How Is Fertility Behavior in Africa Different? Online Appendix

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A Surveys Used For Analyses

Table A.1: Surveys Used for Analysis by Region and Survey Type

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Lestino 2007/02/007/10,2007/10,2017 2000,2019 Liberia 2006/07,2013,2019/20 2018 Madagascar 1992,2000,2004/05,2010,2015/16 2006,2013/14,2019/20 Malaivi 1992,2000,2004/05,2010,2015/16 2006,2013/14,2019/20 Mali 1995,2000,2004/05,2010,2015/16 2007,2011,2015 Mauritania 2019/21 2007,2011,2015 Mozambique 1997,2003/04,2011 2008 Niger 1992,1995,2000,2006,071,2013 2000 Niger 1992,1990,2000,2005,2007/08,2010/11,2014/15,2019/20 2000,2014,2019 Sao Tome and Principe 2008,000 2000,2005,007,002,001/11,2014/15,2019/20 2000,2005/06,2010,2017 Sterra Leone 2008,2013 2018 2000,2005/06,2010,2017 South Africa 1998,2016 2006 2001 Studan 1991/92,1996,1999,2004/05,2009/10,2015/16 2006,2010,2017 2006 Studan 1991/92,1996,1999,2004/05,2009/10,2015/16 2006,2010,2017 2006,2010,2017 Togo 1995/2001/02,2007,2013/14,2018/19 2006,2010,2017 2006,2010,2017 2006,2010,2017 Uganda </td <td>Kenya Lesotho</td> <td>1993, 1998, 2003, 2008/09, 2014, 2022</td> <td>2000-2018</td>	Kenya Lesotho	1993, 1998, 2003, 2008/09, 2014, 2022	2000-2018
Madagoscar 1992, 2003/04, 2008/09, 2021 2018 Malavi 1992, 2000, 2004/05, 2010, 2015/16 2006, 2013/14, 2019/20 Mali 1995/96, 2001, 2006, 2012/13, 2018 2015 Mauritania 20197, 2013, 2012, 2013, 2018 2007, 2011, 2016 Mosambigue 1997, 2003, 04, 2011 2008 Namibia 1992, 2000, 2006, 70, 2013 2000 Niger 1992, 2000, 2006, 2012 2000 Niger 1992, 2000, 2006, 2012, 2007 2000, 2011, 2016/17, 2021 Kwanda 1992, 2000, 2005, 2007/08, 2010/11, 2014/15, 2019/20 2000, 2014, 2019 San Tome and Principe 2008/09 2000, 2005/06, 2010, 2017 Sierra Leone 2008, 2016 2006 South Africa 1998, 2016 2006 South Africa 1998, 2016 2006 Sudan 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2016 Tanzania 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Togo 1998, 2013/14 2016 2006, 2010, 2017 Uganda 1995, 2000/10, 2006, 2011, 2016 2006, 2010, 2017	Liberia	2006/07, 2013, 2019/20	2000, 2013
Malawi 1992, 2000, 2004/05, 2010, 2015/16 2006, 2013/14, 2019/20 Mali 1995/96, 2010, 2006, 2012, 13, 2018 2015 Mauritania 2019/21 2007, 2011, 2015 Mauritania 2019/22 2007, 2011, 2015 Maritania 1997, 2030/04, 2011 2008 Namibia 1992, 2000, 2006/07, 2013 2000 Niger 1992, 1998, 2006, 2012 2000 Rwanda 1992, 2000, 2005, 2017/08, 2010/11, 2014/15, 2019/20 2000, 2014, 2019 Sao Tome and Principe 2008, 2008, 2013, 2018, 2010/11, 2014, 2015, 2016, 2017, 2014 2000, 2016/02, 2010, 2017 Senegal 1992, 1993, 1997, 2005, 2010/11, 2012, 13, 2014, 2015, 2016, 2017, 2016 2000, 2005/06, 2010, 2017 South Africa 1998, 2016 2000 2000 South Sudan 2010 2016 2010 Sudan 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2010 2014 Tanzania 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 2006 Uganda 1995, 2000/01, 2006, 2011, 2016 2006, 2010, 2017 2006, 2010, 2017 Uganda 1995,	Madagascar	1992, 1997, 2003/04, 2008/09, 2021	2018
