Fertility transition in Ethiopia:
A study using reproductive outcome measures of Bongaarts and Casterline

Extended Abstract

Bongaarts and Casterline in their 2018 study of "fertility preferences and reproductive outcomes in the developing world" indicates that one can perfectly explain the progress in fertility transition (FT) in terms of a change overtime in the desired family size (DFS). They further state that in end of FT countries where the DFS is very low, one can find 'highest unplanned pregnancies.' Their findings are based on developing and analyzing a selected set of 'total' pregnancy outcome measures (TROMs) taking demographic health survey (DHS) data of 53 developing countries of various regions of the world, out of which 31 countries observed to be from Sub-Saharan Africa.

Various fertility studies of Ethiopia made based on data of EDHS of 2000 to 2016 indicates that Ethiopia and its regions also undergoing a change in its FT overtime.

The objective of the present study is thus to understand the FT in Ethiopia and its regions in terms of DFS and TROMs developed by Bongaarts and Casterline. Further, it is understood, so far, no such attempt was made by any researcher.

To reach the above goal a set of regression models were developed innovatively to derive DFS and TROMs from the only information on TFR. For this purpose the 53 countries estimated data on DFS and TROMs provided by Bongaarts and Casterline were used as basic input. Results of the study indicates that (1) the DFS and TROMs derived here using various regression models are very useful in understanding the FT of any developing country like Ethiopia in Africa; and (2) the FT is in well in progress in Ethiopia and its various regions, the exceptions being the regions of Somali and Affar for obvious reasons.

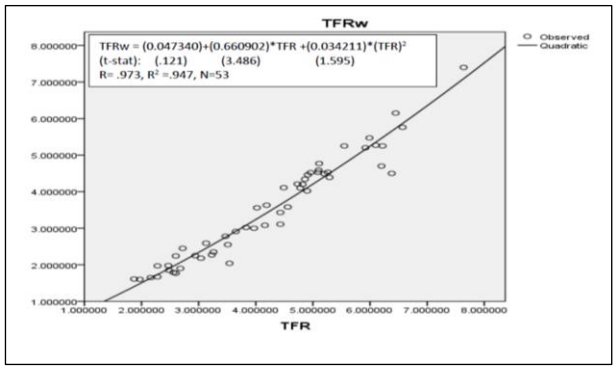
Bongaarts and Casterline (2018: 807) study indicates that all the TROMs defined by Bongaarts and Casterline namely TPR, TFR, TAR, TFRw, TFRunw, TFRmis, TFRpl, and others measure "the average number of pregnancy outcomes women would have over a lifetime if they experienced the current age-specific event rates"; and are interrelated to each other as shown below:

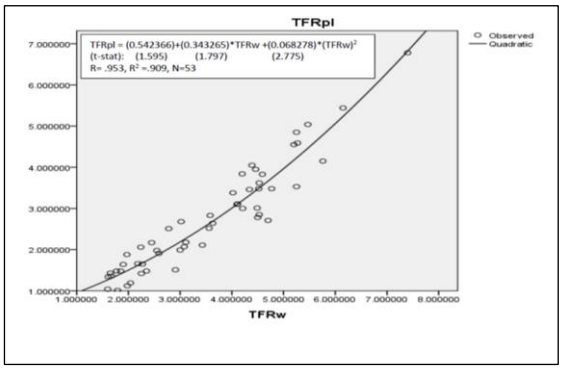
TPR = TFR + TAR; TFR = TFRw+TFRunw; TFRpl = TFR - TFRunw - TFRmis; TFRw = TFRmis + TFRpl.
Where: TPR = Total pregnancy rate, TFR = Total fertility rate, TFRw = Total wanted fertility rate, TFRunw = Total unwanted fertility rate, TFRmis = Total mistimed fertility rate, TFRpl = Total planned fertility rate, TAR = Total abortion rate.

