Demographic Profile and Trends in Early Childhood Mortality Rates of Timor-Leste: Analysis of the 1990 and 2004 Population Censuses Data[i]

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This paper is aimed at presenting demographic profile and early childhood mortality rates of Timor-Leste mainly based on the data of last two population censuses in 1990 and 2004. The 1990 census, perhaps the 2nd modern census carried out in this region, was carried out when Timor-Leste was still the 27th province of Indonesia[ii]. The second census was taken when Timor-Leste has become a sovereign nation. Analysis on trends in early childhood mortality rates uses also Demographic and Health Surveys (DHSs). In the analysis, four indicators are used; namely, infant, child and under-5 mortality rates and life expectancy. These indicators are estimated using an indirect method as proposed by the United Nations for census-survey based data as reported in Manual X.

Population Size and its Growth:
Is the 2004 Over Count or Under Count?

The 2004 population census shows that the total population of Timor-Leste was 923,198 persons. Its growth, compared to the previous census, was about 1.53 percent per year during 1990-2004[iii]. If its assumed this growth rate remained constant, the total population will double in 45.6 year (See Table 1). As shown by the table, there was big variation between districts in terms of population size and its growth rate. In 2004, the total population ranged between 24,347 persons for Aileu and 124,682 persons for Dili. The first three big districts --Dili, Ermera and Baucau --inhabited by more than 350,000 people or more than 40 percent of the total population of the country. The population growth between 1990-2004 period ranged between 0.01 percent for Bobonaro and and 3.23 percent for Aileu.

It might interesting to note a relatively high growth rate for of Ermera. In 1990 the total population of the district was less than 75,000 persons or the 4th biggest after Dili, Bacau and Bobonaro; in 2004 its total was more than 100,000 and hence the second biggest district just after Dili. In contrast, a striking slow growth was found for Bobonaro; its population was the 2nd biggest in 1990 but the 4th biggest in 2004. This contrast situation was very likely reflecting different migration rates between the two districts: more in- than out-migration for Ermera but more out- than in-migration for Bobonaro. However, further study is needed to explain the contrast more clearly.

Table 1
Total Population and Annual Growth Rate of Timor Leste by District

District	1990 (October)	2004 (July)	Annual Growth Rate 1990-2004 (%)	Double Population (year)
Aileu	24,347	37,967	3.23	21.7
Ainaro	42,355	52,480	1.56	44.9
Baucau	87,655	100,748	1.01	69.1
Bobonaro	83,457	83,579	0.01	6,598.3
Covalima	44,878	53,063	1.22	57.4
Dili	124,682	175,730	2.50	28.0
Ermera	74,545	103,322	2.37	29.5
Lautem	47,620	56,293	1.22	57.5
Liquisa	42,385	54,973	1.89	37.0
Manatuto	31,746	36,897	1.09	64.0
Manufahi	34,351	45,081	1.98	35.4
Oecusse	50,026	57,616	1.03	68.1
Viqueque	59,510	65,449	0.69	101.2
Timor Leste	747,557	923,198	1.53	45.6

Sources: The 1990 and 2004 Population censuses (See Reference)
Notes: (1) Exponnetial equation is used to calculate annual growth;
(2) Double population is estimated using the formula: 70/r where r refers to the annual growth rate.

One might also interesting to note a striking high growth rate for Aileu. If its growth rate during 1990-2004 --3.23 percent per annum-- is assumed constant, the population size of the district would be double in less than 25 years. Many think the figures are unrealistic simply because the socio-economic condition of the district during the period --especially after 1999-- was such that more push factors for out-migration than pull factor for in-migration. Casual observation in general strongly suggests that the growth rate for this district as shown by the table is counterfactual.

Informal conversations with a number of staff of the directorate of statistics -- both at the head and district offices --strongly suggest that the growth rate was significantly overestimated due to allegedly over count of the 2004 census. A possible explanation would be that households inclined to overstate their members to the census officers. The main reason would be that households put high expectation the census data were used by the government and donor

agencies as primary basis for allocatting social-humanitarian assistances. Such an expectation for the people of a newly independence country like Timor-Leste seem reasonable. If there was a strong basis for such reasoning, the possibility of over count of the 2004 census would be not only true for Aliau but for other districts as well. Note that contrary to this reasoning, according to Mr. Fredrick, projection report estimated under coverage rate of the 2004 census was about 2.58 percent.