Mail 1995/90, 2007, 2008, 2002/15, 2018 2013 Mauritania 2019/21 2007, 2011, 2015 Mozambique 1997, 2003/04, 2011 2008 Mamibia 1992, 2000, 2006/07, 2013 2000 Niger 1992, 2000, 2006/07, 2013 2007, 2011, 2016/17, 2021 Rwanda 1990, 2003, 2008, 2013, 2018 2000, 2014, 2019 Sao Tome and Principe 2008, 2007, 2007, 2017, 12014/15, 2019/20 2000, 2014, 2019 Senegal 1992/93, 1997, 2005, 2010/11, 2012/13, 2014, 2015, 2016, 2017, 2018 2000, 2005/06, 2010, 2017 South Africa 1992/93, 1997, 2005, 2010/11, 2012/13, 2014, 2015, 2016, 2017, 2018 2006 South Africa 1998, 2016 2001 2001 Sudan 1990 2001/12, 2007, 2013/14 2006, 2010, 2017 Sudan 1990 2001/12, 2006, 2011, 2015/16 1 Tanzania 1991, 299, 2004/05, 2009/10, 2015/16 1 Tanzania 1995, 2000/01, 2006, 2011, 2016 2006, 2010, 2017 Uganda 1995, 2000/01, 2006, 2011, 2016 2006, 2010, 2017 Zambia 1992, 1999, 2001/02, 2007, 2013/14, 2018/19 2009, 2014,	Malawi	1992, 2000, 2004/05, 2010, 2015/16	2006, 2013/14, 2019/20
Mozambique 1997, 2003/04, 2011 2008 Namibia 1992, 2000, 2006/07, 2013 2000 Niger 1992, 2000, 2008, 2013, 2018 2007, 2011, 2016/17, 2021 Nigeria 1990, 2003, 2008, 2013, 2018 2007, 2011, 2016/17, 2021 Swanda 1992, 2000, 2005, 2007/08, 2010/11, 2014/15, 2019/20 2000, 2014, 2019 Sao Tome and Principe 2008, 1003, 2005, 2017/11, 2012/13, 2014, 2015, 2016, 2017, 2018 2000, 2005/06, 2010, 2017 Sereagal 1992/93, 1997, 2005, 2010/11, 2012/13, 2014, 2015, 2016, 2017, 2018 2000, 2005/06, 2010, 2017 South Africa 1998, 2016 2006 2000 South Sudan 1990 2019/19, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Togo 1998, 203/14 2006, 2010, 2017 2006, 2010, 2017 Uganda 1995, 2000/01, 2006, 2011, 2015 2006, 2010, 2017 2006, 2010, 2017 Uganda 1995, 2000/01, 2006, 2011, 2015 2006, 2010, 2017 2006, 2010, 2017 Zambia 1992, 1996, 2007/02, 2007, 2013/14, 2018/19 2006, 2010, 2017 2006, 2010, 2017 Zimbabwe 1994, 1999, 2003/06, 2011, 2015 2009, 2014, 2019 2009, 2014, 2019	Mauritania	2019/21	2007, 2011, 2015
Namibia 1992, 2000, 2006/,07, 2013 Niger 1992, 1998, 2006, 2012 2000 Nigeria 1990, 2003, 2008, 2013, 2018 2007, 2011, 2016/17, 2021 Rwanda 1992, 2000, 2005, 2007/08, 2010/11, 2014/15, 2019/0 2000, 2014, 2019 Sao Tome and Principe 2008, 2003, 2010/11, 2012/13, 2014, 2015, 2016, 2017, 2018 2000, 2005/06, 2010, 2017 Sierra Leone 2008, 2013 2006 2000 South Africa 1998, 2016 2006 Sudan 991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2010 Tanzania 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Uganda 1995, 2000/10, 2006, 2011, 2016 2006, 2010, 2017 Zambia 1991, 1990, 1990, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Tanzania 1991, 1990, 1990, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Tanzania 1991, 1990, 2007/02, 2007, 2013/14, 2018/19 2006, 2010, 2017 Zambia 1992, 1996, 2007/02, 2007, 2013/14, 2018/19 2006, 2010, 2017 Zambia 1992, 1990, 2007/02, 2007, 2013/14, 2018/19 2009, 2014, 2019	Mozambique	1997, 2003/04, 2011	2008
Ingeria 1992, 1970, 2000, 2012, 2000, 2012 2000 Rigeria 1990, 2003, 2008, 2013, 2018 2007, 2011, 2016/17, 2021 Rwanda 1992, 2000, 2005, 2007/08, 2010/11, 2014/15, 2019/20 2000, 2014, 2019 Sao Tome and Principe 2008/09 2000, 2014, 2019 Sterrat Leone 1992/93, 1997, 2005, 2010/11, 2012/13, 2014, 2015, 2016, 2017, 2018 2000, 2005/06, 2010, 2017 South Africa 1998, 2016 2006 South Sudan 1991 2019 Tanzania 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2010 Uganda 1995, 2000/01, 2006, 2011, 2016 2006, 2010, 2017 Zambia 1992, 1996, 1999, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Tanzania 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Zambia 1992, 2000, 2013/14, 2018/19 2006, 2010, 2017 Zambia 1992, 1996, 2007/02, 2007, 2013/14, 2018/19 2009, 2014, 2019	Namibia	1992, 2000, 2006/07, 2013	2000
