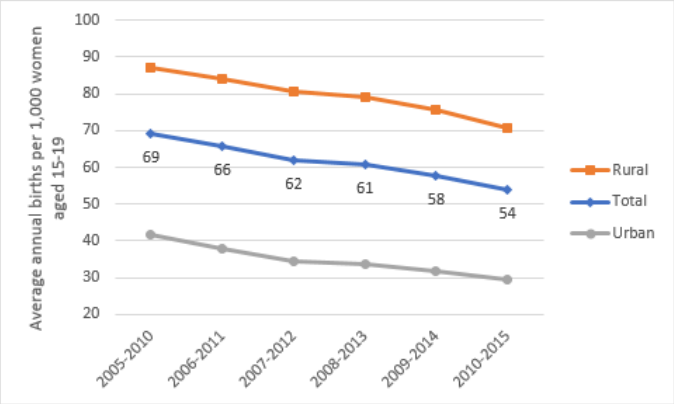


Table 15 presents data on adolescent fertility by age, urban and rural residence and Municipality.

Table 15: Adolescent fertility by age, urban or rural residence and Municipality, 2010 and 2015 Censuses

Background Characteristic	Number of women aged 15-19 who have had a live birth		Percentage of women aged 15-19 who have had a live birth		Number of women aged 15-19	
	2010	2015	2010	2015	2010	2015
Age						
15	241	242	1.9	1.6	12,487	14,976
16	378	328	3.3	2.4	11,402	13,686
17	512	547	4.5	4.1	11,335	13,305
18	1,050	1,095	8.8	8.5	11,947	12,832
19	1,388	1,480	14.3	12.8	9,736	11,577
Place of Residence						
Urban	844	767	4.0	3.3	21,025	22,898
Rural	2,725	2,925	7.6	6.7	35,882	43,478
Timor-Leste	3,569	3,692	6.3	5.6	56,907	66,376
Municipality						
Aileu	138	140	5.2	4.7	2,641	2,983
Ainaro	227	197	8.2	5.6	2,780	3,548
Baucau	398	360	6.8	5.2	5,849	6,861
Bobonaro	309	307	6.6	6.7	4,669	4,586
Covalima	264	236	8.4	6.4	3,138	3,666
Dili	577	654	4.1	4.0	14,207	16,541
Ermera	349	427	5.4	5.5	6,470	7,758
Lautem	212	166	7.1	4.5	2,978	3,682
Liquica	218	250	6	6.3	3,614	3,988
Manatuto	161	184	8.3	8.0	1,938	2,296
Manufahi	164	191	6.2	6.2	2,661	3,060
Oecusse	263	313	9.3	9.4	2,814	3,339
Viqueque	289	267	9.2	6.6	3,148	4,068

There were 242 15 year old girls (1.6 per cent in this age group) recorded in the 2015 Census as already having had a live birth. Although the percentage had declined from 1.9 per cent of girls in the 2010 Census, the number of cases did not (241 in 2010). For those 16 years of age, the number of cases had declined from 378 to 328 and the percentage of all girls recorded as already having had a live birth was also lower in the 2015 Census (2.4 per cent) as compared to the 2010 Census (3.3 per cent). Combined, this means that two per cent of 15 and 16-year olds were reported in the 2015 Census to have had a live birth (as compared with 2.6 per cent in the 2010 Census).

Four per cent of 17-year-old girls were recorded in the 2015 Census as already having had a live birth, a slight decline from 4.5 per cent in the 2010 Census (although the actual number of girls increased by 35 from 512 to almost 550). Combined, this means that 2.7 per cent of all girls aged under 18 were recorded in the 2015 Census as having already had a live birth (as compared with 3.2 per cent in 2010).

In the 2015 Census, the percentage of women aged 18 who were recorded as having had a live birth were 8.5 per cent, slightly lower than in the 2010 Census. For 19-year old's, the percentages who had had a live birth were also lower in the 2015 Census (12.8 percent) than in 2010 Census (14.3 per cent). However, as for age 17, the numbers of cases was higher in 2015 as compared to 2010. In total, 5.6 per cent of women aged less

than 20 were recorded in the 2015 Census as having had a live birth, a decline by 0.7 percentage points from 6.3 per cent in the 2010 Census.

Consistent with Figure 20, the percentage of 15 to 19 year old women who had already given birth was lower (3.3 per cent) in urban areas than in rural areas of Timor-Leste (6.7 per cent of all 15 to 19 year old women). Compared to the 2010 Census, the percentages of 15 to 19 year old women who had already given birth decreased by 0.7 percentage points in urban areas and by 0.9 percentage points in rural areas. The number of 15 to 19 year old women residing in urban areas who had already given birth decreased by 77 from 844 in the 2010 Census to 767 in the 2015 Census. By contrast, the number of 15 to 19 year old women residing in rural areas who had already given birth increased by 200 women from 2,725 in the 2010 Census to 2,925 in the 2015 Census. At the national level, the percentage of women aged 15–19 recorded in the 2010 Census as having given birth was 6.3 per cent and by the 2015 Census, the percentage had fallen by 0.7 percentage points to 5.6 per cent, despite the number of cases increasing from 3,569 in the 2010 Census to 3,692 cases in the 2015 Census.

Across the Municipalities, there is a wide range in the percentages of 15 to 19 year old women who had already given birth. In 2010, the highest was found in Oecusse (9.3 per cent) followed by Viqueque (9.2 per cent) and in 2015, Oecusse still had the highest percentage (9.4 per cent). The percentage of 15 to 19 year old women who had already given increased slightly in three Municipalities (Bobonaro, Ermera and Oecusse) between the 2010 and 2015 Censuses and there was no decline in Manufahi (6.2 per cent in both censuses). The lowest percentage in 2010 and 2015 Censuses was in Dili (4.1 and 4.0 per cent respectively), and the largest declines between the two censuses in the percentage of 15 to 19 year old women who had already given birth were in Ainaro, Lautem and Viqueque (by 2.6 percentage points). The data suggests that there is clearly still a problem with adolescent pregnancy in the Municipalities of Bobonaro, Covalima, Ermera, Liquica, Manufahi, Oecusse and Viqueque.

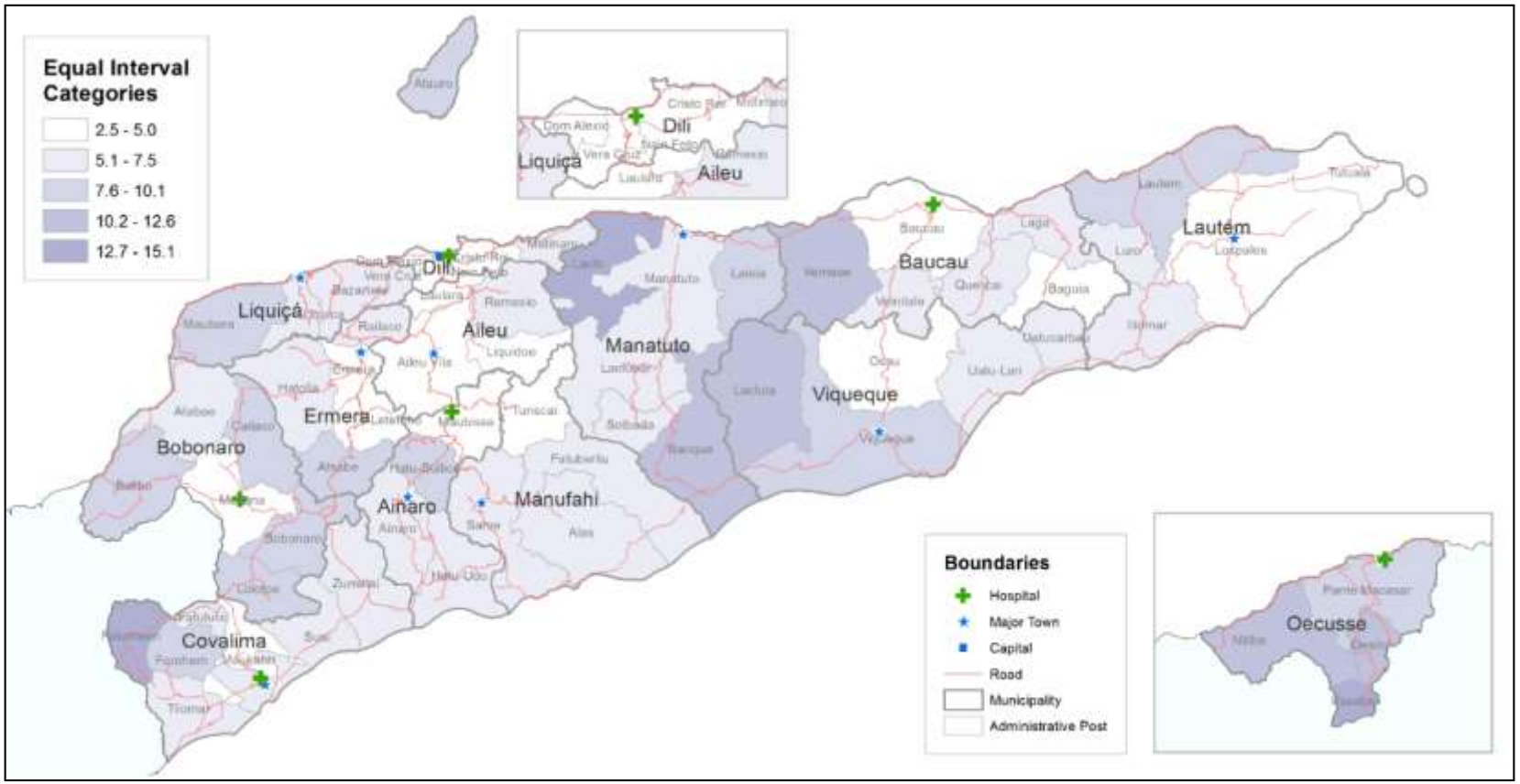
Figure 21 presents adolescent fertility data in a map by Municipality. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Municipalities in each of the bands. Higher percentages are represented by darker shades. Oecusse has the darkest shade, having the highest percentage. Across the rest of the country, higher percentages of childbearing in adolescence can be observed in Manatuto and across the western Municipalities, and lowest rates in Dili and Aileu and in Lautem.

Figure 22 presents adolescent fertility data in a map by Administrative Post. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Administrative Posts in each of the bands. Higher percentages are represented by darker shades. The whole area within Dili have the lowest percentages, transitioning into higher percentages towards south-western contiguous clusters of Administrative Posts in Ainaro, Bobonaro, Covalima and Ermera. The percentages are highest in a band through central Timor-Leste, from Barique to Vamase and in Laclo. Further to the east percentages are lower. In Oecusse percentages increase from the north-east to the south and west. The general impression is that Administrative Posts with higher and highest percentages of adolescent childbearing are those less-well connected, or further away from the Municipality urban centres. This is consistent with the fact that child bearing during adolescence is higher in rural areas than in urban areas of Timor-Leste.

The maps clearly illustrate where higher rates of adolescent childbearing should be targeted through interventions.

Figure 21: Adolescent fertility, Municipalities, 2015 Census

Figure 22: Adolescent fertility, Administrative Posts, 2015 Census



Data on the 15 to 19-year-old population that had already given birth by literacy status are presented in Table 16. Over twice as many women who were non-literate were reported as having given birth in the 2015 Census (11.5 per cent) than women who were reported as literate (4.6 per cent). In 2010, the difference between literate and non-literate women was smaller, but the percentage of non-literate women who had given birth was also lower (9.6 per cent). The reason for this is that the number of women who are non-literate was substantially higher (12,118) in the 2010 Census as compared to the 2015 Census (9,359), whereas the number of non-literate women who have given birth had not actually decreased as substantially.

Table 16: Adolescent fertility by literacy and educational attainment, 2010 and 2015 Censuses

Background Characteristic	Number of women aged 15-19 who have had a live birth		Percentage of women aged 15-19 who have had a live birth		Number of women aged 15-19	
	2010	2015	2010	2015	2010	2015
Literacy						
Literate	2,410	2,615	5.4	4.6	44,789	57,017
Not Literate	1,159	1,077	9.6	11.5	12,118	9,359
Educational Attainment						
None, Pre-primary or Non-formal	992	933	10.3	10.7	9,615	8,755
Primary	1,030	902	8.6	8.2	12,104	10,944
Pre-Secondary	978	1,442	5.1	3.6	19,287	40,029
Secondary	538	415	3.5	6.2	15,229	6,648
Polytechnic / Diploma	7	-	4.9	-	143	-
University	18	-	3.4	0.0	529	-

Consistent with the data on literacy, higher percentages of women aged 15–19 who received only very rudimentary levels of education were reported in the 2015 Census as having given birth. However, the pattern was not entirely linear, as the percentage for women who attained secondary school education (6.2 per cent) was higher than the percentage for women who only attained pre-secondary education (3.6 per cent). This is due to a larger proportion (six times as many) 15–19-year olds reported as having a highest level of attainment of pre-secondary than a highest level of attainment of secondary school, whereas the proportion of women aged 15–19 who had given birth was 3.5 times higher for pre-secondary than secondary school. Placing secondary school aside, the percentage of 15–19-year-old women reported as having had a live birth was higher in the 2010 Census than in the 2015 Census.

Next, scrutiny turns to child bearing by marital status of women aged 15–19 (Table 17). The key observation here is that almost 6 out of ten 15 to 19 year old women reported in the 2015 Census as being married had given birth, as opposed to less than 2 per cent of 'never married' women. However, it should also be noted that only 6 per cent of women were married before age 20. The percentage of married women who had had a live birth was similar in the 2015 Census (57.4 per cent) and the 2010 Census (55.2 per cent). An additional response option (living together) was included in the 2015 Census. Although only 75 women were reported as having a status of 'living together', the percentage who had had a live birth was 46.7 per cent - lower, but not dissimilar from the percentage for married women. The number of women reported as 'separated' was just over one thousand, as compared to a negligible number in the 2010 Census. Of these thousand women, 9.2 per cent were reported in the 2015 Census as having had a live birth.

Table 17: Adolescent fertility by marital status and religion, 2010 and 2015 Censuses

Background Characteristic	Number of women aged 15-19 who have had a live birth		Percentage of women aged 15-19 who have had a live birth		Number of women aged 15-19	
	2010	2015	2010	2015	2010	2015
Marital status						
Never married	1,018	1,152	1.9	1.9	52,318	61,066
Married	2,409	2,371	55.2	57.4	4,364	4,131
Living Together	-	35	-	46.7	-	75
Widowed	65	10	52	40.0	125	25
Divorced	44	29	68.6	67.4	64	43
Separated	33	95	91.7	9.2	36	1,036
Religion						
Christian (Catholic)	3,471	3,575	6.3	5.5	55,510	64,948
Christian (Protestant/Evangelical)	79	102	6.5	8.2	1,218	1,243
Islam	9	8	10.2	7.0	88	115
Buddhist	1	1	10	6.3	10	16
Hindu	-	2	-	33.3	7	6
Traditional	4	-	13.3	0.0	30	11
Other	5	4	11.4	10.8	44	37

By religion (Table 17), a higher percentage of 15–19 year old Protestants were reported in the 2015 Census as having had a live birth (8.2 per cent) as compared to Catholics (5.5 per cent). This was also the case in the 2010 Census. However, the differences should be viewed with some caution as the numbers of Protestants were small (just over 1,200 in both censuses). For other religions, the population sizes were too small to make any meaningful analysis.

Table 18: Adolescent fertility by economic characteristics, 2010 and 2015 Censuses

Background Characteristic	Number of women aged 15-19 who have had a live birth		Percentage of women aged 15-19 who have had a live birth		Number of women aged 15-19	
	2010	2015	2010	2015	2010	2015
Economic Activity						
Employed	738	1,400	10.6	19.4	6,994	7,225
Unemployed	152	67	5.9	7.9	2,588	851
Inactive	2,679	2,225	5.7	3.8	47,325	58,300
Housing Quality						
Highest quality	18	118	3.1	2.5	582	4,760
Second highest quality	507	885	3.6	3.9	14,250	22,466
Medium quality	1,002	1,754	5.3	6.2	18,983	28,182
Second lowest quality	1,630	896	8.4	8.5	19,506	10,598
Lowest quality	412	38	11.5	11.6	3,586	328
Agricultural Activity						
Agricultural Household		3,426		5.7		59,628
Non-Agricultural Household		266		3.9		6,748
Mainly/completely home consumption	-	3,306	-	3.0	-	57,904
Producing mainly for sale	-	120	-	7.0	-	1,724

Higher proportions (19.4 percent) of women aged 15–19 years were reported in the 2015 Census as having had a live birth as compared to unemployed women (7.9 per cent) and especially inactive women (3.8 per cent) (Table 18). This pattern was also seen for 2010 Census data. However, the disparities between employed and inactive categories in the percentage of women reported as having had a live birth was much larger for the 2015 Census (15.6 percentage points) than the 2010 Census (4.9 percentage points). The classification for inactive means that these women were not in the labour force, and as most inactive women aged 15–19 would be in education, this is a rather important indication that in Timor-Leste, leaving education early raises the propensity for childbearing in adolescence.

Attention turns to assess the living conditions of women aged 15–19 years and the association with child bearing. In both the 2010 and 2015 Censuses, there was an indirect linear association between housing quality and the percentage of women reported to have had a live birth. Only 3.9 per cent of women in the second highest quality of dwelling were reported to have had a live birth in the 2015 Census as compared to 8.5 percent in the second lowest category of housing quality (the highest and lowest category were 2.5 and 11.6 per cent respectively, but the number of women living in such conditions were smaller - only 4,760 and 328 respectively).

A higher percentage of women aged 15–19 years were from households engaged in agriculture (5.7 per cent) than from non-agricultural households (3.9 per cent). Finally, birth rates were reported to be higher for 15–19 year old women from agricultural households engaged in production mainly sale (7.0 per cent) as compared to 3.0 per cent for women from households that were engaged in agriculture mainly for home consumption.

In summary, childbearing in adolescence was concentrated in ages 18 and 19, among married, non-literate, women who had left the education sector and who resided in poorer quality housing in rural contexts. The households they live in were more inclined to be engaged in agriculture for their livelihood. The data suggests that there is clearly a problem with adolescent pregnancy in Bobonaro, Ermera, Liquica, Manatuto, Manufahi, and Oecusse as in these Municipalities the percentages were either relatively high in the 2015 Census and/or had increased slightly between the 2010 and 2015 Censuses.