Whatever the case, the possibility of such over count (or under count according to the official report) needs to be taken into account during the evaluation and the dissemination of the results of the upcoming census. Because of this possibility, it is important to 'judge' the plausibility of the 2010 census results not only by the 2004 census but also the 1990 census. During the dissemination, it is advisable to officially declare that the 2010 census uses what so called population at present method (known more popularly as *de facto* method) which is different with that used in the previous censuses that is usual residence method (known as *de jure* method) . The different in such a conceptual level may (or may not) affect the comparability.

Age-Sex Structure:
Young-age Population

The age-sex structure of the population of Timor-Leste in 2004 is shown in Table 2 and Graph 1. They show that in overall there are more males than females in Timor-Leste; on the average, there were about 104 males for every 100 males. The table and the graph also show a typology of young age population of Timor-Leste. This means more young population than old population inhabiting the country: the proportion of population aged below 15 was more than 40 percent, while those aged 65 year or above less than four percent. The high proportion of young ages reflects a high birth rate and high young-dependency with obvious policy implication: a high proportion of the nation resources are dispensable required for social investment for the children (including for primary school and hospital for delivery).

Children Ever Borne:
Five are not enough

Table 3 shows -- quite surprisingly-- the increase in the proportion of young age population during 1990-2004. This increase strongly indicates the increase of birth rate during the period. Graph 2 supports this indication. As shown by Graph 2, the mean of children ever borne (CEB) in almost all age groups of women increased during 1990- 2004.

Table 2
Population of Timor Leste by Age Group and Sex
2004

Age Group	Total	Male	Female	# Male per 100 Female
0-4	150,744	77,720	73,024	106.4
5-9	129,420	66,661	62,759	106.2
10-14	118,647	61,422	57,225	107.3
15-19	95,274	47,953	47,321	101.3
20-24	75,701	37,640	38,061	98.9
25-29	57,138	28,366	28,772	98.6
30-34	62,410	32,227	30,183	106.8
35-39	48,800	24,894	23,906	104.1
40-44	45,946	22,513	23,433	96.1
45-49	34,320	16,917	17,403	97.2
50-54	32,933	16,651	16,282	102.3
55-59	19,205	9,910	9,295	106.6
60-64	20,516	10,613	9,903	107.2
65-69	11,746	5,952	5,794	102.7
70+	20,398	10,480	9,918	105.7
Total	923,198	469,919	453,279	103.7