Rwanda 1992, 2000, 2005, 2007/08, 2010/11, 2014/15, 2019/20 2000, 2014, 2019 Sao Tome and Principe 2008, 00 2000, 2014, 2019 2000, 2014, 2019 Senegal 2008, 2013 2000, 2005, 60, 2010, 2017, 2018 2000, 2005, 60, 2010, 2017, 2018 Sierra Leone 2008, 2013 2006 2000, 2005/06, 2010, 2017, 2018 South Africa 1998, 2016 2010 Sudan 1990 2010 Tanzania 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Uganda 1995, 2000/01, 2006, 2011, 2016 2006, 2010, 2017 Uganda 1995, 2000/02, 2007, 2013/14, 2018/19 2006, 2010, 2017 Zambia 1994, 1999, 2001/02, 2007, 2013/14, 2018/19 2009, 2014, 2019	Nigeria	1990, 2003, 2008, 2013, 2018	2007, 2011, 2016/17, 2021
Sao Tome and Principe 2008, 09 2000, 2014, 2019 Senegal 1992/93, 1997, 2005, 2010/11, 2012/13, 2014, 2015, 2016, 2017, 2018 2000, 2005/06, 2010, 2017 Sierra Leone 2008, 2013 2000, 2005/06, 2010, 2017 South Africa 1998, 2016 2006 South Africa 1990 2010 South Africa 1990 2010 Tanzania 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Tanzania 1991, 2004, 2005, 2007/10, 2015/16 2006, 2010, 2017 Uganda 1995, 2000/01, 2006, 2011, 2016 2006, 2010, 2017 Zambia 1992, 1995, 2001/02, 2007, 2013/14, 2018/19 2009, 2014, 2019	Rwanda	1992, 2000, 2005, 2007/08, 2010/11, 2014/15, 2019/20	
Sciegat 1992/193, 1997, 2005, 2010/11, 2012/13, 2014, 2015, 2016, 2017, 2016 2000, 2005/06, 2010, 2017 Somalia 2006 2006 South Africa 1998, 2016 2010 Souta 1990 2010 Tanzania 1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16 2006, 2010, 2017 Uganda 1995, 2000/01, 2006, 2011, 2016 2006, 2010, 2017 Zambia 1992, 1996, 2007/02, 2007, 2013/14, 2018/19 2006, 2010, 2017 Zambia 1992, 1996, 2007/02, 2007, 2013/14, 2018/19 2006, 2010, 2017	Sao Tome and Principe	2008/09	2000, 2014, 2019
Somalia 2006 South Africa 1998, 2016 South Sudan 2010 Sudan 1990 Tanzania 1991/2, 1996, 1999, 2004/05, 2009/10, 2015/16 Togo 1998, 2013/14 2006, 2010, 2017 Uganda 1992, 1996, 2011, 2016, 2011, 2016 2006, 2010, 2017 Zambia 1992, 1996, 2007, 2007, 2013/14, 2018/19 Zambia	Sierra Leone	1772/75, 1997, 2005, 2010/11, 2012/15, 2014, 2015, 2016, 2017, 2018 2008, 2013	2000, 2005/06, 2010, 2017
South Africa 1998, 2016 South Sudan 2010 Sudan 1990 Tanzania 1991, 2019, 1999, 2004/05, 2009/10, 2015/16 Togo 1998, 2013/14 2006, 2010, 2017 Uganda 1995, 2000/10, 2006, 2011, 2016 2006, 2017, 2007 Zambia 1992, 1996, 2007, 0213/14, 2018/19 2009, 2014, 2019	Somalia	2000/2010	2006
Soutin sucan 2010 Sudan 1990 2010 Tanzania 1991/2,1996,1999,2004/05,2009/10,2015/16 2006,2010,2017 Togo 1998,2013/14 2006,2010,2017 Uganda 1995,2000/01,2006,2011,2016 2006,2017 Zambia 1992,1996,2007/02,2007,2013/14,2018/19 2009,2014,2019	South Africa	1998, 2016	2010
Josephilic Josephilic Tanzania 1991/92,1996,1999,2004/05,2009/10,2015/16 2006,2010,2017 Togo 1995,2000/01,2006,2011,2016 2006,2010,2017 Uganda 1995,2000/01,2006,2011,2016 2006,2010,2017 Zambia 1992,1996,2007/02,2007,2013/14,2018/19 2009,2014,2019	South Sudan Sudan	1990	2010
Togo 1998, 2013/14 2006, 2010, 2017 Uganda 1995, 2000/01, 2006, 2011, 2016 2006, 2010, 2017 Zambia 1992, 1996, 2001/02, 2007, 2013/14, 2018/19 2009, 2014, 2019 Zimbabwe 1994, 1999, 2005/06, 2010/11, 2015 2009, 2014, 2019	Tanzania	1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16	
Uganda 1995, 2000/01, 2006, 2011, 2016 Zambia 1992, 1996, 2001/02, 2007, 2013/14, 2018/19 Zimbabwe 1994, 1999, 2005/06, 2010/11, 2015 2009, 2014, 2019	Togo	1998, 2013/14	2006, 2010, 2017
Zimbabwe 1994, 1999, 2005/06, 2010/11, 2015 2009, 2014, 2019	Uganda Zambia	1995, 2000/01, 2006, 2011, 2016 1992, 1996, 2001/02, 2007, 2013/14, 2018/19	
	Zimbabwe	1994, 1999, 2005/06, 2010/11, 2015	2009, 2014, 2019