3.4 Completed Fertility

Table 19 presents data on the mean number of children ever born to women aged 45–49 years from the 2010 and 2015 Censuses. The mean number of children ever born declined by 0.3 live births from 6.0 live births in the 2010 Census to 5.7 in the 2015 Census. In urban areas, the decline was twice that at the national level (0.6 live births) to reach 5.0 live births in 2015. In rural areas, the decline was 0.2 live births to reach 5.9 live births, such that, on average, in 2015, urban women had almost one fewer birth (0.9) compared to rural women.

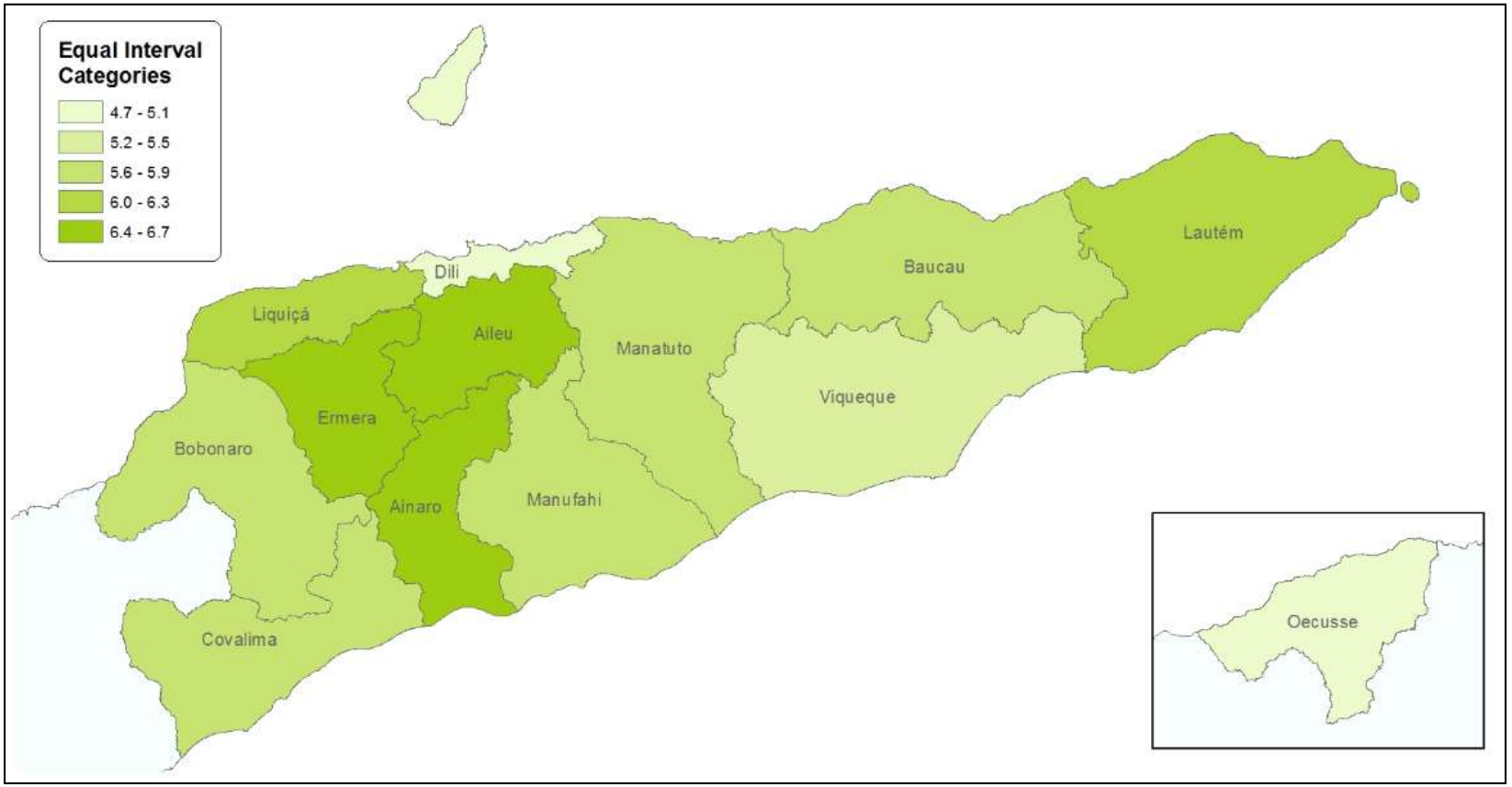
Across the Municipalities, there was a wide range in the mean number of children ever born to women aged 45–49 years. In 2010, the highest completed family size was found in Ermera (6.8 live births) and in 2015 the highest value was in Aileu (6.7 live births, an increase from 6.6 in 2010). In five Municipalities (Ainaro, Covalima, Lautem, Manatuto and Viqueque), the mean number of children ever born to women aged 45–49 years did not decline between the 2010 and 2015 Censuses. The lowest mean number of children ever born was in Oecusse in 2010 (5.2 live births), which was also lowest in 2015 (4.7 live births). The mean number of children ever born to women aged 45–49 years declined most between the 2010 and 2015 Censuses in Dili (0.7 live births) and there was a decline in 6 other Municipalities.

Table 19: Completed fertility by urban or rural residence and Municipality, 2010 and 2015 Censuses

Background Characteristic	Mean Number of Children Ever Born to Women Aged 45-49 Years	
	2010	2015
Place of Residence		
Urban	5.6	5.0
Rural	6.1	5.9
Timor-Leste	6.0	5.7
Municipality		
Aileu	6.6	6.7
Ainaro	6.4	6.4
Baucau	6.0	5.6
Bobonaro	6.1	5.8
Covalima	5.7	5.7
Dili	5.7	5.0
Ermera	6.8	6.4
Lautem	6.2	6.2
Liquica	6.5	6.1
Manatuto	5.7	5.7
Manufahi	5.9	5.7
Oecusse	5.2	4.7
Viqueque	5.3	5.3

Figure 23 presents the Municipality data for 2015 in a map. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Municipalities in each of the bands. Highest completed family sizes were very clearly evident in the neighbouring mountainous Municipalities of Aileu, Ainaro and Ermera. This pattern was the same in 2010.

Figure 23: Completed fertility, Municipalities, 2015 Census



In Table 20, the mean number of children born to women aged 45–49 years is presented by literacy status and education attainment. Literate women had 0.5 fewer live births than non-literate women in 2015. For literate women the mean number decreased by 0.4 live births and for non-literate women the mean number decreased by 0.2 live births. The comparison across time should be treated with some caution because literacy included four languages in 2015 whereas only two languages in 2010.

Table 20: Completed fertility by literacy status and educational attainment, 2010 and 2015 Censuses

Background Characteristic	Mean Number of Children Ever Born to Women Aged 45-49 Years	
	2010	2015
Literacy [1, 2]		
Literate	5.8	5.4
Not Literate	6.1	5.9
Educational Attainment		
Pre-primary	6.1	5.7
Primary	6.3	6.1
Pre-Secondary	5.8	5.9
Secondary	5.1	4.8
Polytechnic / Diploma	5.2	4.4
University	4.0	3.8
Non formal	5.3	6.1

[1] Tetun or Bahasa Indonesia (2010 Census)

[2] Tetun, Portuguese, Bahasa Indonesia or English (2015 Census)

For educational attainment, there is a liner pattern of decline in the mean number of live births to women aged 45–49 years from 6.1 live births for women who only received primary education to 3.8 live births for women who received university level education. The mean number of children ever born decreased for most education attainment levels except for non-formal education, where the value increased by 0.8 live births and pre-secondary, where the increase was 0.1 live birth.

Turning to religious affiliation (Table 21), in 2015, Catholic women aged 45–49 years had had, on average, 5.7 live births (down from 6.0 in 2010). Protestant women had on average had 0.4 fewer live births than Catholic women in both the 2010 and 2015 Censuses. Women who were reported as having traditional religion had the highest number of live births in both the 2010 (7.0 live births) and 2015 Censuses (6.2 live births). Other religions such as Islam, Hinduism and Buddhism had much lower completed family sizes than women who practice Traditional religion, Protestantism and Catholicism in both censuses. However, with the exception of Catholic and Protestant women's completed fertility, caution should be exercised in interpreting this information as the numbers are small (there are only 141 women and 511 live births for all other categories except Catholicism and Protestantism).

The average number of live births to married women aged 45–49 years was 6.2 in the 2015 Census a decrease from 6.5 in the 2010 Census. The second highest category in both censuses was for widowed women (4.5 in the 2010 Census and 4.1 in the 2015 Census). Not surprisingly, women who were never married had the lowest average number of children ever born (1.3 in the 2015 Census, an increase of 0.3 from 1.0 in the 2010 Census). Women who were recorded in the 2015 Census as 'living together' with a partner had the second lowest mean number of children ever born (2.6 live births) in 2015.

Table 21: Completed fertility by religious affiliation and marital status, 2010 and 2015 Censuses

Background Characteristic	Mean Number of Children Ever Born to Women Aged 45-49 Years	
	2010	2015
Religion		
Christian (Catholic)	6.0	5.7
Christian (Protestant/Evangelical)	5.6	5.3
Islam	4.2	3.1
Buddhist	2.7	2.6
Hindu	3.0	2.9
Traditional	7.0	6.2
Other	2.9	3.8
Marital status		
Never married	1.0	1.3
Married	6.5	6.2
Living Together	-	2.6
Widowed	4.5	4.1
Divorced	3.8	3.3
Separated	4.0	3.8

Table 22: Completed fertility by economic characteristics, 2010 and 2015 Censuses

Background Characteristic	Mean Number of Children Ever Born to Women Aged 45-49 Years	
	2010	2015
Economic Activity		
Employed	5.7	5.6
Unemployed	4.6	4.8
Inactive	6.3	5.8
Housing Quality		
Highest quality	3.7	4.3
Second highest quality	5.7	5.5
Medium quality	6.1	5.9
Second lowest quality	6.1	5.7
Lowest quality	6.0	5.4
Agricultural Activity		
Agricultural Household	-	5.8
Non-Agricultural Household	-	4.4
Mainly/completely home consumption	-	5.8
Producing mainly for sale	-	6.0

Table 22 presents completed fertility data by economic activity. In the 2015 Census, women aged 45–49 years who were reported as being employed had a lower mean number of live births (5.6 live births) than women who were not in the labour force (classified as inactive: 5.8 live births) and unemployed women had the least live births (4.8 live births). This pattern was also observed in the 2010 Census data.

There is no clear pattern between completed family size and housing quality, which is not particularly unexpected because the comparison is between a woman's current housing situation and fertility experience across her reproductive lifespan. The largest mean number of live births was to women in medium quality households in 2015, followed by second lowest quality households. The 2010 Census data yielded similar results.

Turning to agricultural activity, women aged 45–49 years from households engaged in agriculture had, on average, larger numbers of live births (5.8 live births) compared to women from non-agricultural households (4.4 live births). Women from agricultural households that were mainly producing for sale had larger numbers of live births (6.0 live births), as compared to households where agriculture was practiced primarily for home consumption of produce (5.8 live births).

In summary, less-well educated, non-literate, Catholic, married women aged 45–49 years, who resided in rural areas, who were not classed as active in the labour force and who resided in households engaged in agriculture for commercial purposes tended, on average, to have had larger numbers of live births compared to other women in Timor-Leste. This pattern remained consistent despite decreasing mean numbers of children ever born between the 2010 and 2015 Censuses. Completed fertility decreased in seven Municipalities and remained constant (or slightly increased) in the other six Municipalities. The geographical pattern clearly shows the highest rates are concentrated in the western mountainous Municipalities.

3.5 Fertility rates by Municipality and Administrative Post

The back projection and Own Children methods are less suitable for estimation of fertility for smaller populations because of the need for the populations to be closed to migration and the standard P/F methods have the disadvantage that they depend on the current fertility function (births occurred during the 12 months preceding the census) which is known to have problems in the case of the 2015 Census. Therefore, the estimates presented here were based on two relatively simple procedures that rely exclusively on the average parity of women in different five-year age groups. The basis of the measures is the average parity of women aged 40–44 years in the 2015 Census. This indicator has two disadvantages:

1. It is relatively insensitive to recent changes in fertility as women aged 40–44 years had their children over a period of about 30 years and their peak fertility years were at least 15 years before the census; and
2. Older women have a tendency to omit children, especially children that died in their infancy, thereby under-stating the actual mean parity levels.

Normalised method

To adapt the method more to current fertility and partly address the first issue, the fertility estimates were normalized, adjusting them with a correction factor. For example, if the average parity of women aged 40–44 years in an Administrative Post was 5 per cent lower than at the national level, the TFR was assumed to be 5 per cent lower than the national level TFR. In the process, the aggregate TFR of the combined sub-national populations must be equal to that of the national level TFR (which was assumed to be 4.7 live births per

woman for the mid-point of the 2010 and 2015 inter-censal period as derived by the Own Children method). The results are presented in Table 23.

Synthetic method

Another approach is based on synthetic parity data from both the 2010 and 2015 Censuses. The method consists of the following steps:

1. Subtracting the mean parity of women aged (x-5, x) years in the 2010 Census from that of women aged (x, x+5) in the 2015 Census;
2. Accumulating the differences to the corresponding age groups to obtain a synthetic cohort;
3. Defining a preliminary estimate corresponding to the mean parity of the 40–44 year age group; and
4. Multiplying this estimate by an adjustment factor to make sure that the weighted average of all fertility estimates corresponds to the known national fertility level.

As for the normalized method, the year 2013 is the central year of the synthetic estimate and the target national level TFR is 4.7. This is the TFR derived using the Own Children method data for mid-point of the inter-censal period. Analytically, the synthetic approach produces consistent estimates with the actual national fertility level for the mid-point of the 2010 and 2015 inter-censal period as derived by the Own Children method.

Both methods do not work well for populations with less than one thousand women of reproductive age and therefore cannot reliably be utilized below the level of Administrative Post.

Table 23 demonstrates that there is a fair amount of variation between the two methods resulting in differences in estimated TFRs. The correlation coefficient between the two series is only 0.524. Although the synthetic cohort estimate in the first column is theoretically superior to the normalized estimate, at the level of small geographical units it can be affected by the following problems:

1. It is more sensitive to the effects of migration than the normalized estimate, particularly if migration levels are correlated with fertility (i.e. families with children moving more or less than families with no or few children);
2. It is more sensitive to age declaration problems; and
3. Because it depends on the 2010 as well as the 2015 Census data, it can be affected by errors in the data on children ever born in both.

An example of a synthetic fertility estimate that is clearly implausibe is that of Baguia Administrative Post in Baucau Municipality (0.62 live births per woman).

Despite the superiority of the synthetic method from a methodological point of view, it is known that in Timor-Leste, internal migration is a common event, which reduces the reliability of the synthetic parity method. Therefore, the normalized method estimates were adopted as the official estimates of TFR for the Municipalities and Administrative Posts.

In Table 23, the highest normalized TFRs were found in Aileu and Ainaro Municipalities (5.5 live births per woman) and the lowest TFR was found in Dili (3.9 live births per woman), followed by Oecusse (4.2 live births per woman). This constitutes a range of 1.6 live births per woman. At the level of the Administrative Post, the highest TFR was in Maubisse in Ainaro (6.0 live births per woman) followed by Illiomar in Lautem, Hatulia and Ermera and Remixio in Aileu (all 5.8 live births per woman). The lowest TFRs were not surprisingly found in Dili (Nain Feto: 3.5; Vera Cruz: 3.6; and Dom Aleixo: 3.7) and Covalima (Fatumean:

3.7). Only in Covalima, Dili and Oecusse were there any Administrative posts with a TFR below 4.0 live births per woman.

Figure 24 presents estimated TFRs by Municipality based on the normalised method. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Municipalities in each of the bands. Higher TFRs are demarked with darker shading. The highest TFRs were very clearly evident in the neighbouring mountainous Municipalities of Aileu, Ainaro and Ermera. Lautem was also classified in the highest TFR band. Central and western neighbouring Municipalities had intermediate TFRs, and Dili stood out with the lowest rate.

Figure 25 presents estimated TFRs by Administrative Post based on the normalised method. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Administrative Posts in each of the bands. Higher TFRs are demarked with darker shading. It is notable that adjacent to Dili, TFRs transitioned immediately, and in some cases to the highest band categories. This clearly illustrates the rural-urban dichotomy in TFRs (for example Dom Aleixo is in the lowest TFR band and Bazartete is in the second highest TFR band) and the association between mountain topography and higher rates (Laulara and Remixio are in the highest TFR band). There is variation in the high TFR Municipalities of Aileu, Ainaro and Ermera, which could be explained by differences in proximity to urban centres. A contiguous group of Administrative posts with lower TFRs is clearly visible across western Viqueque and eastern Manatuto. To the east, it can be observed that the high TFRs in Lautem were concentrated in the west in a band running from Lautem Administrative Post to Iliomar, and into eastern Viqueque. In Oecusse, the TFR increased from east to west and south.

The evidence displayed in these maps demonstrate that there were distinctive geographical patterns in TFRs, with an apparent association between mountainous topography and higher fertility rates. This information should be utilized in any interventions aimed at reducing fertility in Timor-Leste.