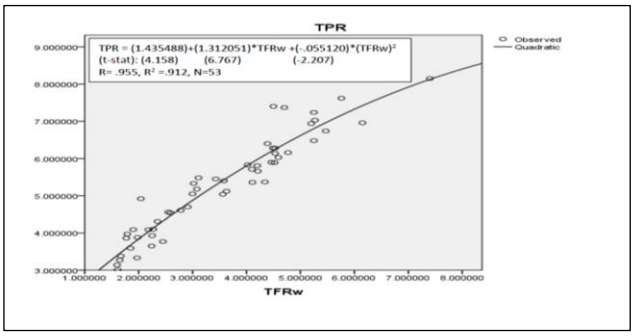
Out of these, it is stated that ,TFR is estimated from the DHS birth histories data. TFRunw is estimated from DHS using a method suggested by Lightbourne in 1985.

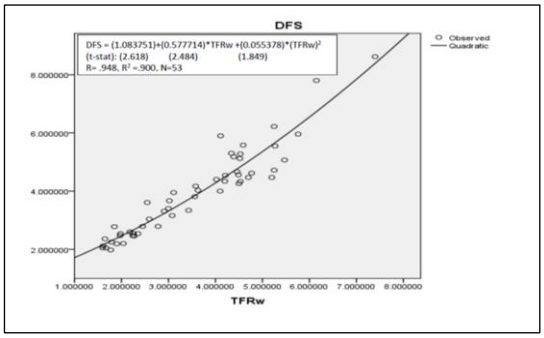
For further details of derivation of other indicators one may refer Appendix given in Bongaarts and Casterline (2018), page 807-808.

For input data on the above indicators used in this study for deriving various regression models shown below one may refer Appendix Table on Estimates of Reproductive Outcome Measures given in pages 808-809 of Bongaarts and Casterline (2018)
Presented below are selected results from the present study, for better understanding.

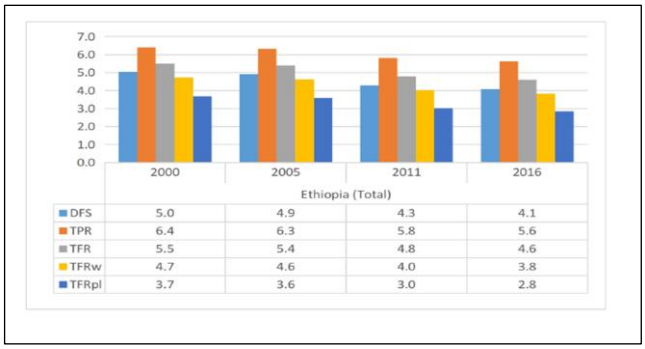




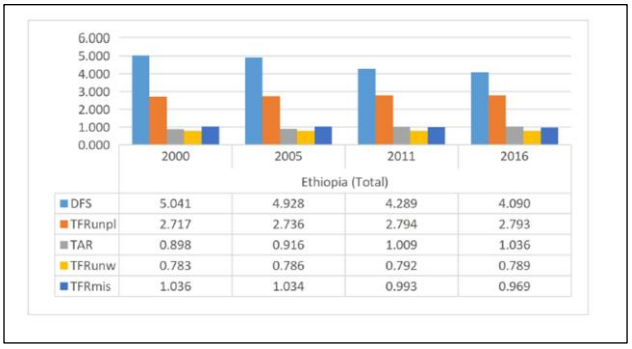




Using the above regression models and the interrelations among the indices as indicated by Bongaarts and Casterline (2018) a reference table was prepared. A condensed version of the reference table was presented below as Appendix Table A, for convenience. Using the given TFR and the reference table one may easily derive various TROMs and DFS without any much effort. For instance, find below diagrammatic presentation of various estimates for Ethiopia as a whole.



	2000	2005	2011	2016
DFS	5.0	4.9	4.3	4.1
TPR	6.4	6.3	5.8	5.6
TFR	5.5	5.4	4.8	4.6
TFRw	4.7	4.6	4.0	3.8
TFRpl	3.7	3.6	3.0	2.8