Note. A total of 353 surveys are used for the analysis. More information on the 235 DHS surveys is available at dhsprogram.com. More information on the 118 MICS surveys is available at mics.unicef.org. For both types, survey years are based on the survey collection rather than the official years.

Table A.2: Surveys Used for Analysis by Region and Whether Survey Includes Non-married Women

Country	Only Ever-married/par	inered Women	All Women
		East Asia and	d Pacific
Cambodia			2000, 2005/06, 2010/11, 2014, 2021/22
riji Indonesia	1991, 1994, 1997, 2007		2021 2002/03, 2007, 2012, 2017
Kiribati			2018/19
Lao PDR Mongolia			2011/12, 2017 2000 2005 2010 2013/14 2018
Myanmar			2015/16
Philippines			1993, 1998, 2003, 2008, 2013, 2017, 2022
Samoa Thailand			2019/20 2005/06.2012/13.2015/16.2019
Timor-Leste			2009/10, 2016
Tonga Tuvalu			2019
Vanuatu			2017/20 2007/08
Vietnam			1997, 2000, 2002, 2006, 2010/11, 2013/14, 2020/21
Argentina		Latin America an	d Caribbean 2019/20
Belize			2011, 2015/16
Bolivia Brazil			1993/94, 1998, 2000, 2003/04, 2008 1991/02, 1996
Colombia			1990, 1995, 2000, 2004/05, 2009/10, 2015/16
Costa Rica			2018
Cuba Dominican Republic			2010/11, 2014, 2019 1991, 1996, 1999, 2000, 2002, 2007, 2013, 2014, 2019
El Salvador			2014
Guatemala			1995, 1998/99, 2014/15
Guyana Haiti			2000, 2006, 2009, 2014 1994/95, 2000, 2005/06, 2012, 2016/17
Honduras			2005/06, 2011/12, 2019/20
Jamaica Maxico			2005
Nicaragua			2015 1997/98, 2001
Paraguay			1990, 2016
Peru Suriname			1991/92, 1996, 2000, 2003/06, 2007/08, 2009, 2010, 2011, 2012 1999/2000. 2006. 2018
Trinidad and Tobago			2011
Turks and Caicos Islands			2019/20
Afghanistan	2015/16	South A	sia 2010/11_2015/16
Bangladesh	1996/97, 2012/13, 2019		1993/94, 1999/2000, 2004, 2007, 2011, 2014, 2017/18
Bhutan			2010
India Maldives			1992/93, 1998/2000, 2005/06, 2015/16, 2019/21 2009. 2016
Nepal	1995/96, 2000/01, 2019		2005/06, 2010/11, 2013/14, 2016, 2021/22
Pakistan	2006/07	Cult Cal	1990/91, 2006/07, 2012/13, 2017/18
Angola		Sup-Saharar	2001, 2015/16
Benin			1996, 2001, 2006, 2011/12, 2014, 2017/18
Burkina Faso Burundi			1992/93, 1998/99, 2003, 2006, 2010
Cameroon			1991, 1998, 2000, 2004, 2011, 2014, 2018/19
Central African Republic			1994/95, 2000, 2006, 2010, 2018/19
Chad			1996/97, 2000, 2004, 2010, 2014/15, 2019 1996-2000-2012
Congo, Dem. Rep.			2001, 2007, 2010, 2013/14, 2017/18
Congo, Rep.			2005, 2011/12, 2014/15
Cote d'Ivoire Equatorial Guinea			1994, 1998/99, 2011/12, 2016 2000
Eswatini			2000, 2006/07, 2010, 2014
Ethiopia			2000, 2005, 2011, 2016, 2019
Gapon Gambia, The			2000/01, 2012, 2019/21 2000, 2006, 2010, 2013, 2018, 2019/20
Ghana			1993/94, 1998/99, 2003, 2006, 2008, 2011, 2014, 2017/18
Guinea Guinea Bissau			1999, 2005, 2012, 2016, 2018
Gumea-bissau Kenya			2000, 2008, 2014, 2018/19 1993, 1998, 2003, 2008/09, 2014, 2022
Lesotho			2000, 2004/05, 2009/10, 2014, 2018
Liberia Madagascar			2006/07, 2013, 2019/20 1992, 1997, 2003/04, 2008/09, 2018, 2021
Malawi			1992, 2000, 2004/05, 2006, 2010, 2013/14, 2015/16, 2019/20
Mali	0014		1995/96, 2001, 2006, 2012/13, 2015, 2018
Mauritania Mozambique	2011		2007, 2015, 2019/21 1997, 2003/04, 2008, 2011
Namibia			1992, 2000, 2006/07, 2013
Niger			1992, 1998, 2000, 2006, 2012
Nigeria Rwanda			1990, 2003, 2007, 2008, 2011, 2013, 2016/17, 2018, 2021 1992, 2000, 2005, 2007/08, 2010/11, 2014/15, 2019/20
Sao Tome and Principe			2000, 2008/09, 2014, 2019
Senegal			1992/93, 1997, 2005, 2010/11, 2012/13, 2014, 2015, 2016, 2017, 2018
Sierra Leone Somalia	2006		2000, 2005/06, 2008, 2010, 2013, 2017
South Africa			1998, 2016
South Sudan Sudan	2010		
Tanzania	1770		1991/92, 1996, 1999, 2004/05, 2009/10, 2015/16
Togo			1998, 2006, 2010, 2013/14, 2017
∪ganda Zambia			1995, 2000/01, 2006, 2011, 2016 1992, 1996, 2001/02, 2007, 2013/14, 2018/19
Zimbabwe			1994, 1999, 2005/06, 2009, 2010/11, 2014, 2015, 2019