Source: 2004 Census Population

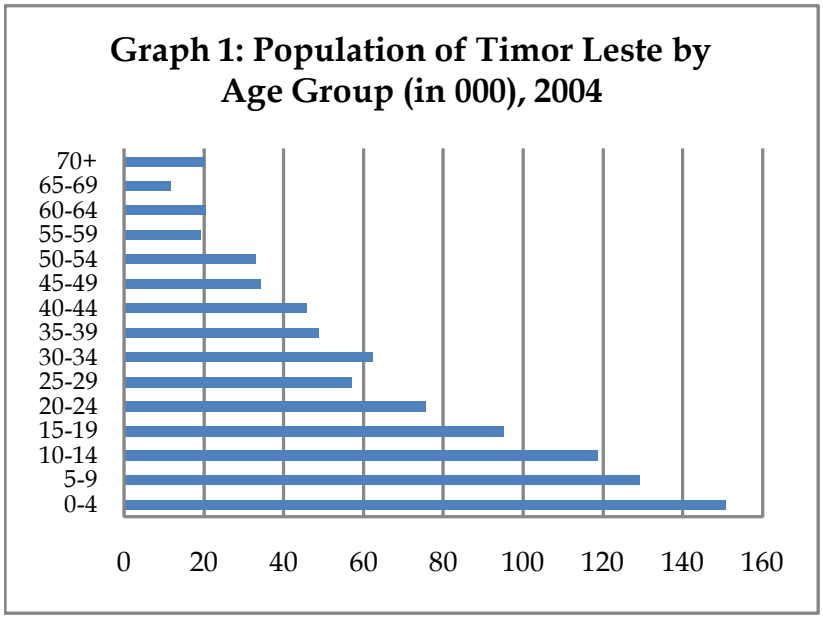
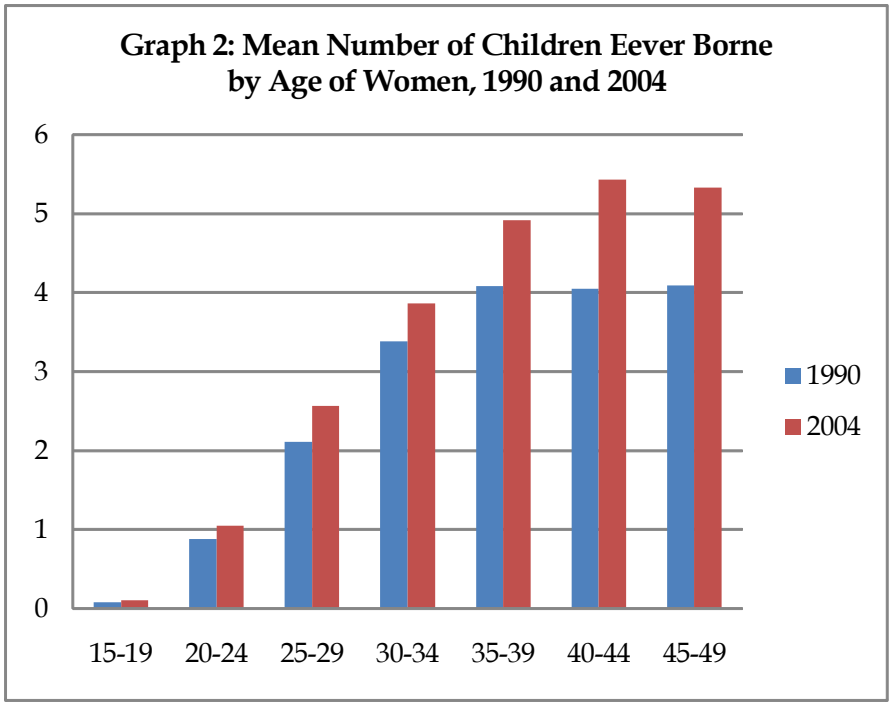


Table 3: The Percentage of Population of Timor Leste by Major Age Groups and Sex: 1990 and 2004

Age Group	Total	Male	Female
1990:			
<15	**41.5**	**42.0**	**41.0**
15-64	**56.5**	**56.0**	**57.0**
65+	**2.0**	**2.0**	**2.0**
	100.0	**100.0**	**100.0**
2004:			
<15	**43.2**	**43.8**	**42.6**
15-64	**53.3**	**52.7**	**54.0**
65+	**3.5**	**3.5**	**3.5**
	100.0	**100.0**	**100.0**

Sources: 1990 and 2004 Population Censuses

Graph 2: Mean Number of Children Eever Borne by Age of Women, 1990 and 2004



The rationale behind this factual knowledge would be that in general household couples of Timor-Leste in the midst of the newly independence "euphoria" perceived the situation was more conducive than before to have more children; in the meantime, the norm of *ideal family size* still unchanged and children were

