Ethnic-religious Differences in Child Survival in Egypt
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1 Introduction

In most countries in the Middle East, discussion remains acutely scarce of ethnic–religious health inequalities. Prevailing tensions among ethnic-religious groups throughout the region may discourage investigation of inequality along the lines of ethnic-religious affiliation. Egypt is no exception; while the relative size of the Christian Copt minority has become a source of significant controversy, health and mortality differentials between the Copt minority and Muslim majority are hardly mentioned. During the 1980s and 1990s, Christians in Egypt have had higher childhood mortality than Muslims despite their advantage in socioeconomic status. This is the first study to explore reasons for their higher mortality.

1.1 Mortality gaps between ethnic–religious groups

Ethnic and religious differentials in infant and child mortality are observed in many countries (e.g. Amitai et al. 2005; Caldwell 1990; Defo 1996; Guillot and Allendorf 2010; Preston et al. 1994). Mensch, Lentzner, and Preston studied infant and child mortality differentials in fifteen less developed countries in Asia, Africa, and Latin America (United Nations 1985). They report that differences between ethnic and religious groups exist in almost all of these countries. They note that gaps are more prominent between ethnic than religious groups and in rural more than in urban areas[1]. Another large-scale, comparative study was conducted by Brockerhoff and Hewett (2000), whose analysis of Demographic and Health Surveys (DHS) from the 1990s reveals significant disparities in early child survival among ethnic groups across a wide range of African countries. The finding of large ethnic gaps encouraged the authors to "strongly support placing the notion of ethnicity at the forefront of the theories and analysis of child mortality in Africa, which incorporates social, and not purely epidemiological considerations" (Brockerhoff and Hewett 2000 :37).

Reasons for these differentials may vary across countries but mostly they represent differences among the ethnic-religious groups in socioeconomic status, regional concentration, or cultural practices. Socioeconomic disparity may comprise the most common explanation for gaps in mortality between ethnic and religious groups. In cases where the ethnic-religious group with a higher mortality rate is also disadvantaged in social and economic terms, socioeconomic differentials become the immediate "natural" explanation for the mortality gap. In fact, cases that do not fit this pattern are usually called "puzzles," reflecting researchers' strong propensity to propose socioeconomic difference as the principal exegetic factor. This propensity is supported by many empirical findings that show that socioeconomic differences account for all, or a significant portion, of observed ethnic-religious mortality differences (Brockerhoff and Hewett 2000; Burgard and Treiman 2006; Weeks 1988).

A handful of cases challenge the socioeconomic explanation showing higher mortality among the socially advantaged ethnic-religious group (e.g. Guillot and Allendorf 2010). In these cases, researchers usually revert to variations between the studied groups in practices and attitudes relevant to child health, such as practices related to child rearing, hygiene, and sanitation. Variations between religious-ethnic groups in this knowledge may account for some of the child survival differentials. In settings where modern health-care is not fully prevalent, local and traditional knowledge play a significant role in childrearing. When modern,

[1]The authors make a clear distinction between religion and ethnicity that is not emphasized in other studies. For example, Brockerhoff and Hewett (2000) regard religion as a defining characteristic of ethnicity.

standardized medicine becomes accessible on a large scale, many of the traditional practices of child rearing begin to fade, a process that leads to some convergence in mortality rates across ethnic-religious groups and regions (Caldwell 1990).

Caldwell (1986) highlighted another possible link between religious-cultural affiliation and child survival. He hypothesized that constrained female autonomy could explain low achievement in child survival in some Islamic societies. Support for this hypothesis, however, is limited (Ghuman 2003; Brockerhoff and Hewett 2000; Kuhn 2010).

A third explanation behind ethnic-religious differences in mortality focuses on the geographic distribution of ethnic-religious groups. Availability of health facilities and other resources could vary considerably across different regions within a single country. Compared to rural areas, urban centers are more likely to have advanced facilities, a higher concentration of experts, and better infrastructure, including access to clean water, transportation, and sanitation. When a specific ethnic-religious group is highly concentrated in an area with relatively poor health infrastructure or in an area characterized by high mortality, there are disadvantages regardless of the socioeconomic attributes of its individual members.