Note. A total of 353 surveys are used for the analysis. More information on the 235 DHS surveys is available at dhsprogram.com. More information on the 118 MICS surveys is available at mics.unicef.org. For both types, survey years are based on the survey collection rather than the official years.

B What is Urban?

There is no generally agreed upon definition of what constitutes an urban area. The DHS and MICS, therefore, relies on the individual country's definition of urban. These definitions vary widely. A substantial number of countries use a simple population cut-off to define urban, with some cut-offs as low as 2,000 people (United Nations, 2019).¹

If there are systematic differences in what is counted as urban, observed differences in fertility across regions may be because of differences in definition rather than behavior.² Within countries there may also be urban areas of different types, for example larger and smaller urban areas, and fertility likely also differs across these areas (Corker, 2017).

A particular concern is that some places counted as urban may be heavily agricultural with relatively easy access to land. Hence, families in these areas likely have a higher return to having children than those in more built-up urban areas.

Because the main concern arising from the lack of a uniform definition of urban is potential differences in the return to children, I attempt to capture the importance of agriculture based on DHS data. The only agricultural-related variable that exists across all phases and countries is the respondent's partner's occupation.³ I calculate the proportion of observed partners who work in agriculture, whether self-employed or an employee, within each cluster.

There are two potential issues with using partner's occupation to capture differences in the return to children. First, the agricultural occupation category includes fishermen, foresters, and hunters. Second, because the modal number of households surveyed per cluster is twenty the occupation measure may be noisy. Unfortunately it is not possible to use a large base for the measure because there is no reliable way to identify which clusters

¹See also https://blogs.worldbank.org/sustainablecities/what-does-urban-mean, https://population.un.org/wup/, and Uchida and Nelson (2010).

²For a discussion of differences between urban areas across high and low income countries see Jedwab, Loungani, Yezer, and Papageorgiou (2019).

³The respondent's occupation is not available in phase 1 of DHS surveys and not available in any MICS surveys.

are located close to each other or even whether two clusters are in the same urban area. Furthermore, because GPS data is only available for a limited number of survey and most of those recent, using the same approach as in Corker (2017) would severely limit the number of observations.



Figure B.1: Proportion of Male Partners working in Agriculture by PSU Across Regions

Figure B.1 show the distribution of respondents by the proportions of partners who work in a agricultural related job in the cluster by region. Furthermore, a respondent is the least likely to live in a cluster with agricultural work in South Asia, where 75% lived in clusters with no reported agricultural work. The highest proportion of agricultural work is in East Asia and Pacific where only 45% are in an cluster with no agricultural work. For

Sub-Saharan Africa and Latin America and Caribbean, 52% and 65% are in clusters with no agricultural work.

Finally, in many places city limits are not clearly demarcated, with peri-urban areas in between the urban and rural areas. With the rapid population growth of cities, these peri-urban areas are mostly classified as rural rather than urban (Corker, 2017). There are, however, no clear evidence on differences in the existence of these peri-urban areas across regions.

C Mortality Risk and Fertility

As discussed briefly in the paper, there are four critical challenges when trying to understand the role that mortality plays in the differences in fertility behavior across regions.

The first challenge is the actual measure to use. A common option is to use underfive mortality, which was and is higher in Sub-Saharan Africa than the other regions (Hill and Pebley, 1989; Roser, Ritchie, and Dadonaite, 2013; Wang et al., 2017). But, parents likely care about the number of children who survive to adulthood rather than the first five years of life (Canning, Günther, Linnemayr, and Bloom, 2013). As Sub-Saharan Africa countries generally have a higher over-five mortality than the other regions, ignoring overfive mortality may bias the results and inflate fertility differences (Ward et al., 2021). Life expectancy at birth is likely better but is heavily influence by very early deaths and does not indicate the likelihood of surviving to adulthood. Furthermore, using current life expectancy might be impacted by the spread of HIV/AIDS, which was likely unanticipated by households.