Table 23: Estimated TFRs calculated using the synthetic and normalized methods, Municipalities and Administrative Posts, 2013

MUNICIPALITY	Administrative Post	TFR (Synthetic Method)	TFR (Normalized Method)
AILEU		4.7	5.5
	Aileu Vila	4.8	5.5
	Laulara	3.2	5.6
	Lequidoe	4.6	4.9
	Remexio	5.6	5.8
AINARO		6.1	5.5
	Ainaro	5.0	5.4
	Hato-Udo	5.8	4.6
	Hato-Builico	6.3	5.7
	Maubisse	7.0	6.0
BAUCAU		3.8	4.7
	Baguia	0.6	4.7
	Baucau	4.6	4.8
	Laga	2.8	4.5
	Quelicai	4.4	4.7
	Vemasse	4.1	5.2
	Venilale	3.4	4.6
BOBONARO		4.8	4.7
	Atabae	3.7	5.1
	Balibo	5.0	4.4
	Bobonaro	4.9	4.8
	Cailaco	5.0	4.9
	Lolotoe	5.3	4.7
	Maliana	5.0	4.5
COVALIMA		5.3	4.7
	Fatululic	6.9	5.5
	Fatumean	3.2	3.7
	Fohorem	5.7	4.9
	Maucatar	4.6	5.0
	Suai	4.7	4.6
	Tilomar	4.8	4.2
	Zumalai	7.5	5.5
DILI		3.2	3.9
	Atauro	4.2	4.1
	Cristo Rei	3.6	4.4
	Dom Aleixo	3.0	3.7
	Metinaro	5.3	5.3
	Nain Feto	2.9	3.5
	Vera Cruz	3.4	3.6
ERMERA		4.6	5.4
	Atsabe	5.2	5.1
	Ermera	4.7	5.4
	Hatulia	4.8	5.8
	Letefoho	4.1	5.2
	Railaco	3.3	5.2
LAUTÉM		5.2	5.2
	Iliomar	5.8	5.8
	Lautém	4.9	5.2
	Lospalos	5.2	5.0
	Luro	4.3	5.3
	Tutuala	5.0	4.5
LIQUIÇA		4.4	5.1
	Bazartete	4.6	5.4
	Liquiça	4.2	5.2
	Maubara	4.2	4.6
MANATUTO		4.8	4.6
	Barique	3.8	4.1
	Laclo	5.2	5.2
	Laclubar	5.4	4.6
	Laleia	4.0	4.4
	Manatuto	4.7	4.5
	Soibada	6.6	4.9
MANUFAHI		4.8	4.9
	Alas	3.6	4.7
	Fatuberlio	4.7	5.1
	Same	5.2	4.7
	Turiscai	4.4	5.6
OECUSSE		3.7	4.2
	Nitibe	4.7	4.6
	Oesilo	3.9	4.5
	Pante Macassar	3.2	3.9
	Passabe	4.0	3.9
VIQUEQUE		5.0	4.6
	Lacluta	2.9	4.4
	Ossu	4.6	4.5
	Uato-Lari	5.6	4.8
	Uatucarbau	4.9	5.1
	Viqueque	5.3	4.3

Figure 24: TFR estimates calculated using the normalised method, Municipalities, 2015 Census

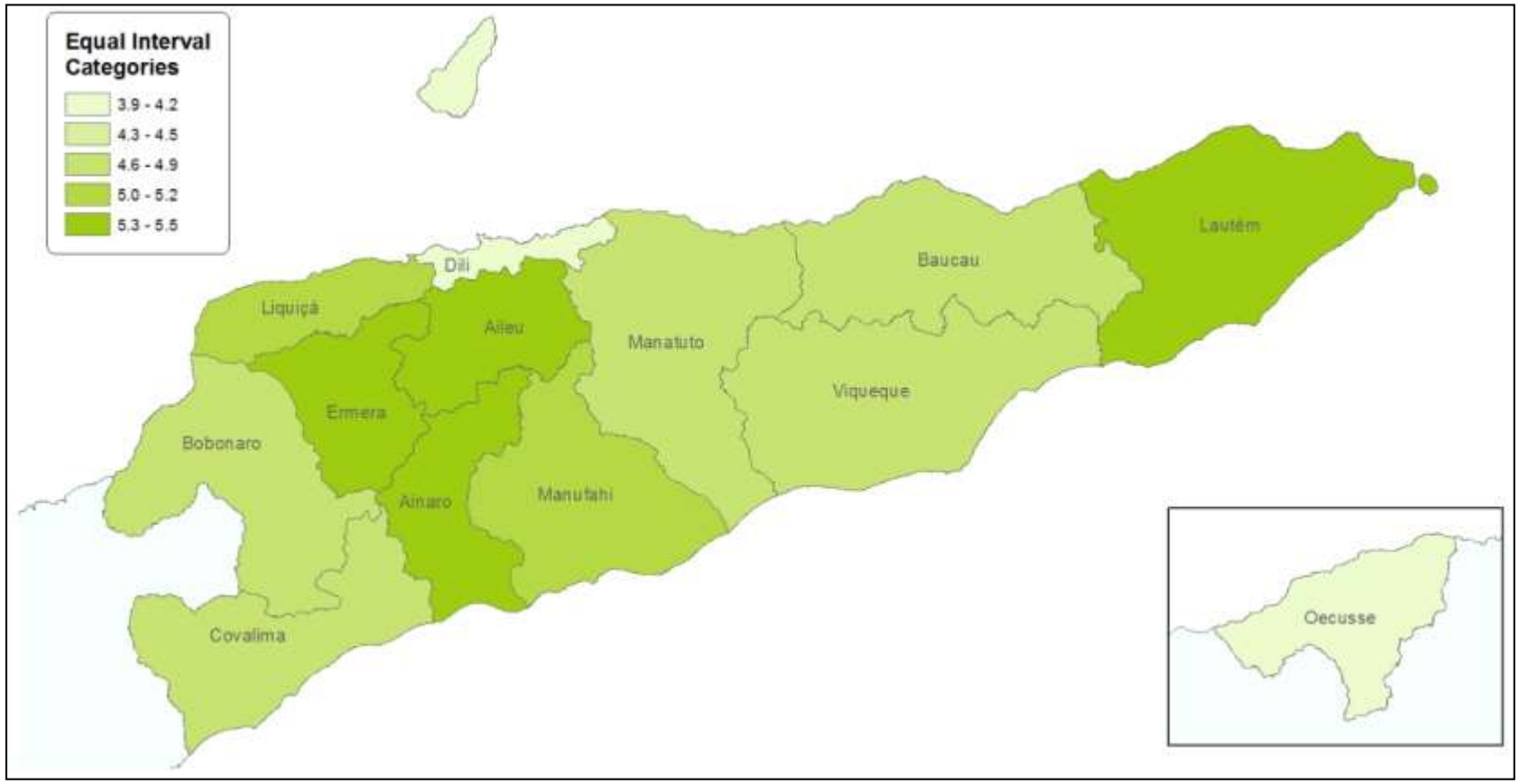
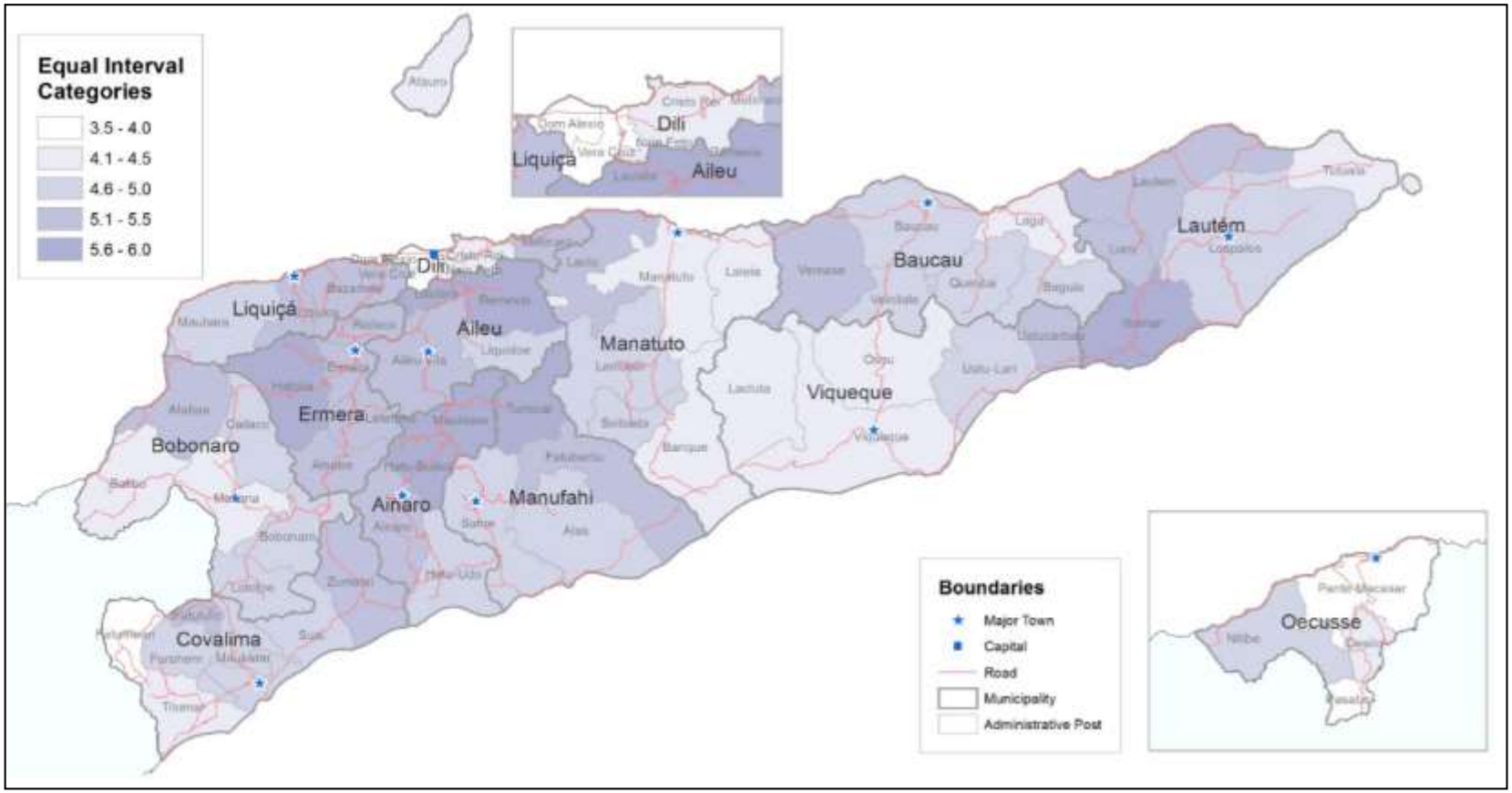


Figure 25: TFR estimates calculated using the normalised method, Administrative Post, 2015 Census



The normalized method was applied to the 2004 and 2010 Census Municipality data using Own Children method fertility estimates to undertake the adjustment on parity data for women aged 40–44 years. This facilitates direct comparison of fertility decline by Municipality across the period covered by the three censuses. Table 24 present the change in TFRs from the 2004 Census to the 2010 Census and the 2015 Census.

According to the normalized method for estimation of TFR, between 2004 and 2010, the largest decline was found in Ainaro (2.0 live births per woman), where TFR decreased from 8.3, the second highest value in Timor-Leste in 2004 to reach 6.4 for the 2010 Census. The second largest decrease was in Manufahi, where TFR fell by 1.8 live births per woman from 7.3 to 5.6. The smallest decrease was found in Viqueque (0.9), which also had the lowest TFR in 2004 (6.3). Dili had the second lowest TFR in 2004, and experienced a decline of 1.4 live births per woman between the 2004 and 2010 Censuses.

Between 2010 and 2015, the largest declines were in Aileu and Ermera (1.5 live births per woman). These two Municipalities had the highest (Aileu: 7.0) and second highest (Ermera: 6.9) TFRs in 2010. The smallest decrease was found in Manufahi (0.7), and Viqueque, Ainaro and Covalima also experienced a decline in TFR of less than one live birth per woman. It is notable that large declines from high TFRs between the 2004 and 2010 Censuses (Ainaro and Manatuto) were followed by lower rates of decline between 2010 and 2015.

Between 2004 and 2015, Aileu had the highest overall decline of 3.0 births per woman, and three Municiplaities experienced a decline of 2.8 live births per woman (Ainaro, Dili and Ermera). Aileu, Ainaro, and Ermera had the highest TFRs in 2004 and in 2015, whereas the TFR in Dili decreased from a lower level (6.7 in 2004) to reach the lowest level in Timor-Leste in 2015 (3.9).

Table 24: TFRs, Municipalities, 2004, 2010 and 2015 Censuses

Municipality	Total Fertility Rate			Decline in TFR (2004 to 2010)	Decline in TFR (2010 to 2015)	Decline in TFR (2004 to 2015)
	2004 Census	2010 Census	2015 Census			
Aileu	8.4	7.0	5.5	1.5	1.5	3.0
Ainaro	8.3	6.4	5.5	2.0	0.9	2.8
Baucau	6.9	5.8	4.7	1.1	1.1	2.2
Bobonaro	6.9	5.9	4.7	0.9	1.2	2.2
Covalima	7.0	5.6	4.7	1.4	0.9	2.3
Dili	6.7	5.3	3.9	1.4	1.4	2.8
Ermera	8.2	6.9	5.4	1.3	1.5	2.8
Lautem	7.7	6.4	5.2	1.3	1.3	2.6
Liquica	7.1	6.2	5.1	1.0	1.1	2.0
Manatuto	6.7	5.6	4.6	1.1	1.0	2.1
Manufahi	7.3	5.6	4.9	1.8	0.7	2.5
Oecusse	6.9	5.2	4.2	1.7	1.0	2.7
Viqueque	6.3	5.3	4.6	0.9	0.8	1.7
Timor-Leste	7.2	5.9	4.7	1.3	1.2	2.5

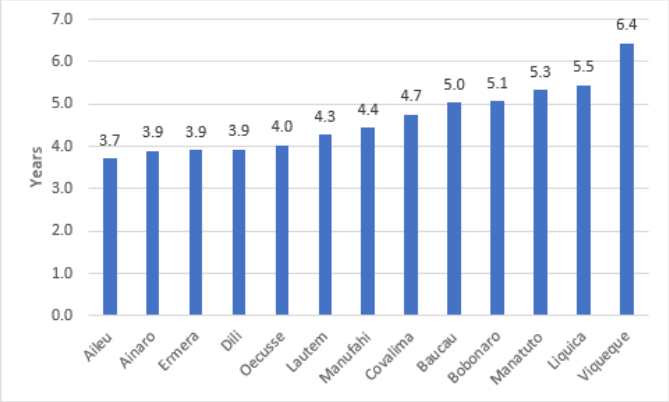
Table 25 is an assessment of the average number of years taken between the 2004 and 2015 Censuses for TFR to decline by one live birth per women for each Municipality. The mean number of years taken to reduce TFR by one birth per woman is 4.6 years, ranging from only 3.7 years in Aileu to 6.4 years for Viqueque. Figure 26 ranks the Municipalities into order from the least average number of years taken to the greatest average number of years taken between the 2004 and 2015 Censuses for TFR to decline by one live

birth per women. In four Municipalities (Aileu, Ainaro, Dili and Ermera), TFR dropped fastest, taking less than 4 years for TFR to decline by one live birth per women. In Oecusse, Lautem, Manufahi, Covalima and Baucau, it took between 4 and 5 years for TFR to decline by one live birth per women, in the Municipalities of Bobonaro, Manatuto and Liquicia it took between 5 and 6 years, and in Viqueque it took more than 6 years for TFR to decline by one live birth per women between the 2004 and 2015 Censuses.

Table 25

Municipality	Number of years
Aileu	3.7
Ainaro	3.9
Baucau	5.0
Bobonaro	5.1
Covalima	4.7
Dili	3.9
Ermera	3.9
Lautem	4.3
Liquica	5.5
Manatuto	5.3
Manufahi	4.4
Oecusse	4.0
Viqueque	6.4

Figure 26



3.6 Fertility by Socio-Economic Groups

For the most part, the sub-populations analyzed in this section are larger than in section 3.5, and as the synthetic parity methodology is considered to be superior to the normalized parity approach, the estimates presented here, were based on the synthetic cohort estimation method introduced in the previous section.

The estimates in Table 26 show the disaggregation of fertility by level of educational attainment. By and large, the differences are as one would expect, with a general pattern of decline in fertility as the level of education increases. One anomaly is the relatively low fertility of those who never attended school. It may be that this category contains a lot of women who never formed families, including women with some type of disability. With the exception of women that attained university level education, the TFRs in rural contexts were in every case higher than the corresponding values for urban contexts.

Table 26: Estimates of TFR based on synthetic parity data by educational attainment, rural and urban locations, 2013

Educational Attainment	Total Fertility Rates		
	Total	Urban	Rural
Pre-Primary	6.2	4.5	5.7
Primary	5.0	4.2	5.3
Pre-Secondary	5.1	4.3	5.5
Secondary	4.6	4.1	5.1
Polytechnic / Diploma	4.7	4.3	4.9
University	3.3	3.2	3.2
Non-Formal	5.6	2.6	6.2
Never Attended School	4.6	2.7	5.1
Timor-Leste	4.7	3.8	5.2

Table 27 disaggregates fertility by religion. Catholic women had the highest TFR, of 4.7 live births per woman, followed by Protestant women (4.5). Islamic women had a relatively low TFR of only 3.7. The estimates of urban and rural women should be treated with some caution due to the small numbers of women involved – for example, it would be expected that Protestant women's TFRs in urban and rural areas would be uniformly higher than the TFRs of Muslim women, but the rural TFR for Protestant women is less than the rural TFR for Muslim women.

Populations affiliated to the Buddhist, Hindu, Traditional and Other religions were so small, especially in urban areas, that TFRs were not estimated.

Table 27: Estimates of TFR based on synthetic parity data by religion, rural and urban locations, 2013

Religion	Total Fertility Rates		
	Total	Urban	Rural
Catholic	4.7	3.8	5.2
Protestant	4.5	5.5	4.1
Islam	3.7	2.9	4.2
Timor-Leste	4.7	3.8	5.2

Since TFRs cannot be reliably estimated for the Buddhist, Hindu, Traditional and Other faiths because there were too few cases, the average parity of women aged 45–49 years was calculated and is presented in Table 28.

Table 28: Average parities of women aged 45–49 by religion, rural and urban locations

Religion	Average Parity for the 45-49 Year Age Group		
	Total	Urban	Rural
Buddhist	2.6	1.7	6.7
Hindu	2.9	1.5	5.7
Traditional	6.2	-	6.5
Other	3.8	2.0	5.3
All Religions [1]	5.7	5.0	5.9

[1] Including Catholic, Protestant and Islam.

Fertility differences by marital status are presented in Table 29. As expected, married women had the highest TFR (6.2 live birth per woman). However, it is surprising that the TFR for never married women (2.6 live births per woman) is higher than that for divorced women (2.2). An explanation lies in the fact that numbers of divorced women were very low in the 2015 Census and therefore, the quality of the estimated TFR should be treated with caution. Other unexpected results include a very high TFR for urban widows (7.5 live births per woman). As for divorcees, an explanation is that small groups have output unstable estimates. As the category 'living together' did not exist in the 2010 Census, it was not possible to compute a Synthetic Parity estimate, however, the average parity of women aged 45–49 years in 2015 'living together' is only 2.6, as compared to the substantially higher average parity of 6.2 for married women (see Table 21).

Table 29: Estimates of TFR by marital status, rural and urban locations, 2013

Marital Status	Total Fertility Rates		
	Total	Urban	Rural
Never Married	2.6	1.8	3.1
Married	6.2	5.7	6.5
Widowed	5.3	7.5	4.9
Divorced	2.2	2.1	2.5
Separated	3.0	2.1	3.4
Timor-Leste	4.7	3.8	5.2

Table 30 displays a clear positive association between economic activity and TFR, such that employed women had a TFR of 6.3 live births per woman, whereas unemployed women had a TFR of 4.2 live births per woman and women who were not in the labour force (inactive) had a TFR of only 3.5. A similar pattern can be observed in both urban and rural locations. These values are not consistent with completed fertility values for women aged 45–49 years, where inactive women had the highest fertility and unemployed women had the lowest fertility. One explanation for the difference is that the age group utilized to estimate TFR was synthesized froom two censuses, whereas completed fertility was reported for an older age group in both censuses (45–49 years). Never-the-less comparisons of TFR and completed fertility data should be made with caution.