While the preceding explanations are presented independently of one another, they may interact in several ways. Regional differences usually reflect variations in level of development and cultural practices. In a pre-modern medical era, ethnic-religious gaps may result from a combination of cultural and socioeconomic factors. With the expansion of modern health care systems, cultural differences may lessen, with socioeconomic differences still contributing to health and mortality inequalities. The following section discusses these explanations in relation to the gap in childhood mortality between Christians and Muslims in Egypt.

1.2 Mortality gaps in Egypt

Before the early 20th century, Christians in Egypt demonstrated lower mortality than Muslims (Courbage and Fargues 1997). The Nile Delta and Upper Egypt, where Christians are highly concentrated and represent more than 10% of the total population, were also the provinces with the lowest infant mortality. By 1920, however, this regional correlation has disappeared. "... [F]rom 1944 the statistics give mortality rates by religion, demonstrating a higher [crude death] rate among Muslims which persisted in independent Egypt. Over time, however, the difference between the two communities was reduced ... as very high mortality rates fell overall, the advantage of the Christians over the Muslims diminished, apparently disappearing during the 1970s" (Courbage and Fargues 1997 :177).

Results from Adlakha et al. (1983) imply that the 1970s were a turning point in the Christian-Muslim gap. Using data from the 1980 World Fertility Survey (WFS), the authors estimate that the risk of neonatal and infant deaths are, respectively, 1.6 and 1.2 times greater for children of Christian mothers than for children of Muslim mothers. Unfortunately, Adlakha et al. (1983) do not provide explanation for the Christian excess mortality. Other sources about religious mortality differentials in Egyptian society could not be located.

Since the 1980 WFS survey, five DHS surveys from Egypt (1988, 1992, 1995, 2003, and 2008) asked respondents about their religious affiliation and thus provide an opportunity to learn about religious differences in child mortality. Figure 1 presents under-five and infant mortality rates by religious group. Table 1 presents neonatal, post-neonatal, infant, child, and under-five mortality rates for Muslims and Christians.

In the late 1970s and early 1980s, under-five mortality among Christians was 160 deaths per

1000 births, compared to 130 deaths per 1000 births for Muslim—a gap of 30 deaths per 1000 births. In spite of mortality reduction, similar gaps are observed in the 1992 and 1995 surveys. The 1992 survey estimates under-five mortality for Christians at 131 deaths per 1000 births, compared to 107 deaths per 1000 births among Muslims—a gap of 24 deaths per 1000 births. The estimated gap using the 1995 survey is 16 deaths per 1000 births: 111 for Christians, versus 95 for Muslims. The absolute gap has been drastically reduced, as evidenced by more recent surveys in 2005 and 2008. A similar trend in the Christian-Muslim mortality gap appears when examining infant mortality.