The second challenge is which period and population to base the mortality measure on. Presumably parents care about their offspring's expected mortality, but no direct information is available on individuals' assessment of that risk (Montgomery, 2000). Calculating mortality risk at the time fertility decisions are made are complicated by three factors. First, mortality declines over time, possibly at different rates within and across countries and regions (Hill and Pebley, 1989; Roser, Ritchie, and Dadonaite, 2013). Second, children of better-educated mother have lower mortality than children of less-educated mothers and urban mothers face lower child mortality rates than rural mothers (Strauss and Thomas, 1995; Pörtner and Su, 2018; Balaj, York, Sripada, Besnier, Vonen, Aravkin, Friedman, Griswold, Jensen, Mohammad, Mullany, Solhaug, Sorensen, Stonkute, Tallaksen, Whisnant, Zheng, Gakidou, and Eikemo, 2021).⁴ Finally, fertility may increase in

⁴More schooling is also associated with better health outcomes for both women and children, which may lead to lower child mortality and, in turn, further decreases fertility, because fewer births are required to reach a desired number of surviving children (Ainsworth, Beegle, and Nyamete, 1996). However, it is not

response to other women's offspring mortality, even if the underlying mortality risk does appear to have changed (Nobles, Frankenberg, and Thomas, 2015).

The third challenge is isolating the exogenous part of any observed mortality risk. The effect of mortality on fertility can arise from three, possibly reinforcing pathways, hoarding—having more children in response to expected mortality—physiological effects, and the deliberate replacement of deceased children Ben-Porath (1976); Rosenzweig and Schultz (1983); Palloni and Rafalimanana (1999). While an exogenous increase in mortality can increase fertility, higher fertility may also lead to higher mortality, for example, through resource dilution or closer spacing of births, although the literature provides conflicting answers to how large this effect is (Chowdhury, 1988; Birdsall, 1988; Benefo and Schultz, 1996; Conley, McCord, and Sachs, 2007). The upshot is that any observed mortality measure will be a combination of both the exogenous component of mortality and the endogenous component, driven by households' response to exogenous mortality.

The final challenge is the empirical specification of the relationship between mortality and fertility. Theoretical models suggest an inverse-U relationship between offspring mortality risk and fertility (Sah, 1991; Pörtner, 2001; Doepke, 2005). A simple intuition for this is that at 100% mortality there are only costs and no benefits associated with having children and fertility is, therefore, zero. As mortality risk decreases, the benefits eventually outweigh the cost and people will begin having children. At very low levels of mortality risk an increase will lead to higher fertility as a hoarding/insurance response.

Another way to look at whether there is a non-linear relationship between mortality and fertility is the literature that attempts to determine whether a reduction in offspring mortality lead to a decline in net fertility, that is, the number of surviving children Olsen (1980); Olsen and Wolpin (1983); Brown and Guinnane (2007); Angeles (2010); Cervellati and Sunde (2015); Bousmah (2017). Although the results generally support a positive re-

clear exactly why there is such a strong effect of education on child health. Thomas, Strauss, and Henriques (1991), Glewwe (1999), and Kovsted, Pörtner, and Tarp (2002) all suggests that it is better health knowledge rather than higher income, changes in norms, or something inherent in education that drives the positive relationship between mothers' education and child health.

lationship between fertility and mortality, there is no consensus on the effect of mortality decline on net fertility. For example, projections suggest that the world's population size in 2000 would have been very close to the observed population size if fertility and mortality rates would have remained at 1950–55 levels, suggesting no net effect (Heuveline, 1999). Correspondingly, most of the literature assume that empirically the relationship is linear (See, for example Shapiro and Gebreselassie, 2008; Chisadza and Bittencourt, 2016; Shapiro and Tenikue, 2017). The exception is a non-linear effects of mortality on completed fertility in an area of rural Senegal (Bousmah, 2017). While a linear approximation may work well for individual country analyses, especially if only a shorter period is covered, it is likely to bias the estimated differences in fertility when comparing regions with large differences in mortality.

D Sensitivity Analyses Figures

D.1 HIV/AIDS



Figure D.1: Differences in Children Ever Born Between Sub-Saharan Africa and Regions Excluding 10 High HIV Countries for Women Age 40–49 by Cohort with 95% Bootstrapped Confidence Intervals in Solid and All Countries in Grey



Figure D.2: Differences in Number of Surviving Children Between Sub-Saharan Africa and Regions Excluding 10 High HIV Countries for Women Age 40–49 by Cohort with 95% Bootstrapped Confidence Intervals in Solid and All Countries in Grey

D.2 Son Preferences and Sex Ratios



Figure D.3: Differences in Predicted Number of Children Ever Born Based on Number of Sons Born Between Sub-Saharan Africa and Regions by Cohort With 95% Bootstrapped Confidence Intervals in Solid and Number of Children Ever Born in Grey



Figure D.4: Differences in Predicted Number of Surviving Children Based on Number of Surviving Sons Between Sub-Saharan Africa and Other Regions by Cohort With 95% Bootstrapped Confidence Intervals in Solid and Number of Children Ever Born in Grey

D.3 Migration

To investigate migration's influence, I create a sample using the set of surveys that have information on prior residence(s).⁵ The sample includes women born in the surveyed area and women whose last previous area of residence was the same as their current type.⁶ For comparison, I use all women from surveys that collected location information, whether they have moved or not or have missing location information. There are 693,668 urban women and 1,163,733 rural women in surveys that collected location information. Of those, 295,442 urban women and 480,398 rural women were either born in the area they were surveyed in or were living in the same type of area as they lived in previously.