Table 30: Estimates of TFR by economic activity status rural and urban locations, 2013

Economic Activity Status	Total Fertility Rates		
	Total	Urban	Rural
Employed	6.3	5.4	6.4
Unemployed	4.2	3.5	5.4
Inactive	3.5	3.0	4.0
Timor-Leste	4.7	3.8	5.2

In summary, the TFR was higher among married Catholic women who were less-well educated and engaged in waged employment as compared to other women in Timor-Leste. These patterns were generally consistent across urban and rural Timor-Leste.

3.7 Access to safe delivery

In the 2015 Census, new questions were added on the following topics:

- Facility of delivery: hospital; Government community health centre; Government health post; private clinic; own/family house; traditional birth attendant's house; other
- Time taken to reach health facility: < 1 hour; 1–2 hours; > 2 hours
- Mode of travel: car/bus/taxi; ambulance; motorcycle; horse; on foot; other
- Assistance during delivery: doctor; nurse; midwife/skilled birth attendant; traditional birth attendant; relatives; no assistance; other

This sub-section analyses the data collected on these questions.

Facility of delivery

For analysis, facility of delivery data were grouped as follows:

a. Health facility delivery: hospital; Government community health centre; Government health post; private clinic

b. Home delivery: own/family house; traditional birth attendant's house

In Figure 27, the data on facility of delivery for last live births are analysed on an annual basis. Home deliveries decreased from 63.7 per cent on 2010–2011 to 56.7 per cent in 2014–2015, whilst at the same time, health facility deliveries increased from 36.3 per cent to 43.3 per cent. Little change is observable between 2011–2012 and 2014–2015. In the remainder of the analysis the data are grouped into a five-year period (2010–2015).

Figure 27: Facility of delivery for last live births, Timor-Leste, 2015 Census

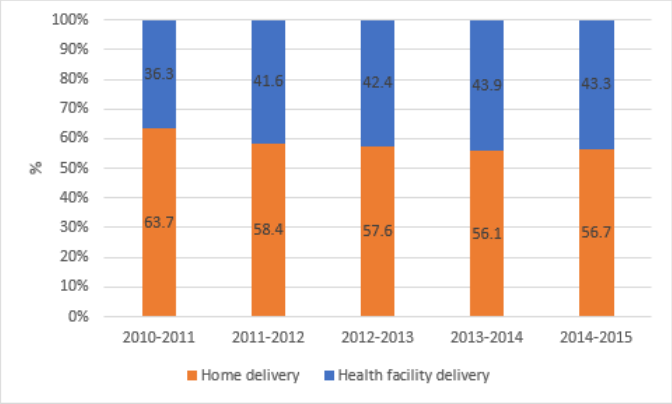


Figure 28 presents data on facility of delivery for last live births by Municipality for the period 2010–2015. The proportion of births that took place in a health facility was 42.5 per cent across Timor-Leste, with 57.5 per cent of births occurring at home.

Compared to the 2015 Census, the 2016 TLDHS yielded a higher percentage for births during the five years preceding the survey that were reported to have taken place in a health facility (48.5 per cent, as compared to 42.5 from the 2015 Census) (RDTL MoF, 2017). An explanation for the higher percentage in the DHS is that the births history data was collected directly from female respondents, and the depth of information gathered is likely to be of better quality than for the census, where the respondent was usually the head of household or any responsible adult available at the time of enumeration. These individuals would not always be able recall accurately which type of health facility was utilized for last live births by all eligible women in the household.

Across the country, Figure 28 illustrates that the percentage of births recorded in the 2015 Census as having taken place in a medical facility varies widely, from 77.5 per cent in Dili to only 15.1 per cent in Ermera, followed by only 15.7 per cent in Oecusse and 20.6 per cent in Ainaro. With the exception of Dili, only in Aileu, Baucau and Covalima were more than 40 per cent of last live births reported in the Census as having taken place in a health facility. In 9 Municipalities (Ainaro, Bobonaro, Ermera, Lautem, Liquicia, Manatuto, Manufahi, Oecusse and Viqueque), the proportion of last births recorded in the 2015 Census as having taken place in a medical facility between 2010 and 2015 was below the national average of 42.5 per cent.

Figure 28: Facility of delivery for last live births, 2010–2015, Municipalities, 2015 Census

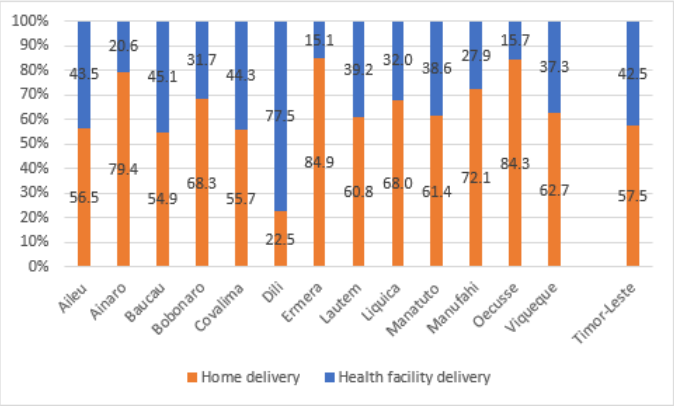


Figure 29 maps the data on the percentage of last live births that took place in a health facility for the Municipalities. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Municipalities in each of the bands. Higher percentages are demarked with darker shading. Ainaro and Ermera clearly stand out (as does Oecusse) as having very low percentages of last live births in health facilities. In Dili, followed by Baucau and Covalima, access to such services is evidently better.

Figure 30 presents data from the 2015 Census on facility of delivery for last live births by Administrative Post for the period 2010–2015. The percentage of births that took place in a medical facility varies widely, from 82.5 per cent in Dom Aleixo, Dili, to only 5.3 per cent in Nitibe, and 5.5 per cent in Passabe, both in Oecusse. The top four Administrative Posts for facility based deliveries are in Dili (Dom Aleixo, Vera Cruz, Nain Feto and Cristo Rei). Administrative posts where less than 10 per cent of deliveries were facility based are in Oecusse (Nitibe and Passabe), Maufahi (Turuscai), Ainaro (Hatu-Builico), Ermera (Hatolia), and Bobonaro (Atsabe and Lolotoe). In a total of 45 out of 65 Administrative Posts (69 percent), the proportion of last births that took place in a health facility between 2010 and 2015 was below the national average of 42.5 per cent.

Figure 31 maps the data on the percentage of last live births that took place in a health facility for the Administrative Posts. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Administrative Posts in each of the bands. Higher percentages are demarked with darker shading. There was evidently less access to medical facilities in a linear group of Administrative Posts that stretches from northern Covalima (Fatulilic), through the high mountains to Hatolia in Ermera and to Turiscai in Manufahi and Laclo in Manatuto. Baguia in Viqueque and Luro in Lautem are neighbouring Administrative Posts which also appear to have had poorer access. In Oecusse, the percentages of last births in health facilities clearly decreased from north-east to south and west. Generally speaking higher percentages were evident in less remote areas with easier access to higher-order health facilities in the Municipality capitals and Dili.

The maps reveal distinctive patterns and the information in these maps should be utilized in targeting the specific areas where utilization of health facilities is lowest.

Figure 29: Health facility delivery for last live births, 2010–2015, Municipalities, 2015 Census

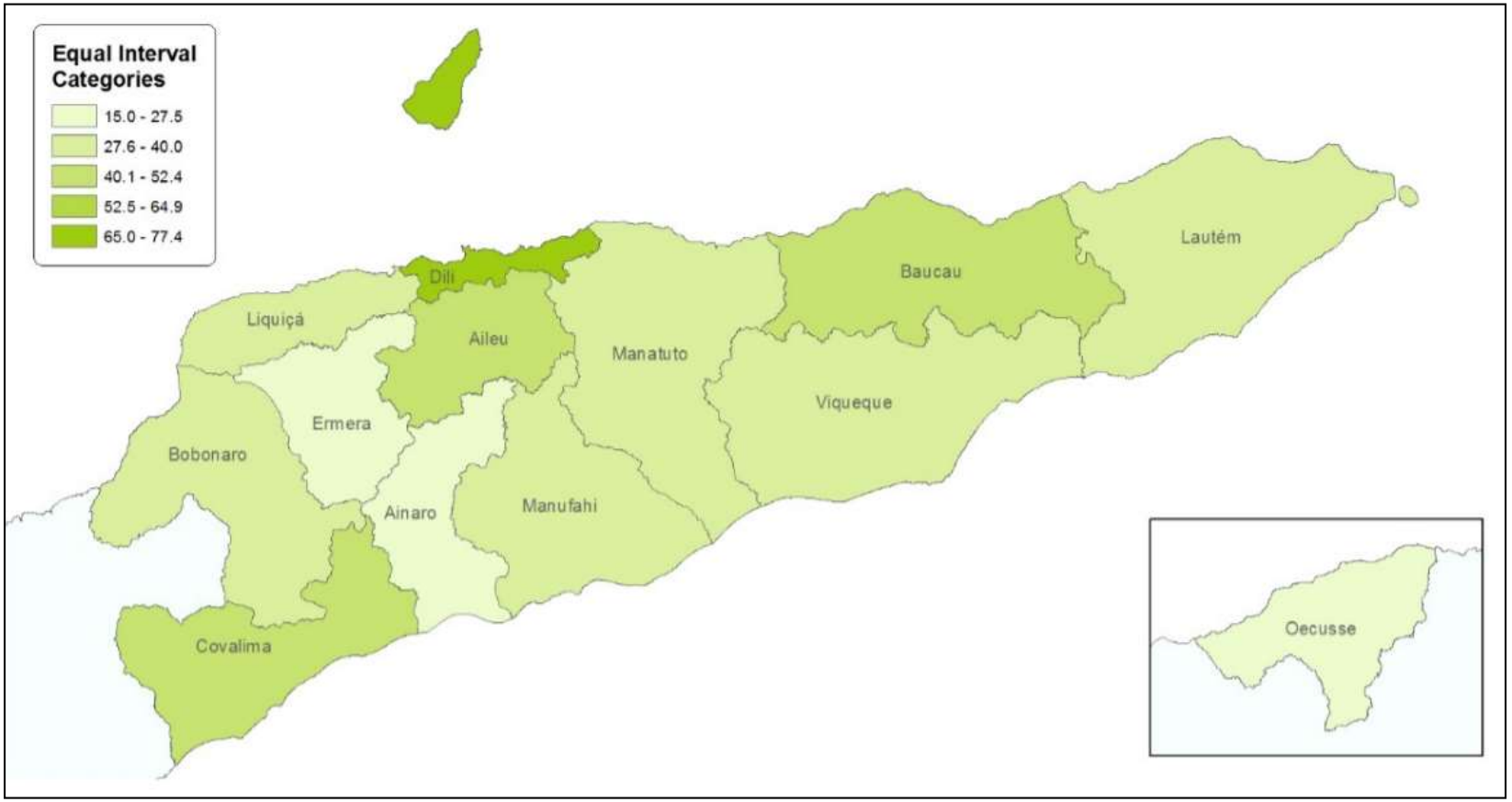


Figure 30: Facility of delivery for last live births, 2010–2015, Administrative Posts, 2015 Census

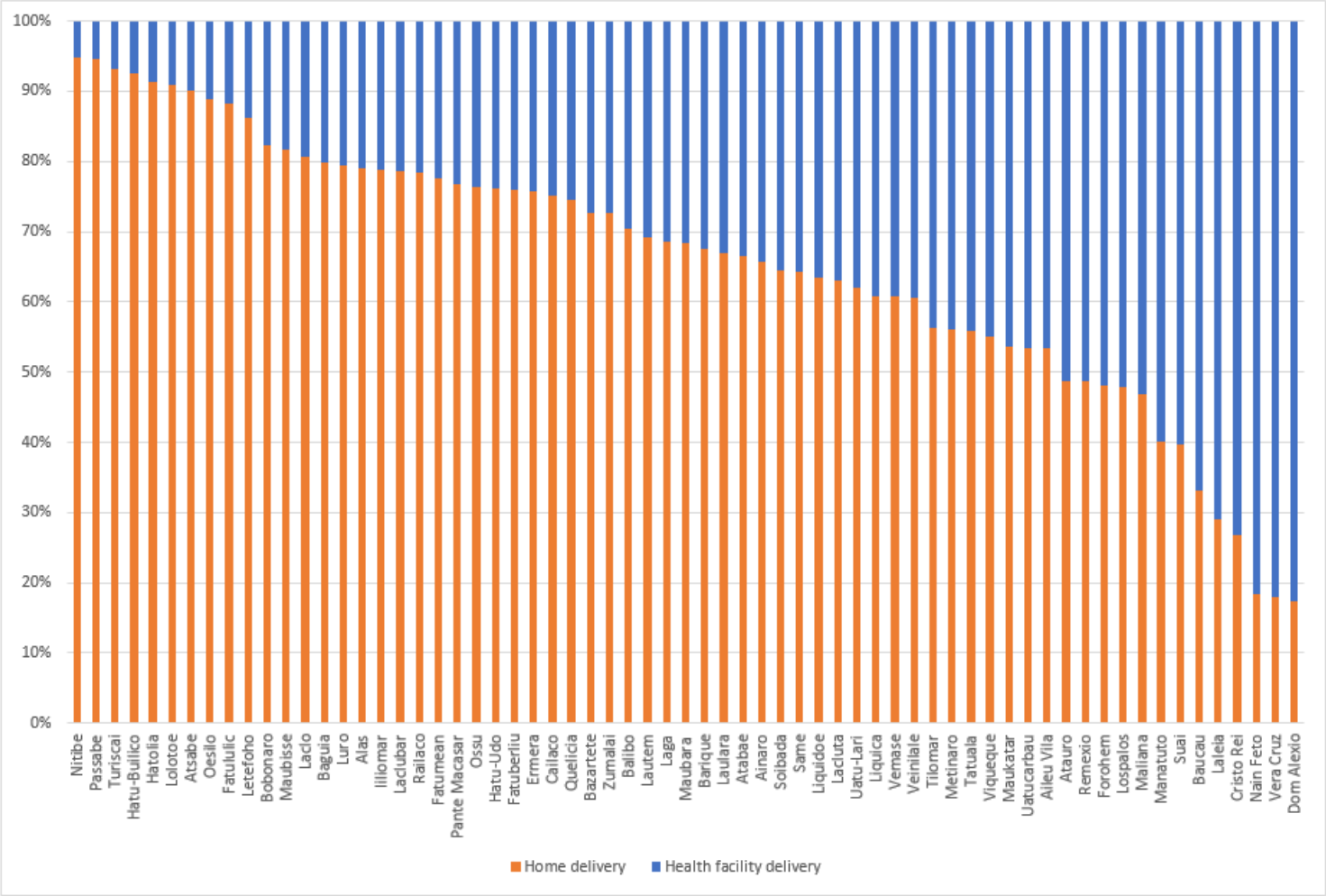


Figure 31: Health facility delivery for last live births, 2010–2015, Administrative Posts, 2015 Census

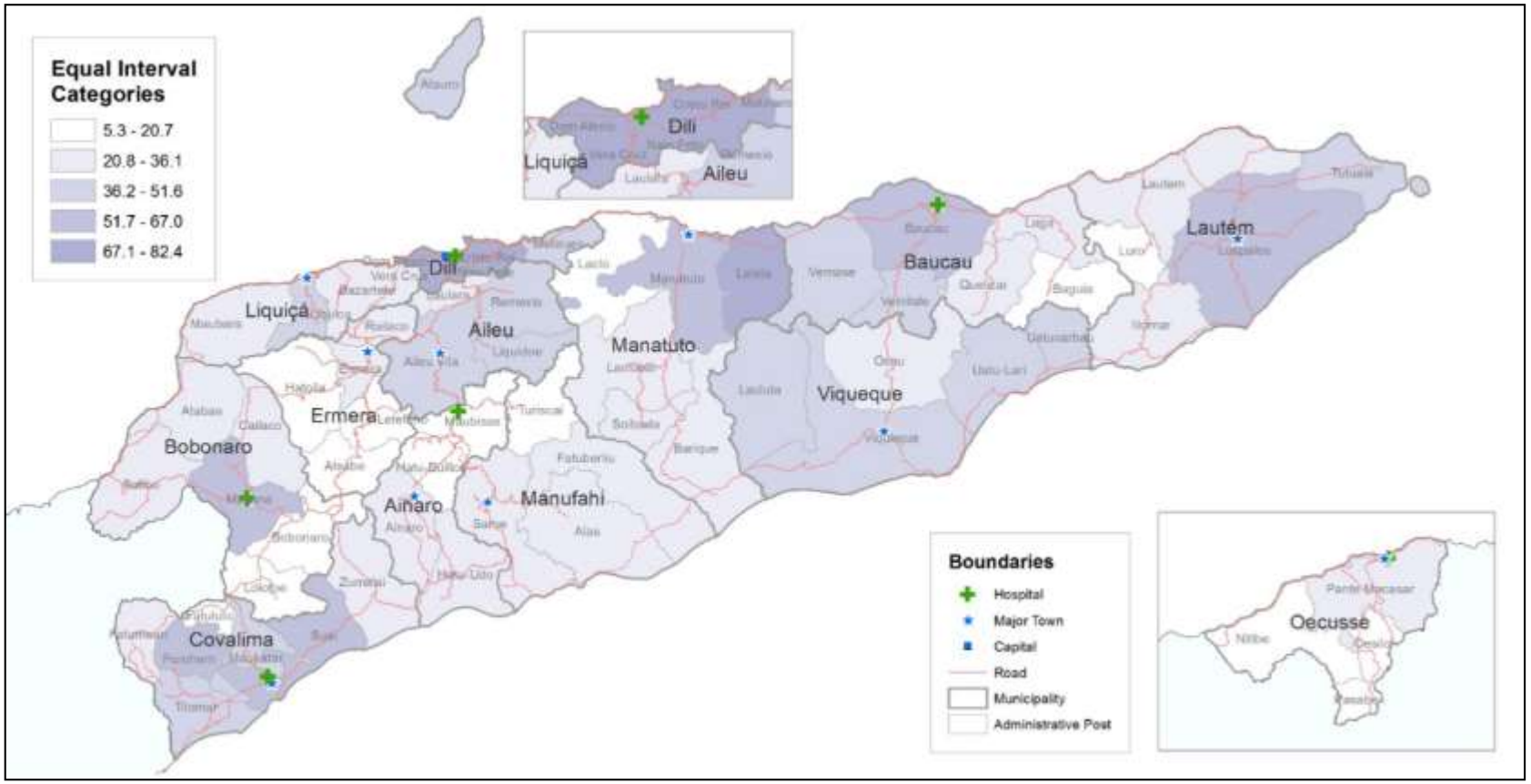
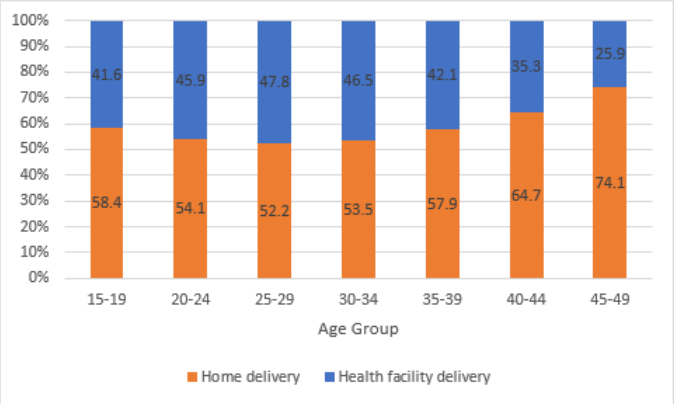


Figure 32 illustrates that the reported percentage of health facility delivery was highest for women aged 25–29 years and lowest for women aged 45–49 years. Health facility deliveries were utilized by 41.6 per cent of adolescent women. The general pattern is an increase in utilization of health care deliveries from adolescence into the peak child bearing years, followed by a sharper decline in utilization of health facilities for delivery as age rises, compared to the increase in uptake for young women. An explanation for this sharper decline could be that older women did not have access to health facility deliveries for earlier births and had less propensity to seek a health facility delivery than younger women, even though such facilities were more readily available than in the past.