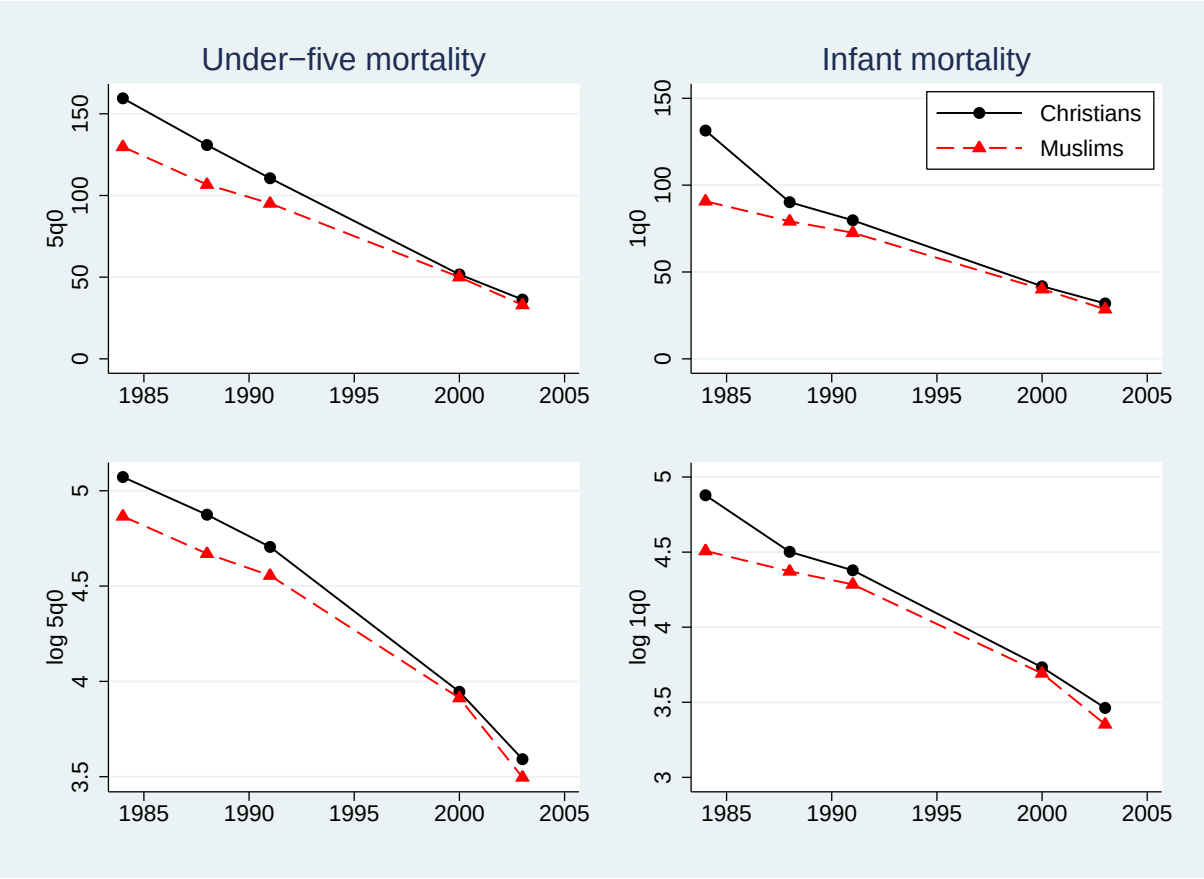
Table 1: Neonatal (NN), postneonatal (PNN), infant, child, and under-five mortality rates for both sexes, by religious group and survey

Survey year	NN	PNN	Infant	Child	Under-five
	Christians				
1988	69	67	131	32	160
1992	48	44	90	45	131
1995	36	46	80	33	111
2005	24	19	42	10	52
2008	17	15	32	5	36
	Muslims				
1988	45	48	91	43	130
1992	42	39	79	30	107
1995	37	37	73	24	95
2005	23	18	40	10	50
2008	18	11	29	5	33
	Absolute difference: Christians-Muslims				
1988	24	19	41	-11	30
1992	6	5	11	15	24
1995	-2	9	7	9	16
2005	1	1	2	0	2
2008	-1	4	3	0	3
	Ratio: Christians/Muslims				
1988	1.54	1.39	1.45	0.74	1.23
1992	1.14	1.13	1.14	1.52	1.23
1995	0.96	1.24	1.10	1.36	1.16
2005	1.05	1.06	1.04	1.00	1.03
2008	0.94	1.40	1.12	1.00	1.10

Source: Author's calculations based on the 1988, 1992, 1995, 2005 and 2008 DHS surveys from Egypt. Calculations use births in the ten years preceding each survey and incorporate samples weights.

The reviewed theoretical explanations suggest that the Christian-Muslim gap could have

Figure 1: Trends in under-five and infant mortality, in arithmetic (upper panel) and log (lower panel) scales, by religious group, Egypt 1983-2008



Source: Author's calculation. Each survey contributes one data point based on the births in the five years preceding the survey.

resulted from differences between the groups in socioeconomic status, regional distribution, or cultural practices. The distribution of maternal educational level and household wealth, proxies for socioeconomic status, among each religious group are presented in Table 2. As will be explained later, observations from the 1988, 1992 and 1995 surveys were combined into one sample, and observations from the 2005 and 2008 surveys are combined to one sample.

In the period 1988-95, Christians generally enjoyed a socioeconomic advantage over Muslims; Christian mothers attained higher levels of education than their Muslim counterparts. As a result of higher rates of mobility among Muslim mothers, however, this advantage was less in 2005-08. A measure of household wealth, available only in the two recent surveys, indicates that on average, Christian households are wealthier than Muslim ones. Based on these socioeconomic indicators, survival rates are predicted to be higher among Christians than Muslims, especially in the earlier period.