⁵DHS phases 6 and 7 did not include prior location question in the core questionnaires and location questions were not added to MICS until phase 6.

⁶I also tried a sample consisting of only women born in their surveyed area, but the sample was too small to provide useful results.



Figure D.5: Differences in Children Ever Born Between Sub-Saharan Africa and Regions for Women Age 40–49, Who are Either Born Where Surveyed or Always Lived in the Same Type of Area, by Cohort with 95% Bootstrapped Confidence Intervals



Figure D.6: Differences in Number of Surviving Children Between Sub-Saharan Africa and Regions for Women Age 40–49, Who are Either Born Where Surveyed or Always Lived in the Same Type of Area, by Cohort with 95% Bootstrapped Confidence Intervals

E Almost Complete Fertility: 30–39 Year Olds

There are two problems with focusing on completed fertility. First, it tells us little about the recent developments in fertility behavior across regions, and those developments are mainly behind the argument that Sub-Saharan Africa is different. Second, the sample size decreases with increasing age leading to noisier estimate and makes it more difficult to understand if there are significant differences across regions.

However, using younger age groups does have three important limitations. First, differences across regions for non-complete fertility may reflect differences in the distribution of births across ages rather than differences in the final number of children born. Imagine two regions where the only difference in fertility behavior is when childbearing begins. Say that in one region, women begin childbearing at age 20 and have two children before age 25 after which they stop childbearing. In another region, women begin childbearing at age 25, and have two children by age 30, after which they stop childbearing. If we regress children ever born on a set of explanatory variables, it would appear that fertility is higher in the first region than the second region among the younger age group (it is identical from age 30 across regions).

Second, as I discussed above, changes in the timing of fertility over time can lead to significant overestimates of how fast fertility declines, which, in turn, would make us substantially overestimate the differences for anything but completed fertility (Pörtner, 2022).

Finally, the risk of a downward bias in fertility increases the more recent data is used, especially for lower quality surveys (Schoumaker, 2014; Gerland, Biddlecom, and Kantorová, 2017). Fertility estimates based on retrospective birth histories covering the last three years before a survey can be underestimated by 10 percent or more. One possible explanation is that by failing to record recent births, enumerators can lower their workload because they no longer have to go through the health module. The result is that fertility estimates for non-complete fertility for a given period tend to be revised upwards as new surveys become available.

Below are the same tables and graphs presented in the paper and above but using the sample of women aged 30 to 39 born in the thee cohorts 1960-1969, 1970-1979, and 1980-1989. The predicted fertility for women aged 30 to 39 closely follow the same pattern as for the predicted completed fertility above. Except for women with some primary or completed primary, there is little evidence that Sub-Saharan Africa is fundamentally different from the other regions. Fertility for women with two to seven years of education is, however, still substantially higher for Sub-Saharan Africa than the other regions.