Figure 32: Facility of delivery for last live births by age-group of women, 2010–2015, 2015 Census



The 2016 TLDHS found that 42.3 per cent of women aged less than 20 years had utilized a health facility for delivery during the five years before the survey (RDTL MoF, 2017). This figure is reassuringly close to the 2015 Census figure (41.6 per cent). For women aged between 20 and 34 years, the DHS figure of 50.5 per cent is slightly higher than the figure from the 2015 Census (47.0 per cent). For women aged between 35 and 49 years, the DHS figure of 41.9 per cent is somewhat higher than the figure from the 2015 Census (36.5 per cent). An explanation for this may be that in the 2015 Census, women of older ages may have had their last child further back in the five-year period of assessment, reducing the quality of the respondent's recall (bearing in mind that the respondent may have been another household member). In the DHS, woman were the respondents, and therefore their recall is likely to be better.

Facility of delivery data and survival status data were used to derive infant mortality rates for facility based deliveries and for home-based deliveries (using births in facilities and at home as denominators, respectively). There was very little difference found between health facility deliveries (26 deaths per thousand live births) as compared to home deliveries (28 deaths per thousand live births).

Assistance during delivery

For analysis, assistance during delivery data were grouped as follows:

a. Doctor; nurse; midwife/skilled birth attendant

b. Traditional birth attendant; relatives; no assistance

In Figure 33, the data on assistance during delivery for last live births are analysed on an annual basis. Deliveries that took place with the assistance of traditional birth attendants (TBAs), family members or without any assistance decreased from 60.7 per cent on 2010–2011 to 53.1 per cent in 2014–2015, whilst at the same time, deliveries that took place with the assistance of skilled birth attendance increased from 39.3 per cent to 46.9 per cent. The percentage of deliveries that took place with the assistance of skilled birth attendance increased year on year between 2010–2011 and 2013–2014. In the remainder of the analysis the data are grouped into a five-year period (2010–2015).

Figure 33: Assistance during delivery for last live births, Timor-Leste, 2015 Census

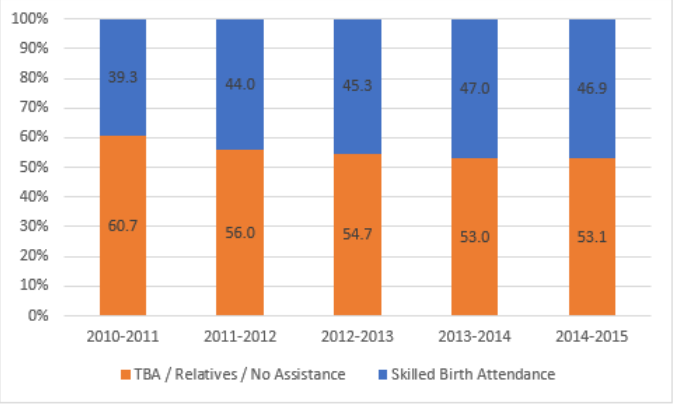


Figure 34 presents data on assistance during delivery for last live births by Municipality for the period 2010–2015. The proportion of deliveries that took place with the assistance of skilled birth attendance was 45.6 per cent across Timor-Leste, with 54.4 per cent of deliveries reported as having the assistance of traditional birth attendants (TBAs), family members or no assistance.

Compared to the 2015 Census, the 2016 TLDHS yielded a higher percentage for births during the five years preceding the survey that were reported to have taken place with the assistance of a skilled birth attendant (56.7 per cent, as compared to 45.6 from the 2015 Census) (RDTL MoF, 2017). An explanation for the higher percentage in the DHS is that the births history data was collected directly from female respondents, and the depth of information gathered was likely to be of better quality than for the census, where the respondent was usually the head of household or any responsible adult available at the time of enumeration. These individuals would not always be able recall accurately which type of assistance was utilized by all eligible women in the household for last live births.

Across the country, Figure 34 illustrates that the proportion of deliveries reported in the 2015 Census as having taken place with the assistance of a skilled birth attendant varies widely, from 76.1 per cent in Dili to only 18.2 per cent in Ermera, followed by 18.9 per cent in Oecusse and 24.1 per cent in Ainaro. With the exception of Dili, only Manatuto had more than half of last live births reported in the census as having taken place with the assistance of a skilled birth attendant between 2010 and 2015. In 8 Municipalities (Ainaro, Bobonaro, Ermera, Lautem, Liquicia, Manufahi, Oecusse and Viqueque), the proportion of last births between 2010 and 2015 delivered by a skilled birth attendant was below the national average of 45.6 per cent.

Figure 34: Assistance during delivery for last live births, 2010–2015, Municipalities, 2015 Census

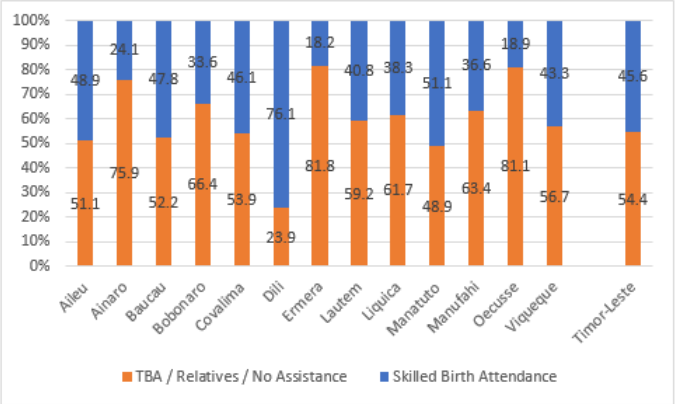


Figure 35 maps the data on skilled birth attendance during delivery for last live births for the Municipalities. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Municipalities in each of the bands. Higher percentages are demarked with darker shading. Ainaro and Ermera clearly stood out as having very low percentages for skilled birth attendance during delivery for last live births. Except for Covalima, percentages were generally lower in the west, than across the central Municipalities and Dili stood out as highest.

Figure 36 presents data from the 2015 Census on assistance during delivery for last live births by Administrative Post for the period 2010–2015. The percentage of births reported to have taken place with the assistance of a skilled birth attendant varied widely, from 80.5 per cent in Dom Aleixo, Dili, to only 5.6 per cent in Passabe and 8.4 per cent in Nitibe, both in Oecusse. The top three Administrative Posts for skilled birth attendance at deliveries were in Dili (Dom Aleixo, Vera Cruz and Nain Feto) with Cristo Rei, Dili in sixth position. Administrative Posts where less than one quarter of all deliveries were reported to have had skilled birth attendance were in Oecusse (Oesilo, Nitibe and Passabe), Ermera (Atsabe, Letefoho and Hatolia), Covalima (Fatulilic, Fatumean and Zumalai), Ainaro (Hatu-Builico and Maubisse), Manufahi (Turuscai), Lautem (Luro) and in Bobonaro (Lolote and Bobonaro Administrative Post). In a total of 42 out of 65 Administrative Posts (65 percent), the proportion of last births between 2010 and 2015 delivered by a skilled birth attendant was below the national average of 45.6 per cent.

Figure 37 maps the data on skilled birth attendance during delivery for last live births for the Administrative Posts. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Administrative Posts in each of the bands. Higher percentages are demarked with darker shading. In the west, there was evidently least skilled birth attendance in the mountainous Administrative Posts between Hatolia in Ermera and Turiscai in Manufahi. The general pattern across the country was of higher percentages of utilization in the Administrative Posts with greater proximity to higher-order health facilities in the Municipality capitals and Dili. Thus, the pattern was in general similar to Figure 31 (for last births in health facilities), but not as clear-cut. This is because home-based skilled birth attendance was taking place, but the geographical span was not reaching far enough into remoter areas, particularly in the mountains of the west, north-eastern Viqueque, eastern Baucau, western Lautem and in the western part of Oecusse.

Figure 35: Skilled birth attendance for last live births, 2010–2015, Municipalities, 2015 Census

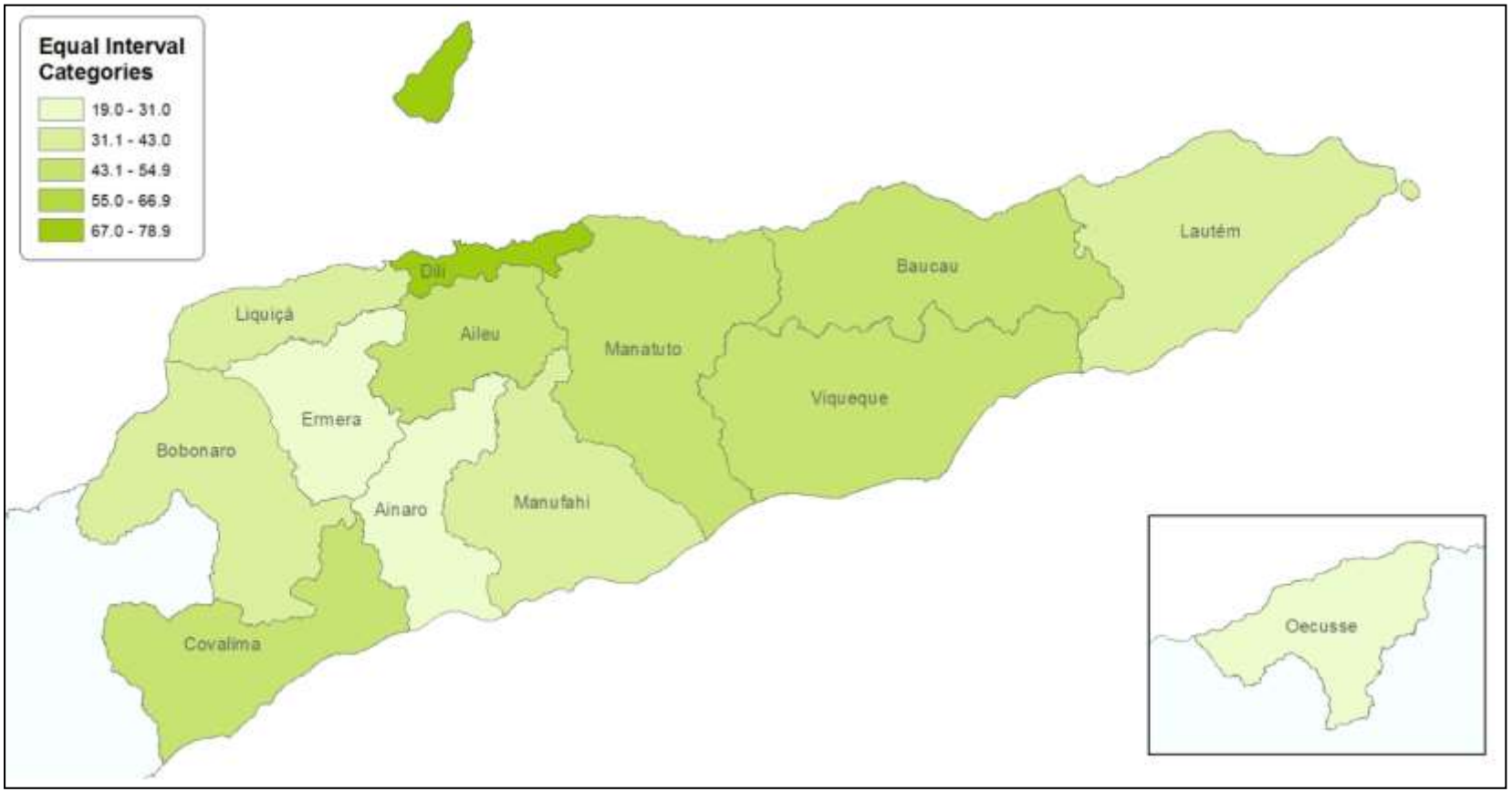


Figure 36: Assistance during delivery for last live births, 2010–2015, Administrative Posts, 2015 Census

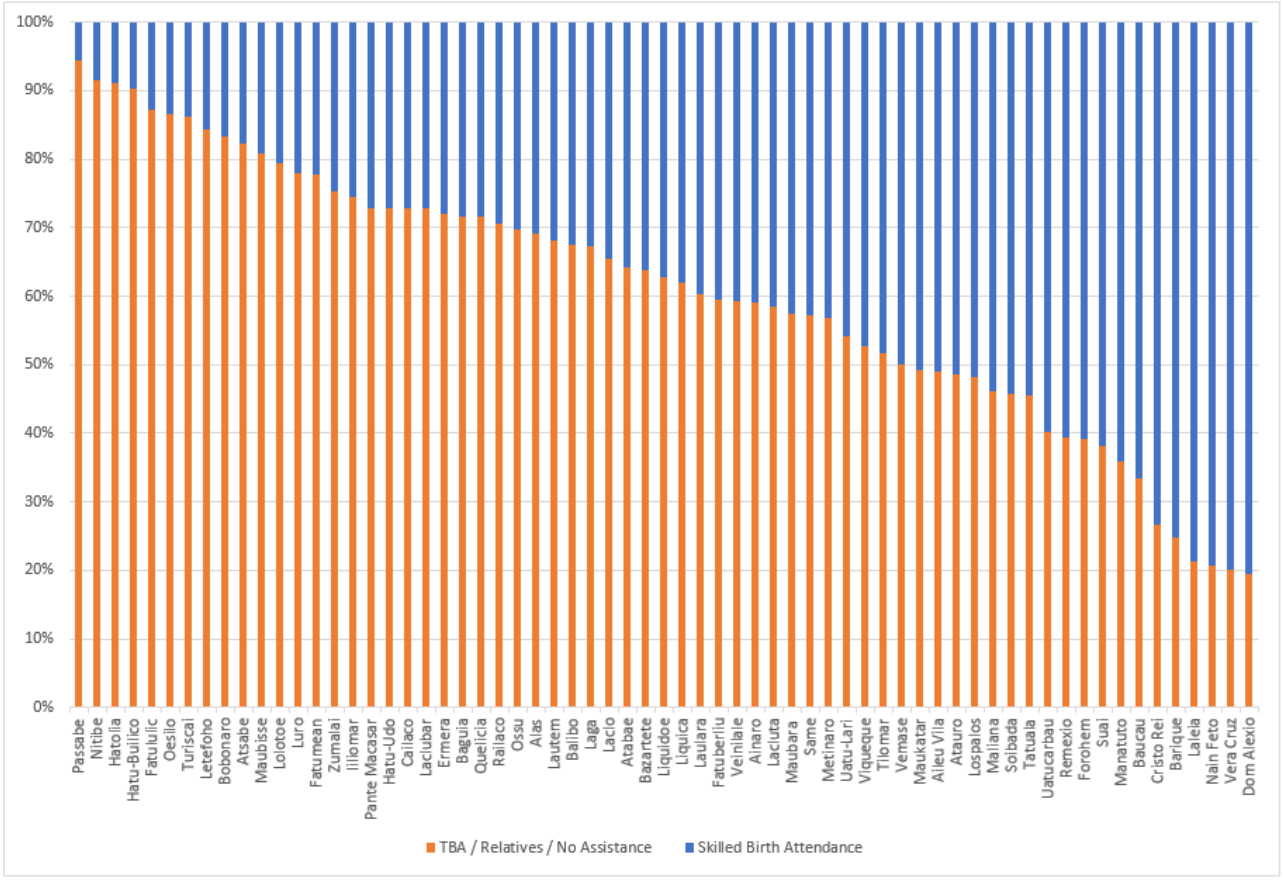


Figure 37: Skilled birth attendance for last live births, 2010–2015, Administrative Posts, 2015 Census