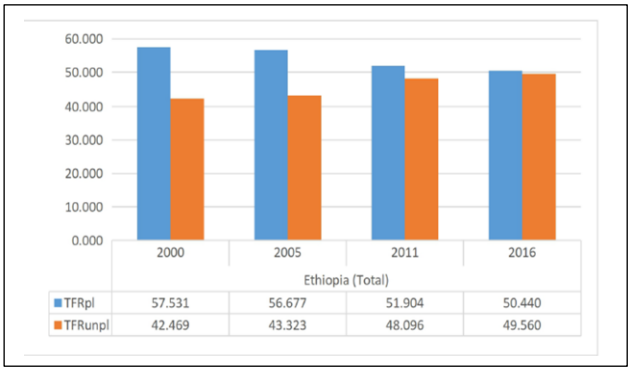
	2000	2005	2011	2016
DFS	5.041	4.928	4.289	4.090
TFRunpl	2.717	2.736	2.794	2.793
TAR	0.898	0.916	1.009	1.036
TFRunw	0.783	0.786	0.792	0.789
TFRmis	1.036	1.034	0.993	0.969

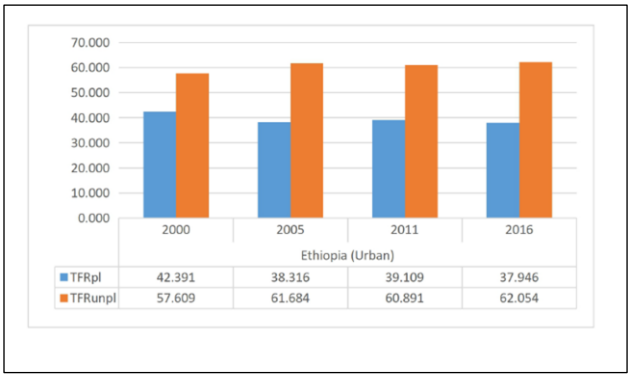
Reference Table A: Model estimates of Bongaarts reproductive outcome measure corresponding to a given TFR

TFR	DFS	TPR	TFRw	TFRpl	TFRunpl	TAR	TFRunw	TFRmis
6.6	6.419	7.258	5.900	4.944	2.314	0.658	0.700	0.956
6.4	6.150	7.109	5.678	4.693	2.415	0.709	0.722	0.985
6.2	5.889	6.956	5.460	4.452	2.504	0.756	0.740	1.008
6.0	5.637	6.800	5.244	4.220	2.580	0.800	0.756	1.024
5.8	5.392	6.642	5.031	3.998	2.644	0.842	0.769	1.033
5.6	5.156	6.480	4.821	3.784	2.696	0.880	0.779	1.037
5.4	4.928	6.316	4.614	3.580	2.736	0.916	0.786	1.034
5.2	4.708	6.149	4.409	3.383	2.766	0.949	0.791	1.026
5.0	4.494	5.980	4.207	3.195	2.785	0.980	0.793	1.012
4.8	4.289	5.809	4.008	3.015	2.794	1.009	0.792	0.993
4.6	4.090	5.636	3.811	2.843	2.793	1.036	0.789	0.969
4.4	3.898	5.461	3.618	2.678	2.783	1.061	0.782	0.940
4.2	3.714	5.284	3.427	2.520	2.764	1.084	0.773	0.906
4.0	3.535	5.106	3.238	2.370	2.736	1.106	0.762	0.868
3.8	3.363	4.927	3.053	2.227	2.701	1.127	0.747	0.826
3.6	3.198	4.747	2.870	2.090	2.657	1.147	0.730	0.780
3.4	3.038	4.566	2.690	1.960	2.606	1.166	0.710	0.730
3.2	2.885	4.384	2.513	1.836	2.548	1.184	0.687	0.677
3.0	2.737	4.202	2.338	1.718	2.484	1.202	0.662	0.620
2.8	2.595	4.019	2.166	1.606	2.413	1.219	0.634	0.560
2.6	2.458	3.836	1.997	1.500	2.336	1.236	0.603	0.497
2.4	2.327	3.653	1.831	1.400	2.253	1.253	0.569	0.431
2.2	2.201	3.469	1.667	1.304	2.165	1.269	0.533	0.363
2.0	2.079	3.286	1.506	1.214	2.072	1.286	0.494	0.292
1.8	1.963	3.104	1.348	1.129	1.975	1.304	0.452	0.219
1.6	1.851	2.922	1.192	1.049	1.873	1.322	0.408	0.144
1.4	1.744	2.740	1.040	0.973	1.767	1.340	0.360	0.067