		East Asia and Pacific		Latin America and the Caribbean		South Asia		Sub-Saharan Africa				
Grade	1960	1970	1980	1960	1970	1980	1960	1970	1980	1960	1970	1980
						Ur	ban					
0	943	1,208	951	2,092	1,728	682	6,723	12,585	19,211	12,595	26,507	19,346
1	256	222	192	737	801	302	142	281	456	445	806	733
2	652	470	413	1,398	1,345	460	402	717	1,204	1,030	1,901	1,450
3	1,017	788	546	1,809	2,038	613	542	906	1,524	1,249	2,620	2,155
4	769	724	626	1,835	1,759	629	733	1,319	2,501	1,760	3,225	2,586
5	845	1,162	1,152	3,342	3,793	941	1,559	2,997	6,916	2,389	5,365	4,136
6	3,434	5,468	2,445	2,964	4,932	2,311	623	1,305	2,601	2,895	7,266	5,618
7	435	871	726	1,916	2,252	1,252	1,108	2,173	5,276	3,162	5,018	3,621
8	548	1,453	1,331	2,678	3,138	1,263	1,340	3,089	8,139	2,272	4,775	4,269
9	2,104	4,793	3,536	2,354	4,055	2,380	1,363	3,135	8,007	2,500	5,878	5,106
10	1,656	2,430	2,216	2,773	2,249	1,293	2,563	5,315	13,230	2,712	4,488	3,777
11	304	763	1,300	5,240	11,814	3,526	412	778	1,646	1,657	4,108	3,769
12	4,339	8,177	5,941	2,571	5,337	5,202	1,267	3,672	10,823	2,162	7,494	8,606
13	251	519	818	1,225	2,618	2,242	129	313	829	649	1,599	2,104
14	933	1,361	2,282	1,693	5,110	2 <i>,</i> 795	479	827	1,260	339	1,392	1,999
15	180	1,585	2,413	1,323	1,316	1,604	1,495	3,470	10,391	648	2,100	2,595
16	1,299	4,242	5,400	3,583	9,172	6,025	906	2,510	8,749	807	2,885	4,228
						Ru	ıral					
0	5,485	6,271	4,958	6,114	4,786	1,868	26,894	48,103	96,750	41,110	83,670	67,565
1	1,026	967	843	1,355	1,724	754	456	888	1,870	1,514	3,573	3,214
2	2,326	1,938	1,495	2,312	2,869	998	1,022	2,185	5,196	2,691	6,179	5,007
3	3,096	2,551	1,781	2,621	3,562	1,288	1,135	2,391	6,322	2,976	6,799	5,984
4	2,445	2,510	1,809	2,040	2,797	1,088	1,481	3,424	9,454	3,257	7,162	6,561
5	2,192	3,173	3,048	2,533	3,636	1,267	2,759	7,361	23,588	3,284	7,984	7,145
6	7,029	10,256	4,717	2,413	6,075	3,377	868	2,248	7,954	3,470	11,100	10,009
7	966	1,544	1,433	857	1,352	719	1,277	4,180	14,421	5,170	9,699	6,718
8	890	2,212	1,915	1,027	1,679	803	1,294	5,001	21,347	1,899	5,813	5,517
9	3,315	5,430	5,038	843	1,925	1,405	1,113	4,370	19,495	1,412	4,292	4,131
10	1,375	1,819	2,469	773	1,187	645	1,450	5,210	22,227	1,496	3,013	2,905
11	256	678	1,635	967	3,248	1,201	222	726	2,684	962	2,441	2,396
12	2,687	4,169	4,636	543	1,285	1,841	476	2,660	14,153	704	4,053	5,237
13	113	251	840	152	405	425	46	171	797	172	500	613
14	401	632	1,651	207	771	471	125	309	1,068	104	585	822
15	80	903	1,656	175	326	274	276	1,296	7,594	194	796	860

Table E.1: Number of Observations by Region, Cohort, and Highest Grade Level Completed for Women in the 30–39 Age Grou

1,028 Note. Unweighted raw numbers of observations for women in the 30–39 age group with complete information on children ever born, surviving children, highest grade completed, and area of residence

113

667

5,047

162

593

1,001

16

475

1,694

3,429

396

1,219







Figure E.1: Distribution of Education for Women Age 30–39 Across Cohorts by Region



Figure E.2: Distribution of Education for Women Age 30–39 Across Regions by Cohort



Figure E.3: Differences in Number of Children Ever Born to Sub-Saharan Africa for Women Age 30–39 by Cohort with 95% Bootstrapped Confidence Intervals



Figure E.4: Differences in Number of Surviving Children to Sub-Saharan Africa for Women Age 30-39 by Cohort with 95% Bootstrapped Confidence Intervals in Blue and Number of Children Ever Born in Grey 21



Figure E.5: Differences in Literacy (Tested and Self-Reported) Between Sub-Saharan Africa and Regions for Women Age 30–39 by Cohort with 95% Bootstrapped Confidence Intervals



Figure E.6: Difference-in-Difference in Children Ever Born and Surviving Children Between Sub-Saharan Africa and Regions for Women Age 30–39 by Cohort with 95% Bootstrapped Confidence Intervals



Figure E.7: Compare HIV surviving - Differences in Predicted Fertility to Sub-Saharan Africa for Rural Women Age 30–39 by Cohort with 95% Bootstrapped Confidence Intervals 24



Figure E.8: Differences in Predicted Number of Children Ever Born Based on Number of Sons Born Between Sub-Saharan Africa and Regions by Cohort With 95% Bootstrapped Confidence Intervals in Solid and Number of Children Ever Born in Grey



Figure E.9: Differences in Predicted Number of Surviving Children Based on Number of Surviving Sons Between Sub-Saharan Africa and Other Regions by Cohort With 95% Bootstrapped Confidence Intervals in Solid and Number of Children Ever Born in Grey



Figure E.10: Differences in Children Ever Born Between Sub-Saharan Africa and Regions for Women Age 30–39, Who are Either Born Where Surveyed or Always Lived in the Same Type of Area, by Cohort with 95% Bootstrapped Confidence Intervals



Figure E.11: Differences in Number of Surviving Children Between Sub-Saharan Africa and Regions for Women Age 30–39, Who are Either Born Where Surveyed or Always Lived in the Same Type of Area, by Cohort with 95% Bootstrapped Confidence Intervals

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