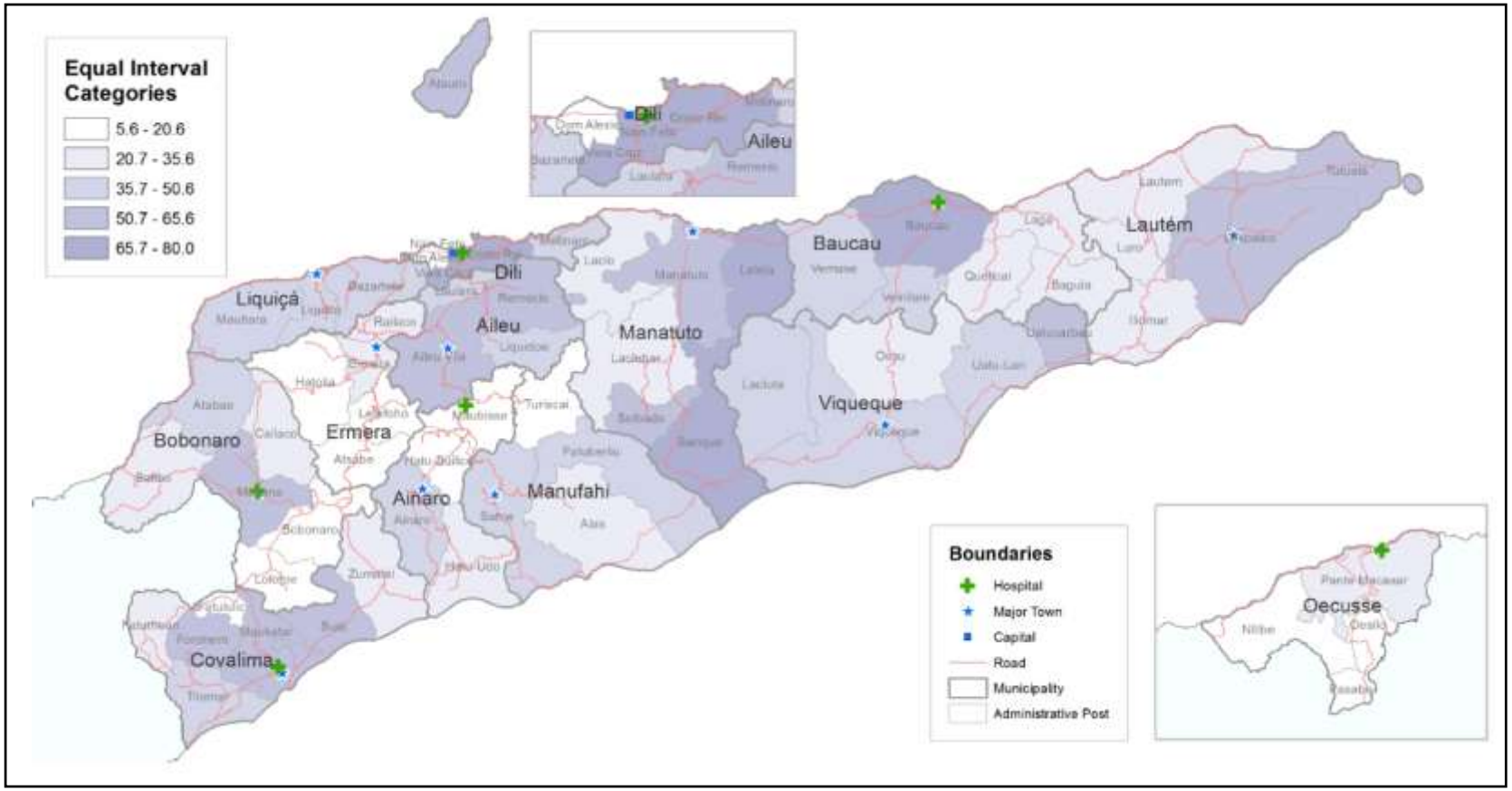
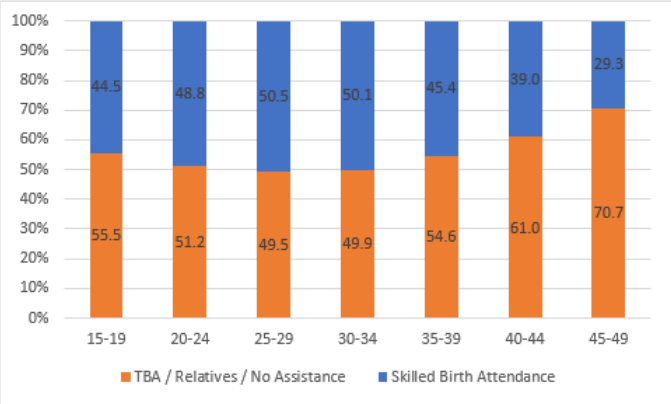


Figure 38 illustrates that according to the 2015 Census, between 2010 and 2015, the reported percentage of last live births delivered with skilled birth attendance was highest for women aged 25–29 years (50.5 per cent) and lowest for women aged 45–49 years (29.3 per cent). Skilled birth attendance was provided to 44.5 per cent of adolescent women for their last live birth. The general pattern was of a slight increase in utilization of skilled birth attendance during deliveries from adolescence to age 24, followed by a plateau from ages 25 to 34 and a steady decline for women aged between 35 and 49 years. An explanation for this sharper decline could be that older women did not have access to skilled birth attendance for their earlier child births and had less propensity to seek these services than younger women, even though the service was more readily available than in the past.

Figure 38: Assistance during delivery for last live births by age-group of women, 2010–2015, 2015 Census



The 2016 TLDHS found that 53.8 per cent of women aged less than 20 years had received skilled birth attendance for delivery during the five years before the survey (RDTL MoF, 2017). This figure was over 9 per cent higher than the 2015 Census figure (44.5 per cent). For women aged between 20 and 34 years, the DHS figure of 58.3 per cent was just over 8 per cent higher than the figure from the 2015 Census (50.0 per cent). For women aged between 35 and 49 years, the DHS figure of 50.7 per cent was almost 11 per cent higher than the figure from the 2015 Census (40.0 per cent). The DHS figures for skilled birth attendance were therefore uniformly higher than the 2015 Census figures irrespective of age, and the difference was greater than for data on facility of delivery. An explanation for this may be that 2015 Census respondents had less accurate recall of the form of assistance that female household members received for their last live births than for the location where the birth took place.

Assistance for delivery data and survival status data were used to derive infant mortality rates for skilled birth attendance deliveries and for deliveries assisted by TBAs, relatives or cases where no assistance was given (using data on the type of assistance given as denominators). In the five-year period 2010 to 2015, there was a higher infant death rate for deliveries assisted by TBAs, relatives or cases where no assistance was given (30 deaths per thousand live births) as compared to deliveries with skilled birth attendance (25 deaths per thousand live births).

Adjusted Administrative Post level data on the percentages of live births with a health facility delivery and with delivery by a skilled birth provider

As stated earlier, the 2016 TLDHS data on the reported percentages of health facility deliveries and deliveries attended by a skilled birth provider are considered to be of a higher quality than the 2015 Census data, because in the DHS, women were the respondents on their own birth histories. However, the DHS did not provide any data on the reported percentages of health facility deliveries and deliveries attended by skilled birth providers below the level of the Municipality. Since Administrative Post level data for these variables is useful for planning purposes, it was considered prudent to adjust the 2015 Census Administrative Post level data for these variables.

The method involved two steps, which were conducted separately for data on percentages of health facility deliveries and deliveries assisted by a skilled birth attendant:

1. calculate the percentage difference between each Administrative Post's 2015 Census data with the 2015 Census data for each respective Municipality; and
2. apply the respective percentage difference obtained for each Administrative Post to the 2016 TLDHS Municipality data to obtain an adjusted estimate for each Administrative Post.

The estimates for Administrative Posts based on the 2016 TLDHS Municipality data are for the period 2011–2016 (centred upon the year 2014). The 2016 TLDHS Timor-Leste and Municipality data are presented for comparison. An additional adjustment of -1.8 per cent was made to all the skilled birth attendance data. Due to the methods used, all data are presented as whole numbers only. These data can be found in the statistical annex (Table A.7), which is available on the General Directorate of Statistics website at: http://www.statistics.gov.tl/category/publications/census-publications/

Mode of travel

In the 2015 Census, respondents were asked about the mode of travel women in their household utilized to reach a facility for delivery of their last live birth. For analysis, data were grouped as follows:

a. mechanized - car/bus/taxi; ambulance; motorcycle

b. non mechanized - horse; on foot

Between 2010 and 2015, there was no change found in use of mechanized versus non-mechanized modes of travel to reach the facility of delivery. On average 83.6 per cent of respondents reported that a mechanized mode of travel was utilized and 16.4 per cent responded that women either walked or travelled on horseback to reach the facility of delivery for their last live birth (Figure 39). There was variation across the Municipalities, ranging from only 6.8 per cent of women traveling by horse or on foot in Dili, to 36.3 per cent in Ainaro and 35.4 per cent in Aileu either travelling by horse or on foot. In a further five Municipalities (Bobonaro, Ermera, Lautem, Manatuto and Viqueque) between two and three out of ten women were reported to have either walked or travelled by horse to deliver their last live birth.

Figure 39: Mode of travel to facility for delivery of last live births, 2010–2015, Municipalities, 2015 Census

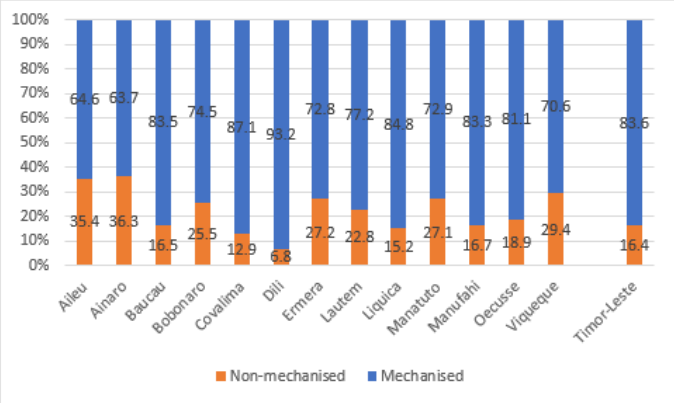


Figure 40 maps the percentage of women who either walked or travelled by horse to a medical facility for the delivery of their last live birth for the Municipalities. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Municipalities in each of the bands. Higher percentages are demarked with darker shading. Aileu and Ainaro stood out as having higher percentages of women travelling on foot or on horseback to deliver their child. The percentages were lowest in Dili. More detail is required to understand the pattern.

Figure 41 presents data from the 2015 Census on mode of travel to a facility for the delivery of last live births by Administrative Post for the period 2010–2015. The percentage of women who either walked or travelled by horse (non-mechanised travel) to deliver their last live birth varied from 67.6 per cent in Liquidoe, Aileu, to 2.4 per cent in Maukatar, Covalima (and all women were reported to have used mechanized transportation in Fatulilic, Covalima). More than half of all women were reported to have either walked or travelled by horse to deliver their last live birth in Liquidoe and Laulara in Alieu, Laleia in Manatuto, and Maubisse in Ainaro. In 45 out of 65 (predominately rural) Administrative Posts between 2010 and 2015, the proportion of women who either walked or travelled by horse to deliver their last birth was above the national average of 16.4 per cent.

Figure 42 maps the data on the percentage of women who either walked or travelled by horse to deliver their last birth for the Administrative Posts. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Administrative Posts in each of the bands. Generally speaking, higher percentages were found in the mountainous west and between eastern Manatuto and southern Lautem. The highest percentages were found in Administrative Posts that lie on the peripheries of Municipalities. This could be explained by limited vehicular access for these locations.

Mode of travel data and survival status data were used to derive infant mortality rates. In the five-year period 2010 to 2015, there was a slightly higher infant mortality rate for children born to mothers who had to either walk or travel by horse to give birth (28 deaths per thousand live births) as compared to children born to mothers who used mechanized transport (26 deaths per thousand live births).

Figure 40: Percentage of women who walked or travelled by horse for delivery of their last live birth, 2010–2015, Municipalities, 2015 Census

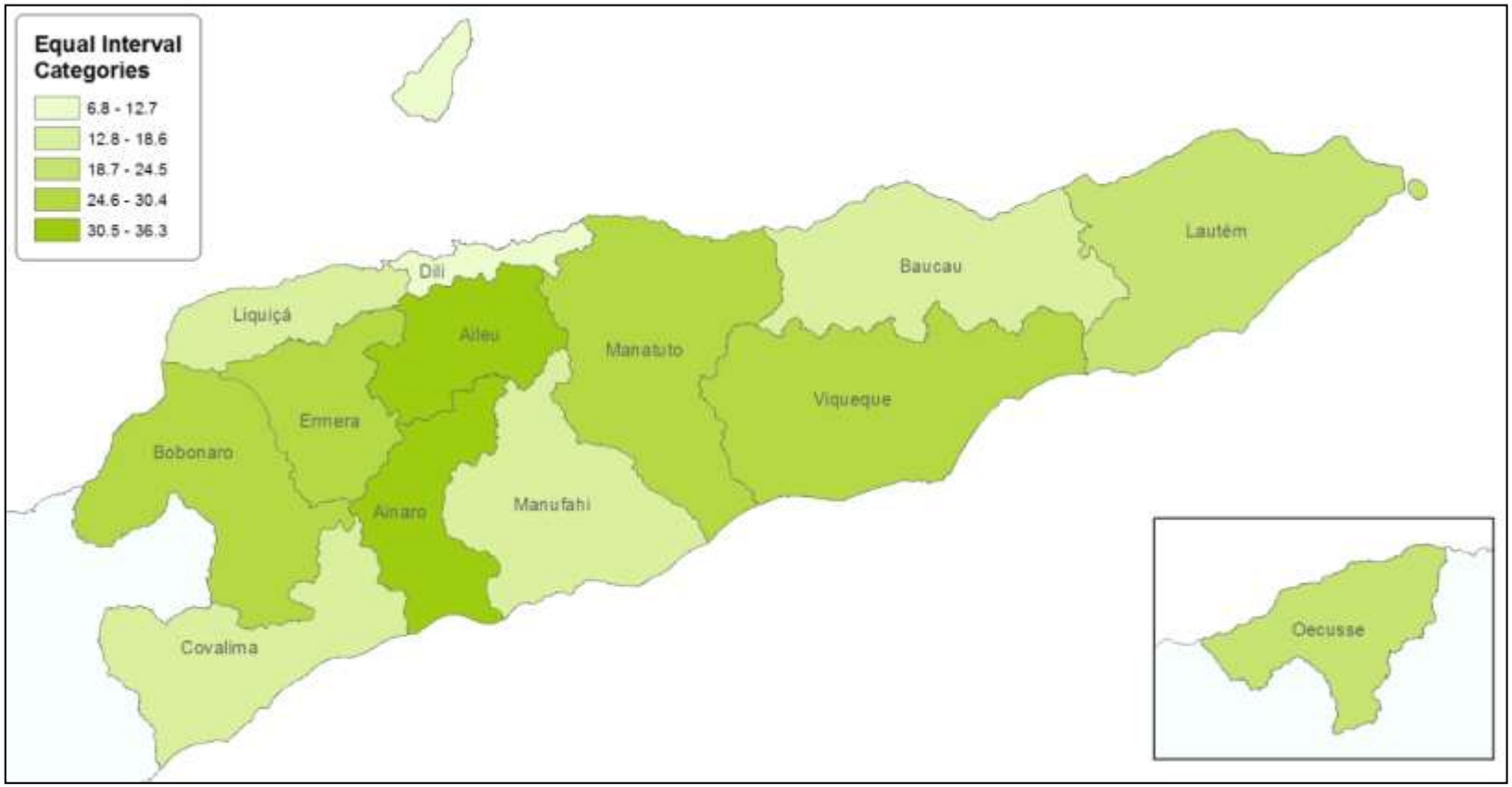


Figure 41: Mode of travel to facility for delivery of last live births, 2010–2015, Administrative Posts, 2015 Census

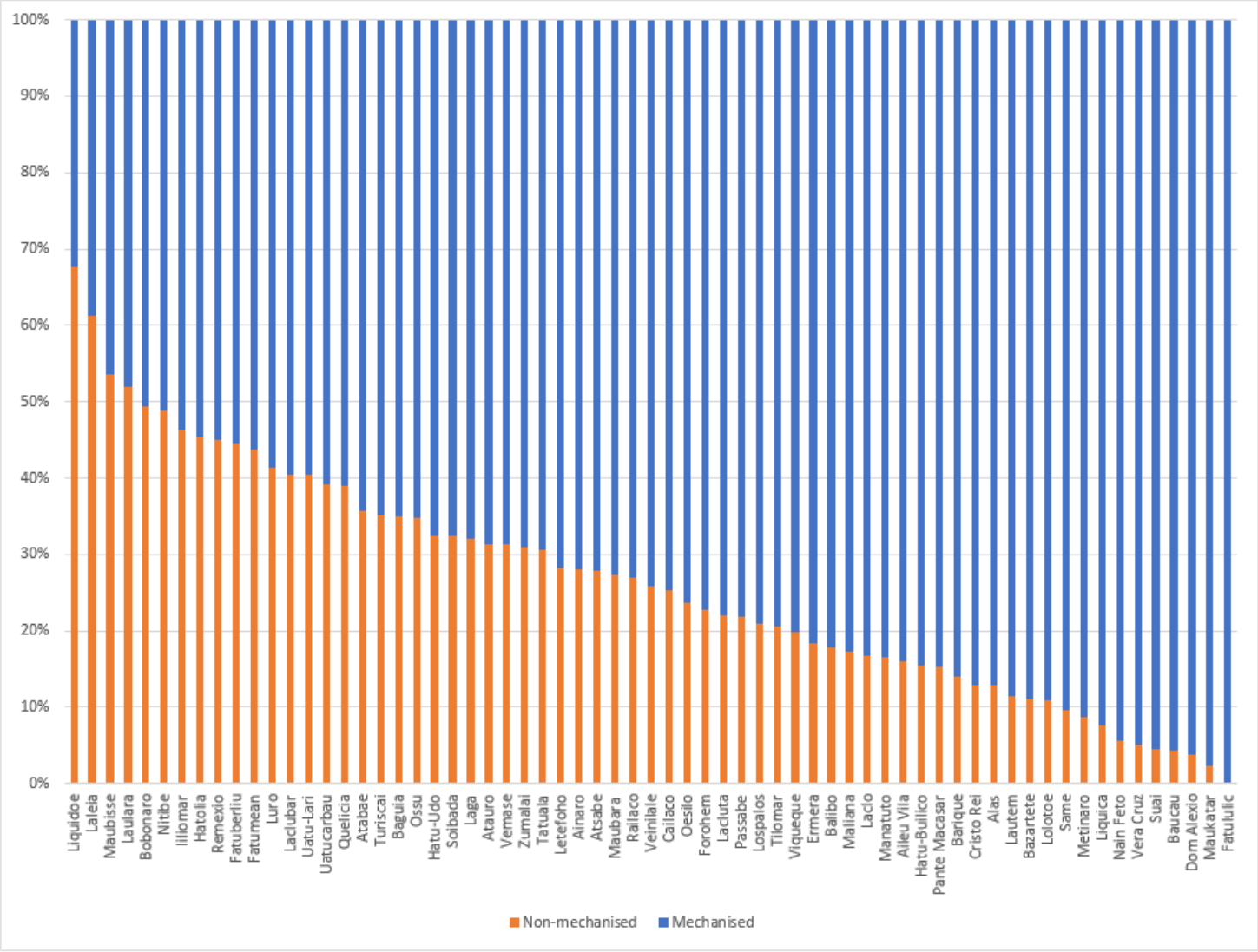
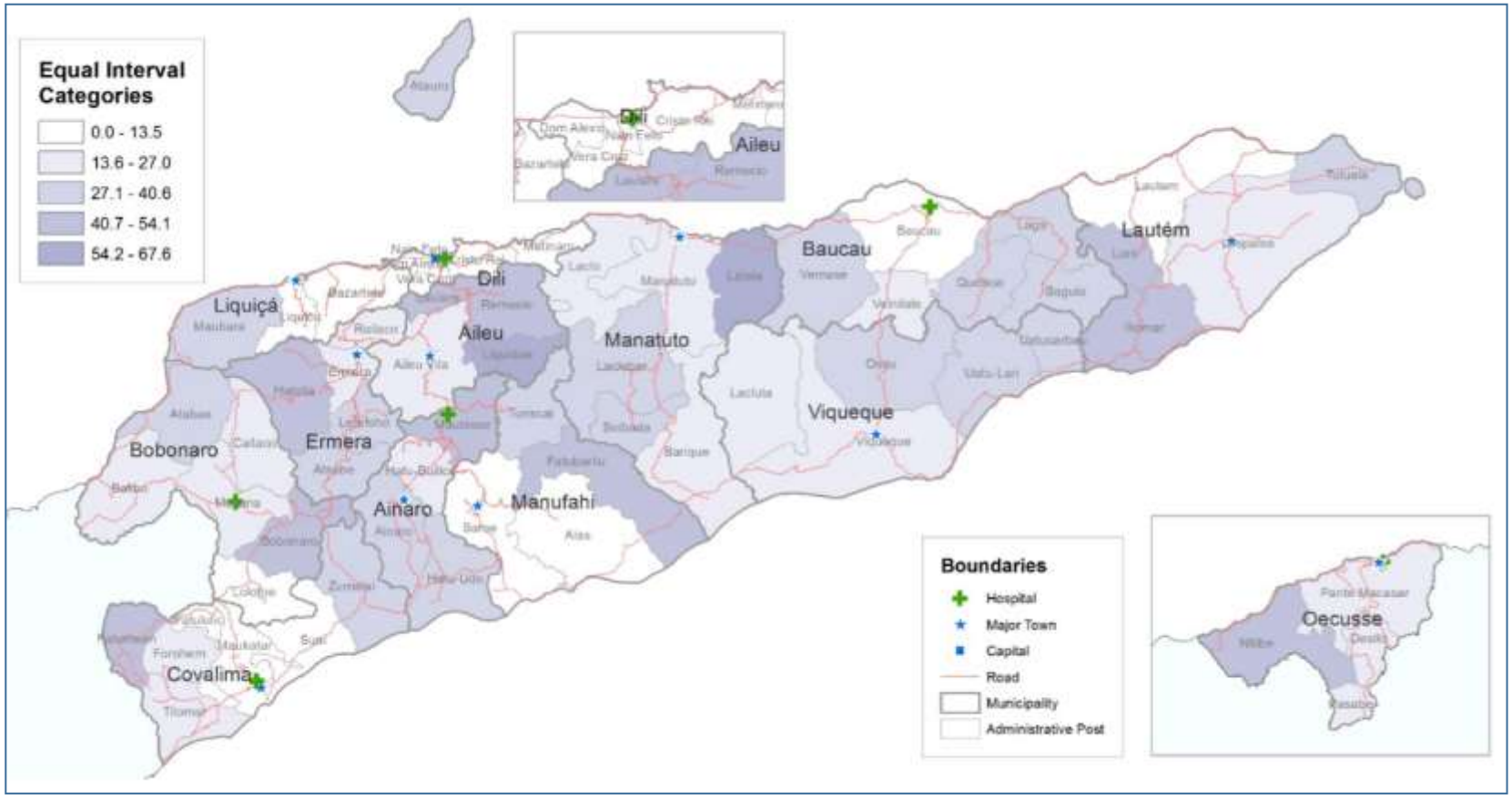