Table 2: Distribution of socioeconomic and regional indicators by religious group, Egypt 1988-95 and 2005-08

	1988-95		2005-08	
	Muslims	Christians	Muslims	Christians
Mother's education				
No education	48	39	33	31
Primary	27	24	13	9
Secondary	21	27	45	47
Higher	5	10	10	13
Household wealth quintile[a]				
Poorest	na	na	23	21
Poorer	na	na	20	16
Middle	na	na	20	16
Richer	na	na	19	20
Richest	na	na	18	27
Type of residence				
Urban	44	54	39	53
Rural	56	46	61	47
Region				
Lower Egypt	37	10	35	10
Upper Egypt	38	66	45	71
Urban governorates[a]	20	23	15	17
Frontier governorate[b]	4	1	5	3

[a] Wealth index is not available (na) in the 1988,1992, and 1995 surveys.
Source: Based on the characteristics of mothers who gave at least one birth in the ten year preceding each DHS survey (1988, 1992, 1995, 2005 and 2008).

Changes in the geographic distribution of each group between the periods 1988-95 and 2005-08 are minor. In the first period, 49% of Christians lived in urban areas, compared to 41% of

Muslims. In the second period, 51% of Christians lived in urban areas, compared to 37% of Muslims. The higher urban concentration contributes to a mortality advantage for Christians, as mortality in both periods is significantly lower in urban than rural areas (El-Zanaty and Way 2009). At the same time, Christians are highly concentrated in Upper Egypt, about 70% compared to about 40% of Muslims, a region characterized by higher mortality rates than elsewhere in Egypt.

The Christian mortality disadvantage of 1988-95 persists despite this group's advantage over Muslims in socioeconomic status (SES) and higher concentration in urban areas. Higher Christian mortality, it would seem, is principally a function of this group's geographic concentration in Upper Egypt. In 2005-08, the socioeconomic advantage of Christians decreases while their regional and urban concentration remains largely the same. The absence of a mortality gap during the 2000s might reflect a balance between Christian advantages and disadvantages in addition to a general reduction in mortality level and differentials.

2 Methods

Data for this study is drawn from Egypt's 1988, 1992, 1995, 2005 and 2008 DHS surveys. Each survey includes a variable describing the respondent's religious-ethnic affiliation. The analytical sample includes only mothers who identified themselves as Christian or Muslim and had at least one birth in the ten years preceding the interview; it includes 50,204 mothers who reported 108,590 births (see table 3).

Table 3: Numbers of mothers and births by religious group and survey

Survey	Muslims	Christians	Total
		Mothers	
1988	6,269	399	6,668
1992	7,110	398	7,508
1995	10,377	613	10,990
2005	13,010	668	13,678
2008	10,832	528	11,360
Total	47,598	2,606	50,204
		Births	
1988	15,691	909	16,600
1992	17,105	927	18,032
1995	23,928	1,370	25,298
2005	25,774	1,220	26,994
2008	20,724	942	21,666
Total	103,222	5,368	108,590

Source: The 1988, 1992, 1995, 2005 and 2008 DHS surveys from Egypt. Numbers include mothers who gave births in the ten years preceding each survey and births in those years.

The main analysis compares children of Christian and Muslim mothers in two measures of mortality: whether or not a child born in the ten years preceding the interview died by the age of five or the age of one year. Differences between children of Christian mothers and children of Muslim mothers in these measures are tested using Cox regression models using the Stata 11.2 software.

Four different models are fitted. The baseline model includes only religious affiliation and estimates the unadjusted Christian-Muslim gap. Model two controls for mother's education, type of residence, and household wealth, variables in which Christians have an advantage. Model three controls for region only, the minorities disadvantage. Model four controls for both socioeconomic and regional variables: mother's education, type of residence, region, and household wealth. All models use survey weights. Because most Christians reside in Upper Egypt, a factor ostensibly central to their mortality disadvantage, same regression models are applied for births only from Upper Egypt.

Because of the relatively small number of Christian births in each sample, power analysis is conducted using the *stpower cox* function in Stata. For each survey, this analysis calculates the sample size required to detect, with 80% power, the expected Christian-to-Muslim hazard ratio, where the expected hazard ratio is based on the ratio of the under-five death rates presented in table 1. The analysis also provides the achieved test power given the actual sample size and calculates the smallest gap (in units of hazard ratio) that can be detected with 80% power given the actual sample size.