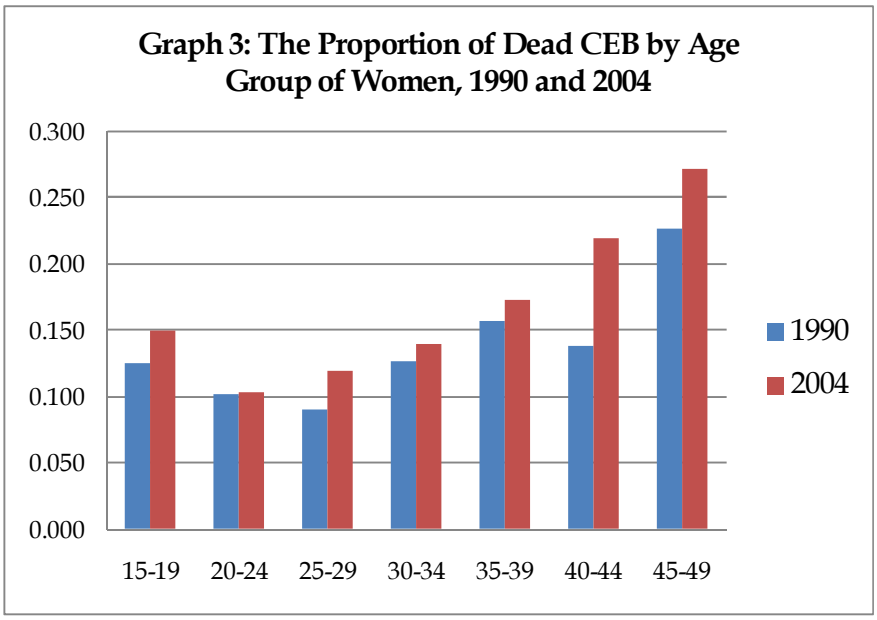
perceived by parents more as economic asset (than liability) as cheap labour and or old age insurance. For parents of Timor-Leste five are not enough: the 2009-2010 Tmor Leste DHS shows that more than 50 percent of parents with five surviving children still reported want more children. In such a situation, it is understandable if mortality rate had been increased—especially among young ages--- as a result of combined factors; namely, shorter birth spacing and still lacking affordability to access medical facilities.

Estimates of Early Childhood Mortality Rates

The Proportion of Dead Children Ever Borne

In the 1990 and 2004 censuses there are questions to women aged 15 and above on the number of children ever borne (CEB) and the number of survived children. Based on these question tabulation of the mean CEB and the proportion dead children by age group of women is possible. The mean CEB by age groups of women indicating the level of birth rate among population. As mentioned before, the mean CEB increased during 1990-2004 period (Graph 2). On the other hand, the proportion of dead children --especially for young women (say between 20 and 35 years old)-- is reflecting child mortality level: the higher the proportion, the higher child mortality.

Graph 3 presents the proportion of dead children by age group of women based on the 1990 and 2004 census data. As shown by the graph, the proportion increased during 1990 and 2004 period for almost all age groups. This increase is strongly indicating the increase of child mortality rate in Timor-Leste during the period.



Infant and Child Mortality Rates and Life Expectancy

The proportion of dead CEB by age group of women can be used to estimate indirectly infant and child mortality rates and life expectancy. Annex 1 presents technical notes for the indirect estimation.

Table 4 shows that the estimated infant child mortality rate[iv] of Timor-Leste based on the 1990 census data was 92 per 1000 live births and the figure refers to the period between August 1984 and November 1988. The estimated figure based on the 2004 census data was higher; that was, 103 per 1000 live-births and the figure refer to the period between July 1988 and July 2002. Consistent with the increase, child and under-5 mortality rates also increased while life expectancy decreased. Commenting the trend, a few high level officials at the directorate of statistics of Timor-Leste in a short conversation with the author inclined to see this 'unusual' trend (i.e., the increase in early childhood mortality or the decrease in life expectancy) as quite understandable for Timor-Leste during the period[v]. As argument they mentioned the accessibility of basic health services especially in rural and remote areas and the condition basic infrastructure were not much improved during the period.

An important point to be made is the decrease in early childhood mortality rates during the period 2003-2009 as shown by the data provided by the Demographic and Health Surveys (DHSs) 1993 and 2004 of Timor-Leste (See Table 5)[vi]. The decrease is understandably due to, among other, the increase in immunization coverage among children (DHS 2009-2010). Other possible factors responsible for the decrease would a better accessibility to basic health facilities than before and; in the meantimes; parents --especially in the last five years-- could have better understanding than before about the and economic reasons as well.

Table 4
Estimated Infant, Child, and Under-5 Mortality Rates (per 1000 live-births) and Life Expectancy of Timor Leste Based on the 1990 and 2004 Census Data

Data source	Infant mortality rate (1q0)	Child mortality rate (1q4)	Under-5 mortality rate (0q5)	Life expectancy, e0 (in year)	Reference date
1990 Census	92.0	28.7	118.0	59.2	Aug-84-Nov-88
2004 Census	102.7	34.0	133.2	57.3	Jul-88-Jul-02

Source: Derived from Annex 2

Notes:

(1) 5q0 is estimated using the formula: 1-(1-1q0)(1-1q4).