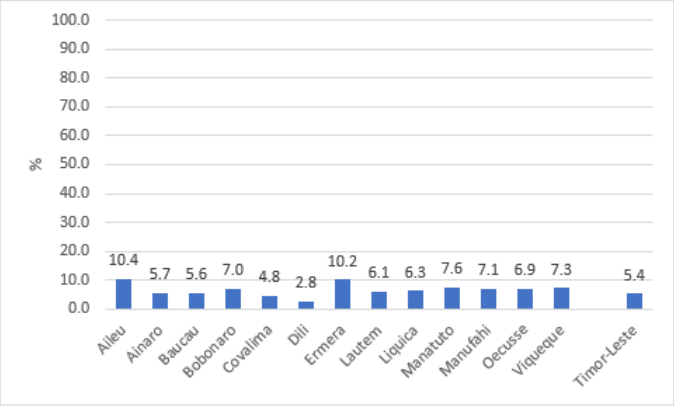
Figure 42: Percentage of women who walked or travelled by horse for delivery of their last live birth, 2010–2015, Administrative Posts, 2015 Census



Time taken to reach health facility

The first categorization adopted for the analysis is travel time of more than two hours as compared to travel time of less than two hours. In Figure 43, only the percentages for women reported to have travelled for more than two hours to deliver are presented for clarity, because they are low percentages. Nationally, the 2015 Census data for 2010 to 2015 illustrates that 5.4 per cent of women travelled for more than two hours to deliver their last live birth, with the remaining 94.6 per cent travelling for two hours or less. Year-by year comparison showed no change in these proportions between 2010 and 2015. The highest proportion of women travelling for more than two hours was in Aileu (10.4 per cent), followed by Ermera (10.2 per cent). In Baucau (5.6 per cent), Covalima (4.8 per cent) and Dili (2.8 per cent) - lower proportions of women - travelled for more than two hours to give birth than the national average (5.4 per cent).

Figure 43: Travel time greater than two hours to reach a health facility for last live birth, 2010–2015, Municipalities, 2015 Census



Despite the percentages of women travelling for more than two hours being low, a cross-comparison with mode of travel data illustrates that 21.8 per cent of these women travelled on foot or by horse to deliver their last birth, which is above the national average for non-mechanised travel (16.4 per cent). This demonstrates that women taking longer to reach a medical facility to give birth were more likely than other women to have had to walk to get there.

Analysis of the survival status of children born to women who had to travel for more or less than two hours to reach a medical facility was undertaken. Children born to mothers travelling for more than two hours had a higher infant mortality rate (47 deaths per thousand live births) compared to children born to mothers travelling for less than two hours (26 deaths per thousand live births). This perhaps indicates that remoteness from medical facilities has some bearing on survival for infants in Timor-Leste.

Figure 44 maps the data on the percentage of women who travelled for more than two hours to deliver their last birth for the Municipalities. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Municipalities in each of the bands. Higher percentages are demarked with darker shading. Aileu and Ermera stood out as having higher percentages of women travelling more than two hours to give birth, followed by Ainaro. The percentages were lowest in Dili. More detail is required to understand the pattern.

Figure 45 maps the data on the percentage of women who travelled for more than two hours to deliver their last birth for the Administrative Posts. The data are presented in equal interval categories, which means that the size of the bands are of equal width, and consequently there are differing frequencies of Administrative Posts in each of the bands. Higher percentages are demarked with darker shading. What is apparent is that in Administrative Posts bordering Municipality capitals (for example Liquido in Aileu, or Alas in Manufahi) and in Administrative Posts bordering Dili, such as Railaco in Ermera and Laulara in Aileu, higher percentages of women travelled for more than two hours to give birth. An explanation for this is that these women were travelling for longer durations to reach higher-order facilities (such as the hospitals in Same or Dili) to deliver their child. This suggests that women in Timor-Leste wish to receive skilled birth attendance in a higher-order healthcare facility and are willing to make arduous journeys to obtain these services, which places their health and the health of their unborn child at greater risk. More research is required to determine why women were travelling to higher-order facilities rather than lower-order facilities closer to home and also in support of the evidence in Figure 37, increasing provision of home-based skilled birth attendance in remoter Administrative Posts may be necessary.

Figure 44: Percentage of women who travelled for more than two hours to deliver their last live birth, 2010–2015, Municipalities, 2015 Census

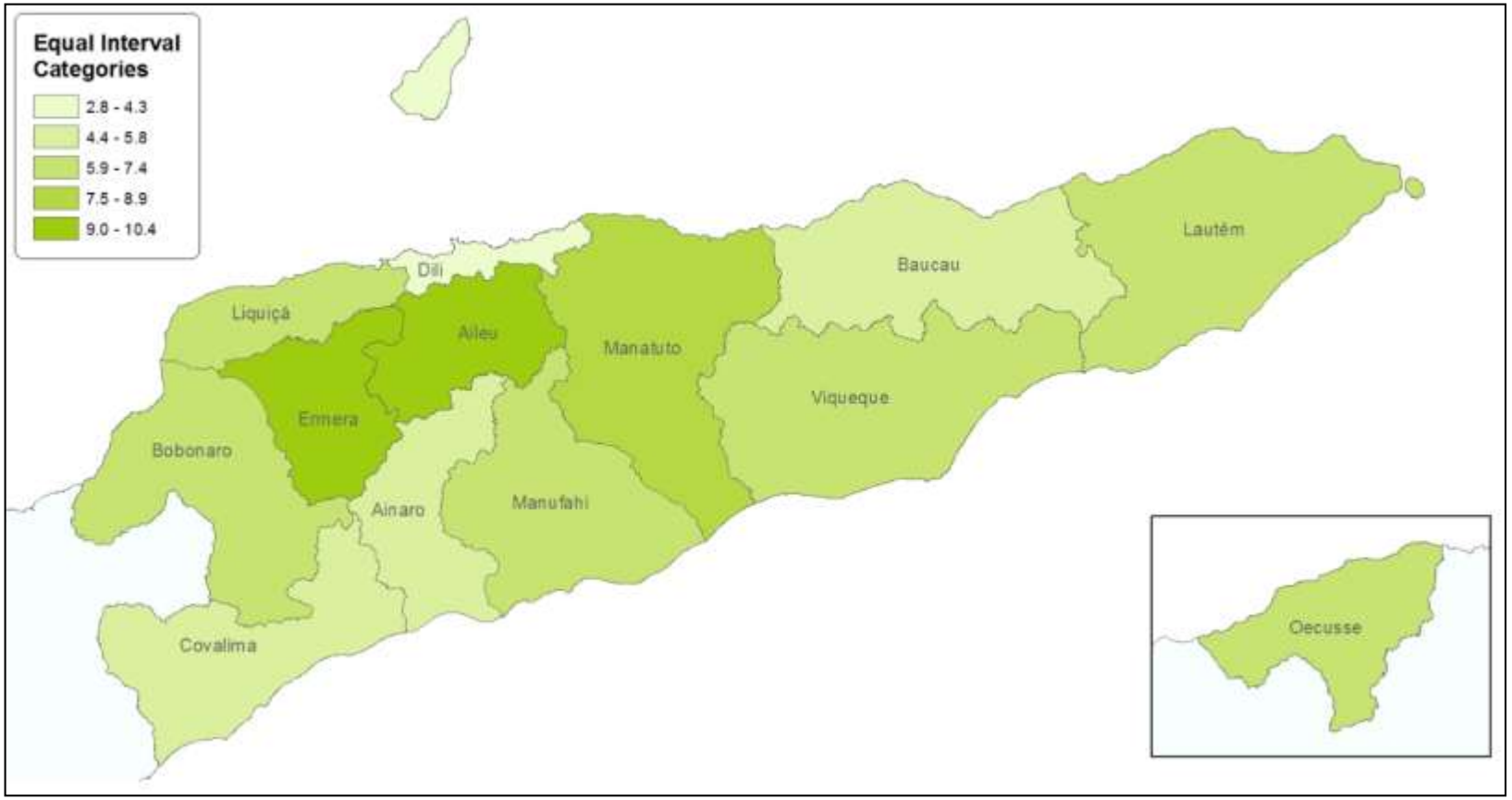
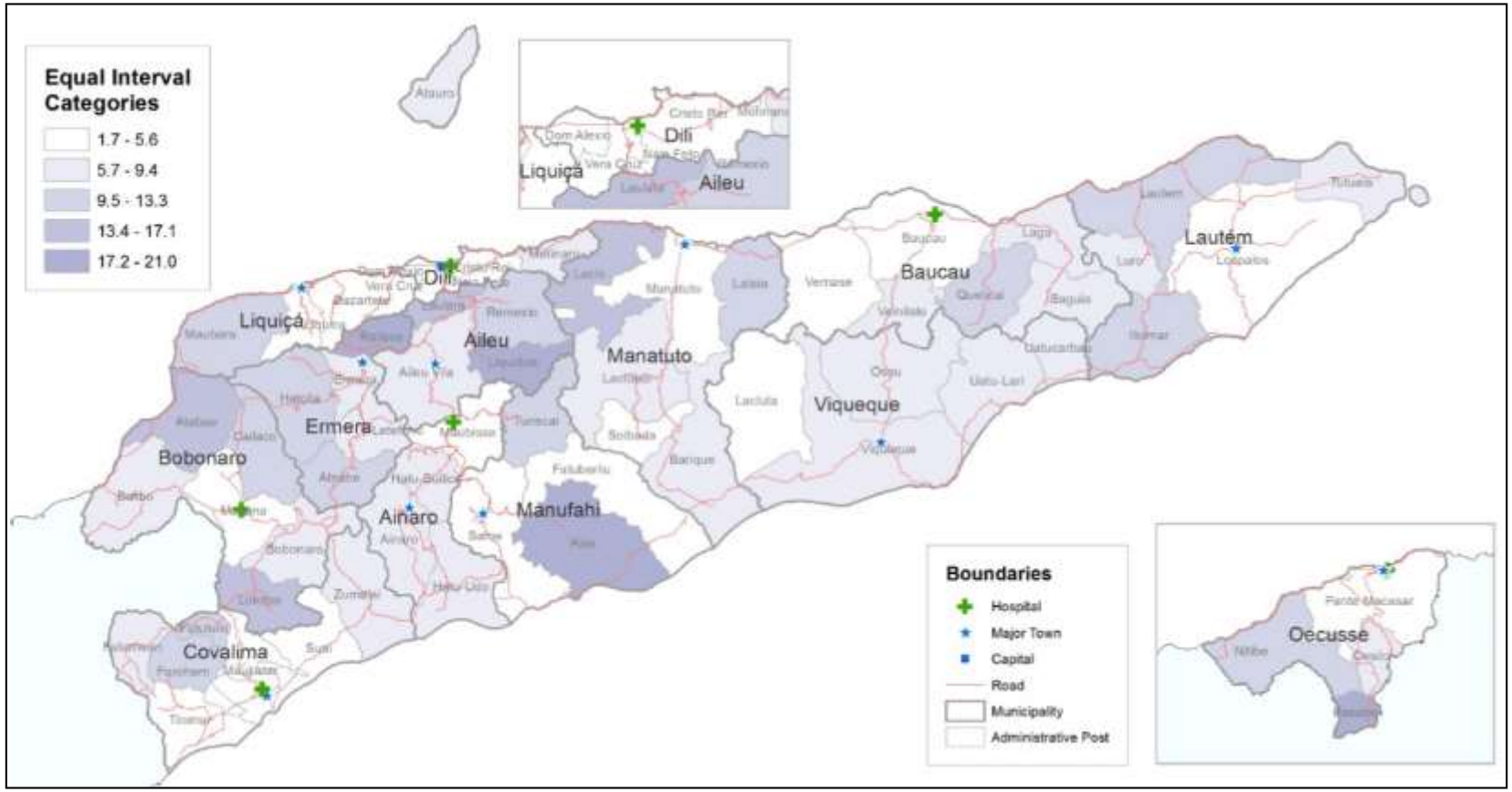


Figure 45: Percentage of women who travelled for more than two hours to deliver their last live birth, 2010–2015, Administrative Posts, 2015 Census



Attention turns to the analysis of travel time of one hour or more as compared to travel time of less than one hour (Figure 46). Nationally, the 2015 Census data for 2010 to 2015 illustrates that 21.3 per cent of women travelled for one hour or more to deliver their last live birth, with the remaining 78.7 per cent travelling for less than one hour. Year-by year comparison showed no change in these proportions between 2010 and 2015. The highest proportion of women that travelled for one hour or more was in Ermera (36.7 per cent), followed by Aileu (34.9 per cent). Dili had the lowest proportion for women travelling for one hour or more to deliver their last live birth (13.5 per cent) and was the only Municipality were the proportion was below 20 per cent of all cases. In eleven Municipalities, a higher percentage of women than the national average (21.3 per cent) were reported in the 2015 Census as having had to travel for one hour or more to give deliver their last live birth.