To test whether our results are affected by biases from reporting births that happened in a relatively long period before each interview, i.e. births in the ten years preceding the interview, a different analysis uses births in the five years preceding each survey. Results are not reported as they are very similar to that of using births in the ten years preceding each survey.

3 Results

Results from the power analysis show that the size of each individual survey is less than that required to detect the expected gap in child survival, the calculated test power is less than 80%, and the gap which can be detected with 80% power given the actual individual samples is higher than the expected gap based on the observed death rates (see table 4). Therefore, the 1988, 1992, and 1995 surveys are combined into a single sample and the 2005 and 2008 surveys into another. While the 1988-95 combined sample is large enough to detect the expected mortality gap, the minimal gap that can be detected using the 2005-08 combined sample (hazard ration of 1.15) is less than the expected 1.10 hazard ratio.

Under-five mortality gradients by maternal education, household wealth, type of residence, and region are reported in table 5. (Gradients for infant mortality appear in appendix 1). In the 1988-95 sample, rural mortality exceeds urban mortality by 60 deaths per 1000 births, mortality among the least educated exceeds that among the most educated by 75 deaths per 1000 births, and mortality in Upper Egypt exceeds that in the other regions by 62 deaths for every 1000 births. In Upper Egypt, Christians have higher under-five mortality (164 deaths per 1000 births) than the Muslim population residing in the same region (142 deaths per 1000 births), which implies that factors other than concentration in Upper Egypt likely contribute to their higher mortality. The excess Christian mortality is not observed in the other regions. In fact, in those regions Christians experience lower mortality rates than Muslims, 56 vs. 83 deaths per 1000 births, respectively.

Table 4: Required sample size, actual test power, and minimal detectable gap for individual and combined surveys

Survey	Expected gap	Sample size	Required size	Test power	Minimal gap
1988	1.25	16,600	20,548	0.72	1.28
1992	1.25	18,032	25,607	0.67	1.30
1995	1.25	25,298	26,286	0.79	1.26
2005	1.10	26,994	327,497	0.18	1.39
2008	1.10	21,666	494,519	0.13	1.58
1988-95	1.25	59,930	24,235	0.99	1.15
2005-08	1.10	48,660	386,732	0.22	1.31

Notes: Test is a Cox regression model comparing two groups in survival. The required sample size is calculated assuming the expected gap, i.e. a hazard ratio of 1.25 for the 1988, 1992, 1995 surveys and a hazard ratio of 1.10 for the 2005 and 2008 surveys.

In about two decades, all of these gradients fall off drastically as appears in the 2005-08 sample; the gap between the least and most educated falls to about 25 deaths per 1000 births, the gap between Upper Egypt and the other regions narrows to 22 deaths per 1000 births, and the gap between rural and urban areas falls to 12 deaths per 1000 births.

Results from the Cox regression models are presented in table 6. In the 1988-95 sample, model one shows that the hazard of death before age five is 24% higher for Christians than for Muslims (hazard ratio=1.24, $p< 0.01$). Controlling for socioeconomic indicators and type of residence (model two) increases the relative gap (hazard ratio=1.35, $p< 0.01$) because Christians have an advantage in these variables. At the same time, controlling for region only (model three) renders the gap to non-significant (hazard ratio=1.06, $p> 0.05$), which indicates a strong disadvantage for Christians due to their concentration in Upper Egypt. It also accounts for Christians' mortality advantage in regions other than Upper Egypt. Model four, which accounts for both Christians' mortality advantages (higher SES and higher urban concentration) and disadvantage (higher concentration in Upper Egypt), yields a significant gap (hazard ratio=1.17, $p< 0.01$). This result indicates that the regional disadvantage outweighs both SES and urban residence advantages. Analyzing infant mortality rates gives similar results.

If the main disadvantage of the Christian population is a result of a higher concentration in Upper Egypt, limiting analysis to this region should result in lower mortality rates among Christians, owing to their socioeconomic and urban residence advantages. Results from the Upper Egypt sample do not support this prediction. In fact, the Christians in Upper Egypt have higher under-five mortality (164 deaths per 1000 births) than the Muslim population of the same region (142 deaths per 1000 births), and accounting for socioeconomic indicators and type of residence (model 2) estimates a higher hazard of death among Christians (hazard ratio=1.21, $p > 0.05$).