(2) Each estimate is the mean of the rates as reported by women at three ages groups: 20-24, 25-29 and 30-34.

(3) Coale-Demeney life table of East Model was used for the estimations.

Table 5
Early Childhood Mortality Rates for the Period 0-4 Years Preceeding the Survey, 2003 DHS and 2009-2010 TLDHS

Data Source	Infant mortality	Child mortality	Under-five mortality
2003 DHS	60	23	83
2009-2010 TLDHS	44	20	64

Source: National Statistics Directorate (2010)

By reconciling the censuses and DHS data with regards to the trends in childhood mortality in Timor-Leste, a crude inference can be made: childhood mortality rates increased during 1990s---until perhaps early years of 2000s --- but decreased during the 2000s. Nonetheless, further study is needed to convince such an inference.

References

Biro Pusat Statistik Indonesia (1992), Population of Timor-Leste: Results of the 1990 Population Census, ISBN 979-402-732-4

Direcção Nacional de Estatistíca (2006), Timor-Leste, Census of Population and Housing 2004: National Priority Tables, 1st edition

National Statistics Directorate (2010), Timor-Leste Demographic and Health Survey 2009-2010: Preliminary Report.

Annex 1:

Indirect Estimate of Childhood Mortality and Life Expectancy

UN Manual X is the major reference for the indirect method for estimating childhood mortality. The basic logic of the method can be summarized in the following formula:

$$q(X) = k\,(d(i))$$

q(a): the probability of children dead at exact age X;

d(i): the proportion of dead CEB of women at age group I (i=1 for age group 15-19, i=3 for age group 20-24, ... and i=7 for age group 45-49); and

k : weighting factor required to convert the proportion into the probability.

Using Life Table model(s), q(X) can then be used to estimate terms of ${}_1q_0$ (the probability of dying between age 0 and 1 or infant mortality), ${}_1q_4$ (the probability of dying between 1 and (1+4) or 5), and e_0 (life expectancy). Under-5 mortality can be derived from 1q0 and 1q4 using the formula:

$${}_5q_0 = 1 - (1-{}_1q_0)(1-{}_1q_4).$$

While infant, child and under-5 mortality rates are usually measured by 1000 live birth; life expectancy at age 0 (e_0) is expressed in year.

In practice, a computer-assisted calculation is usually used in the estimation. In this paper, the calculation was made using Mortpack package program.

The results of the application of the method for Timor-Leste data, using the 1990 and 2004 population census data, are presented in Annex 2.

Annex 2:

INDIRECT ESTIMATION OF EARLY AGE MORTALITY FOR TIMOR LESTE: 1990 Population Census

ENUMERATION OF OCT 1990

PROBABILITY OF DYING BEFORE AGE X

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	AVERAGE NO. OF CHILDREN SURVIVING	PROPORTION DEAD	AGE X	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST	NORTH	EAST	SOUTH
15-20	.080	.070	.125	1	.135	.148	.135	.134	.134	.152	.150	.150	.146
20-25	.880	.790	.102	2	.113	.114	.113	.110	.112	.112	.109	.112	.113
25-30	2.110	1.920	.090	3	.093	.093	.093	.091	.092	.092	.088	.092	.093
30-35	3.380	2.950	.127	5	.128	.128	.129	.127	.127	.129	.127	.129	.131
35-40	4.080	3.440	.157	10	.159	.157	.160	.157	.158	.161	.165	.162	.163
40-45	4.050	3.490	.138	15	.134	.136	.138	.134	.134	.140	.143	.140	.141
45-50	4.090	3.160	.227	20	.223	.222	.225	.220	.222	.229	.231	.229	.229