Figure 46: Travel time of one hour or more to reach a health facility for last live birth, 2010–2015, Municipalities, 2015 Census

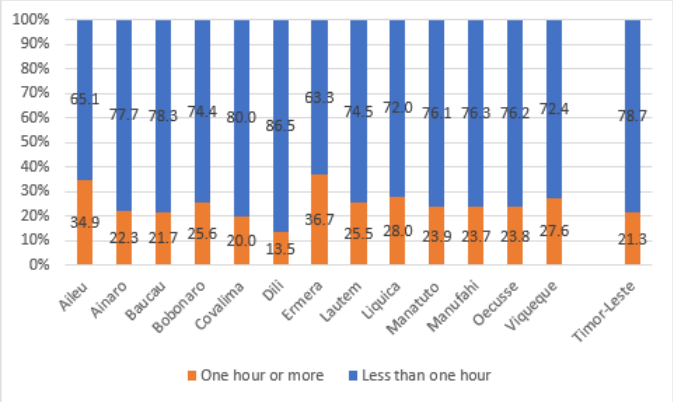
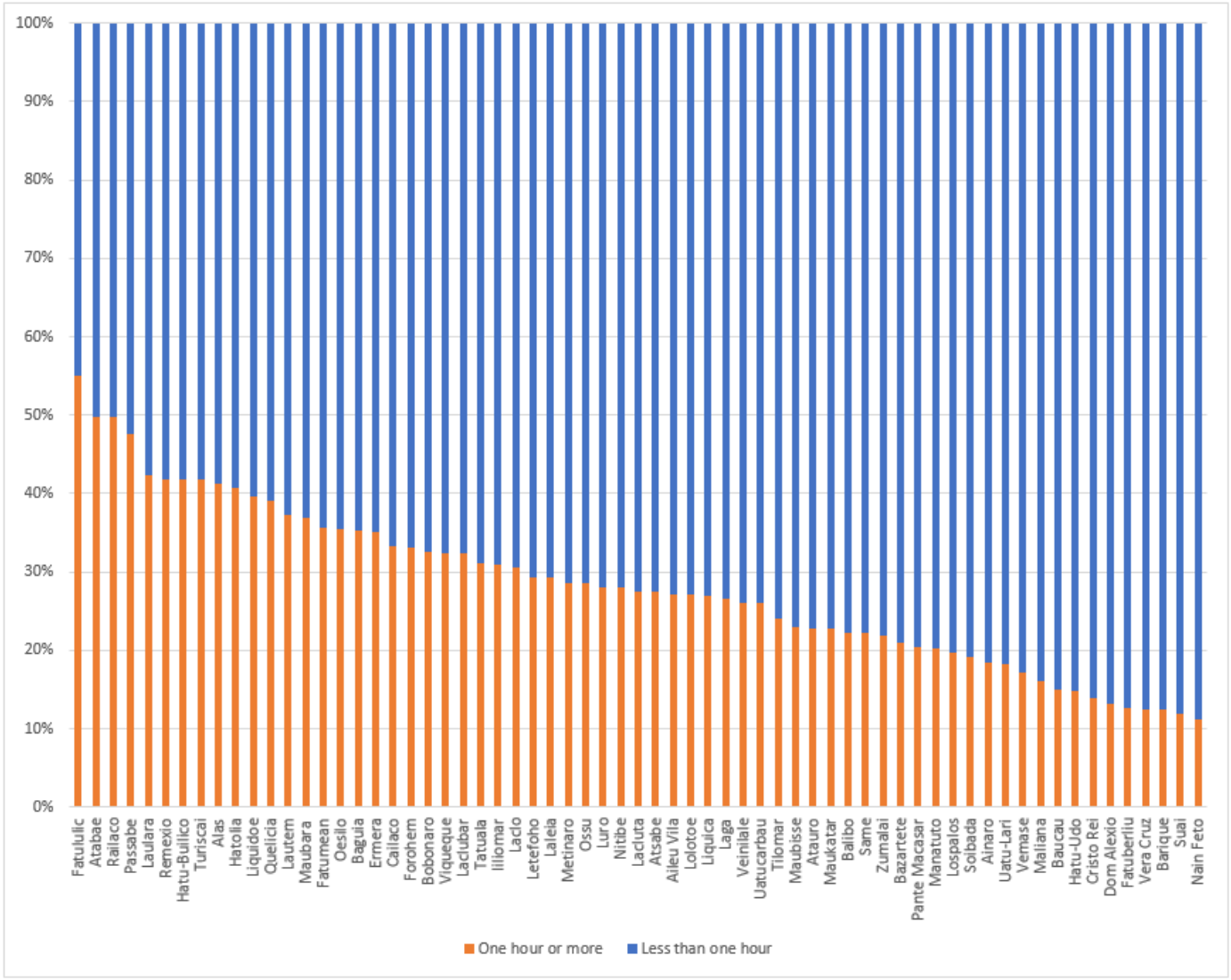


Figure 47 presents data on travel time to a facility for the delivery of last live births by Administrative Post for the period 2010–2015 from the 2015 Census. The percentage of women who travelled for one hour or more to deliver their last live birth varied from 11 per cent in Nain Feto, Dili, to 55 per cent in Fatulilic, Covalima. More than four out of every ten women were reported to have travelled for one hour or more to deliver their last live birth in Fatulilic in Covalima, Atabae in Bobonaro, Hatolia and Railaco in Ermera, Passabe in Oecusse, Laulara, and Remixio in Aileu, Hatu-Builico in Ainaro and Alas and Turiscai in Manufahi. In 47 out of 65 (predominately rural) Administrative Posts between 2010 and 2015, the proportion of women who travelled for one hour or more to deliver their last live birth was above the national average of 21.3 per cent.

Figure 47: Travel time of one hour or more to reach a health facility for last live birth, 2010–2015, Administrative Posts, 2015 Census



A cross-comparison of data on the percentages of women who travelled for one hour or more with mode of travel data illustrates that almost 20 per cent of these women travelled on foot or by horse to deliver their last birth, which was above the national average for non-mechanised travel (16.4 per cent). This further demonstrates that women taking longer to reach a medical facility to give birth were more likely than other women to have had to walk to get there.

Analysis of the survival status of children born to women who had to travel for one hour or more to reach a medical facility was undertaken. Children born to women who travelled for one hour or more had a higher infant mortality rate (41 deaths per thousand live births) compared to children born to mothers travelling for less than one hour (23 deaths per thousand live births). This further indicates that accessibility of medical facilities has some bearing on survival for infants in Timor-Leste.

Summary of access to safe delivery

By way of summarizing these findings from the 2015 Census, data on facility of delivery did not change markedly during the 2010 to 2015 period, whereas the percentage of births attended by skilled healthcare personnel increased during this period. Both variables had high levels of variation across the Municipalities and Administrative Posts – in short, home births that took place without attendance of a skilled healthcare provider were generally higher in rural than urban areas, and particularly in the remoter and more mountainous parts of the country. Both indicators varied by age of women such that adolescent women and women in older childbearing age groups had a greater tendency to have home births without the attendance of skilled medical personnel. This places greater risk on these already more vulnerable groups of women. The infant mortality rate for last live births that took place without the assistance of a skilled birth attendant was higher than for births assisted by a skilled birth attendant.

There were still sizeable proportions of women outside of Dili, and especially in the mountainous interior who had to either walk or travel by horse to deliver their last live birth, with no sign of any decrease in the percentages of women travelling by these means between 2010 and 2015. The infant mortality rate was slightly higher for children whose mother had to walk or travel by horse to give birth, presumably because this is an indication of inaccessibility of healthcare facilities.

The percentages of women who had to travel for more than two hours to give birth were generally below 10 per cent across the country. However, more than one fifth of women had to travel for one hour or more to reach a health facility for their last live birth. It is significant that above average proportions of these women had to either walk or travel by horse and the infant mortality rates for children whose mothers had to travel for a longer period were significantly higher than for women with a shorter journey time. These findings further support the view that inaccessibility of healthcare facilities places vulnerable populations in remote rural areas, and especially mountainous areas, at greater risk of morbidity and mortality.

Chapter 4: Conclusions and Recommendations

4.1 Conclusions

Fertility has declined rapidly, though it is still amongst the highest in the world

In the 2015 Census, in comparison with the 2010 Census, there was clear evidence of a sustained decline in fertility as experienced between the 2004 and 2010 Censuses. The TFR decreased linearly from 7.1 live births per woman for the period 2003–2005 to 6.7 for 2005–2007 and finally to 4.5 live births per woman for the period 2013–2015. The rate of decline in fertility between 2003–2005 and 2013–2015 was -4.6 per cent per annum. To place this into context, comparing this rate of decline with average annual rates of decline in TFR data from the 2017 revision of World Population Prospects (United Nations, 2017), this rate of decline was the fastest for any country in the world between 2000–2005 and 2010–2015, just ahead of Nepal, where the rate of decline was -4.5 per cent per annum. It is necessary to go back a decade (to 1990–1995 to 2000–2005), to find a higher rate of decline (Vietnam: -5.2 per cent), or a similar rate of decline (Brunei Darussalam: -4.3 per cent; Laos: -4.1 per cent) in the South-east Asian region.

Using the Own Children method, the estimated TFR for 2010–2015 was 4.7, 1.4 live births per woman lower than the U.N. estimate of 5.9 for the same period. Even if we compare the Own Children method estimate of 4.7 live births against U.N. estimates for 2010–2015, the TFR is exceeded only by values in Africa and Afghanistan. Despite sustained decline since the early 2000s, the TFR in Timor-Leste is still exceptionally high for an Asian country.

During the decade preceding the 2015 Census, ASFRs declined in all age groups. The decline was greatest for age groups between 20 and 34 years, leading to a flattening of the shape of the fertility curve between 2005–2007 and 2013–2015.

Adolescent fertility decline has not been universal

The Own Children method yielded an adolescent ASFR of 54 live births per thousand women aged 15 to 19 years for the period 2010–2015 and 69 for 2005–2010, so the decline was 15 live births per thousand adolescent women in five years. These data were consistent with U.N. estimates which confirms a decline in the adolescent fertility rate for Timor-Leste. Even although the rate is still higher than in neighbouring South-east Asian countries, the trend in the adolescent ASFR has been of sustained decrease, rather than stability (Indonesia) or increase (Philippines).

At the national level, the percentage of women aged 15 to 19 years that had already given birth fell by 0.7 percentage points between the 2010 and 2015 Censuses to 5.6 per cent. Slightly greater reductions occurred in rural areas, however, in 2015, twice as many rural adolescent women had already given birth compared to urban adolescent women. Childbearing in adolescence was concentrated in ages 18 and 19 (10.5 per cent of these women had given birth as compared to only 2.6 percent of women aged 15 to 17 years).

Despite the declining adolescent ASFR at national level, in Bobonaro, Ermera, Liquica, Manatuto, Manufahi, and Oecusse, the percentages of adolescents who had given birth were either high and/or had increased slightly between the 2010 and 2015 Censuses. Therefore, national declines have masked higher rates in several Municipalities and Administrative Posts.

Geographical variations in fertility

Over the decade preceding the 2015 Census, there was broad variation in rates of fertility decline across the country, which can be attributed to differing levels of development. In the 2015 Census, the highest TFRs were in Aileu and Ainaro (5.5 live births per woman) and the lowest TFR was in Dili (3.9 live births per woman). Therefore, in Municipalities adjacent to each other, the highest and lowest fertility rates can be found: urban Dili, and mountainous rural Aileu. The highest TFR in the country was in a remote mountainous Administrative Post - Maubisse, Ainaro (6.0 live births per woman) and the lowest TFRs were all in Dili (Nain Feto: 3.5; Vera Cruz: 3.6; and Dom Aleixo: 3.7).

Besides cultural factors that cannot be measured through the census, an urban-rural dichotomy, and remoteness in mountainous areas versus accessibility to services and facilities, can explain much of the variation in fertility decline and recent fertility rates across the country. Thus, at the Administrative Post level, it is notable that adjacent to Dili, TFRs transitioned immediately, and in some cases to the highest band categories in neighbouring mountainous Aileu. Also, variation in Aileu, Ainaro and Ermera can be explained by differences in proximity to Municipality capitals. Furthermore, higher percentages of childbearing in adolescence were clustered in remoter Administrative Posts within Ainaro, Bobonaro, Covalima and Ermera, in central Timor-Leste (in an area encircled-by but not penetrated by navigable roads and far from urban centres), and in western Oecusse, furthest from accessibility to services and facilities.

Fertility and vulnerable circumstances

Cross-tabulations of completed fertility or adolescent fertility by background characteristics yielded consistent findings across the 2010 and 2015 Censuses. Fertility was higher among non-literate women, less-well educated women, rural residents, women from agricultural households and women residing in lower quality housing conditions. What is clear therefore, is that commencing childbearing early, and going on to have larger numbers of births is associated with less developed circumstances at the individual, household and broader contextual levels.

Safe delivery is less accessible to the most vulnerable women

In the 2015 Census, new questions were added on facility of delivery for last live births, time taken to reach a health facility to give birth, the mode of travel taken to reach a health facility to give birth, and the provider of assistance during delivery of last live births.

Home births, and those that took place without attendance of a skilled healthcare provider were higher in rural than urban areas in the 2015 Census, and particularly in the remoter and the more mountainous parts of western Timor-Leste, with pockets in north-eastern Viqueque, eastern Baucau, western Lautem, and western Oecusse. Home-based skilled attendance was geographically more diffuse than facility deliveries, but not penetrating into the remotest areas of the country as effectively as it should. Furthermore, higher-risk cases (adolescent women and women in older childbearing age groups) had a greater tendency to have home births without the attendance of skilled medical personnel, which places greater risk on these already more vulnerable groups of women and their children. This vulnerability is emphasized by the fact that the infant mortality rate for last live births that took place without the assistance of a skilled birth attendant was higher (30 deaths per thousand live births), than for births assisted by a skilled birth attendant (25 deaths per thousand live births).

In the 2015 Census, sizeable proportions of women outside of Dili, and especially in the mountainous parts of the country, either walked or travelled by horse to deliver their baby in a health facility, particularly in Aileu, Ainaro, and between eastern Manatuto and southern Lautem, most probably due to limited vehicular access for these locations. Furthermore, above average proportions of women who travelled for longer durations to deliver their baby either walked or travelled on horseback. In Administrative Posts bordering Municipality capitals or Dili, higher percentages of women were travelling for more than two hours to give birth, most probably to reach higher-order facilities (such as the hospitals in Same or Dili). Thus, rural women are willing to make arduous journeys to receive skilled birth attendance in a higher-order healthcare facility, which places their health and the health of their unborn child at greater risk. The infant mortality rates for children whose mothers had to travel for longer were significantly higher (47 deaths per thousand live births where women travelled for more than two hours) than for women with a shorter journey time (26 deaths per thousand live births). These findings support the view that inaccessibility of healthcare facilities in remote rural and especially mountainous areas renders the most vulnerable women and their children at greater risk of morbidity and mortality.

4.2 Recommendations

Between the 2010 and 2015 Censuses, significant progress was made in in delaying childbearing and reducing fertility. The government should aim to capitalize on the trajectory of these improvements through interventions that will sustain or even increase the pace of these changes.

As marriage is a proximate determinant of fertility, preventing early marriage reduces the risk of childbearing in adolescence. The data in this report demonstrates this. The data also shows that childbearing in adolescence is higher among women who had already entered the labour force (and who had therefore left education). Interventions should aim to encourage females to remain in education longer as a mechanism for preventing early marriage and childbearing during adolescence. A critical step is to change behavior by sharing information regarding the benefits for young women of remaining in education to fully reach their potential, the drawbacks of early marriage and the health and wellbeing risks of childbearing during adolescence. The Government must also continue to foster enabling environments so that all adolescent women are able to remain in the education system for longer.

The percentages (and absolute numbers) of adolescent women who had already given birth before age 16 or 17 were much lower than those in the older ages. However, childbearing in early adolescence represents a particular health and wellbeing risk for both mothers and their babies. Therefore, it is important that students (especially girls) aged 13 and 14 are made aware of the risks in advance and those adolescent women who fall pregnant are given necessary medical support and opportunities to continue in education.

A great deal of progress has been made in reducing the very high fertility rate in Timor-Leste, but the TFR is still among the highest in the world. The Government needs to re-double its efforts to reduce the fertility rate to levels which more closely match Timorese women's desired family size. In the 2016 TLDHS, 27.2 per cent of women of reproductive age expressed that they did not want more children, and eight-in-ten of these women had more than two children already. However, 25.3 per cent of women of reproductive age had unmet need for family planning (RDTL MoF, 2017). Therefore, interventions should aim to reduce unmet need for contraception to decrease unwanted fertility among women of reproductive age. The most appropriate way to achieve this is through universal provision of reproductive health services including modern contraception. Universal access includes provision of information and commodities to everyone, including adolescents and unmarried women.

Tackling unsafe delivery, and childbearing, and high fertility through reproductive health services, including modern contraceptive methods involves providing services and commodities everywhere, especially where fertility is higher. Targeting of high fertility should use the information in this report and the statistical annex to reach all women, including in the remoter, less-accessible mountainous areas, where the highest fertility rates were found. In this regard, it is notable that in the 2016 TLDHS one-in-five women in Ainaro stated that they did not want more children, and nine-in-ten of these women had more than two children already. However, one-in-four women reported unmet need for family planning (RDTL MoF, 2017).

It is clearly apparent that access to safe deliveries is a major issue in remoter, mountainous parts of the country. More research is required to determine why women are travelling to higher-order facilities rather than lower-order facilities closer to home to deliver their babies. The evidence in the report suggests that increasing provision of home-based skilled birth attendance into the remotest parts of the country is required, specifically targeting adolescent and older women of reproductive age. Improving the quality of services in lower-order healthcare facilities is also necessary. Targeting of these interventions should be based on the information in this report and the data in the statistical annex.

Geographical data provides part of the picture, but it does not explain which women within Administrative Posts are the most appropriate recipients of interventions. The evidence generated in this report demonstrates that childbearing during adolescence, higher completed fertility and unsafe delivery were more common among women with less-developed circumstances at the individual, household and broader contextual levels. Therefore, information campaigns and services should, in particular, be channeled towards communities and families that exhibit these characteristics in order to be more effective in improving coverage of safe deliveries, preventing childbearing during adolescence and reducing completed family size.

The Sustainable Development Goals (SDG) framework offers a mechanism within which to implement, monitor and evaluate these interventions. The Government should focus on:

- SDG 3 (Ensure healthy lives and promote well-being for all ages and at all times)
    - Target 3.1: By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births
        - Indicator 3.1.2: Proportion of births attended by skilled health personnel.
    - Target 3.7: By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes
        - Indicator 3.7.1: The proportion of women of reproductive age who have their needs for family planning satisfied with modern methods;
        - Indicator 3.7.2: Adolescent birth rate.

- SDG 4 (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all)
    - Target 4.3: By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
        - Indicator 4.3.1: Participation rate in formal and non-formal education, by age and sex;
        - Indicator 4.5.1: Female/male parity indices for education indicators.
- SDG 5 (Achieve gender equality and empower all women and girls)
    - Target 5.3: By 2030, eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation
        - Indicator 5.3.1: Proportion of women aged 20–24 years who were married or in a

union by age 15 and before age 18.

- Target 5.6: Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences
  - Indicator 5.6.1: Proportion of women aged 15-49 years who make their own informed decisions regarding sexual relations, contraceptive use and reproductive health care.

Finally, Chapter 2 of this report demonstrates that despite improvements in the quality of age reporting in the 2015 Census compared with earlier censuses, there is still room for improvement. Additionally, there were still many other issues with the quality of data collected. Particular issues concern consistencies between enumerated data on numbers of children ever born, children living in the household, children living elsewhere, and child deaths. There were also inconsistency issues between children living in the household (questions P42 and P43 in the 2015 Census questionnaire) and the age and sex of the reported household population. Another problematic area concerns the quality and consistency of data linkages between mothers and their children.

Since Timor-Leste has one of the highest fertility rates in the world, accurate collection of data on fertility in the census is critical. It is recommended that for the 2020 Census, the data collection issues outlined in Chapter 2 of this report, and summarized here, be given much more emphasis within interviewer training, and are given higher priority in the interviewer's instruction manual. Interviewers must be instructed to check the consistency of data collected and to probe where inconsistencies are identified before leaving a household. Furthermore, supervisors need to be held to account. They need to be much more diligent in spotting errors and do so in a timely manner, then instruct interviewers to rectify these errors through return visits. Supervisors also need to check that interviewers improve their data quality in subsequent cases. It is also recommended that tablets be used to enumerate the 2020 Census, and that internal checks be written into the electronic questionnaire to automatically flag errors so that they can be rectified before enumerators leave households.

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