Because of a drastic reduction in Egyptian mortality, regional and socioeconomic differentials—as well as their contribution to the Christian-Muslim mortality gap—become relatively small between Christians. The Christian-Muslim mortality gap has declined to a low level of 4 under-five deaths per 1000 births (see table 5). The power analysis shows that the 2005-08 sample is not large enough to detect such a small difference, as indicated by the

Table 5: Socioeconomic and regional under-five mortality gradients, for Christians (Chr.), Muslims (Mus.) and total population in all regions (upper panel) and in Upper Egypt (lower panel) by survey

	1988-95			**2005-08**		
	Chr.	Mus.	Total	Chr.	Mus.	Total
	All-regions					
Type of residence						
Rural	191	128	131	58	46	46
Urban	64	72	72	34	34	34
Education						
Primary or less	164	121	123	56	55	55
Secondary or higher	48	48	48	37	29	30
Region						
Upper Egypt	164	142	143	46	55	55
Other regions	56	83	81	44	32	33
Wealth quintile						
Poorest	na	na	na	69	53	54
Middle	na	na	na	35	39	39
Richest	na	na	na	29	29	29
All sample	131	106	107	46	41	41
	Upper Egypt					
Type of residence						
Rural	196	158	160	59	59	59
Urban	80	98	97	24	44	43
Education						
Primary or less	191	152	154	61	65	65
Secondary or higher	65	71	71	31	37	37
Wealth quintile						
Poorest	na	na	na	66	62	62
Middle	na	na	na	30	53	52
Richest	na	na	na	23	34	33
All Upper Egypt	164	142	143	46	55	55

Source: Author's calculations based on the 1988, 1992, 1995, 2005 and 2008 DHS surveys from Egypt. Calculations use births in the ten years preceding each survey and incorporate samples weights.

Table 6: Estimated Chritian-to-Muslim hazard ratio and 95% confidence intervals (95CI) of dying before age five or age one, in all regions and in Upper Egypt

	Dying before age five		Dying before age one	
	Hazard ratio	95CI	Hazard ratio	95CI
All regions, 1988-95				
Model 1	1.24**	(1.11–1.39)	1.22**	(1.08–1.38)
Model 2	1.35**	(1.21–1.52)	1.33**	(1.17–1.50)
Model 3	1.06	(0.94–1.18)	1.05	(0.93–1.18)
Model 4	1.17**	(1.05–1.31)	1.16*	(1.02–1.31)
All regions, 2005-08				
Model 1	1.07	(0.85–1.34)	1.08	(0.85–1.38)
Model 2	1.10	(0.88–1.38)	1.11	(0.87–1.41)
Model 3	0.94	(0.75–1.19)	0.96	(0.75–1.23)
Model 4	1.01	(0.80–1.28)	1.03	(0.80–1.31)
Upper Egypt, 1988-95				
Model 1	1.17*	(1.03–1.32)	1.15*	(1.03–1.31)
Model 2	1.21**	(1.07–1.37)	1.19*	(1.04–1.36)
Upper Egypt, 2005-08				
Model 1	0.83	(0.64–1.08)	0.85	(0.64–1.12)
Model 2	0.90	(0.69–1.17)	0.91	(0.69–1.21)

** $p < 0.01$, * $p < 0.05$.

Notes: Model 1 controls for religious affiliation only. Model 2 controls for religious affiliation, maternal education, and type of residence. Model 3 controls for religious affiliation and region. Model 4 controls for religious affiliation, maternal education, type of residence and region.

absolute death rates. Therefore, the regression models based on the 2005-08 sample, which all estimate an insignificant mortality gap, can only show changes in the gap as a result of controlling for socioeconomic and regional variations. These changes are similar to those indicated by the 1988-95 sample; controlling for socioeconomic status increases the gap while controlling for regional differences decreases it.