MEAN AGE AT CHILDBEARING = 26.00

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) REFERENCE DATE	LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) REFERENCE DATE	WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	SEP 1989	.135	.148	.135	.134	.134	JAN 1990	.152	.150	.150	.146
20-25	OCT 1988	.089	.102	.091	.091	.092	NOV 1988	.093	.086	.098	.092
25-30	MAR 1987	.070	.082	.071	.072	.071	DEC 1986	.072	.064	.078	.075
30-35	JAN 1985	.084	.104	.088	.088	.087	AUG 1984	.091	.079	.100	.092
35-40	MAY 1982	.094	.119	.099	.097	.097	JAN 1982	.102	.088	.115	.104
40-45	MAY 1979	.079	.102	.086	.080	.082	MAR 1979	.085	.073	.097	.091
45-50	DEC 1975	.113	.147	.124	.110	.116	MAR 1976	.124	.104	.144	.124
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	SEP 1989	.108	.050	.097	.088	.093	JAN 1990	.088	.121	.061	.113
20-25	OCT 1988	.053	.026	.049	.046	.047	NOV 1988	.045	.058	.032	.043
25-30	MAR 1987	.035	.017	.032	.030	.031	DEC 1986	.030	.038	.022	.026
30-35	JAN 1985	.048	.027	.046	.043	.044	AUG 1984	.042	.052	.032	.042
35-40	MAY 1982	.057	.034	.056	.050	.052	JAN 1982	.051	.060	.040	.055
40-45	MAY 1979	.043	.025	.044	.037	.039	MAR 1979	.039	.045	.031	.041
45-50	DEC 1975	.078	.049	.082	.062	.070	MAR 1976	.067	.076	.057	.080
LIFE EXPECTANCY AT BIRTH											
15-20	SEP 1989	45.6	48.7	50.3	39.4	44.6	JAN 1990	44.8	41.7	49.9	46.7
20-25	OCT 1988	57.2	57.8	60.1	49.8	55.1	NOV 1988	55.3	54.9	58.1	60.1
25-30	MAR 1987	62.5	62.3	64.8	55.2	60.4	DEC 1986	59.7	60.3	61.6	64.8
30-35	JAN 1985	58.6	57.5	60.9	50.8	56.2	AUG 1984	55.9	56.6	57.9	60.2
35-40	MAY 1982	56.1	54.4	58.4	48.5	53.8	JAN 1982	53.5	54.5	55.4	57.2
40-45	MAY 1979	60.0	58.0	61.3	52.8	57.7	MAR 1979	56.9	58.2	58.3	60.5
45-50	DEC 1975	51.2	49.1	52.9	45.2	49.3	MAR 1976	49.4	50.8	50.8	52.1

INDIRECT ESTIMATION OF EARLY AGE MORTALITY FOR TIMOR LESTE:
2004 Population Census

ENUMERATION OF JUL 2004

AGE OF WOMAN	AVERAGE NO. OF CHILDREN BORN	AVERAGE NO. OF CHILDREN SURVIVING	PROPORTION DEAD	AGE X
15-20	.110	.100	.091	1
20-25	1.050	.940	.105	2
25-30	2.560	2.260	.117	3
30-35	3.860	3.320	.140	5
35-40	4.910	4.060	.173	10
40-45	5.430	4.230	.221	15
45-50	5.330	3.870	.274	20

PROBABILITY OF DYING BEFORE AGE X

	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS)					COALE-DEMENY MODELS (TRUSSELL EQUATIONS)			
	LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	WEST	NORTH	EAST	SOUTH
1	.096	.105	.096	.095	.095	.107	.105	.106	.102
2	.115	.116	.116	.113	.114	.114	.110	.114	.115
3	.122	.122	.122	.119	.120	.120	.115	.120	.122
5	.141	.141	.142	.139	.140	.143	.141	.142	.145
10	.176	.173	.176	.173	.175	.179	.184	.179	.181
15	.215	.217	.221	.214	.215	.226	.231	.225	.227
20	.269	.268	.272	.265	.268	.278	.281	.277	.277