Note: TFR: Total fertility rate; DFS: Ideal family size; TPR: Total pregnancy rate; TFRw: Total wanted fertility rate; TFRpl: Total planned fertility rate; TFRunpl: Total pregnancy rates unplanned; TAR: Total abortion rate; TFRunw: Total unwanted fertility rate; TFRmis: Total mistimed fertility
Source: Prepared by the researcher

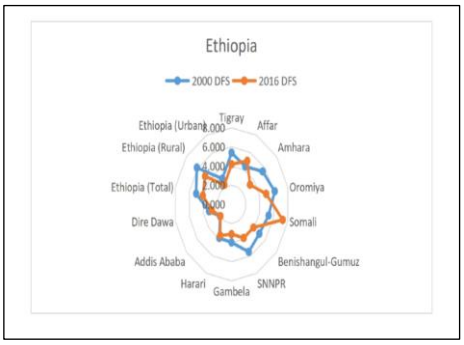
Proportion of pregnancies planned (TFRpl) and unplanned (TFRunpl) in Ethiopia Total and Ethiopia Urban areas, From 2000 to 2016 based on TFR of EDHS Data

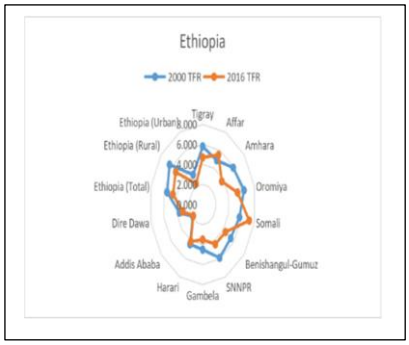


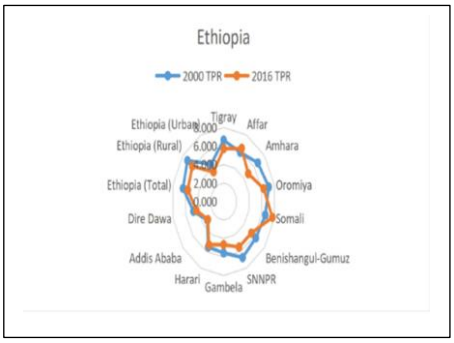


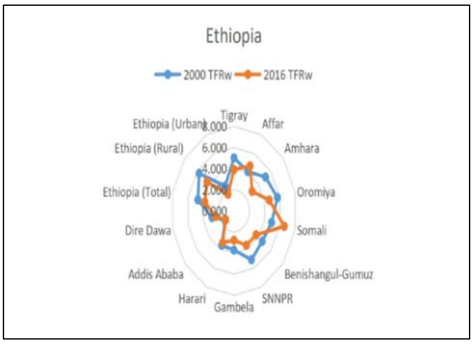
The above results indicates that, as stated by Bongaarts and Casterline (2018), in Urban areas when compared to total areas, the untended pregnancies increasing with time and a decline in DFS for below 3 children.

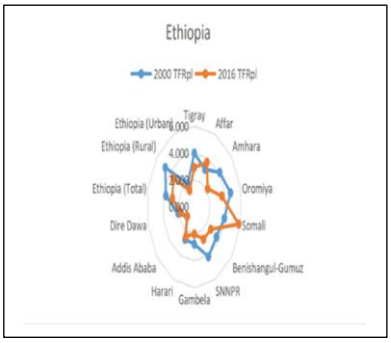
Other interesting results of the study are summarized below in terms of various radar diagrams:

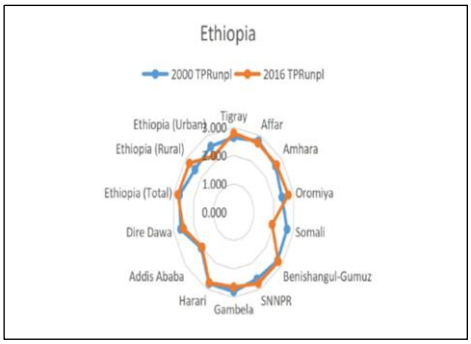


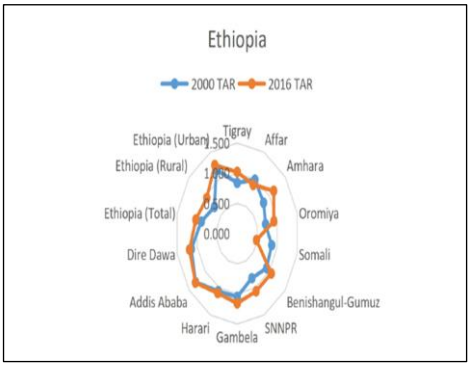


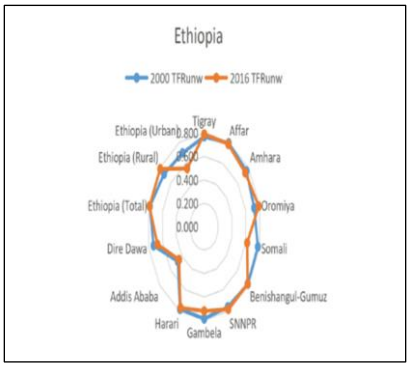


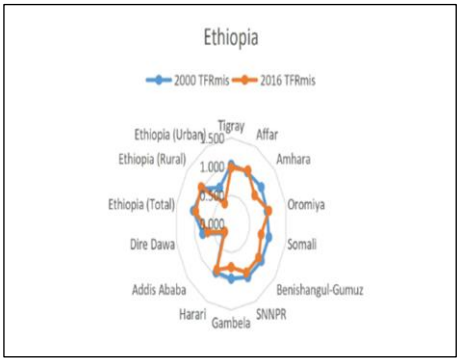












As stated by Bongaarts and Casterline (2018) one may represent various regions in Ethiopia in terms of DFS and the progress made in the FT.

Table : Fertility Transition in Ethiopia
(By DFS and EDH time periods of 2000, 2005, 2011 and 2016)

EDHS time Period	Desired Family Size (DFS)					
	7.4 - 6.5	6.4 - 5.5	5.4 - 4.5	4.4 - 3.5	3.4 - 2.5	2.4 - 1.5
	High DFS (Early Transition Stage)		Moderate DFS (Late Transition Stage)		Lowest DFS (<3 children) (End Transition Stage)	
2000		Amhara(5.5) Oromiya(6.1) SNNPR(5.5) ETH (Rural)(6.1)	Tigray (5.4) Somali (5.3) Benishangul-Gumuz(4.9) ETH (Total)(5.0)	Affar(4.4) Gambela(4.0) Harari(3.9)	Dire Dawa(3.2) ETH (Urban)(3.0)	Addis Ababa (2.0)
2005		Oromiya(5.9) Somali (5.6) ETH (Rural)(5.6)	Tigray (4.6) Amhara(4.6) Benishangul-Gumuz(4.7) SNNPR(5.2) ETH (Total)(4.9)	Affar(4.4) Gambela(3.5)	Harari(3.4) Dire Dawa(3.2)	Addis Ababa (1.7) ETH (Urban)(2.3)
2011	Somali (7.1)		Affar(4.5) Oromiya(5.2) Benishangul-Gumuz(4.7) ETH (Rural)(5.0)	Tigray(4.1) Amhara(3.7) SNNPR(4.4) Gambela(3.5) ETH (Total)(4.3)	Harari(3.4) Dire Dawa(3.0) ETH (Urban)(2.5)	Addis Ababa (1.8)
2016	Somali (7.3)		Affar(5.0) Oromiya(4.9) ETH (Rural)(4.7)	Tigray(4.2) Benishangul-Gumuz(3.9) SNNPR(3.9) Harari(3.6) ETH (Total)(4.1)	Amhara(3.3) Gambela(3.1) Dire Dawa(2.8)	Addis Ababa (2.0) ETH (Urban)(2.3)

Important Reference:

Bongaarts, John and John B. Casterline (2018) From Fertility Preferences to Reproductive Outcomes in the Developing World. *Population and Development Review* 44(4): 793-809.