4 Discussion

Census data from early 19th century Egypt show that, compared to Muslims, Christians enjoyed lower mortality rates, including infant and child mortality (Courbage and Fargues 1997). During the 1980s and early 1990s, childhood mortality was still relatively high, for example under-five rates ranged between 160-110 deaths per 1000 births (El-Zanaty and Way 2009). Three DHS surveys from that period recorded the religion of the respondents, thereby enabling estimates of religious gaps. They point to elevated childhood mortality among Christians. This estimated Christian-Muslim gap is consistent with previous reports based on the 1980 WFS (Adlakha et al. 1983). As mortality has dramatically declined among both Christians and Muslims, as shown in the 2005 and 2008 DHS surveys, so too has the absolute Christian-Muslim mortality gap.

Previous research has posited three central explanations for ethnic-religious gaps in health and mortality: socioeconomic status, regional distribution, and cultural differences. This study tests the first and second hypotheses with regard to the Christian-Muslim mortality gap.

Socioeconomic differences between Christians and Muslims are not the likely cause of the observed mortality difference. In fact, according to the socioeconomic indicators used in this study, Christians are expected to have lower mortality rates than Muslims. Similar reasoning applies to high urban concentration of Copts, which also predicts lower relative mortality among this group. Yet the Christian mortality disadvantage prevails irrespective of this group's socioeconomic advantage. These findings are at odds with many findings demonstrating the significance of socioeconomic status and urban concentration to ethnic-religious mortality gaps (United Nations 1985; Brockerhoff and Hewett 2000).

The results indicate that differences in the regional distributions of Christians and Muslims positively contributed to the mortality gap during the 1980s and early 1990s. The majority of Christians resided in Upper Egypt where under-five mortality rates were considerably higher than in other regions. However, the results show that only part of the excess Christian mortality can be explained by this group's higher concentration in Upper Egypt. Restriction of the analysis to Upper Egypt, which rules out the regional effect without accounting for socioeconomic differences, shows that Christians continue to show higher mortality relative to Muslims. In other words, the majority of Christians reside in a region characterized by high levels of child mortality and in this region, they have elevated child mortality relative to the Muslim population despite. This result is puzzling given that Christians have enjoyed higher socioeconomic status, as well as greater urban residence not only at the national level, but also within Upper Egypt.

Because regional differences only partially account for the Christian-Muslim mortality gap (and socioeconomic differences are not part of the explanation), one may posit cultural differences as a possible cause of the observed mortality gap. It is important to mention, however, that this study did not test for cultural differences between the two groups and cannot provide empirical evidence regarding the possible contribution of cultural differences to

the studied mortality gap. Previous research that has explored cultural differences as a factor in regional mortality differences points to "stronger persistence in Upper Egypt of practices that affect detrimentally the health of the mother and child during pregnancy, at delivery, and during early infancy. Of particular relevance would be avoidance of pre- and postnatal care provided by midwives-nurses with modern training, the cutting of the umbilical cord with unsanitary implements, potentially harmful postnatal practices (e.g., the practice of not washing the newborn for at least 7 days), and a host of behaviors grounded in traditional theories of illness ..." (Casterline et al. 1989 :30). While these factors may explain higher mortality in Upper Egypt, no evidence is provided to suggest that such practices are more prevalent among one religious group than another.

Between 1988-95 and 2005-08, a drastic decline in infant and child mortality is witnessed at the national level. Many attribute this decline to the National Control of Diarrheal Disease Project (1980-91) (El-Rafie et al. 1990), though others have demonstrated that diarrhea remained a leading cause of death among infants and children (Langsten and Hill 1995; Yassin 2000). Absolute and relative mortality differentials—including regional and religious gaps—declined as well. A significant Christian-Muslim gap during the 1980s and 1990s nearly disappeared in 2005-08. Over the same period, maternal education increased for Christians and Muslims, albeit with higher increases among Muslims. These trends reduced the relative socioeconomic advantages of Copt mothers. On the other hand, changes in the regional distribution of the two groups are less remarkable. That is, Christians' regional concentration disadvantage and urban residence advantage both persist. A balancing effect in the contribution of these opposing factors likely explains the absence of a sizable gap.

This study documents a mortality gap not mentioned in the literature of ethnic-religious mortality gaps. It concludes that the central mortality disadvantage of Christians stems from their relatively higher concentration in Upper Egypt. However, this disadvantage cannot explain the total mortality gap—there are likely additional contributing factors.

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