MEAN AGE AT CHILDBEARING = 26.00

CORRESPONDING MORTALITY INDICES

AGE OF WOMAN	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) REFERENCE DATE	LAT AM	CHILEAN	SO ASIAN	FAR EAST	GENERAL	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) REFERENCE DATE	WEST	NORTH	EAST	SOUTH
INFANT MORTALITY RATE											
15-20	JUN 2003	.096	.105	.096	.095	.095	SEP 2003	.107	.105	.106	.102
20-25	JUN 2002	.091	.105	.093	.093	.093	JUL 2002	.095	.087	.100	.094
25-30	DEC 2000	.088	.104	.089	.090	.090	SEP 2000	.091	.081	.099	.092
30-35	NOV 1998	.092	.114	.095	.095	.095	JUL 1998	.099	.087	.109	.099
35-40	MAY 1996	.102	.130	.107	.105	.106	JAN 1996	.113	.097	.126	.112
40-45	JUN 1993	.116	.152	.125	.118	.120	APR 1993	.132	.112	.150	.128
45-50	FEB 1990	.132	.172	.144	.127	.135	APR 1990	.151	.126	.173	.143
PROBABILITY OF DYING BETWEEN AGES 1 AND 5											
15-20	JUN 2003	.060	.027	.053	.049	.052	SEP 2003	.054	.077	.036	.055
20-25	JUN 2002	.055	.027	.050	.047	.049	JUL 2002	.046	.060	.033	.045
25-30	DEC 2000	.051	.027	.047	.045	.046	SEP 2000	.043	.054	.032	.043
30-35	NOV 1998	.055	.031	.052	.049	.050	JUL 1998	.048	.059	.037	.050
35-40	MAY 1996	.065	.039	.064	.057	.060	JAN 1996	.058	.068	.047	.065
40-45	JUN 1993	.081	.052	.084	.070	.074	APR 1993	.073	.083	.061	.086
45-50	FEB 1990	.100	.065	.106	.080	.090	APR 1990	.087	.098	.075	.107
LIFE EXPECTANCY AT BIRTH											
15-20	JUN 2003	55.4	57.2	59.0	48.6	53.9	SEP 2003	52.7	50.7	56.7	57.5
20-25	JUN 2002	56.7	57.4	59.7	49.3	54.6	JUL 2002	55.0	54.6	57.8	59.7
25-30	DEC 2000	57.7	57.5	60.5	50.1	55.6	SEP 2000	55.7	56.0	57.9	60.2
30-35	NOV 1998	56.7	55.6	59.2	48.8	54.4	JUL 1998	54.2	54.7	56.3	58.4
35-40	MAY 1996	54.1	52.4	56.6	46.4	51.8	JAN 1996	51.6	52.5	53.6	55.1
40-45	JUN 1993	50.7	48.1	52.5	43.2	48.4	APR 1993	48.0	49.1	50.0	51.2
45-50	FEB 1990	46.8	44.5	48.6	40.9	44.9	APR 1990	44.9	46.2	46.6	47.6

[i] Valuable and constructive comments on the draft of the early draft of article came from Mr. Fredrick Oteino, the advisor of the 2010 census of Timor-Leste, Mr. Helio Xavier, the national manager of the 2010 census of Timor-Leste. The author highly appreciates all of the comments. The author also appreciates Mr. Syafi'i Nur of BPS-Statistics Indonesia for his assistance in estimating early childhood mortality rate, and Mr. Americo Soares and Mr. Lorenzo Soares of the Directorate of Statistics of Timor-Leste for providing the data used in this paper.

[ii] The 1st one in the 1980.

[iii] Two important notes are worth presenting here. First, the publication of the 1990 census presents the number of population aged 5+ by sub-district but not for aged 0-4 and age 0+ (the total). To estimate the total population of each district, the proportion of age 0-4 at the national (i.e., TimorLeste) level is applied to each district. Exponential equation is used to calculate the growth rate. Second, according to Mr. Fredrick, official estimate of the growth

rate was about 3.2 percent annually. This is obviously a big difference compared to that shown in Table 1. However, the author so far has no idea to explain the big difference.

[iv] AS shown in the notes of Table 4, East Model of Coale-Demeny Life Table is used for calculation. There is no specific reason for this selection except that the model is also used officially during analysis of the 2004 census. Just to note, the West Model provides lower mortality rates and lower life expectancy than the East Model. Nonetheless, both models provide very similar picture of the trends.

[v] A decrease in life expectancy in a population is obviously unusual in contemporary world. A recent report by UN about the decrease in life expectancy Sub-Saharan countries--- reportedly due to the failures of many governments in that region to solve HIV/AID—related problems--- had been generally viewed as almost exclusively exceptional.

[vi] Early childhood mortality rates form DHS data may not directly comparable with those from census data due to the differences in methodology of calculation. However, the concern here is not at the rates but the trends.